



CITY OF GREENVILLE  
BICYCLE MASTER PLAN



# Acknowledgements

The City of Greenville, SC is grateful for the support it received in the development of its Bicycle Master Plan. This plan would not have been possible without the efforts and input of Greenville's residents, the City Council and the Greenville City Manager John Castile, the Greenville-Pickens Area Transportation Study (GPATS) Policy and Technical Committee, South Carolina Department of Transportation (SCDOT) District 3, the volunteers who assisted with the bicycle count, and the Bicycle Master Plan Planning Advisory Committee.

## Bicycle Master Plan – Planning Advisory Committee

Alan Smith – Downtown Real Estate Developer  
Andrew Meeker – City of Greenville, Project Manager  
Brian Graham – City of Greenville, Greenway Planner  
Dana Souza – City of Greenville, Director of Parks and Recreation  
Elise Dunbar – Bikeville and Heritage Neighborhood President  
Greg Baney – Greenlink Transit Planner/Grants Manager  
Sergeant Jeff Long – Greenville Police Department  
Jennifer Rigby – City of Greenville, Development Manager  
Keith Brockington – GPATS, Transportation Planner  
MD Nelson – Greenville Police Department, Corporal  
Nancy Fitzer – Upstate Forever, Education Director  
Ronnie Hyatt – Bon Secours St. Francis Health System SVP/CFO  
Scott McCrary – Greenville Spinners Advocacy Chair  
Stacy Ashmore – Greenville Family Partnership  
Stephen Edgerton – Caine Company, Chief Operating Officer  
Will Ravenhorst – City of Greenville, Assistant City Engineer  
Yvonne Reeder – Nicholtown Neighborhood President

## Consulting Team



*In association with: Fuss & O'Neill, Darrohn Engineering, and DNA Creative Communications*



# Contents

0.	City Council Adoption Resolution & Executive Summary .....	0-0
1.	Introduction .....	1-1
1.1.	Vision of the Plan.....	1-1
1.2.	Becoming a Bicycle Friendly Community .....	1-2
1.3.	Bicycle Master Plan Process.....	1-2
1.4.	Setting and Study Area.....	1-3
1.5.	Benefits of Bicycling.....	1-6
1.6.	Overview of the Plan.....	1-8
2.	Vision, Goals, Objectives, and Policies.....	2-1
2.1.	Vision.....	2-1
2.2.	Goals and Objectives .....	2-2
2.3.	Existing City Goals and Policies.....	2-10
3.	Existing Conditions.....	3-1
3.1.	Existing Bicycle Facilities and Programs .....	3-1
3.2.	Existing Bicycling Conditions.....	3-10
4.	Needs Analysis.....	4-1
4.1.	Bicycle Count .....	4-1
4.2.	Bicycle Collision and Safety Analysis .....	4-8
4.3.	Current and Future Bicycle Demand .....	4-19
4.4.	Community Identified Needs .....	4-28
5.	Non-Infrastructure Recommendations .....	5-1
5.1.	Existing Program Resources.....	5-1
5.2.	Program Recommendations.....	5-3
5.3.	Policy Recommendations .....	5-19
6.	Design Guidelines .....	6-1
6.1.	The Bicycle as a Design Consideration .....	6-5
6.2.	Routine Accommodation of Bicyclists (Complete Streets).....	6-8
	<i>On-Street Facility Design Guidelines</i> .....	6-12
	<i>On Street Bikeway Continuum</i> .....	6-14
	<i>Shared Roadways</i> .....	6-15

<i>Bike Lanes</i> .....	6-18
<i>Separated Bikeways</i> .....	6-30
<i>Bicycle Boulevards/“Neighborhood Greenways”</i> .....	6-35
<i>General Intersection Design Guidelines</i> .....	6-45
<i>Bicycle Parking</i> .....	6-52
<b>7. Proposed Network Improvements</b> .....	<b>7-1</b>
7.1. Network Improvements .....	7-1
<b>8. Project Prioritization and Implementation</b> .....	<b>8-1</b>
8.1 Infrastructure Improvement Prioritization.....	8-3
8.2 Infrastructure Improvement Cost Options.....	8-20
8.3 Bicycle Facility Maintenance.....	8-22
8.4 Bikeway Maintenance Policy Recommendations.....	8-23
8.5 Non Infrastructure Improvement Prioritization.....	8-24
8.6 Non Infrastructure Improvement Implementation.....	8-26
<b>A. Appendix A: Summary of Existing Plans</b> .....	<b>A-1</b>
<b>B. Appendix B: Bicycle Friendly Community Action Plan</b> .....	<b>B-1</b>
B.1. Overview .....	B-1
B.2. The Five E’s.....	B-2
B.3. Next Steps.....	B-20
<b>C. Appendix C: Public Outreach Summary</b> .....	<b>C-1</b>
C.1. Advisory Committee.....	C-1
C.2. Stakeholder Interviews.....	C-1
C.3. Online Survey .....	C-3
C.4. Online Publicity.....	C-7
C.5. Public Workshops .....	C-7
C.6. Project Flyers & Newsletters .....	C-12
<b>D. Appendix D: Funding</b> .....	<b>D-1</b>
D.1. Federally-Administered Funding .....	D-1
D.2. State-Administered Funding .....	D-2
D.3. Locally-Administered Funding .....	D-6
D.4. Other Sources.....	D-8

E.	Appendix E: Sample and Supporting Documents .....	E-1
F.	Appendix F: Streetplan Results Table .....	F-1
G.	Appendix G: Prioritization and Implementation with Cost Estimates .....	G-1
	G.1. Infrastructure Improvement Cost Options .....	G-1
H.	Appendix H: Cycle Zone Analysis Tech Memo .....	H-1

A RESOLUTION

TO ADOPT IN PRINCIPLE A BICYCLE MASTER PLAN

WHEREAS, the city of Greenville contracted with Alta Planning + Design to develop a city-wide Bicycle Master Plan, which includes recommendations to guide the expansion of a network of interconnected bicycle facilities and infrastructure improvements and to promote bicycle safety and education to increase ridership; and

WHEREAS, in 2006, Greenville City Council passed Resolution 2006-32, an "Action Plan for a Bicycle Friendly Community Designation", which recommended the City implement a series of initiatives to improve the conditions for bicyclists; and

WHEREAS, in 2008, Greenville City Council passed Resolution 2008-49, a "Complete Street Resolution to support a policy to provide safe and convenient access for all users of streets"; and

WHEREAS, the development of a Bicycle Infrastructure Plan was a specific Implementation Strategy listed in the City's Comprehensive Plan, which was adopted by Greenville City Council on May 26, 2009; and

WHEREAS, the Bicycle Master Plan's development was guided by a multi-disciplinary committee which served as planning advisors throughout the project; and

WHEREAS, the project provided neighborhood associations, businesses, residents, transportation officials, and the general public an opportunity to participate in two community workshops and a public survey, through which input and comments were received; and

WHEREAS, the Bicycle Master Plan provides a method for prioritizing bikeway projects that will guide future development and funding and serve as a resource for improving the safety and transportation options for the residents and visitors of Greenville; and

WHEREAS, specific projects and initiatives recommended in the Bicycle Master Plan will receive additional review by City Council, City staff, the general public and SCDOT prior to construction; and

WHEREAS, the Planning Commission, on July 14, 2011, passed a resolution supporting the adoption and incorporation of the Bicycle Master Plan into the City's Comprehensive Plan; and

WHEREAS, City Council finds the proposed Master Plan worthy of adoption in principle, but it is detailed for purposes of incorporation into the Comprehensive Plan, and prefers adopting it in principle so that it can more easily be improved upon with continuing input from users and others affected by it;

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE

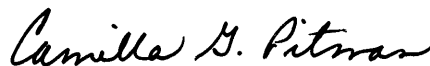
CITY OF GREENVILLE, SOUTH CAROLINA that the Bicycle Master Plan prepared by Alta+Planning and presented to the Planning Commission is adopted in principle and that the City Manager and staff continue evaluating effective means of implementation.

RESOLVED THIS 26 DAY OF September, 2011.



\_\_\_\_\_  
MAYOR

Attest:



\_\_\_\_\_  
CITY CLERK



## Becoming a Bicycle Friendly Community

The City of Greenville, South Carolina is well known for bicycling due to a growing number of educational programs, events, and a network of bicycle lanes, greenways, and other facilities.

- 2005: **First bike lane** in Greenville
- 2005: First **bicycle network concept plan**
- 2006: **Swamp Rabbit Trail** opens in Greenville; Council adopts **action plan for becoming a Bicycle Friendly Community (BFC)**
- 2007: Council adopts **Trails & Greenways Master Plan**
- 2008: Council adopts **Complete Streets** resolution
- 2009: National designation as **Bronze BFC**
- **Since 2005:** 4+ new bike shops and increasing sales at all shops (up to 20%)



## Bicycle Master Plan Process

In 2010, the City of Greenville received a grant from the Greenville Pickens Area Transportation Study (GPATS) to develop a Bicycle Master Plan. This Plan was developed with extensive input from the public and key partners in making Greenville bicycle-friendly, including SCDOT, the Greenville Police Department, and local bike industry entrepreneurs. Public Outreach for the Plan included:

- City Council-nominated Plan Advisory Committee
- Two Public Meetings (over 200 attendees)
- Public Survey (690 responses)
- Project Website with Interactive Map
- Press releases
- Project Newsletters
- Bikeville e-newsletter

## Vision of the Plan

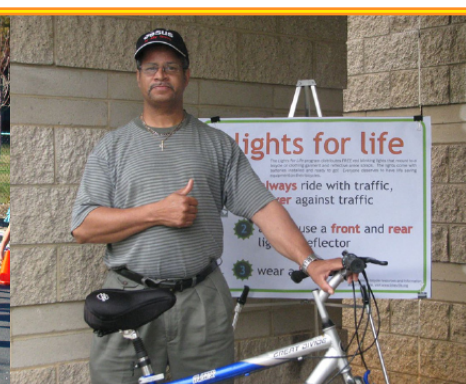
The vision of this Bicycle Master Plan is to expand the existing bikeway network, complete network gaps, and provide greater connectivity while educating and encouraging bicycling. The Plan takes a comprehensive approach to the Six E's of a Bicycle Friendly Community – Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity.

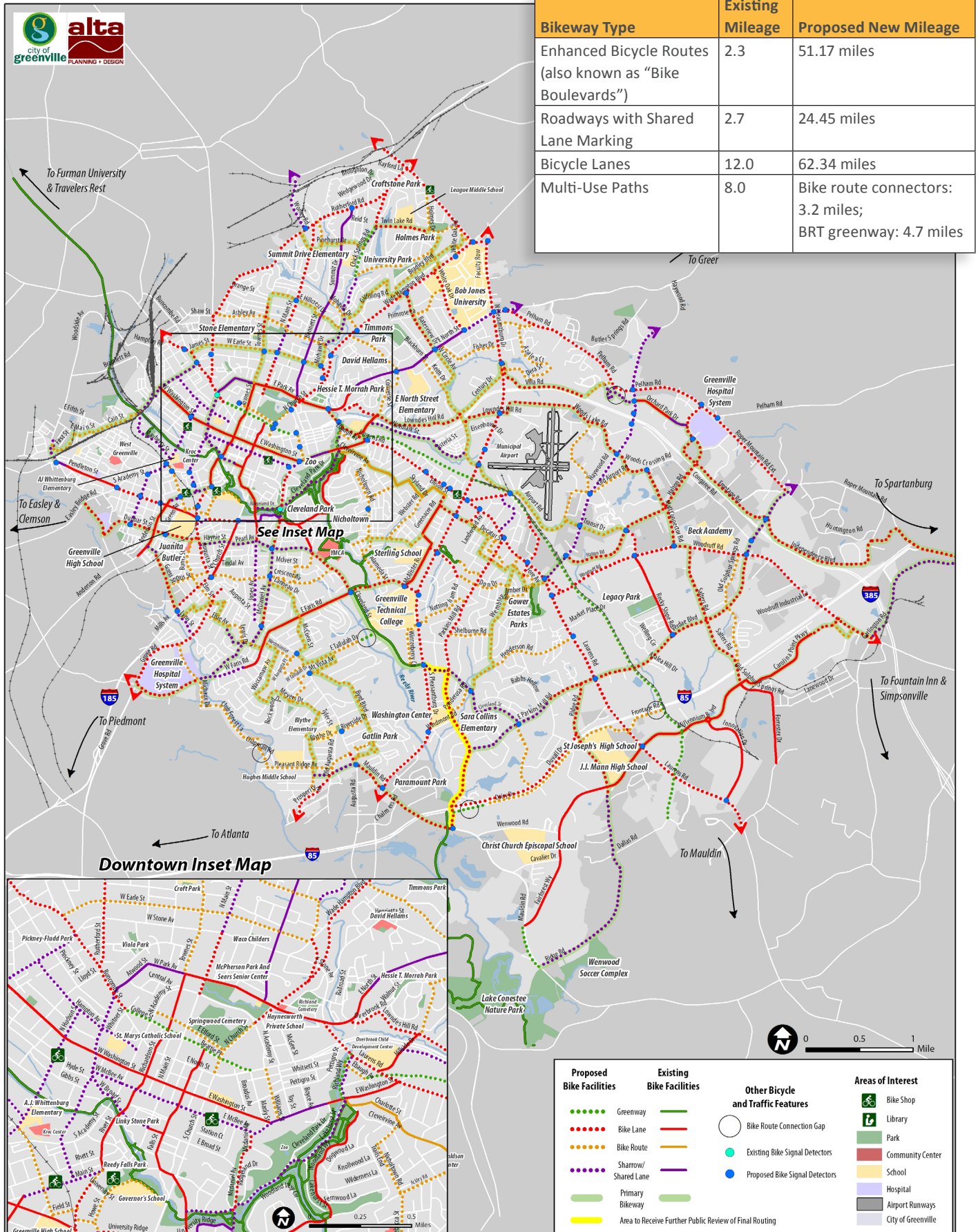
## Existing Conditions & Needs Analysis

The existing conditions and needs analysis sections of the plan include analysis of bicycle crash trends, bikeway suitability analysis of existing roadways, a bikeability rating of the city's various zones, bicycle counts, and analysis of public input. Augusta and Laurens were the top corridors for reported bicycle crashes during the period of 2005-2010. Augusta Street, Laurens Road, and Pleasantburg Road were also indicated by public survey participants as the highest priority corridors for improved bicycling conditions. High traffic volume, high speed roads such as these are the least comfortable for cyclists according to the Plan's bicycle suitability analysis. These corridors also provide major barriers for cyclist movement across the city. An analysis of cycling conditions (Cycle Zone Analysis) based on connectivity, existing bikeways, barriers, and destinations in various areas of the city reveals that downtown and the areas immediately south and east (generally north of Augusta and Faris) are the most bikeable.

The plan process also included a sample count of bicyclists at 36 locations around the City. Key results of Greenville's bicycle count show that:

- The majority of the bicyclists counted were male (76%).
- Bicycling is more common on the weekend than weekdays.
- The most popular areas for bicycling are near Willard Street, at the Swamp Rabbit Trail, and McDaniel Avenue at Ridgeland Street, at Cleveland Park.







**Engineering:** *An inviting network of bicycling facilities for cyclists of all ages and abilities and destinations that support bicycling*

### Proposed Bikeway Network Improvements

The bikeway recommendations include the long-term development of nearly 140 miles of new on-street bikeways (including bike lanes, bike routes, and shared lane markings). Pavement markings and signage will support the bikeway network by providing network identification and wayfinding for cyclists.

The proposed network map on the facing page shows the existing and proposed bikeway network.

**Primary Bike Routes:** In addition to the bikeway recommendations for specific roadways and greenways, the Plan includes an overlay of recommended cross-town bike routes that will eventually provide a continuous network of connected bike facilities parallel to major roadways and/or connecting major areas of the city.

**Bicycle Detection at Traffic Signals:** The plan recommends bicycle detection at all actuated intersections along existing and proposed bikeways.

**Corridor Design Recommendations:** Comprehensive corridor design solutions are recommended for Greenville's major arterials, including access management, land use policies to facilitate more bicycle- and pedestrian-friendly development patterns, connectivity improvements to pro-

vide additional parallel route options, urban street design, and speed reduction measures for motor vehicle travel.

**Design Guidelines:** The plan establishes standards and best practices for implementation of bikeway facilities and other infrastructure improvements.

### Non-infrastructure Recommendations

Of the six E's of bicycle planning, five are closely related to non-infrastructure policies and programs: education, encouragement, enforcement, evaluation, and equity. The existing bicycling culture of the City offers a strong foundation on which to build new programs. The following are the Plan's vision statements for the non-infrastructure E's. Specific action-oriented goals and objectives are included in the plan for each E.

**Education:** *Community understanding and respect for the roles and responsibilities of cyclists*

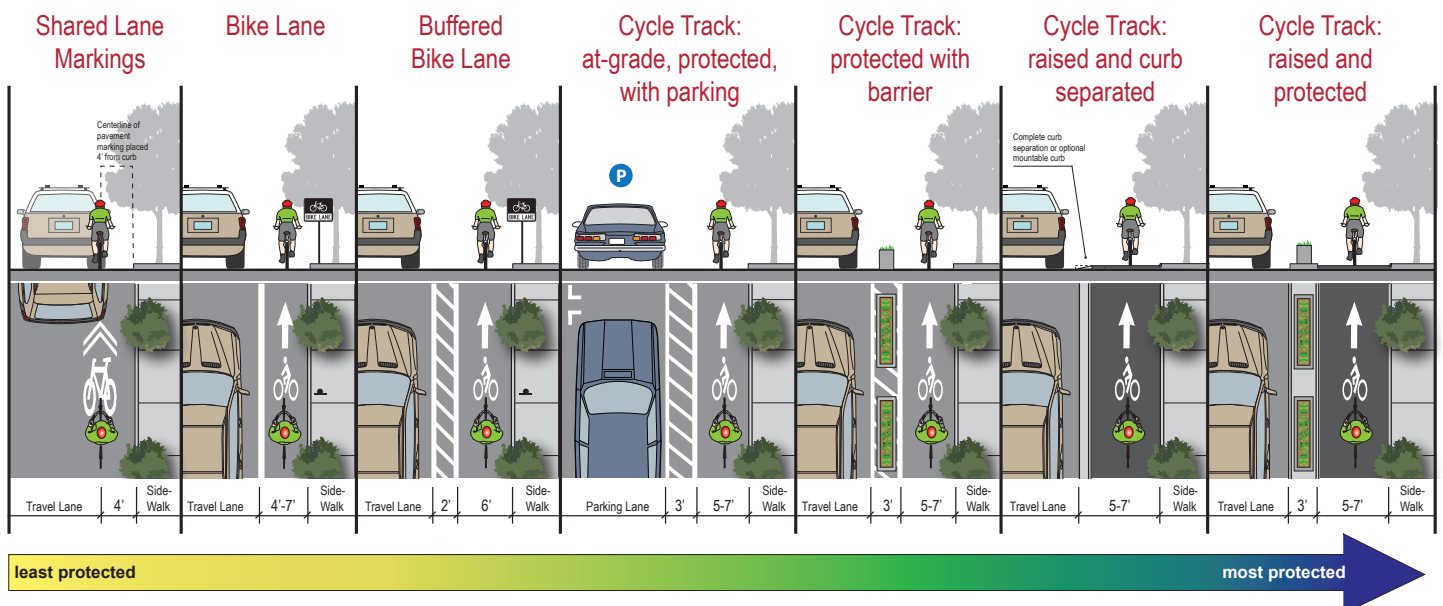
**Encouragement:** *Increased bicycle ridership and support for a strong bicycle advocacy community and bicycle culture*

**Enforcement:** *A safer environment for cyclists and other transport modes*

**Evaluation & Planning:** *Institutional support and collaboration for bicycling*

**Equity:** *A community that serves a diverse population of bicyclists and provides for the needs of those who ride out of necessity, as well as those who choose to cycle*

## On-Street Marked Bikeway Continuum



## Implementation

The Plan's implementation strategy includes several policy and program recommendations and also includes a prioritization ranking matrix and cost estimates for proposed projects.

**Cost Estimates:** Cost estimates for bikeway facilities are based on cost opinions provided by the City of Greenville.

Facility	Cost	Materials	Additional Costs*
Multi-use Path (per mile)	\$800,000	Construction, signing	30%
Bike Lanes: restriping + retrofitting (per mile)	\$15,000	Striping and signing	20%
Bike Lanes w/ resurfacing project (per mile)	\$8,000	Striping and signing	20%
Bike Lane: widening (per mile; minimum)	\$250,000	Roadway widening	40%
Bike Lane: widening, no curb (per mile)	\$28,000	Asphalt, striping, signing	20%
Bike Route (per mile)	\$2,000	Signing	15%
Bike route marking (per mile)	\$2,600	Pavement stamp	15%
Shared Lane Marking (per mile)	\$6,500	Signing, markings	15%
Inverted U Bicycle Rack (ea)	\$200	Rack	15%
Share the Road Signs (ea)	\$100	Signs, posts	15%
Bike Route Marking	\$50	Stencils (52 per mile)	15%
Shared Lane Marking (ea)	\$200	Stencils (20 per mile)	15%
Wayfinding/ Destination Sign (ea)	\$150	Signs, posts	15%
Loop Detectors (two)	\$1,500	Detector, stencil, labor	\$300 for calibration only
Colored bike lane (per sq. ft.)	\$4.50	Thermoplastic	15%
Traffic circles	\$40,000	Concrete curb, landscaping	15%
Diverter	\$15,600 - \$40,000	Concrete curb, landscaping	15%
* Planning and engineering; environmental; contingency			

## Bikeway Prioritization

The plan suggests a prioritization methodology for recommended bikeways based on a weighted scoring system for the following factors:

- Safety Needs/Crash History
- School Access
- Transit Access
- Connectivity to Existing Bikeways
- Gaps in Existing Bikeway Network
- Destinations for Bicyclists
- Cycle Zone Analysis (identifying potential for bicycling activity)
- Ease of Implementation
- Primary Bike Route Continuity
- Special Emphasis Neighborhoods

## Recommended near-term implementation steps:

1.) Institutionalize the City's Bicycle Friendly Community goals:

Hire or formally appoint a City staff person as bicycle coordinator.

Infuse all City departments with the responsibility that bicycle accommodations and safety is a priority for the City.

Fund capital projects related to bikeways.

2.) Grow the population of bicyclists:

Expand the Swamp Rabbit Trail and continue to improve the trail's safety and appeal where needed.

Create a robust encouragement program of Safe Routes to School, car-free events, and individualized marketing activities.

Engage residents on proposed projects at a community and neighborhood level

Support local efforts to open a bike station and launch a bike share system

3.) Implement the highest priority items within each of the six E's:

Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity

For additional information visit [www.bikeville.org/masterplan](http://www.bikeville.org/masterplan) or email [bikeville@greenvillesc.gov](mailto:bikeville@greenvillesc.gov) or phone 864-467-4355



This project was made possible by funding from GPATS and the City of Greenville

in association with: Fuss & O'Neill, Darrohn Engineering, and DNA Creative Communications

# 1. Introduction

The City of Greenville's Bicycle Master Plan is intended to serve as the guiding document for development of an integrated network of bicycle facilities and supporting programs, linking neighborhoods and activity centers throughout the City. The network will not only make bicycling a more viable mode of transportation, but will contribute to an enhanced quality of life for residents and visitors.

In development of the City's Comprehensive Plan, *Plan-it Greenville*, as well as many other previous local and regional planning efforts, residents and stakeholders have indicated a strong interest in the development of facilities and programs that support bicycling for recreation and transportation. The recommendations in this Plan will help reach goals adopted in the City's Comprehensive Plan, *Plan It Greenville* ( 2009), as well Greenville's *Trails and Greenways Master Plan* (2007), GPATS' *2030 Long Range Transportation Plan* (2005), and other plans and policies adopted by the City and regional partners, by creating an environment and programs that support bicycling for transportation and recreation, encourage fewer trips by car, and support active lifestyles.



One purpose of the Bicycle Master Plan is to expand the existing bicycle network in Greenville.

This Plan includes a city-wide evaluation of the existing roadway network of streets to identify opportunities for an interconnected network of bicycle facilities, the development of a bike route system, and a detailed implementation and budget plan. The Plan identifies optimal bicycling routes, preferred treatments, design guidelines and current best practices, and serves as an important reference document that will ensure that bicycle facilities are considered during routine road maintenance, reconstruction, construction, and land development. It also provides recommendations for programs and policies that will support bicycling, which will enable Greenville to be recognized as one of the most bicycle-friendly cities in the country.

This Plan was developed with extensive input from the community and seeks to meet Greenville's vision for a pleasant, enjoyable, and safe place to bicycle. The diligent efforts of the City of Greenville staff, the Bicycle Plan Advisory Committee, and residents interested in improving the bicycle environment in the City have provided the basis for recommendations in this document.

## 1.1. Vision of the Plan

The vision of this Bicycle Master Plan is to expand the existing bikeway network, complete network gaps, provide greater connectivity while educating and encouraging bicycling. This Plan provides a broad vision, strategies, and actions for the improvement of the bicycling environment in Greenville. It envisions a bicycling environment in the year 2020 that takes a comprehensive approach to the Six Es of a Bicycle Friendly Community – Education, Enforcement, Engineering, Encouragement, Evaluation, and Equity – by establishing the following vision elements:



1. **Engineering:** An inviting network of bicycling facilities for cyclists of all ages and abilities and destinations that support bicycling
2. **Education:** Community understanding and respect for the roles and responsibilities of cyclists
3. **Encouragement:** Increased bicycle ridership and support for a strong bicycle advocacy community and bicycle culture
4. **Enforcement:** A safer environment for cyclists and other transport modes
5. **Evaluation & Planning:** Institutional support and collaboration for bicycling
6. **Equity:** A community that serves a diverse population of bicyclists and provides for the needs of those who ride out of necessity, as well as those who choose to cycle

In Chapter 2, the Plan outlines associated goals and objectives in each of the Six Es to achieve this vision. One of the key objectives is that Greenville will achieve silver-level recognition as a Bicycle Friendly Community (BFC) by 2013.

## 1.2. Becoming a Bicycle Friendly Community

The City of Greenville, South Carolina is well known for bicycling, in part because of the long history of elite and professional level bicycle racing that has put a spotlight on the city, but also due to a growing number of educational programs, events, and a network of bicycle lanes, greenways, and other facilities that enabled the League of American Bicyclists (LAB) to designate the city as a 'bronze' level Bicycle Friendly Community in October of 2009. In 2008, following a Bicycle Friendly Community Workshop hosted by city staff, the Palmetto Cycling Coalition, and the LAB, a coalition of local bicycle advocates created the informal organization of Bikeville. Its mission is to serve as a volunteer organization to assist the City in its effort to become a designated BFC. Bikeville led the BFC initiative by implementing an action plan based on the League's BFC application. Since receiving a 'bronze' designation in 2009, Bikeville has been active in implementing the feedback provided by the LAB, including the development of this plan. The Bikeville.org website serves as a community resource by providing essential resources to new and existing bicyclists.



*Greenville has adopted the name 'Bikeville' because of its efforts in making the City bicycle friendly.*

The League of American Bicyclists manages the Bicycle Friendly Community program, which provides incentives, hands-on assistance, and award recognition for communities that actively support bicycling. A BFC welcomes cyclists by providing safe accommodation for cycling and encouraging people to bike for transportation and recreation.<sup>1</sup> A City is designated a Bicycle Friendly Community by showing progress in their five Es: Engineering, Education, Encouragement, Enforcement, and Evaluation/Planning (for purposes of the national Bicycle Friendly Community program, the sixth E, Equity, is incorporated into the other Es).

An integral part of this Plan's effort is a Bicycle Friendly Community Action Plan (see Appendix B), which outlines a strategy for the implementation of the programs

---

<sup>1</sup> <http://www.bikeleague.org/programs/bicyclefriendlyamerica/communities>

and policies laid out in the Bicycle Master Plan (BMP) while targeting the goal of achieving the Silver, Gold and ultimately Platinum Levels of Bicycle Friendly Community (BFC) recognition, furthering Greenville's reputation as 'Bikeville'.

### 1.3. Bicycle Master Plan Process

The City of Greenville received a grant from the Greenville Pickens Area Transportation Study (GPATS) in 2010 to develop a Bicycle Master Plan and plan development began in September, 2010. In November, the City hosted a public workshop to solicit insights and priorities from the public. Ninety-one people representing a broad cross-section of the region attended. A second public meeting was held in March, 2011 to present the draft plan recommendations. Over 100 people attended, 60% of whom had not attended the first public meeting.

The City also invited public comment through an online survey. 690 people responded, 60 percent of whom were residents of Greenville. (The remaining 40 percent were residents of the Greenville region.) Survey respondents provided feedback, including on which corridors there should be bicycle improvements, types of programs they would like to see implemented, and which facilities would influence them to ride more.

Those interested in the Bicycle Master Plan also could elect to receive E-newsletters to stay up-to-date on the Plan or visit the Bicycle Master Plan website, which included an interactive map on which they could submit their ideas for improvements.

### 1.4. Setting and Study Area

The City of Greenville has a population of 58,409 as of the 2010 U.S. Census.<sup>2</sup> It is the sixth largest city in South Carolina and the largest city in the Greenville-Spartanburg-Anderson Metropolitan Area. The City of Greenville is located in Greenville County, near its center, and is surrounded almost entirely by unincorporated Greenville County. In recent decades, City population has shown modest growth. Population is expected to grow in Greenville by about 11.5 percent per decade, creating a population of about 77,600 in 2030.<sup>3</sup>

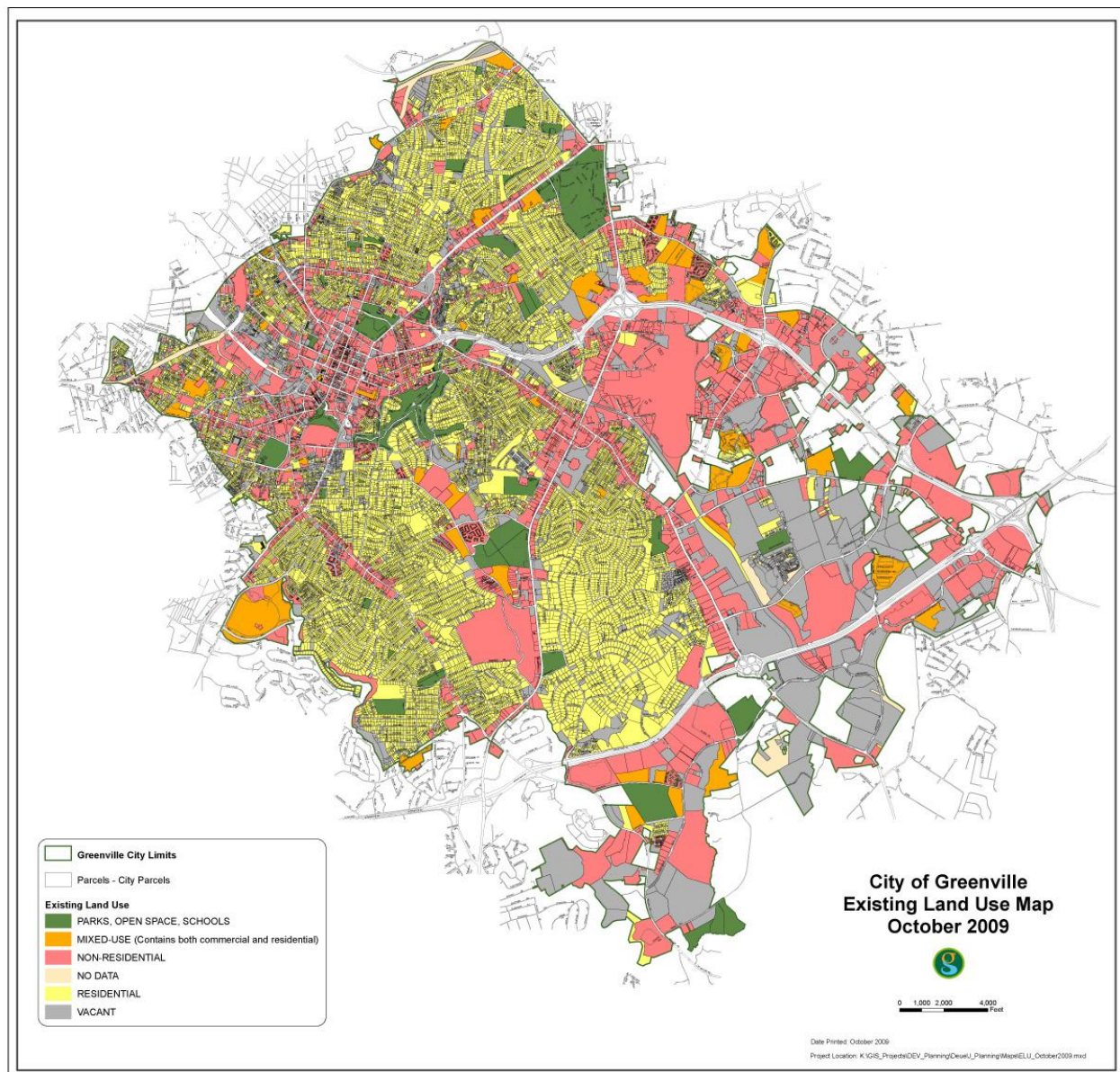


*The Swamp Rabbit Trail is the centerpiece of the City's bicycle network.*

<sup>2</sup> US Census, [uscensus.gov](http://uscensus.gov)

<sup>3</sup> City of Greenville Comprehensive Master Plan

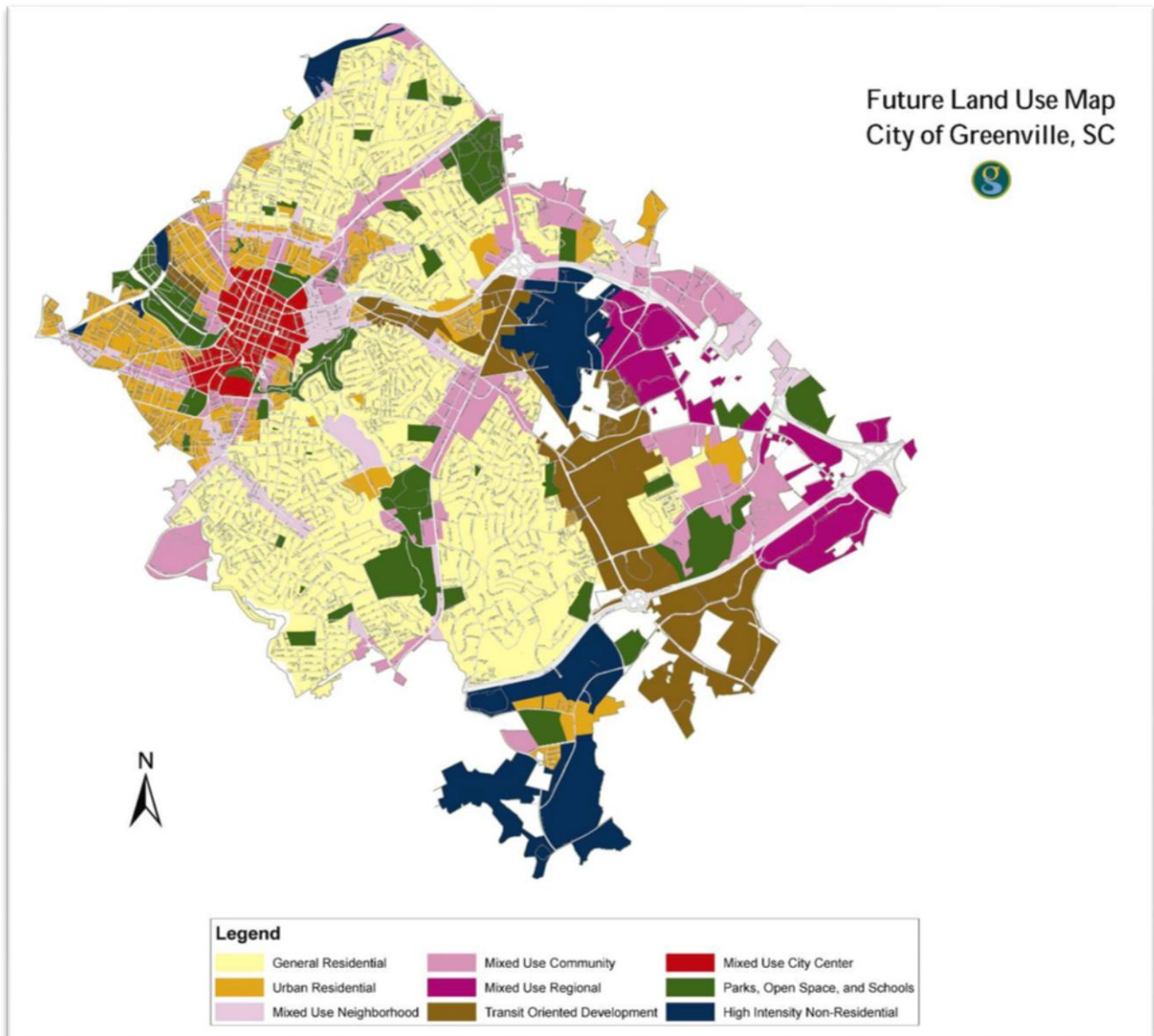
Figure 1-1 represents Greenville's existing land use map. The majority of Greenville's land area consists of low-density residential uses. Offices and commercial uses are concentrated downtown and along major corridors, such as Laurens Road and Pleasantburg Drive. Parks and mixed-use developments are located throughout the City. The City is home to developing employment and residential areas along the I-85 corridor including the renowned International Center for Automotive Research (ICAR) campus and related businesses.



*Figure 1-1: Greenville Existing Land Use Map*  
*Source: City of Greenville*



Figure 1-2 displays Greenville's future land use map. In the coming years, the City of Greenville intends to increase its proportion of mixed-use and transit-oriented developments, as well as increase its urban residential uses.



*Figure 1-2: Greenville Future Land Use Map*  
Source: City of Greenville Comprehensive Plan

The City of Greenville is accessible by several highways and both regional and local transit. Interstate Highway 85 runs east-west, connecting Greenville to nearby major cities, including Atlanta, Georgia, and Charlotte, North Carolina. Interstate Highway 385 runs south from the center of Greenville, connecting the City via Interstate Highway 26 to Columbia and Charleston, South Carolina.

Approximately 1 percent of Greenville residents use public transit.<sup>4</sup> The City operates the county-wide Greenville Transit Authority (GTA) bus service, named Greenlink, which has 12 routes throughout the City. All buses are equipped with bicycle racks and Bikeville created an informational video on how to use the racks on its website ([www.bikeville.org](http://www.bikeville.org)).



*Greenlink buses are equipped with bicycle racks to expand access and mobility for local cyclists.*

## 1.5. Benefits of Bicycling

Planning to create a more bicycle friendly city contributes to resolving several complex and interrelated issues, including, economic development, traffic congestion, air quality, public health, and livability. By guiding policies and infrastructure investment toward bicycle friendly development, this plan can affect all of these issue areas, which collectively can have a profound influence on the existing and future quality of life in Greenville.

### 1.5.1. Environmental Benefits

Replacing vehicular trips with bicycle trips has a measurable impact on reducing human-generated greenhouse gases (GHGs) in the atmosphere that contribute to climate change. Fewer vehicle trips and vehicle miles traveled (VMT) translates into fewer mobile source pollutants, such as carbon dioxide, nitrogen oxides and hydrocarbons, being released into the air. Providing transportation options that reduce VMT is an important component of decreasing greenhouse gas emissions and improving air quality. Chapter 4 outlines the estimated air quality impacts of improved bicycling in Greenville.



*Cities that support bicycling experience many benefits, including economic, safety, and air quality benefits.*

### 1.5.2. Public Health Benefits

Public health professionals have become increasingly aware that the impacts of automobiles on public health extend far beyond asthma and other respiratory conditions caused by air pollution. There is a much deeper understanding of the connection between the lack of physical activity resulting from auto-oriented community designs and various health-related problems, such as obesity and other chronic diseases. Although diet and genetic predisposition contribute to these conditions, physical inactivity is now widely understood

<sup>4</sup>American Community Survey, United States Census, 2006-2008.



to play a significant role in the most common chronic diseases in the U.S., including heart disease, stroke, and diabetes.

According to the LiveWell Greenville Community Action Plan, about 40% of Greenville County adults fall well below recommended levels of physical activity, and 15% are completely inactive. As a result, approximately 65% of adults and more than 40% of children in Greenville County are overweight or obese. Numerous chronic diseases are correlated to lack of physical activity and obesity. In Greenville, rates of diabetes, heart disease and asthma are rising.<sup>5</sup> Creating bicycle-friendly communities is one of several effective ways to encourage active lifestyles, ideally resulting in a higher proportion of Greenville's residents achieving recommended activity levels.

### 1.5.3. Economic Benefits

Bicycling is economically advantageous to individuals and communities. Cost savings associated with bicycle travel expenses are accompanied by potential savings in health care costs. On a community scale, bicycle infrastructure projects are generally far less expensive than automobile-related infrastructure. Further, shifting a greater share of daily trips to bike trips reduces the impact on the region's transportation system, thus reducing the need for improvements and expansion projects. Studies have also shown that the overall contribution of bicycling to the economy is significant. A 2006 study conducted by the Wisconsin Department of Transportation and the Bicycle Federation of Wisconsin estimates that the bicycle-related sector contributes \$556 million to the Wisconsin economy annually<sup>6</sup>. This estimate does not include the economic benefits derived from bicycle tourism, which is reported to constitute a significant portion of the state's \$11.7 billion in the tourism sector. The 2008 value of the bicycle-related economy in Portland, Oregon – the first major city to achieve Platinum BFC status – was estimated to be \$90 million, representing a 38 percent increase over 2006.<sup>7</sup>

### 1.5.4. Community/Quality of Life Benefits

Fostering conditions where bicycling is accepted and encouraged increases a city's livability from a number of different perspectives, that are often difficult to measure but nevertheless important. The design, land use patterns, and transportation systems that comprise the built environment have a profound impact on quality of life issues. Studies have found that people living in communities with built environments that promote bicycling and walking tend to be more socially active, civically engaged, and are more likely to know their neighbors.<sup>8,9</sup> Settings where walking and riding bicycles are viable also offer greater independence to the elderly, the disabled, and people of limited economic means who are unable to drive automobiles for physical or economic reasons. The aesthetic quality of a community also improves when visual and noise pollution caused by automobiles is reduced and when green space is reserved for facilities that enable people of all ages to recreate and commute in pleasant settings.

<sup>5</sup> LiveWell Greenville. (2010). [www.livewellgreenville.org](http://www.livewellgreenville.org) and the LiveWell Greenville *Community Action Plan*.

<sup>6</sup> "The Economic Impact of Bicycling in Wisconsin." Bicycle Federation of Wisconsin and WI DOT, 2006. <http://www.dot.wisconsin.gov/business/econdev/docs/impact-bicycling.pdf>

<sup>7</sup> "The Value of the Bicycle-Related Industry in Portland." Alta Planning + Design. 2008.

<sup>8</sup> Frumkin, H. 2002. *Urban Sprawl and Public Health*. Public Health Reports 117: 201–17.

<sup>9</sup> Leyden, K. 2003. "Social Capital and the Built Environment: The Importance of Walkable Neighborhoods." *American Journal of Public Health* 93: 1546–51.

### 1.5.5. Safety Benefits

Conflicts between bicyclists and motorists result from poor riding and/or driving behavior as well as insufficient or ineffective facility design. Encouraging development and redevelopment in which bicycle travel is fostered improves the overall safety of the roadway environment for all users. Well-designed bicycle facilities improve safety and security for current cyclists and also encourage more people to bike, which in turn, can further improve bicycling safety. Studies have shown that the frequency of bicycle collisions has an inverse relationship to bicycling rates – more people on bicycles equates to fewer crashes.<sup>10</sup> Providing information and educational opportunities about safe and lawful interactions between bicyclists and other roadway users also improves safety.

## 1.6. Overview of the Plan

The Greenville Bicycle Master Plan contains the following chapters:

- *Chapter 1 – Introduction:* Sets the context for the Plan, including purpose and structure.
- *Chapter 2 – Vision, Goals, Objectives, and Policies:* Summarizes the vision, goals, objectives, and policies guiding the implementation of the Plan.
- *Chapter 3 – Existing Conditions:* Provides a description of the existing bicycle conditions in the City of Greenville. The chapter includes a map of existing bikeways and descriptions of existing bicycle programs.
- *Chapter 4 – Needs Analysis:* this chapter reviews the relationship between bicycle activity, commute patterns, demographics, land use, and collisions. This chapter also includes a review of community input.
- *Chapter 5 – Recommendations:* Includes recommended network, signage and pavement marking, spot improvements, and program and policy recommendations.
- *Chapter 6 – Design Guidelines:* Establishes standards and best practices for implementation of bikeway facilities and other infrastructure improvements.
- *Chapter 7 – Implementation:* Outlines an implementation strategy, including cost estimates for proposed projects.

---

<sup>10</sup> Jacobsen, P. “Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling”. *Injury Prevention*, 9: 205-209. 2003.

## 2. Vision, Goals, Objectives, and Policies

### Introduction

This Plan lays out a framework for creating and expanding programs and improvements to increase bicycling in Greenville. The Vision, Goals, Objectives, and Policies of the City of Greenville Bicycle Master Plan are principles that guide the development and implementation of the City's bicycle network and programming for years to come. Goals and objectives are intended to direct decisions about where public improvements are made, where resources are allocated, how programs are operated, and how City priorities are determined.

This chapter identifies recommended vision elements, goals and objectives of Greenville's Bicycle Program. These goals are intended to support the City's existing vision and policy initiatives and describe the most important aspects of the City's programs, priorities, and attitudes.

### Recommended Vision, Goals, Objectives, and Policies

The infrastructure improvements and programs recommended in the City of Greenville Bicycle Master Plan will be shaped by the vision, goals, objectives, and policies which were developed by the Bicycle Plan Advisory Committee, public input, and existing City and regional policies and visions. A number of the recommended Bicycle Master Plan goals and objectives are drawn from and/or echo other City of Greenville and regional plans as well as feedback from the League of American Bicyclists (LAB) on Greenville's 2008 Bicycle Friendly Community application.

#### 2.1. Vision

The Bicycle Master Plan envisions a bicycling environment in the City of Greenville in year 2020 that takes a comprehensive approach to the Six Es of a Bicycle Friendly Community – Education, Enforcement, Engineering, Encouragement, Evaluation, and Equity – by establishing:

1. **Engineering:** An inviting network of bicycling facilities for cyclists of all ages and abilities and destinations that support bicycling
2. **Education:** Community understanding and respect for the roles and responsibilities of cyclists
3. **Encouragement:** Increased bicycle ridership and support for a strong bicycle advocacy community and bicycle culture
4. **Enforcement:** A safer environment for cyclists and other transport modes
5. **Evaluation & Planning:** Institutional support and collaboration for bicycling
6. **Equity:** A community that serves a diverse population and provides for the needs of those who ride out of necessity, as well as those who choose to cycle

## 2.2. Goals and Objectives

This plan will achieve the Vision by pursuing the following goals, and associated objectives:

### 2.2.1. Engineering

**Vision:** An Inviting Network of Bicycling Facilities for Cyclists of All Ages and Abilities and Destinations that Support Bicycling

**Goal 1:** New developments (both private and public) are designed to integrate with and include bike facilities.

Objective 1.1: Provide re-occurring continual education opportunities on the accommodation of cyclists to local planners and engineers.

Objective 1.2: Educate school district and schools about importance of integrating bicycle usage into design.

Objective 1.3: Integrate review of connectivity to other bicycle facilities as part of development review process.

**Goal 2:** Create and expand a complete and integrated network of bicycle facilities that is safe for all ages and abilities.

Objective 2.1: Increase the amount of bicycle facilities on arterial streets and on bridges.

Objective 2.2: Establish a bikeway network link within 1/2 mile of every resident by 2015.

Objective 2.3: Expand the “Bicycle Route” wayfinding signage program.

Objective 2.4: Create a dedicated maintenance plan for bicycle facilities that includes restriping/markings and scheduled street-sweeping of bicycle lanes and edge of asphalt/curb line on bicycle routes.

Objective 2.5: Install bicycle detection facilities at all critical signalized bikeway intersections.

Objective 2.6: Ensure that new and improved facilities to accommodate bicyclists conform to current best practices and guidelines provided by SCDOT and the AASHTO *Guide for the Development of Bicycle Facilities*. (LAB Feedback)

Objective 2.7: Ensure that every park and other major destinations are connected to bike facilities.

Objective 2.8: Install adequate, safe, and attractive bike storage facilities at important destinations.

**Goal 3:** Create safe and convenient linkages between popular destination and bikeways.

Objective 3.1: Integrate the on-street bikeway network with the greenway trail network.

Objective 3.2: Expand access points/trailheads/destinations within the bike network.

Objective 3.3: Expand wayfinding signage and pavement markings to direct bicyclists to the greenway trail network.

Objective 3.4: Install “2009 Bicycle Friendly Community” designation signage.

**Goal 4: Expand bicyclists' access and mobility through the integration of bicycling into the transit system.**

Objective 4.1: Provide bicycle parking at all transit shelters.

Objective 4.2: Coordinate planning with the Greenlink bus system to connect bus routes with bicycle facilities.

Objective 4.3: Implement the Downtown Bike Station concept that is proposed at the Greenlink Transit Station.

**Goal 5: Fully fund the implementation of the Bicycle Master Plan and Bike Program.**

Objective 5.1: Create a Bike Planner position with a focus on mobility and non-motorized transportation.

Objective 5.2: Partner with other governmental, non-profit, and private organizations to increase funding for staff and facilities.

Objective 5.3: Establish a dedicated funding source to fund the Bike Program.

Objective 5.4: Apply for national competitive grants.

**Goal 6: Improve technical engineering standards to improve conditions for bicyclists.**

Objective 6.1: Collaborate with the South Carolina Department of Transportation on an update of the roadway standards within the Engineering Directive Memo-22 (EDM-22).

Objective 6.2: Support the creation of a statewide Bicycle Advisory Committee sponsored by the SCDOT.

Objective 6.3: Advocate for SCDOT's compliance with their 2003 bicycle accommodations resolution.

Objective 6.4: Revise the City's Design and Specification Manual to provide greater flexibility and accommodation for bicycles. Provide acceptable ranges rather than set dimensions. Decrease parallel parking widths to 7', minimum travel lane widths on arterials and collectors to 10', and bicycle lane widths to 5-6'.

## **2.2.2. Education**

**Vision:** Community Understanding and Respect for the Roles and Responsibilities of Cyclists

**Goal 1: Establish safety training and accident reduction for entire community.**

Objective 1.1: Combat dangerous bicycling through targeted education programs for every type of bicyclist. This includes parents of bicycling children, bicyclists who ride out of necessity, recreational bicyclists who are concerned with fitness, and commuting/transportation bicyclists.

Objective 1.2: Conduct Bicycle Rodeos throughout the year through partnerships with organizations such as the Greenville Police Department, Greenville Fire Department, YMCA, the Greenville Spinners, Greenville County School District, Safe Kids Upstate, LiveWell



Greenville, the Palmetto Cycling Coalition, the Department of Health and Environmental Control, and other community advocates.

Objective 1.3: Work with Clemson University, Furman University, Bob Jones University, Greenville Tech and other area institutions to provide bicycle education programs to students, faculty, staff, and the community at large.

Objective 1.4: Produce audio and video Bike Safety PSA's for local media.

Objective 1.5: Establish driver training for anyone operating a city-owned vehicle and include bicycle safety information.

Objective 1.6: Conduct Traffic Skills 101 courses three times each year.

Objective 1.7: Encourage local bicycle shops and organizations to conduct short bicycle education courses on specific topics, such as beginner trail riding or bicycling with a child in-tow.

Objective 1.8: Increase the number of League Cycling Instructors and frequently offer Smart Cycling courses.

**Goal 2: Implement a Bike Safety Education Curriculum for school children and youth.**

Objective 2.1: Create/Adapt Bike Safety Education Program for school children K-2, 3-5, middle school, and high school.

Objective 2.2: Create a Bike Safety Activity Book (or traditional book) for elementary-age children that is Greenville-specific and features Greenville landmarks. (Maybe do both an activity/coloring book AND a “traditional book” that can be used during Educational Outreach Programs).

Objective 2.3: Expand partnerships with the Greenville Spinners Safety Foundation to increase bicycle safety programs and provide equipment to youth.

Objective 2.4: Create clubs that learn about safe cycling while exercising and traversing the streets of Greenville and the surrounding areas.

**Goal 3: Increase bicycle safety education with law enforcement officer training.**

Objective 3.1: Ensure each new and existing police officer within the Traffic Enforcement Division has attended training as it relates to existing state and local bicycle laws.

### **2.2.3. Encouragement**

**Vision:** Increased Bicycle Ridership and Support for a Strong Bicycle Advocacy Community and Bicycle Culture

**Goal 1:** Greenville is characterized by a network of strong advocates for a balanced transportation system.

Objective 1.1: Formalize Bikeville into a City Council appointed Board.

Objective 1.2: Support the establishment of a non-governmental advocacy organization focused on providing the residents and visitors of Greenville with programs and resources to travel by bike.

**Goal 2:** Residents have good knowledge of network and bike-friendly roads.

Objective 2.1: Publish a “Bicycle Network Map”.

Objective 2.2: Distribute and promote the “Bicycle Network Map” and other resources through bicycling events, workshops and local bicycle shops.

Objective 2.3: Maintain up-to-date information on the bicycling webpage of the City website, including a network map.

**Goal 3:** Make bicycle travel an integral part of daily life, particularly for trips under 3 miles.

Objective 3.1: Partner with local bike shops, health systems, and other local organizations to promote and campaign for the Bicycle Master Plan.

Objective 3.2: Increase education on the numerous benefits of bicycling.

Objective 3.3: Ensure every resident has access to a bike.

Objective 3.4: Expand connectivity of the Swamp Rabbit Trail to surrounding neighborhoods.

Objective 3.5: Create a campaign for local businesses to be designated a “Bicycle Friendly Business”.

Objective 3.6: Establish a bike share program (See Goal 8).

Objective 3.7: Create a Smart Trips/Travel Smart transportation demand management program to encourage short trips made by bicycle. (LAB Feedback)

**Goal 4:** Increase ridership and bike mode share.

Objective 4.1: Increase bicycle mode share to 2.8 percent by 2013, establishing a mode share comparable to Silver-Level Bicycle Friendly Communities.

**Goal 5:** Expand Bike Month Programs. (LAB Feedback)

Objective 5.1: Establish a Bike Month Event Planning Committee.

Objective 5.2: Begin documentation of the number of bicyclists reached through Bike Month programs.

Objective 5.3: Develop a “Commuter Buddy” program to assist potential new riders.

Objective 5.4: Develop a “Commuter Challenge” program where local employers compete using resources such as the World Commute Challenge.

Objective 5.5: Encourage a local, state, or national political leader to lead a Bike Month ride event.

Objective 5.6: Establish a dedicated funding source to fund Bike Month events, prizes, and promotional materials.

**Goal 6: Continue to promote and grow non-competitive cycling events. (LAB Feedback)**

Objective 6.1: Implement Cyclovias (car-free events) regularly and use them for education and encouragement.

**Goal 7: Encourage the use of bicycles through the provision of convenient and secure bicycle parking and support facilities.**

Objective 7.1: Provide incentives for workplaces to have changing/shower facilities.

Objective 7.2: Implement the Downtown Bike Station concept that is proposed at the Greenlink Transit Station.

Objective 7.3: Provide free Bicycle Valet parking as a routine part of several city special events and include within promotional material.

**Goal 8: Develop a Downtown Bike Share/Bike Rental Program.**

Objective 8.1: Explore feasibility of community bike share program, including corporate sponsorship opportunities.

Objective 8.2: Provide storage and signage for the bike rentals/shares.

Objective 8.3: Seek out and provide (financial and non-monetary) support for local entrepreneurs to start bike rental/share ventures.

**Goal 9: Encourage Safe Routes to Schools.**

- Objective 9.1: Ensure that every Greenville school has an easily accessible and easily usable bicycle rack by 2013.
- Objective 9.2: Ensure that every public school has at least one safe & effective way to arrive by bicycle for children in zoning area of school.
- Objective 9.3: Identify and improve problematic crossings and other impediments to bicycling to school.
- Objective 9.4: Encourage and support schools and neighborhoods in pursuit of SRTS grants.
- Objective 9.5: Establish and support cycling clubs at middle and high schools as a means of growing youth interest in cycling and training the next generation of bicycling advocates.

**2.2.4. Enforcement**

**Vision:** A Safer Environment for Cyclists and Other Transport Modes

**Goal 1: Increase safety through promoting greater awareness of bike-car issues and conflicts.**

- Objective 1.1: Ensure that police officers are aware of the latest changes to the state bicycle legislation and have general knowledge regarding traffic law as it applies to bicyclists. (LAB Feedback)
- Objective 1.2: Host re-occurring Enforcement for Bicycle Safety seminar with Greenville Police Department. (LAB Feedback)
- Objective 1.3: Increase enforcement of key bicycle related violations (including parking in bicycle lanes, bicyclists failing to stop at stop signs, bicyclists riding more than 2 abreast, motorists failing to yield a safe distance while passing, etc).
- Objective 1.4: Utilize relevant enforcement/education resources provided by the National Highway Traffic Safety Administration. (LAB feedback)
- Objective 1.5: Ensure police department conducts frequent speed checks along roads with bicycle facilities.

**Goal 2: Engender mutual respect between different transport user groups.**

- Objective 2.1: Increase targeted enforcement by Greenville Police Department to encourage motorists and cyclists to obey the law. (LAB feedback)
- Objective 2.2: Encourage drivers to be considerate of cyclists (“Share the Road” billboards, PSA’s, Bus Wraps, etc).
- Objective 2.3: Encourage cyclists to engage in safe and proper behavior, including stopping at stop signs, not riding more than two abreast, and following all traffic laws.

### **2.2.5. Evaluation and Planning**

**Vision:** Increase Funding and Improve Institutional Support of Bicycling

**Goal 1:** Pursue Silver Level designation from the LAB in the Fall of 2013.

Objective 1.1: Encourage City Council to formally adopt the BFC Silver Action Plan.

**Goal 2:** Pursue cost-effective multi-modal integration/improvements.

Objective 2.1: Improve collaboration between the various local, regional, state, and national transportation planning agencies.

Objective 2.2: Develop annual implementation plans that are coordinated with City, County, and State resurfacing projects.

**Goal 3:** Prioritize and increase bicycle funding to support facility upgrades, enforcement and education programs.

Objective 3.1: Set a minimum percentage of city transportation funding that will be dedicated to bicycling facilities. This percentage may be based on the Bicycle Master Plan implementation matrix and associated cost estimates.

Objective 3.2: Hire a Transportation Planner by 2012, with training and interest specific to Non-Motorized Transportation. (LAB feedback: Create full-time bike coordinator position.)

Objective 3.3: Update Bicycle Master Plan in 10 years.

Objective 3.4: Include performance measures within this Plan to track increases in mode share and to track the progress of the plan's implementation. (LAB feedback)

Objective 3.5: Continue to collect data on bicycle usage and crash statistics and use this data to prioritize improvements to the bicycle network and to target enforcement and education efforts. (LAB feedback)

Objective 3.6: Revise City Council "Strategic Initiative" metrics to the following:

- Percentage of roadways with a sidewalk.
- Percentage of residential units within one-quarter mile of bicycle lane.
- Percentage of residential units within one-half mile of a greenway trail.

**Goal 4:** Develop an action plan for crash reduction to better understand the collection and reporting of Greenville's crash data.

Objective 4.1: Set specific annual targets and performance measures.

Objective 4.2: Encourage the Greenville Police Department to create an annual report on number of bicycle related citations and accidents documented each year.

### **2.2.6. Equity**

Vision: Bicycling Engineering, Encouragement, Education, Enforcement, and Planning that serves a diverse constituency and provides for the needs of those who ride out of necessity, as well as those who choose to cycle.

**Goal 1: Increase safety education targeted to low-income bicyclists**

- Objective 1.1: Sustain and expand the “Lights for Life” program that is targeted to Greenville’s population of cyclists who bicycle out of necessity.
- Objective 1.2: Provide scholarship opportunities for all fee-based Bicycling Education courses.
- Objective 1.3: Provide free (or low cost) bicycles, helmets, and other safety gear to underserved and low-income children.

**Goal 2: Provide appropriate bicycle facilities in and near Greenville’s Special Emphasis Neighborhoods.**

- Objective 2.1: Ensure that the Bicycle Master Plan identifies connectivity opportunities for targeted neighborhoods.
- Objective 2.2: Include bike counts within predominantly low-income areas.
- Objective 2.3: Collaborate with Community Centers and neighborhood presidents on programs that encourage and educate their constituents on bicycle issues.

**Goal 3: Tailor resources and programs to specific users.**

- Objective 3.1: Consider bilingual educational materials for non-English speaking residents.
- Objective 3.2: Acknowledge social and cultural differences among local cyclists.
- Objective 3.3: Assume underserved populations will require a greater level of outreach. Focus cycling programs in cultural and social centers such as churches, restaurants, or parks.

## 2.3. Existing City Goals and Policies

This Bicycle Master Plan builds on and supports a number of other plans and policies from the City of Greenville and other agencies and organizations. Planning and policy context is important to the successful implementation of this Plan because much of the support for bicycle-related projects will come from local sales tax, and federal and state money administered by regional and state agencies. A clear understanding of the existing policy context will enable Greenville to position projects that fulfill the policies adopted by Council and partner funding agencies.

City of Greenville land use and transportation policy is guided by a variety of plans with varying scopes. The Comprehensive Plan guides future development and sets a foundation for future growth and small area planning. GPATS Long Range Transportation Plan sets the regional vision and priority for area transportation investments. Greenville also has adopted several specific plans establishing land use, transportation, and design recommendations for focused geographic areas of the city. The recommendations in this Plan refer to and support relevant goals, policies, programs, and guidelines from each of these documents.

Other planning efforts conducted by a variety of public agencies also occur at the county, regional, and state levels. This Plan is also consistent with and supports the relevant goals, policies, and standards of these documents. Goals and objectives from the two most relevant of these plans are summarized below.

Appendix A provides a more complete review of planning and policy documents relevant to this Bicycle Master Plan. The review of each document includes the most relevant policies to this citywide Bicycle Master Plan.

### **Greenville Forward: Vision 2025 (2005)**

Download at: <http://www.greenvilleforward.com/Download/Vision%202025%202010-01.pdf>

In 2003, the Greenville Chamber of Commerce launched a long-range visioning process called Greenville Forward. Bicycling-related goals are primarily included within the healthy community vision and the public sector vision:

- “A healthy Greenville is supported by programs for community health bikeway and walkway networks, and a collaborative healthy system.”
- “In 2025, Greenville County will be a place where parks, greenways, open spaces and other destination points of interest such as residential communities, business and retail centers, hospitals, downtown areas, and multi-modal centers are connected via a system of bikeways and walkways, thereby enhancing the quality of life for all residents of the County. . .”

### **Plan-It Greenville Comprehensive Plan (2009)**

Download at: <http://www.greenvillesc.gov/PlanningZoning/CompPlan.aspx>

The City of Greenville’s *Comprehensive Plan (Plan It Greenville)* established a broad vision and set of goals. That planning effort included the creation of Theme Committees. The following goals and objectives from the Comprehensive Plan, as developed by the Theme Committees, are especially relevant to the Bicycle Master Plan:

- Encourage walking or biking to increase activity, reduce traffic congestion, and reduce their carbon footprints
- Create a healthy environment for all Greenville citizens
- Provide a variety of transportation options for all incomes
- Create Bicycle Boulevards
- Limit Curb Cuts
- Change shoulder requirements
- Make the urban environment more bike friendly
- Institute spot improvement programs (to fix little problems)
- Integrate cycling with transit
- Implement traffic management and traffic calming
- Improve bicycle parking
- [Implement] blue bike lanes
- [Establish] guaranteed ride home programs



### **Trails and Greenways Master Plan (2008)**

Download at: <http://www.greenvillesc.gov/ParksRec/Trails/MasterPlan.aspx>

The City of Greenville's *Trails and Greenways Master Plan*, adopted by City Council Resolution in 2008, established specific visions and goals for the future trails and greenways network. Per the goals in that plan, the City intends to:

- Develop a safe and interconnected city-wide network of trail facilities that link together destinations and people, both locally and regionally.
- Improve the quality of life in Greenville by developing a trail network that provides facilities and programs designed to expand and encourage active recreation, community strength, and alternative transportation.
- Enhance, protect, and preserve the environmental quality of open space, waterways, and wildlife habitats.
- Stimulate economic growth through increases in tourism and real property value by developing a city-wide trail network.
- Conserve and tell the story of local culture, history, and heritage through interpretive trails and signage.

### **City of Greenville Downtown Master Plan – 2008**

Download at: <http://www.greenvillesc.gov/PlanningZoning/forms/DowntownMasterPlanFinalReport.pdf>

Greenville City Council adopted the Downtown Greenville Master Plan in 2008. This document laid forth a cohesive vision for the heart of the city. While there are limited specific references to downtown's bicycling environment many elements of the plan will have an impact on Greenville's bicycle-friendliness and accessibility.

In terms of the urban core's accessibility and points of interest, the plan identifies five corners of downtown:

- Gateway District
- Heritage Green
- Broad & River
- County Square
- West End/Warehouse

The plan recommends that Greenville create a "Green Necklace" for downtown comprised of a trail corridor that touches, and connects, each of the five corners.

The document states that a comprehensive approach should be taken to accommodating bicyclists. Bike lanes are recommended for arterials, as well as an effort to integrate bicycles into vehicular traffic on low volume and low speeds streets.

### 3. Existing Conditions



*Greenways are separated from the roadway.*



*Sidepaths are adjacent to roadways, separated from traffic.*



*Bike lanes provide a striped travel lane on roadways for bicyclists.*



*Signed routes indicate a preferred bicycle route.*

#### 3.1. Existing Bicycle Facilities and Programs

Research has shown that cities taking a comprehensive approach to increasing levels of bicycling have the most consistent success rate in terms of higher levels of bicycling mode share. In order to achieve this, programs, policies, and infrastructure investments must be fully integrated. As defined by the League of American Bicyclists, bicycle-friendly cities demonstrate achievements in each of five categories, often referred to as the Five Es of bicycle planning. (A sixth E, Equity, is incorporated into the other Es for the purposes of the Bicycle Friendly Community Program). The Five Es are:

- Engineering
- Encouragement
- Education
- Enforcement
- Evaluation

Engineering includes on-street bicycle facilities and bicycle parking as well as signage and maintenance. Programs are a great way to maximize use of bicycle facilities. Of the Five Es of bicycle planning, four are related to programs: encouragement, education, enforcement and evaluation. Production of bike maps and programs to celebrate Bike to Work Day encourage people to ride bicycles. Education programs improve safety and awareness. Programs that enforce legal and respectful driving and bicycling make novice bicyclist feel more secure. Evaluation programs provide a method for monitoring improvements and informing future investments. All Five Es work together to enhance the bicycling experience in Greenville. Analysis of Greenville's existing facilities and programs within the framework of the Five Es is one way to assess the City's bicycle-friendly status.

This chapter presents existing facilities and programs in order to identify where new facilities are needed and what programs will better support bicycling in Greenville.

The City of Greenville has already received Bronze level of the Bicycle Friendly Community (BFC) recognition from the League of American Bicyclists. The City has a growing network of bicycle paths, lanes and routes throughout the City. The City has also implemented programs

to support bicycling. Greenville has now set its sights on achieving the next level of BFC recognition – Silver. As a result, many of these existing conditions assessments are related directly to the BFC selection criteria<sup>1</sup>.

### 3.1.1. Engineering

#### Existing Bikeways

The primary designated bikeway in the City is the Swamp Rabbit Trail – currently a 13.5-mile long paved rail trail that passes through Greenville. The 5.4 miles that lie within Greenville city limits serves as a spine for Greenville’s bicycle network.

The City has been working diligently over the last few years to install on-road bicycle facilities and more facilities are planned. Some of the main roads accommodate bicycle travel with wide lanes, shoulders, bike lanes, and shared lane markings. For example, Greenville has installed Shared Lane Markings or “Sharrows” on several downtown streets. Although several of Greenville’s major roads already have dedicated bicycle facilities (13 percent in 2009), more are needed to significantly improve local bicycling conditions. The top-level Bicycle Friendly Communities (BFC) report that more than half of their arterial streets have bike lanes, as they provide important connections to other routes and may be the only access to many retail and commercial destinations.

Cleveland Park currently provides popular mountain biking trails near the Central Business District, namely the Troop 19 Trail, Dog Park Trail, and Eagle Park Trail. Linkages between these trails and the Swamp Rabbit Trail exist and could be further enhanced. Timmons Park offers a 1.5-mile hike and bike trail along a small creek and the relatively new East North Street bike facilities have improved access to that trail. Additionally, a signed bike route connects downtown to the soft surface trails of Paris Mountain State Park, which is beyond the City’s limits.

*Table 3-1 - Existing Bikeway Mileage*

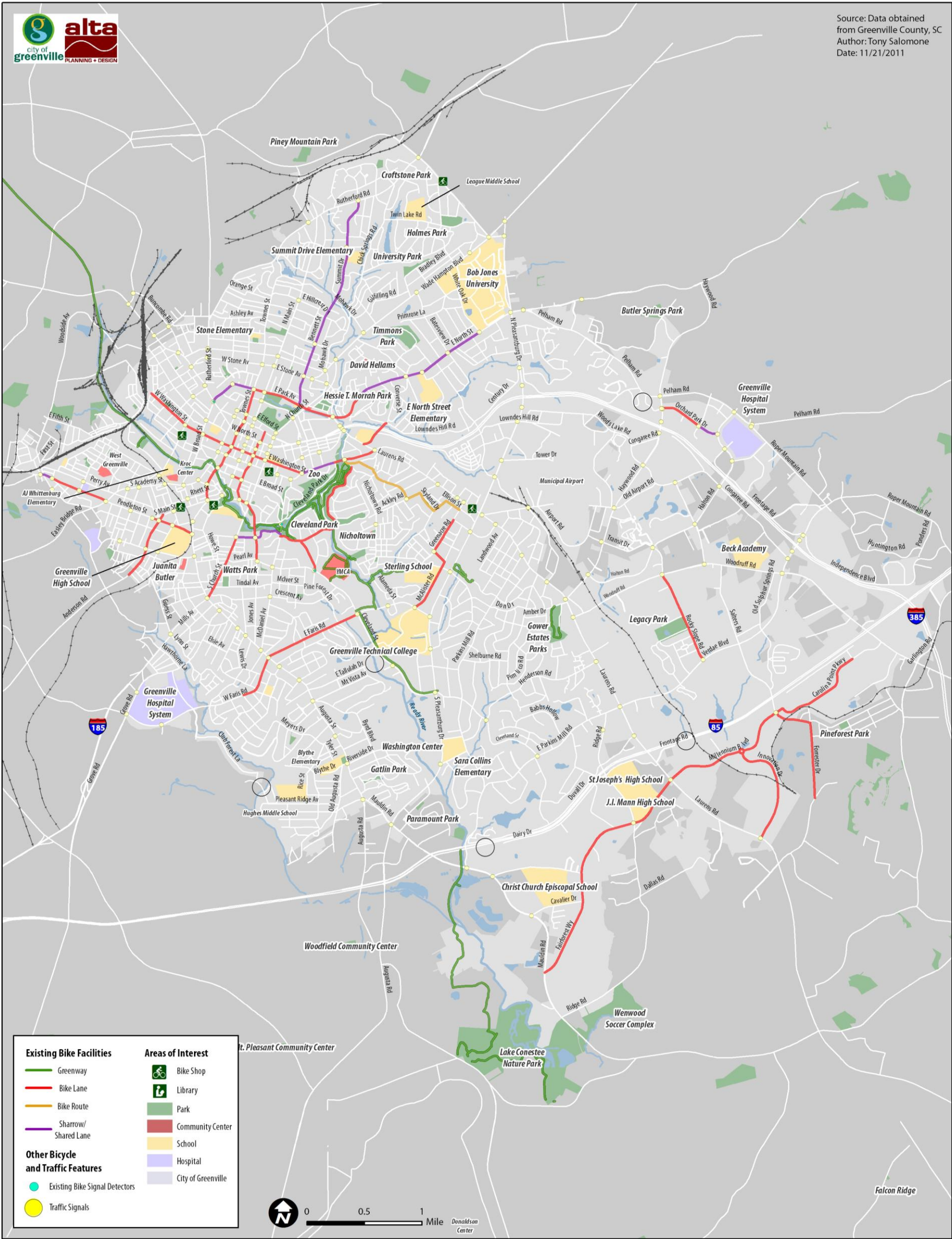
Facility Type	Length (mi)
Greenway	9.57
Bike Lane	7.30
Shared Lane Marking (Sharrow)	2.70
Signed Route	2.20
<b>Bikeways Total</b>	<b>21.77</b>

A more detailed discussion of the City’s existing roadway network and bicycle environment is included in Section 3.2.

<sup>1</sup> A full BFC audit is included as Appendix B and includes recommendations for achieving the next level of recognition.



Map 3-1: Existing Bike Facilities Conditions





## Signing

The Manual on Uniform Traffic Control Devices (MUTCD) outlines guidelines for bikeway signage. Signing bike routes for both transportation and recreation purposes is a cost effective way to designate desired routes for bicyclists. The routes should include “Share the Road” signage and can also include MUTCD approved wayfinding signs with local branding.

Greenville has already used this approach with a locally-branded variation of the MUTCD approved M1-8 sign for bicycling by-pass routes. Currently, two bypass routes are signed: Lauren Road bypass and Pleasantburg Road bypass. Each route guides bicyclists along low-volume and low-speed roads that parallel the two major arterials that do not offer bicycle facilities.

Greenville also offers a bicycle wayfinding signage network that guides bicyclists along bicycle-friendly roads. The distance to key attractions and destinations, including the Swamp Rabbit Trail, is identified on each sign.

Greenville County has ten signed bicycle routes, several of which travel through the City. Signed, scenic bicycle routes serve an important purpose and should be updated every five years to ensure that the network remains safe and practical for users.

## Bicycle Signal Detection

Bicycle signal detection actuates traffic signals when bicycles are present, turning the light green for bicyclists. Loop detectors use the disturbance of an electromagnetic current running in pavement coil and video cameras use pixel analysis to actuate traffic signals. The City has installed bicycle signal detection at the following intersections:

- Cleveland Street & Southland Avenue
- Buncombe Street & Atwood Street
- Ridgeland Drive & McDaniel Avenue

## Bicycle Parking

Bicycle storage can range from a simple and convenient bicycle rack to storage in a bicycle locker or cage that protects against weather, vandalism and theft. Greenville’s bicycle parking policy establishes a minimum number of bicycle parking spaces required based on a percentage of automobile parking for all new development. The ordinance ensures that at least two bicycle parking spaces are



*Greenville’s bicycle route by-pass signage*



*Greenville’s bicycle signal detections*



*Bicycle Racks at Greenville’s Downtown Zoo*

provided at all sites. The policy also includes standards for bicycle parking functionality and location. The City has recently installed bike racks throughout downtown. Bike rack locations are located on a Google Map (found [here](#)), which is linked from the City's website.

### Multi-Modal Connections

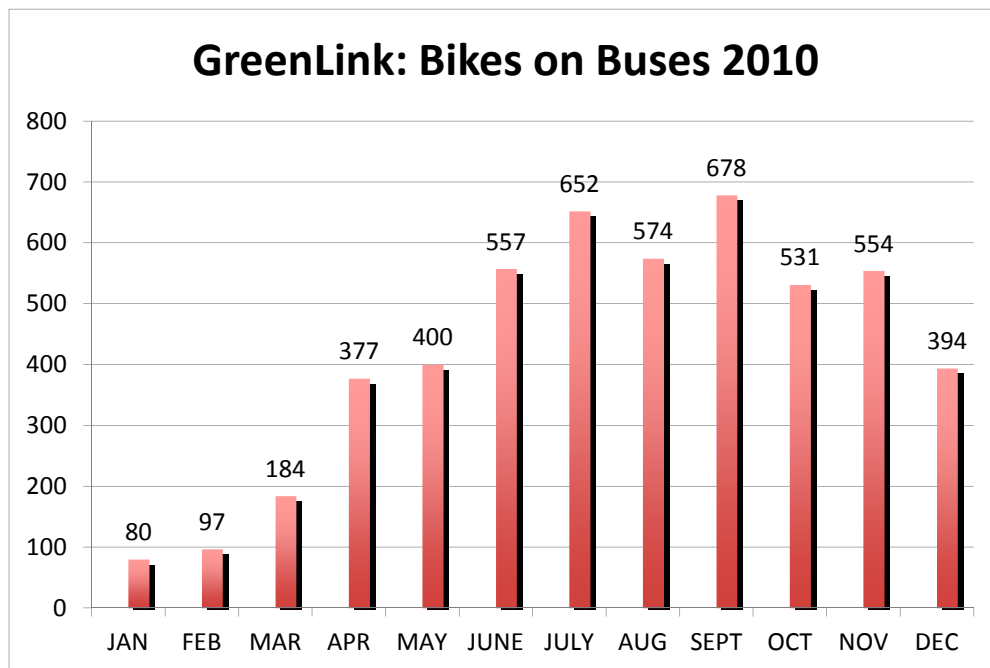
Approximately 1.1 percent of Greenville residents use public transit.<sup>2</sup> Greenlink is the public transit agency that operates within the City.



*All GreenLink buses are equipped with bicycle racks.*

Bicycle racks on buses have become an important tool for improving multi-modal connections. GreenLink has installed bike racks on all buses and over the course of the 2010 calendar year, monthly usage of the racks quintupled. GreenLink and the City are planning for the renovation of the downtown transit hub to provide long term bicycle parking and other bicycle amenities.

As shown in the graph below, during the 2010 year, bicycles were increasingly used in conjunction with transit.



*During 2010, the number of bikes being used in conjunction with bus patronage increased.*

### Bridges

Bridges are long-term infrastructure projects and since they may not be rehabilitated or reconstructed for a number of decades, it is vitally important to insure that all bridges have access for bicyclists. In Greenville, a significant number of bridges are closed or inaccessible to cyclists (16 out of 42, or 38%).<sup>3</sup>

<sup>3-2</sup> American Community Survey, United States Census, 2007-2009.

### **Complete Streets Policies**

“Complete Streets” policies are often recommended as an important step toward institutionalizing bicycle-friendly design. Complete streets policies direct transportation planners and engineers to consistently design roadways with all users in mind (e.g., motorists, transit riders, pedestrians, bicyclists, seniors, children, and people with disabilities).

Though South Carolina lags in several areas of institutional support for bicycling and walking, the state’s policies have progressed significantly over the last decade. In 2003, South Carolina’s Department of Transportation became one of the first states in the country to adopt a Complete Streets policy (supported by engineering directive memorandum 22, EDM 22, which provides direction for providing bicycle facilities on State roadways). To date, the state is one of only 18 states in the country to have such a policy in place.

In 2008, Greenville’s City Council passed a Complete Streets Resolution officially establishing the city’s support for accommodating alternative transportation. Additionally, the City amended its *Engineering Design & Specifications Manual* to include bicycle lanes of a minimum five-foot width on all collector and arterial streets. The City has been dedicated to implementing and advocating for the Complete Streets policy on all roadway projects, including projects on State-maintained roads. A proposed Complete Streets Resolution for Greenville County failed to receive the requisite votes in November 2010.

### **Maintenance**

Street sweeping clears the road of debris that would otherwise make bicycling difficult. Greenville’s weekly street sweeping is important to the functionality of the overall bike network, but a formalized maintenance program for existing and future bikeways will be critical. The City should increase its public outreach to citizens to not place yard waste or debris in bike lanes. Additionally the City can promote its existing maintenance resource, Greenville 311, as a service for requesting street sweeping on specific streets.

#### **3.1.2. Encouragement**

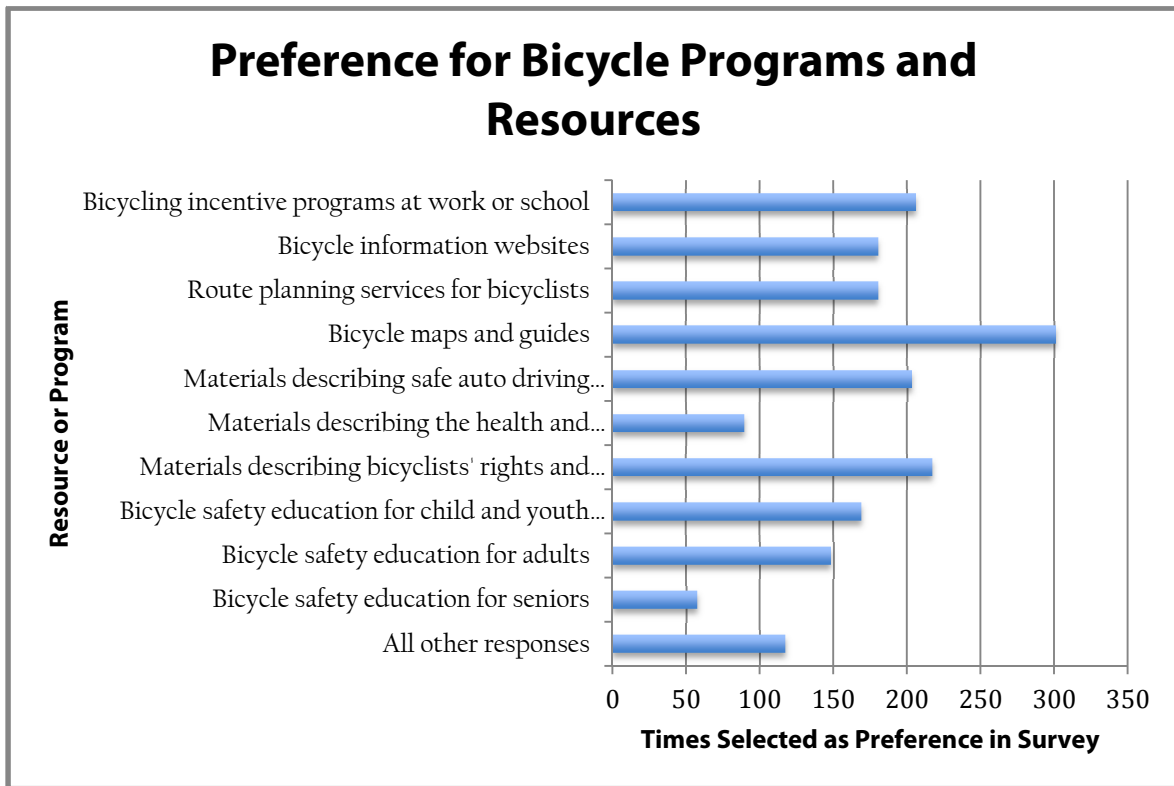
Greenville hosts many large and small scale community events that have a wide draw from throughout the region, including Fall for Greenville, Artisphere, Downtown Farmers Market, Main Street Jazz, and the nationally recognized U.S. Pro Cycling Championship. The City has also received numerous awards and recognitions, including the “Bicycle Friendly Community” designation by the League of American Bicyclists (2009), the “Great Places in America” award from the American Planning Association (2009), the “Great American Main Street” award from the National Trust for Historic Preservation (2003, 2009), “Tree City USA” by the National Arbor Day Foundation, “City at Your Feet” award by American Walks (2003) and more. Continued and expanded encouragement of bicycling, along with a well-connected bicycle facility network, will enhance Greenville’s reputation as a destination for cycling and appealing place to live.

---

<sup>3</sup> City of Greenville Bicycle Friendly Community Application to the League of American Bicyclists, 2009.



Figure 3-1. Response to each program and resource option provided by the online survey.



### Bike Month Activities and Other Organized Events

Bikeville, the City of Greenville and local organizations organize annual events to support Bike Month, including family rides, valet bicycle parking at special events, skills courses, and Bike-to-Work Day.

The Greenville Spinners Cycling Club regularly organizes numerous recreational and road rides, which they make available for other riders through their online presence, listserv, MapMyRide.com, and other outreach.

### Bicycle Resource Website and Public Information

The City of Greenville hosts a bicycle resource website at [www.bikeville.org](http://www.bikeville.org). This webpage provides a link to various items including bicycle maps of the City that utilize Google mapping technology as well as information about recreational rides, Bike Month, and other City initiatives that promote bicycling.

The Bikeville E-newsletter has established regular communication with the public regarding trails, greenways, and Bikeville related activities. As of the adoption of this plan, the E-newsletter had over 1,000 people on its distribution list.



The City dedicates a page of its website to bicycle information.

### **Bicycle Friendly Businesses**

The City of Greenville website encourages local businesses to achieve the Bicycle Friendly Business designation from the League of American Bicyclists. The website proudly acknowledges the following businesses that have achieved this recognition:

- Platinum Recipient: TTR Bikes
- Bronze Recipient: Upstate Forever
- Bronze Recipient: Fluor
- Bronze Recipient: Caine Halter Family YMCA

### **Active Living Promotion**

The YMCA of Greater Greenville recently garnered a grant from the Robert Wood Johnson Foundation to combat childhood obesity. The Healthy Kids, Healthy Communities grant is being administered by Activate Greenville, a program of the YMCA. Additionally, a coalition of dozens of public and private organizations is working to make Greenville County a healthier place for persons of all ages. This coalition, LiveWell Greenville, is developing a plan that will include recommended policy and systems changes related to increasing safe, active environments, healthier foods in schools and workplaces, better access to parks and similar goals.<sup>4</sup>

Lack of physical activity is a leading contributor to high rates of overweight and obese individuals. According to the LiveWell Greenville Community Action Plan, about 40% of Greenville County adults fall well below recommended levels of physical activity, and 15% are completely inactive. As a result, approximately 65% of adults and more than 40% of children in Greenville County are overweight or obese. Numerous chronic diseases are correlated to lack of physical activity and obesity. In Greenville, rates of diabetes, heart disease and asthma are rising.<sup>5</sup> The LiveWell Greenville coalition hopes to combat this trend.

### **3.1.3. Education**

#### **State-level Initiatives**

South Carolina is one of 33 states in the country with a Share the Road public safety campaign, and one of 43 states with information about bicycling in the state Driver's Manual. Additionally, South Carolina is one of 23 states that includes questions about bicycling on the driver's test (administered by the South Carolina Department of Motor Vehicles). It is one of 15 states offering a state-sponsored bike ride to promote bicycling. The Palmetto Cycling Coalition is an important leader in South Carolina for advocacy and education for cycling.

Though South Carolina does not have a law establishing the recommended three-foot passing distance for cars, the state's recent passage of the Bicycle Traffic Law reform bill (H3006) provided other legal measures that improved the bicycling environment for the state. Notably, it states that a driver of a vehicle must at all times "maintain a safe operating distance between the motor vehicle and a bicycle." The full bill is available in Appendix E.

---

<sup>4</sup> LiveWell Greenville. (2010). [www.livewellgreenville.org](http://www.livewellgreenville.org) and the LiveWell Greenville Community Action Plan.

<sup>5</sup> LiveWell Greenville. (2010). [www.livewellgreenville.org](http://www.livewellgreenville.org) and the LiveWell Greenville Community Action Plan.

### Share the Road Promotion

Educating motorists that bicyclists have a right to the road and need a minimum amount of operating space is critical to improving road safety and reducing the number of car-bike collisions. The collaborative effort between the City of Greenville, the Greenville Spinners Cycling Club, and community volunteers, known as Bikeville, is a key element of educating motorists and bicyclists to share the road. Share the Road signs introduce the message at the road level. SCDOT promotes sharing the road through a specialty license plate program. Additionally, Bikeville produced a bicycle safety public service announcement (PSA) that airs on Greenville's Public Access channel. The "Share the Road" PSA can be viewed online (found [here](#)).



*Share the Road signs in Greenville*

### Safe Routes to School

Safe Routes to School (SRTS) is a federally funded program to provide safe, convenient, and fun opportunities for children to bicycle and walk to school. SRTS can include a variety of multi-disciplinary programs aimed at promoting walking and bicycling to school and improving traffic safety around school areas through education, incentives, law enforcement, and engineering measures. SRTS Programs typically involve partnerships among municipalities, school districts, community and parent volunteers, and law enforcement agencies. The primary goals of SRTS include improved safety for children, establishing good health and fitness habits for children, and decreased traffic and air pollution.<sup>6</sup> Augusta Circle Elementary received a \$200,000 Safe Routes to School grant in 2008 to construct infrastructure and promote bicycling and walking opportunities, and Blythe Academy received a \$1,000 mini-grant for Safe Routes to School in 2011. The City works directly with schools to develop project proposals and complete the Safe Routes to School application.<sup>7</sup>

### Skills Classes and Outreach

It is important to educate bicyclists on vehicle and traffic laws to insure that they are riding as safely as possible. The League of American Bicyclists offers bicycle education training through its League Cycling Instructor (LCI) program, which trains local residents to teach bicycle education classes. Currently, six LCIs are located in Greenville and more than twenty live in South Carolina. Bikeville promotes bicyclist safety through its Lights for Life program. The Light for Life program provides essential bicycle safety equipment such as helmets, lights, and safety vests to Greenville's underserved cycling populations.



*Lights for Life is a Bikeville outreach program.*

<sup>6</sup> [www.saferoutesinfo.org](http://www.saferoutesinfo.org)

<sup>7</sup> City of Greenville. (2009). *Bicycle Friendly Community Application*. Submitted to the League of American Bicyclists.

### **Bicycle Rodeos**

Bicycle rodeos are the most common type of traffic safety training oriented towards children that serve as a forum to teach children safe bicycling skills and the rules of the road. Greenville should increase partnerships with organizations to provide frequent bike rodeos and helmet fittings for local children.

### **3.1.4. Enforcement**

#### **Bicycle Patrol**

Police bicycle patrols not only increase the mobility of officers in dense areas but it also provide law enforcement officers with an opportunity display safe and legal bicycle skills. Bicycle patrols also show the community that the City is engaged in sustainable transportation. In 2009, the City of Greenville employed eight bicycle patrol law enforcement officers. These officers could further their ambassadorship by conducting routine “Rules of the Road” outreach at various community events.

#### **Targeted Enforcement**

Targeted enforcement is focused efforts of police officers. For example, police can conduct stings at locations where bicyclists and motorists conflict and do not comply with traffic signals. The Greenville’s Police Department is not currently formally using targeted enforcement of laws pertaining to bicycle operation and bicycle-motorist interaction, but the department has increased its vigilance about recording and documenting bicycle-related crashes (see Chapter 4 for more information).

### **3.1.5 Evaluation**

Evaluation programs measure and evaluate the impact of projects, policies, and programs. Typical evaluation programs range from a simple year-after-year comparison of U.S. Census Journey to Work data to bicycle counts and community surveys. Bicycle counts and community surveys act as methods to evaluate not only the impacts of specific bicycle improvement projects but can also function as way to measure progress towards reaching City’s transportation goals, including the 2006 City Council Resolution ‘To declare that the City of Greenville endorses the League of American Bicyclists Action Plan for Bicycle Friendly Community designation.’ This resolution includes an intention to ‘adopt a target level of bicycle use (e.g. percent of trips) and safety to be achieved within a specific timeframe.’

#### **Bicycle Activity**

Nationally, bicyclists and pedestrians make up 9.6 percent of all trips for transportation, but those modes of travel are allotted only 1.2 percent of federal transportation dollars. Similarly at the state level, bicycle and pedestrian travel make up 4.7 percent of all utilitarian trips in South Carolina, but receive only 0.4 percent of the State’s transportation funding. Documentation of pedestrian and bicycle activity is an increasingly important factor for successful and sustained allocation of funding for bicycle and pedestrian projects.

Greenville conducted its first bicycle count in October 2010 in order to establish more useful and accurate baseline data. The City also gained a replicable methodology to allow annual bike counts in the future. While the counts will not provide a figure comparable to mode share data, they will provide targeted information about users of the local transportation network. Additionally, GreenLink currently tracks the number of bike boardings on its fleet. The bike boardings are counted by route and stop. The “strategic initiatives” of City Council, which provide measurable benchmarks for Council priorities, do not currently include a measure of

bicycling activity. The metrics, instead, focus on the percentage of homes within a close walking distance to a bicycle facility. A more detailed discussion of Greenville's bike mode share and bicycle counts is provided in Chapter 4.

## **Safety**

Collisions involving bicyclists are tracked by the Greenville Police Department and reported to the South Carolina Department of Public Safety (SCDPS). SCDPS manages a statewide database of traffic collisions. This data is, in turn, provided to SCDOT and state and local law enforcement offices. To be included in the statewide database, a collision must: 1) involve a licensed motor vehicle such as an automobile, truck or motorcycle (mopeds, go-carts and trains on tracks do not qualify); 2) occur on a public roadway (shopping center parking lots and private roads do not qualify); and 3) involve a reportable injury or at least \$1,000 in total property damage. While these criteria are used for collision data in many states, they do not adequately measure bicycle crashes. Many bicycle collisions are not reported to law enforcement, and the necessary involvement of a motor vehicle excludes any record of bike-to-bike, bike-to-pedestrian, or single-bike crashes. (Additional discussion of bicycle crash information is included in Chapter 4.)

## **Institutional Capacity**

The City of Greenville does not currently staff a bicycle and pedestrian program manager (or coordinator). Additionally, the City does not have a transportation planner on staff. The local metropolitan planning organization (GPATS) also does not have a bicycle and pedestrian program manager. Following the adoption of the City's Trails and Greenways Master Plan (2007), the City heeded the plan's recommendation to hire a trails and greenways planner. Currently, Greenville's bicycling- and pedestrian-centered programs are generally managed by the Urban Designer and/or the Greenways Manager. Each of those staff positions is housed within the Parks and Recreation Department. Additionally, the City's Traffic Engineer, housed within the Engineering Division of the Public Works Department, plays an important role in bicycle facility implementation. Their role in addressing the city's bicycling and pedestrian issues is significant. However, neither position is dedicated to those issues on a full-time basis.

The City of Greenville offers bicycle-focused education opportunities for staff, partner agencies, and elected officials. According to the 2009 Bicycle Friendly Community application, City planners, engineers, and designers have historically attended the South Carolina Bicycle and Pedestrian Accommodations Conferences. Additionally, the City regularly offers on-line webinars hosted by national and regional organizations such as: Association of Pedestrian & Bicycle Professionals (APBP), National Highway Institute (NHI), Clean Air Partnership, and the National Center for Safe Routes to School. City staff attended the ProWalk ProBike Conferences in 2008 and 2010 and have also taken part in the National Bike Summit. The Greenville Pickens Area Transportation Study (GPATS) maintains a strong working relationship with City staff and regularly offers access to online webinars for a variety of interested agencies and departments.

Refer to Appendix A for a detailed review of Greenville policies and plans that support bicycling.



## 3.2. Existing Bicycling Conditions

This section presents several analysis tools for understanding the existing physical conditions for bicycling in Greenville as well as the potential for improving conditions for bicycle use.

- **Cycle Zones Analysis** - The Cycle Zones Analysis (CZA) tool utilizes a variety of relevant data sources to understand both the existing obstacles as well as the potential for bicycling in different parts of Greenville. This tool uses a variety of inputs, including roadway connectivity, population density, trip attractors, and barriers. The CZA provides framework for tailoring solutions to the unique challenges and opportunities of different sections of Greenville.
- **Suitability Analysis** - From the city-wide perspective of CZA, a Suitability Analysis focuses more specifically on the arterial and collector roadway network. This tool evaluates the suitability of a given road for bicycle traffic given existing conditions. Inputs include average annual daily traffic (AADT), number of lanes, and the amount of truck traffic.
- **StreetPlan** - Finally, a StreetPlan analysis identifies existing opportunities and spatial constraints for adding bicycle facilities to the existing roadway network. Key inputs include the number and width of travel lanes, as well as the presence of medians and on-street parking. StreetPlan builds upon the Suitability Analysis, moving from an understanding of the existing conditions to the potential to make changes to improve conditions for bicycle travel.

### 3.2.1. Cycle Zones Analysis

A Cycle Zone Analysis (CZA) aids the planning effort by highlighting factors that affect cycling conditions in different areas of the city and identifying zones with the highest potential for good cycling conditions to maximize the efficacy of future investments. The analysis projects which areas have the greatest potential for cycling through an evaluation of roadway and bicycle network density, road and bicycle network connectivity, trip attractors, and trip barriers. This Bicycle Master Plan will use this information to target investment recommendations to locations that are likely to result in the highest increase in cycling.

#### Data Gathering and Synthesis

The Cycle Zone Analysis uses existing data from the City of Greenville. It divides Greenville into 14 zones of roughly similar cycling characteristics. The boundaries for each zone were determined by combining boundaries in available data (such as census tracts) with physical boundaries in the city (such as streets with high average daily traffic volumes). Such factors have a tendency to create their own bikeability boundaries, with the biking experience being relatively similar within a given zone. Metrics incorporate the following data:

- Density – roadway network density, bicycle network density
- Connectivity – roadway network connectivity, bicycle network connectivity
- Attractors – public facilities, commercial land use designations
- Barriers – highways, railroads, roadway slopes over five percent

The following section discusses each of these factors, outlining the rationale for their inclusion in the model and a basic methodology for how they were calculated. The resulting normalized scores were summed to

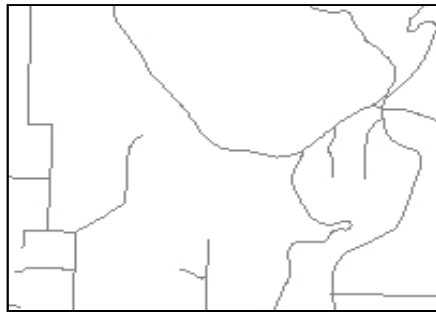
create a composite score of overall bikeability per zone. Additional detail on the CZA methodology is provided in Appendix H. This methodology can easily be modified by the City in future to include additional factors calibrated and weighted based on the purpose of the specific model analysis.

### 3.2.2. Roadway and Bikeway Density

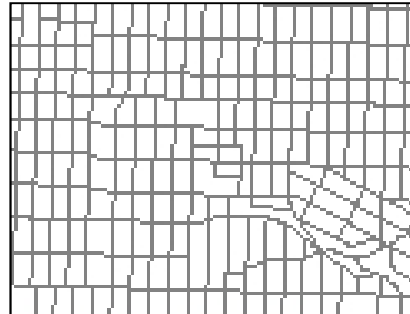
#### Total Roadway Network Density:

**Definition:** The density in linear feet per square acre of all roads in the cycling zone. This includes roads of all types except for interstate highways, where bikes are not allowed.

**Example:**



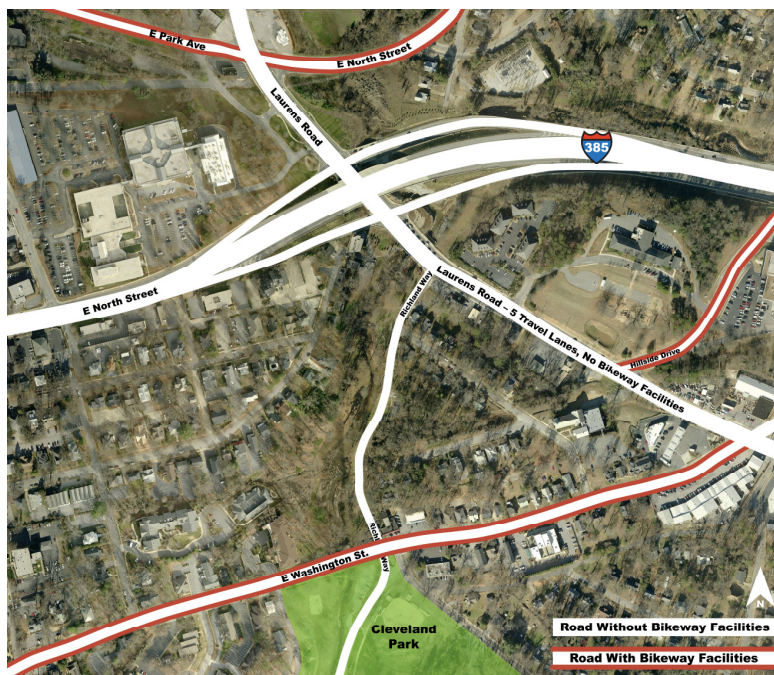
*Sparse network limits rider choice*



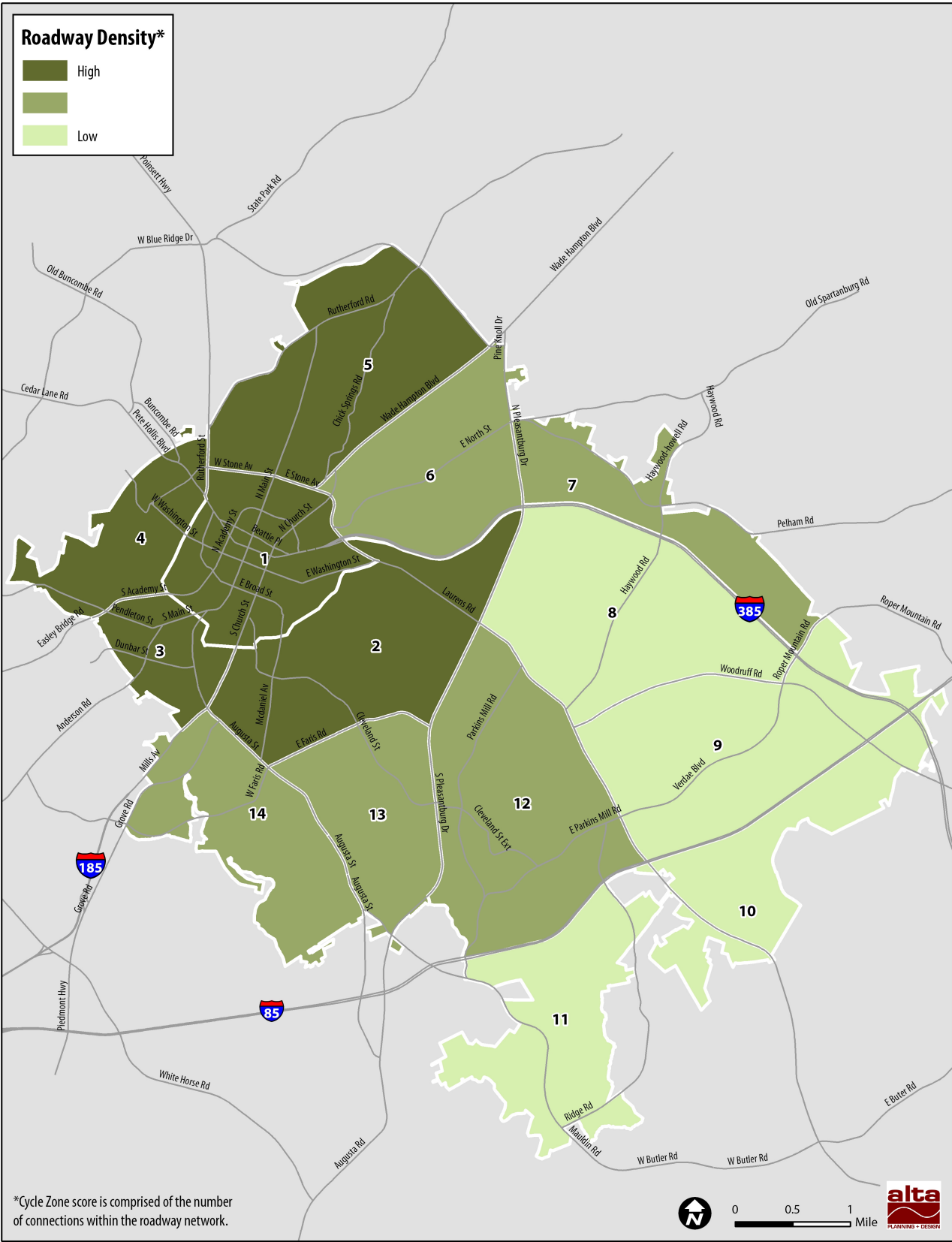
*Dense network facilitates rider choice*

**Reasoning:** A zone with a greater density of roads will facilitate a better cycling experience. Riders will be able to go more places and have greater route choice.

**Basic Methodology:** GIS tools were used to determine the overall length of roads falling within each cycle zone. This was divided by the zone's acreage to obtain an average road network density.



*The area surrounding I-385 and Laurens Road offers limited connectivity.*



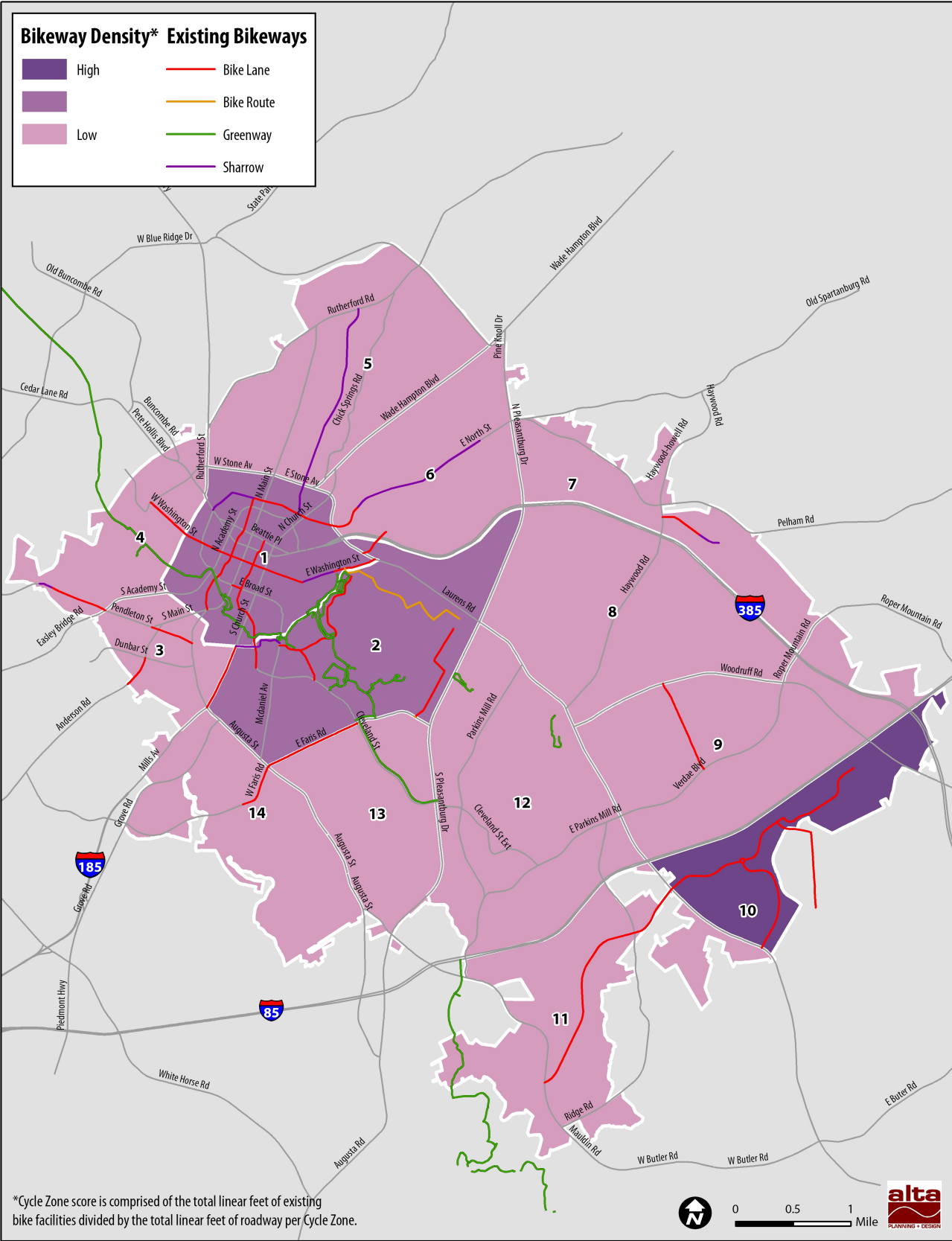
Map 3-2: Roadway Density CZA Scores

### **3.2.3. Bike Network Density**

**Definition:** The proportion of all roadways in the zone that provide bicycle accommodation.

**Reasoning:** The presence of facilities designed for cyclists increases their comfort and safety. A greater presence of facilities will improve the cycling experience.

**Basic Methodology:** The bicycle network layer was intersected with the cycle zone boundary, and then the lengths of each segment or partial segment that fell within a specific zone were summed. The resulting number was divided by the total length of all roadways in the zone to obtain the density of bikeways.



Map 3-3: Bikeway Density CZA Scores

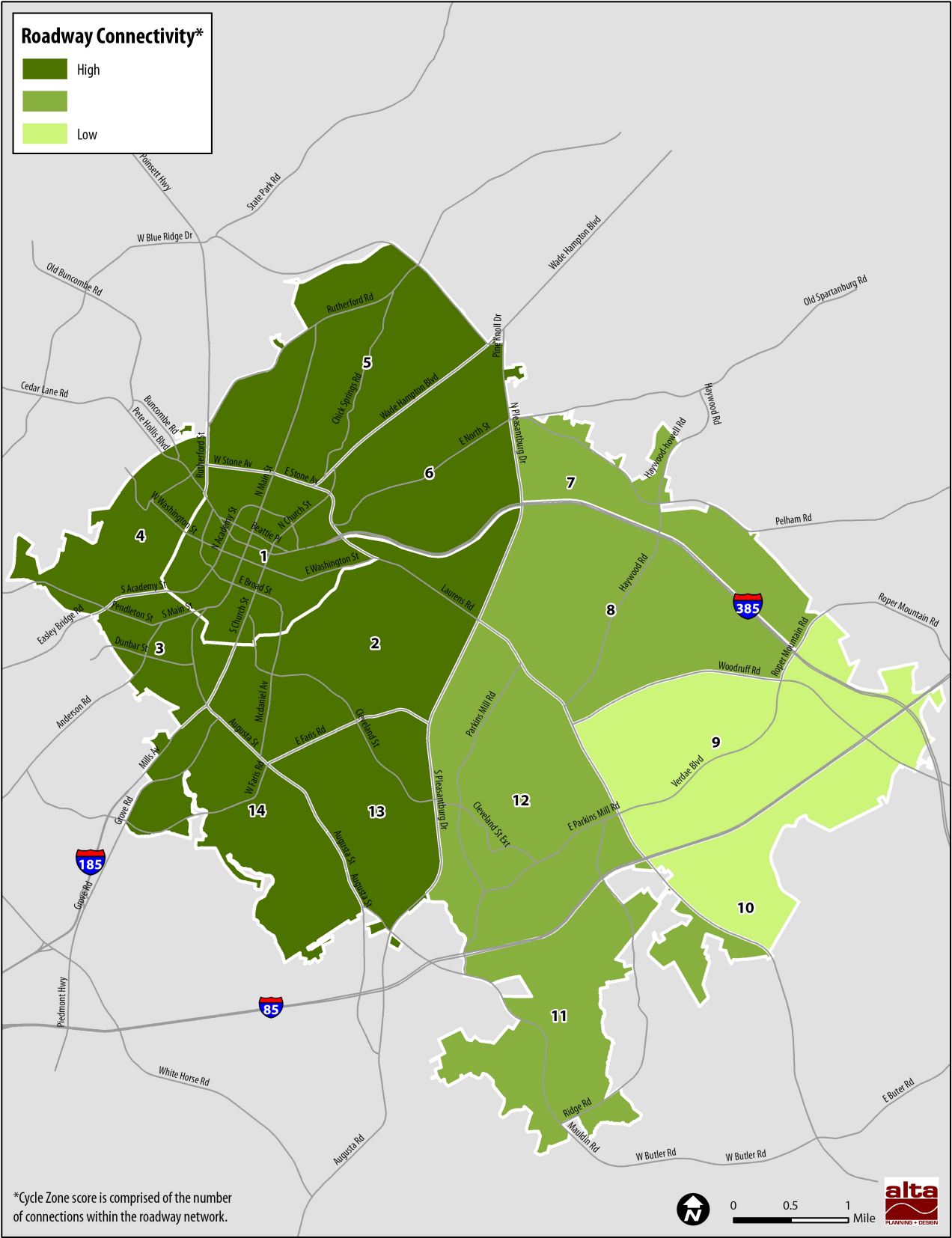
### 3.2.4. Roadway Connectivity

**Definition:** A measure of roadway connectivity, this number, ranging from 0 – 1, represents the ratio of cul-de-sacs and three-way intersections to four- or more way intersections. The closer to one, the more grid-like the street pattern. An overall average score was calculated for each zone.

**Reasoning:** A zone with greater roadway connectivity will facilitate a better cycling experience. Riders will be able to easily go more places and have a greater route choice.

**Basic Methodology:** GIS was used to determine points in Greenville where one road was intersected by at least one other road. The location and number of roads at each intersection points were recorded. For each cycle zone, the overall number of intersections was summed as well as the number of intersections that were at least four-way. These numbers were used to determine the percentage of intersections that are four-ways or more.





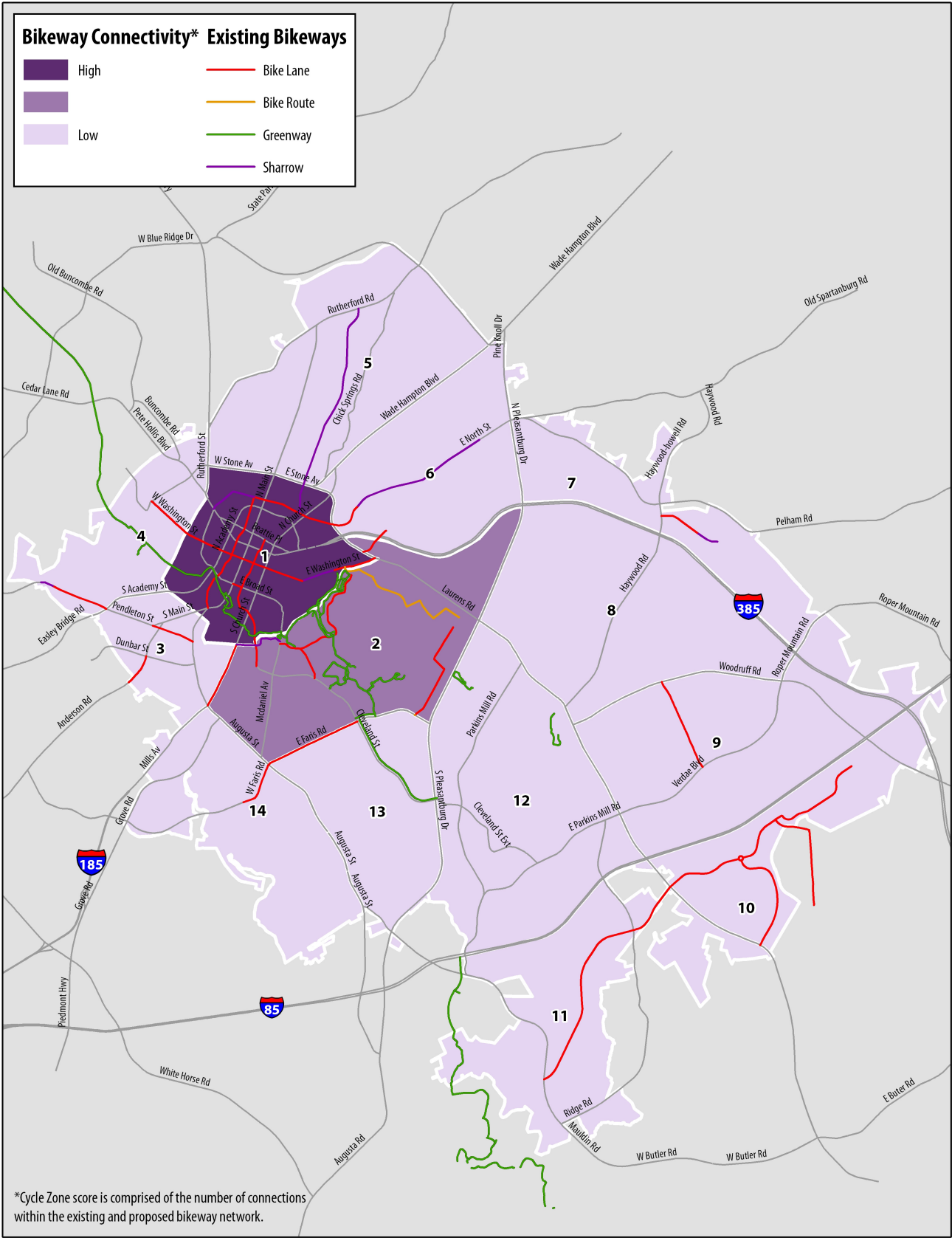
Map 3-4: Roadway Connectivity CZA Scores

### 3.2.5. Bikeway Connectivity:

**Definition:** A measure of bikeway connectivity, this number, ranging from 0 – 1, represents the ratio of cul-de-sacs and three-way intersections that include bikeway facilities to four- or more way intersections that include bikeway facilities. The closer to one, the more grid-like the bikeway pattern. An overall average score was calculated for each zone.

**Reasoning:** A zone with greater bikeway connectivity will facilitate a better cycling experience. Riders will be able to easily go more places and have a greater route choice.

**Basic Methodology:** GIS was used to determine the points where segments of the existing bikeway network connect. The number of connected (four-way and T intersections) and disconnected (cul-de-sacs and bikeways that do not connect to other bikeways) points were recorded. For each cycle zone, a ratio of these intersections was calculated.



Map 3-5: Bikeway Connectivity CZA Scores

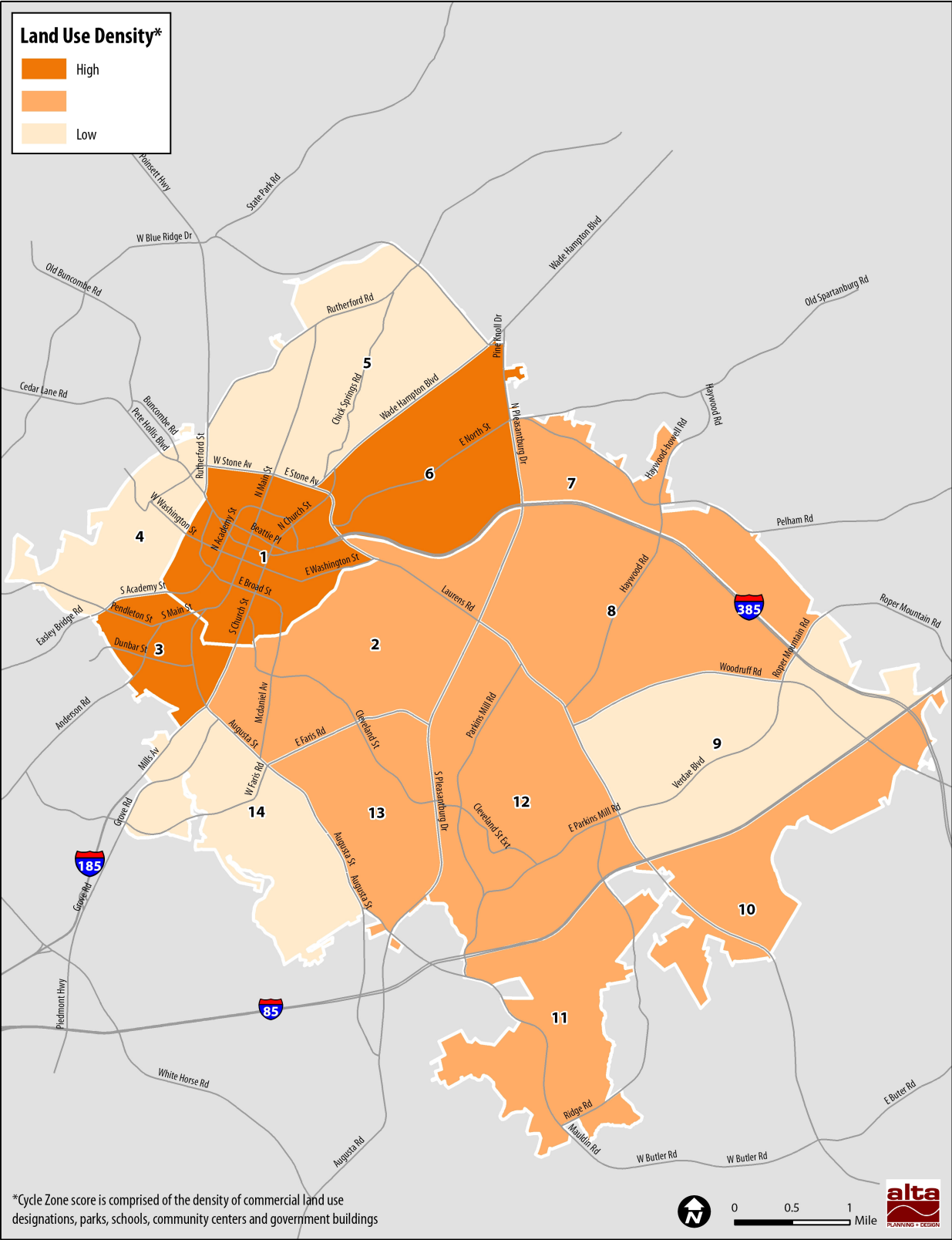
### 3.2.6. Trip Attractors

#### **Commercial Land Uses and Public Facilities Acreage:**

**Definition:** The density of commercial/retail land use designations and public facilities in each zone. Public facilities are defined as parks, schools, and government buildings.

**Reasoning:** Commercial land uses and public facilities are important destinations for bicyclists.

**Basic Methodology:** In this analysis, commercial land uses were derived from Greenville's current zoning layer. The public facilities used in this analysis (defined above) were extracted from another layer received from the City of Greenville. These layers were intersected with the cycle zone boundaries, and then the total area of these land uses within each zone was summed.



Map 3-6: Attractors CZA Scores

### 3.2.6. Barriers

#### Highways and Railroad Density:

**Definition:** Barriers that impede bicycling travel include interstates, railroads, and slope.

**Reasoning:** Limited crossing opportunities along highways and railroads force bicyclists to share major roadways with cars and/or force them to ride significantly out of direction to access a destination.

**Basic Methodology:** GIS was used to measure the length of interstates and railroads in each zone. This measure was divided by the total acreage of the zone to determine density.

#### Slope:

**Definition:** The length of roadways with an average slope over 5 percent for each cycling zone.

**Example:**



*Steep hills can be significant barriers for some cyclists.*

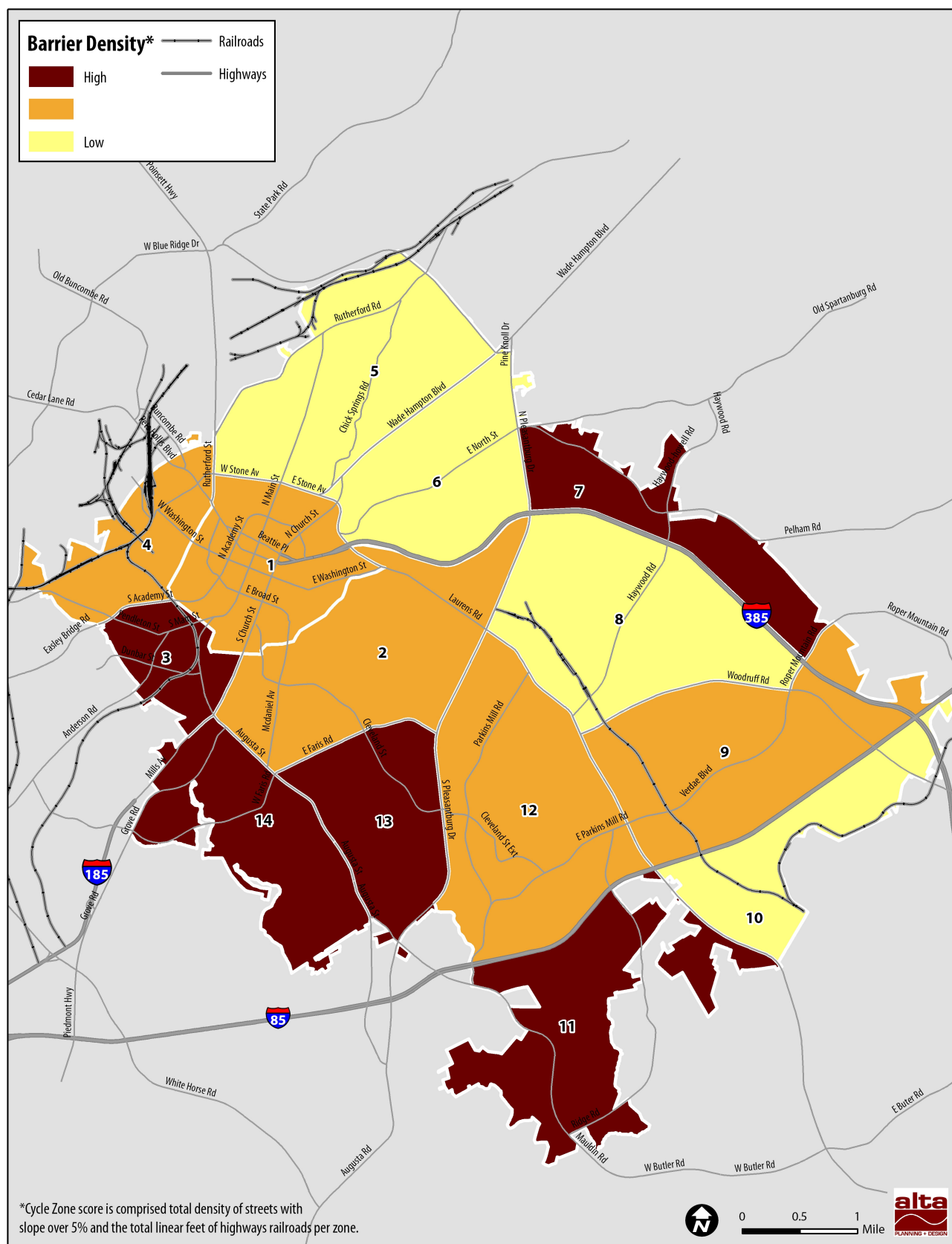


*Flat terrain reduces barriers to cycling*

**Reasoning:** Topography can decrease the ease of cycling. A great cycle zone will be relatively flat. Topography is an issue that is difficult or impossible to change and is very important to consider when evaluating the bikeability of a zone.

**Basic Methodology:** Elevation data from the U.S. Geological Survey was used to determine the slope at 2 foot intervals throughout the city. Roadways were divided in 100 foot segments and average slope was recorded using GIS. Roadways with average slope over 5 percent were added together to estimate the footage of roadway with slope over 5 percent in each zone.





Map 3-7: Combined Barriers CZA Scores

### 3.2.7. CZA Evaluation

The resulting scores for each factor for each zone were weighted and incorporated into the model. Each factor has a potential score of three, with the eight factors adding to a maximum of 24 points. A score of 24 therefore represents a zone with the most ideal bicycling conditions. The influence of each variable can be weighted by changing the percentage that a variable contributes to the final score. For example, slope can account for five percent or 50 percent of a zone score depending on the need to emphasize or de-emphasize a factor. Table 5 represents the weights given to the factors in Greenville's CZA:

*Table 3-2: CZA Factors and Weights*

<b>Bikeway Density</b>	<b>Bikeway Connectivity</b>	<b>Roadway Density</b>	<b>Roadway Connectivity</b>	<b>Land Use</b>	<b>Topography</b>	<b>Highway Density</b>	<b>Railroad Density</b>	<b>Total</b>
11%	11%	16%	16%	19%	19%	4%	4%	100%

Greenville's designated bicycle network is primarily clustered within the vicinity of Downtown. The bikeway network outside of this area is limited and the density and connectivity of bicycle facilities in Greenville is currently relatively low. Therefore, roadway density and connectivity were given higher weights than bikeway density and connectivity. Introducing new designated bicycle facilities have proven to increase cycling activity in cities across the country. As this analysis is used to evaluate existing bikability, it can also be used to target future bicycle facility installation and analyze the impact of installing bike facilities in various zones.

While Greenville has a relatively level topography, there are street segments with significant slopes and this is a concern for citizen cyclists. Greenville also has an abundance of bikable destinations within and outside of downtown Greenville. These include schools, parks, retail locations, and other public places. Slope and land uses were therefore given the highest weights.

Highways and railroads are significant features that do not facilitate cycling activity, but impact a network's connectivity. Greenville has two major highways that run through the southern and eastern sections of the City. Its railroads are generally isolated from the existing network with the exception of the westernmost part of West Washington Street which is adjacent to a cluster of rail facilities. Highway and rail density were weighted to reflect their relative significance versus the other analysis features.

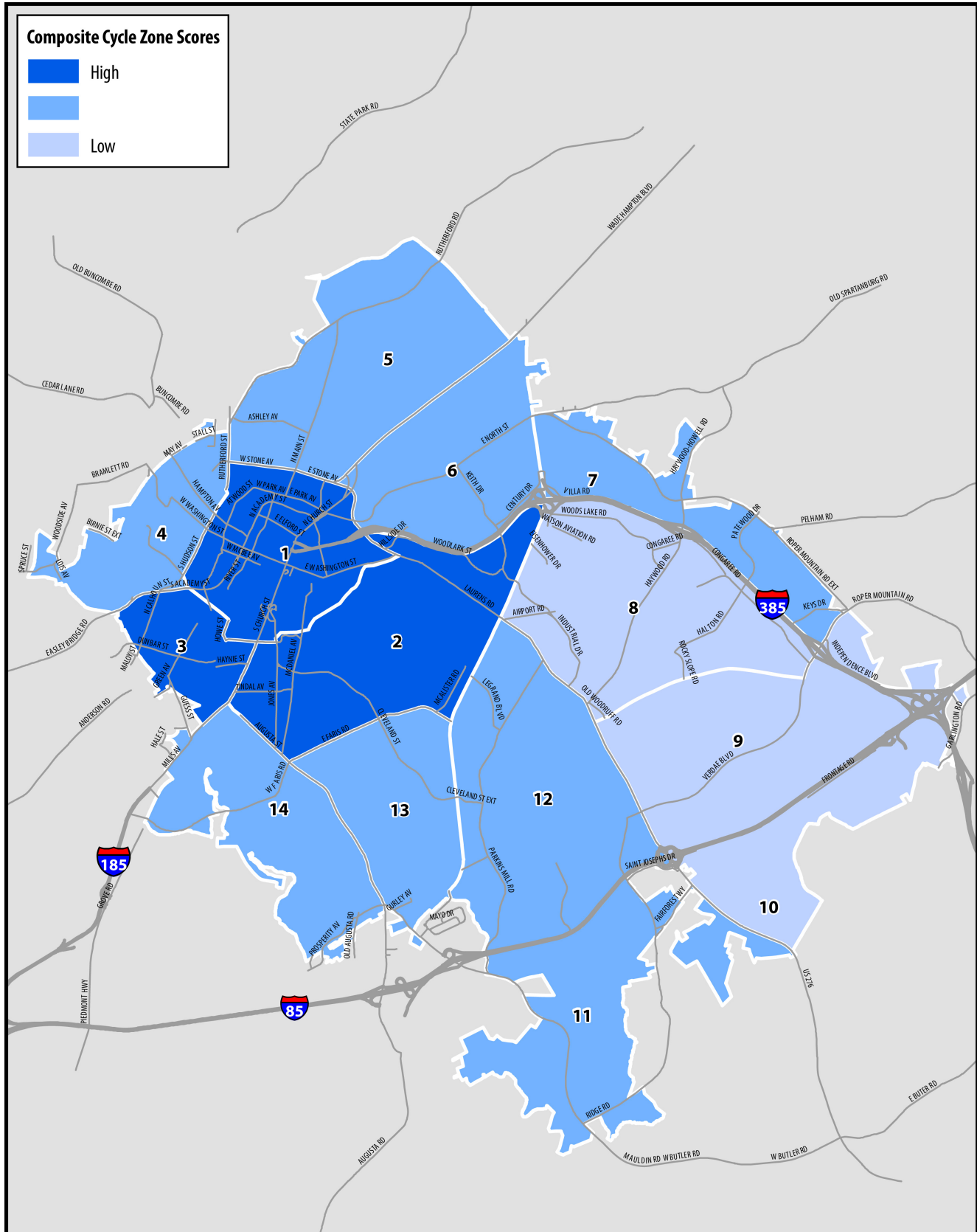
### Using CZA to Identify Cycling Potential

The CZA can be used to highlight zones with issues such as topography and lack of road network connectivity, but these issues are difficult to remedy through near term planning solutions. Road network density, roadway connectivity, slope, and destinations are all baseline factors that define the cycling potential in a given area. The development of the bicycle network will improve a zone from the baseline. Table 6 illustrates the relationship between the factors, scores, and zones. This table can be used to understand the existing conditions in each zone, understand the factors that can be changed, and develop a strategy to develop each zone to its maximum cycling potential.

The composite CZA scores and map show the area of downtown and the areas immediately south and southeast (zones 1-3) to be the most bikeable based on the measured factors. These are areas with good roadway connectivity, many important destinations, limited highway and rail barriers, as well as the City's best bikeway connectivity. The analysis also shows, for example, that areas 6 (between Wade Hampton Blvd. and I-385) and areas 13 and 14 (south of downtown, between Pleasantburg Dr. and I-185) can easily increase overall bikeability from medium to high through increasing bikeway connectivity and density of bike facilities.

Table 3-3: Summary of CZA Scores

Cycle Zone	Bikeway Connectivity	Bikeway Density	Roadway Connectivity	Roadway Density	Land Use	Topography	Highway Density	Railroad Density	Composite CZA
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									



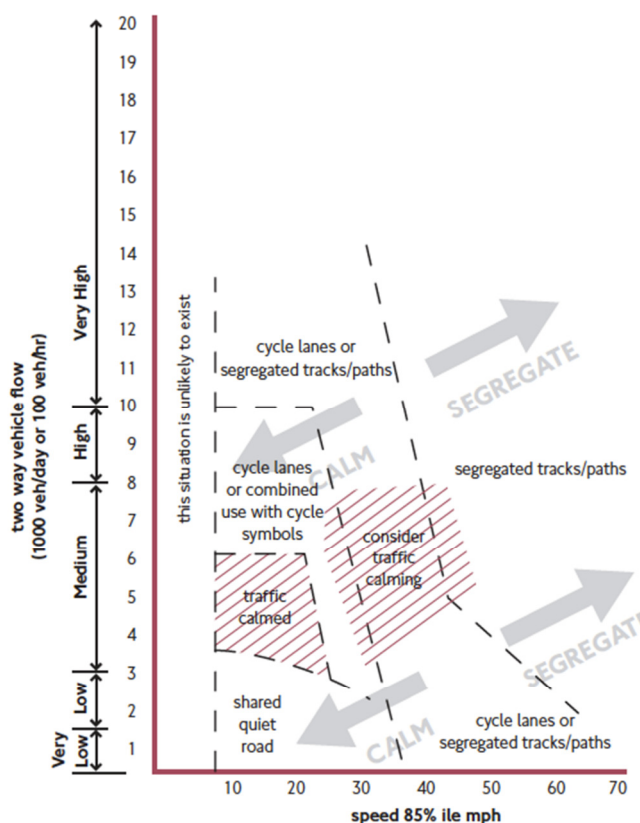
Map 3-8: Composite CZA Scores

### Goal Setting with CZA

The CZA can also be used for goal setting by setting a target that all zones must rate a score of five or higher by 2020, for example. The CZA can be calibrated to highlight areas where additional cycling facilities will increase the rating from good to great, or poor to good. This can be accomplished by heavily weighting the scores associated with bike infrastructure density while holding the other factors equal. Once the recommended future bikeway network is finalized, the CZA will be used to measure the impact of the proposed bike facilities on the various zones.

### 3.2.8. Bike Route Suitability Analysis

A Bike Route Suitability Analysis was performed to identify conditions on Greenville roads that directly impact cyclist comfort: volume of motor vehicles, volume of trucks, motor vehicle speeds, and the number of lanes<sup>8</sup>. The analysis is based on the understanding that as motor vehicle traffic volumes and speeds increase on roadways, the need and desire increases to separate bicycle and motorist traffic for comfort and safety. For example, most cyclists are comfortable riding in the road on low volume, low speed neighborhood streets without any special bicycle facilities. On major roadways with heavier traffic and higher motor vehicle speeds, cyclists and motorists are generally more comfortable with separate bicycle facilities. National and international bicycle design guidelines generally recommend that as motor vehicle volumes exceed 3,000 vehicles per day and traffic speeds exceed 25mph, facilities to separate bicycle and motor vehicle traffic are recommended. Multi-lane roads are typically more dangerous for all users because of the increased traffic volume, the potential for higher speeds, and the additional number of conflict locations due to turning vehicles.



#### Notes:

1. Each route will need to be judged in the light of its specific situation
2. Cycle lanes or tracks will not normally be required in traffic calmed areas
3. Congested traffic conditions may benefit from cycle lanes or tracks
4. Designs should tend to either calm traffic or segregate cyclists

*Speed/Volume table from the London Cycling Design Standards showing the need to segregate bicycle and traffic as motorist speed and volume increases.*

<sup>8</sup> The data used in this analysis describe the arterial and collector network and are the same data utilized for the 2005 Long Range Transportation Plan for Greenville.

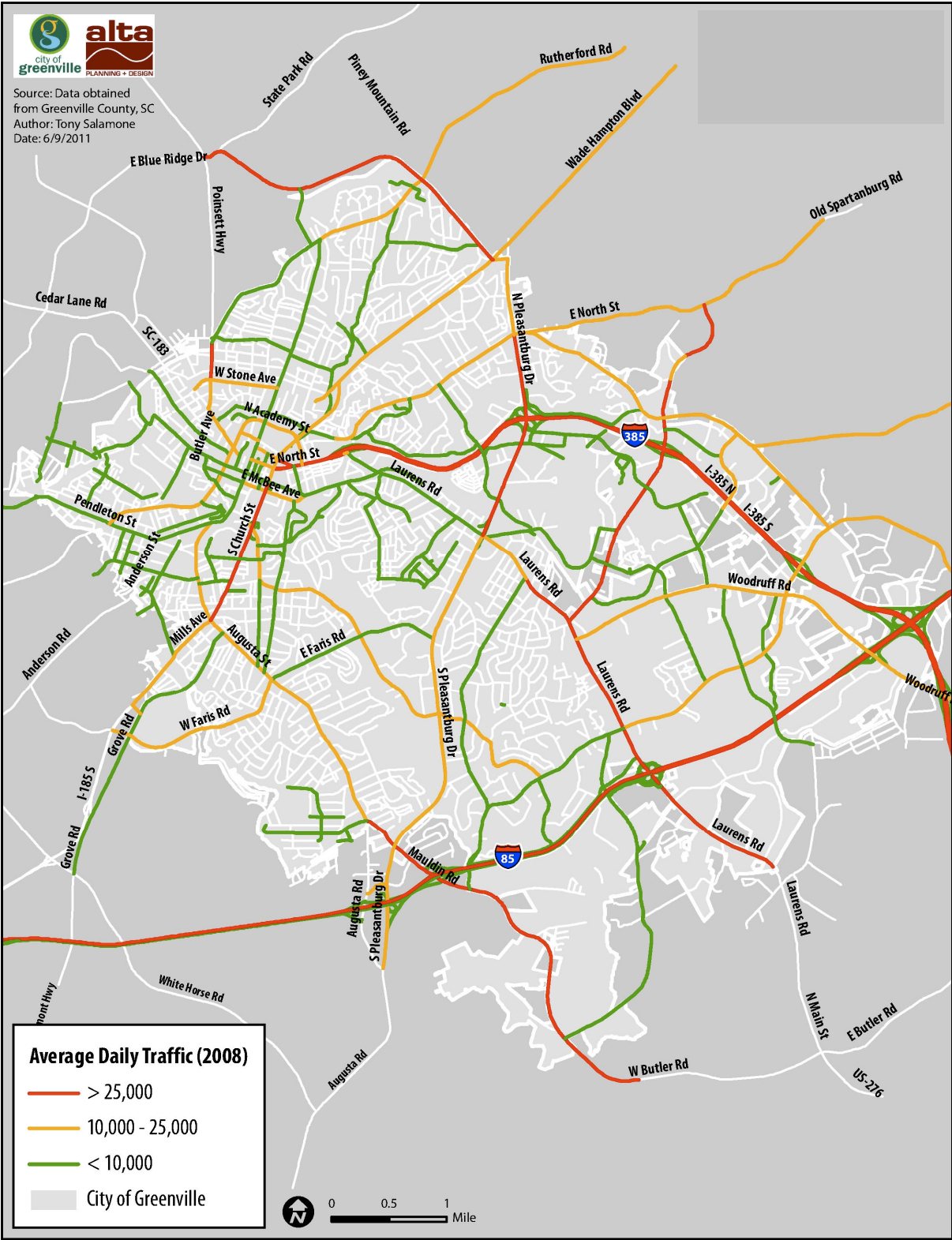
The maps on the following pages describe each of the factors discussed above (volume of motor vehicles, volume of trucks, motor vehicle speeds, and the number of lanes) for Greenville's major roadway network. The final composite map of these factors shows a generalized suitability rating of Greenville's existing roads based on assumptions of an average adult's perceived cycling comfort.

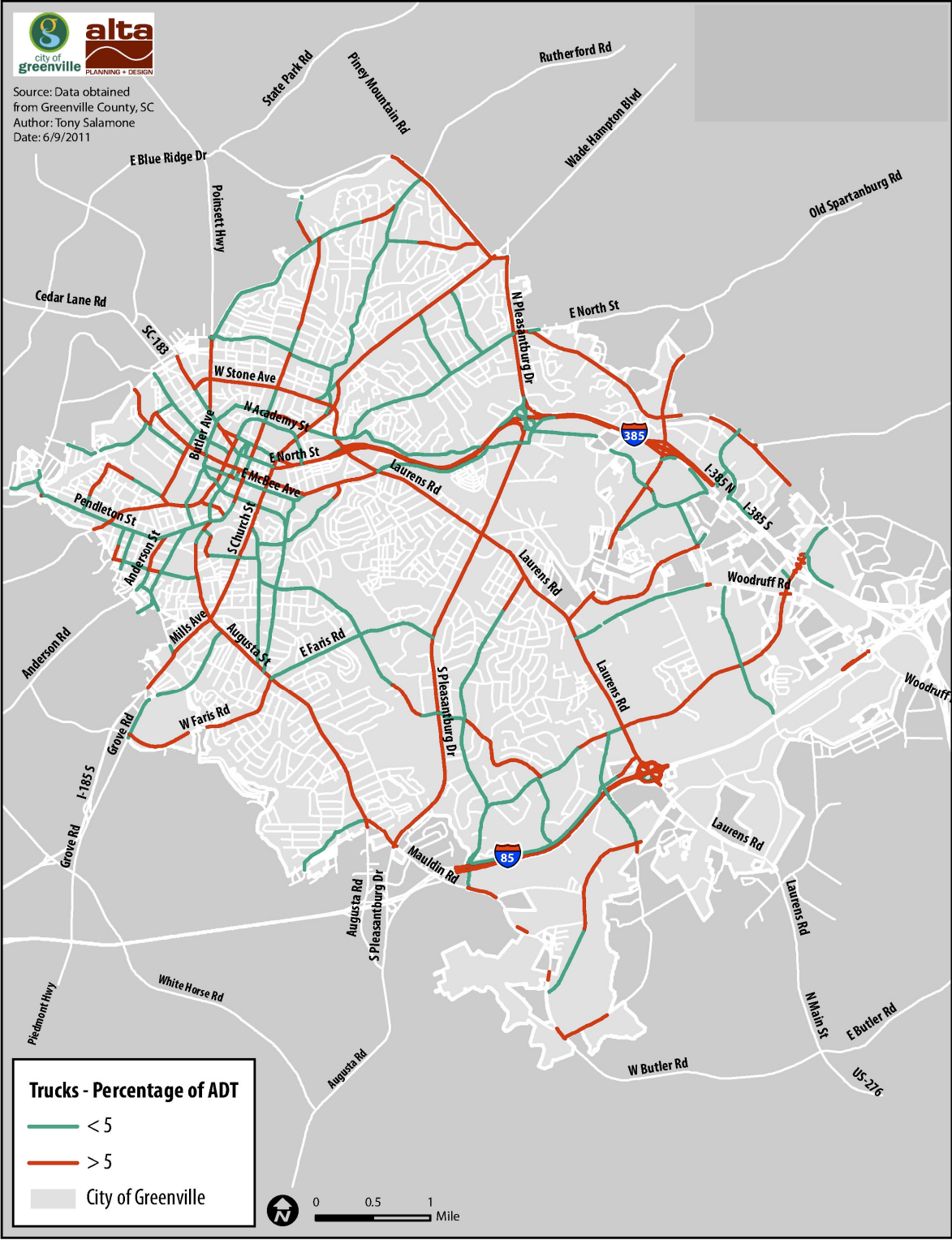
The streets in red on the composite map identify those streets that are the most challenging for bicycling given the factors above, but could serve as important bikeway network connections. These include the highway network as well as several multi-lane arterials. Major arterials in Greenville with five to seven lanes – such as Pleasantburg Dr., Laurens Rd., and Wade Hampton Blvd. – serve as barriers for bicycling as they are each challenging to both travel along and cross.



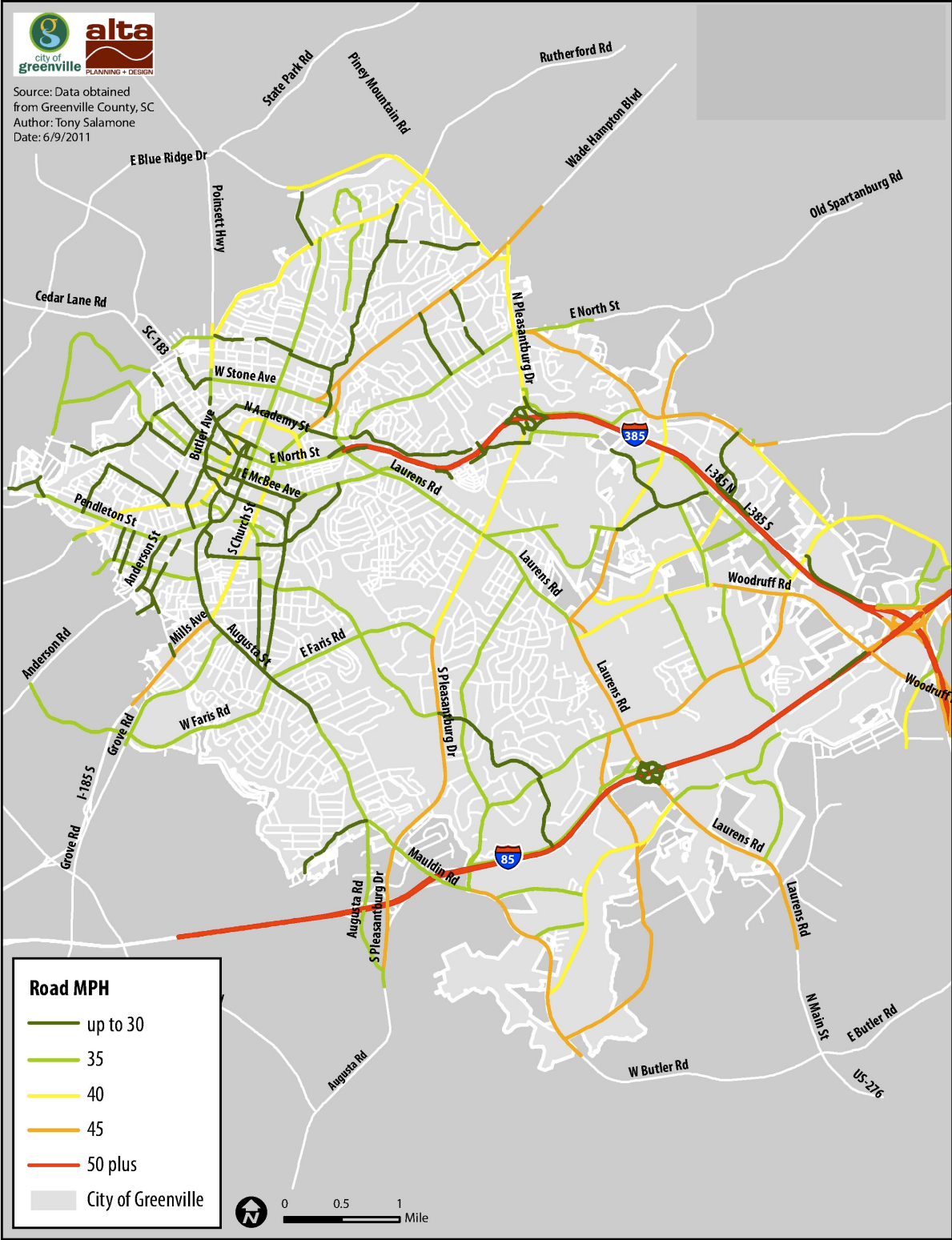
*A major arterial with five or more lanes, such as Wade Hampton Blvd (shown), is a barrier to bicyclists.*





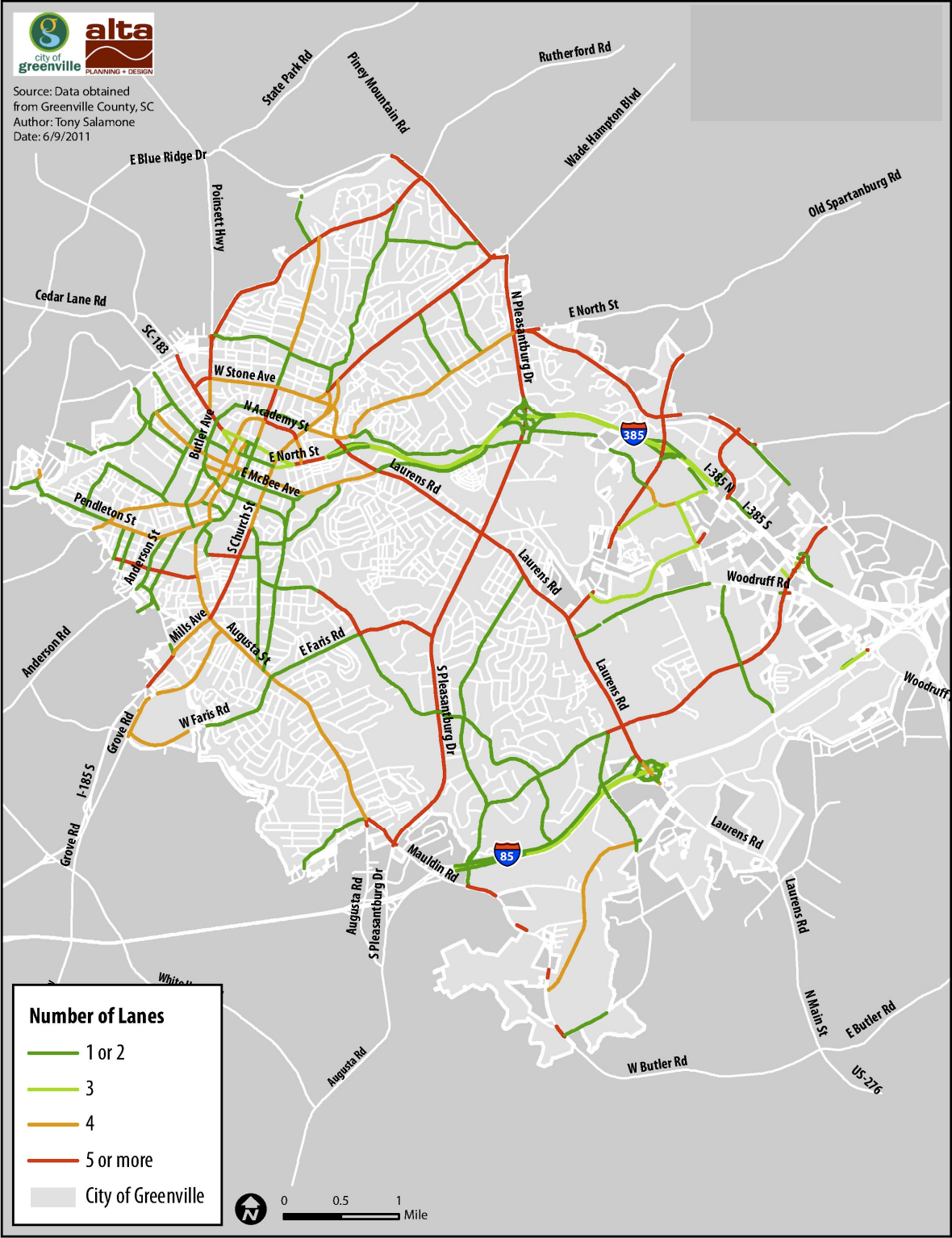


Map 3-10: Bike Route Suitability Analysis – Trucks – Percentage of ADT

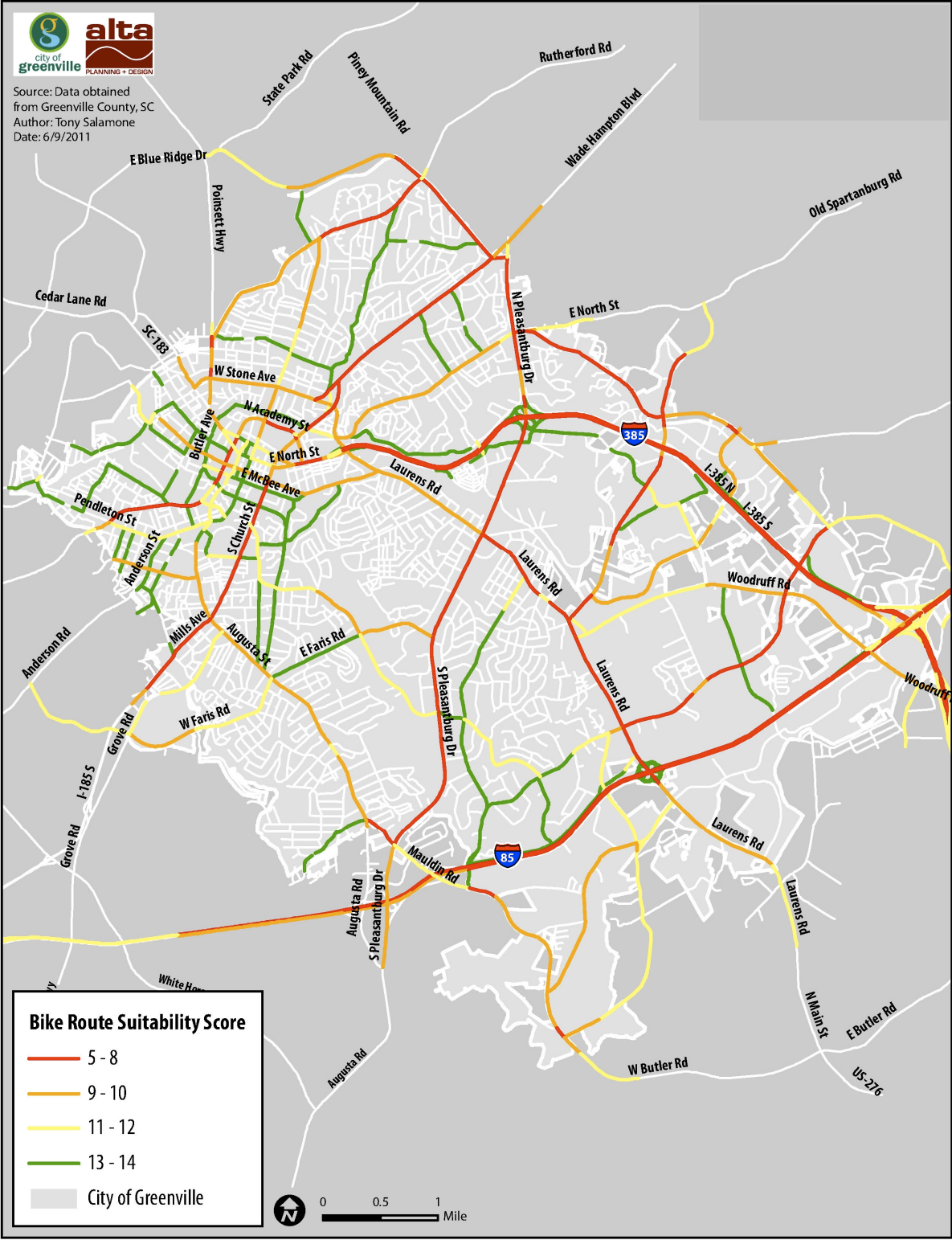


Map 3-11: Bike Route Suitability Analysis –Road Speeds





Map 3-12: Bike Route Suitability Analysis – Number of lanes



### **3.2.9. Streetplan Analysis**

The Cycle Zone Analysis (Chapter 3.2.1) facilitates an understanding of the bicycling opportunities and challenges in different areas of Greenville. The Bike Route Suitability (3.2.8) complements this analysis by focusing on the existing conditions on Greenville streets from the perspective of bicycling. The StreetPlan analysis tool focuses on opportunities for improving conditions for bicyclists on Greenville streets.

The StreetPlan analysis tool excels at quickly identifying corridors with the greatest potential for striping bike lanes. It does not make recommendations for other commonly utilized bikeway treatments such as shared lane markings, bicycle boulevards, or signed bike routes. Assuming acceptable minimum widths for each roadway element, the model analyzes a number of roadway characteristics to retrofit bike lanes on each surveyed roadway segment. Factors used in this analysis include:



### 3.2.10. Streetplan Analysis

The Cycle Zone Analysis (Chapter 3.2.1) facilitates an understanding of the bicycling opportunities and challenges in different areas of Greenville. The Bike Route Suitability (3.2.8) complements this analysis by focusing on the existing conditions on Greenville streets from the perspective of bicycling. The StreetPlan analysis tool focuses on opportunities for improving conditions for bicyclists on Greenville streets.

The StreetPlan analysis tool excels at quickly identifying corridors with the greatest potential for striping bike lanes. It does not make recommendations for other commonly utilized bikeway treatments such as shared lane markings, bicycle boulevards, or signed bike routes. Assuming acceptable minimum widths for each roadway element, the model analyzes a number of roadway characteristics to retrofit bike lanes on each surveyed roadway segment. Factors used in this analysis include:

- Current roadway width
- Raised or painted median
- Number and width of travel lanes
- Presence and number of turn lanes and medians
- Location and utilization of on-street parking
- Presence of roadway shoulder

In some cases, the retrofit is simple and only requires the addition of a bike lane in readily available roadway space. Other corridors may be more challenging and require a tradeoff to stripe bike lanes. Though the model makes recommendations for bike lanes, its outcomes should not be considered a replacement for a striping plan. The model is useful in its ability to clearly illustrate locations where projects can be completed easily and locations where adding bike lanes may be more difficult. The decision to narrow or eliminate a travel lane, or remove on-street parking should be considered in conjunction with engineering judgment and traffic impact studies. However, if there is a need for bicycle lanes on a corridor, the difficulty of implementation should not preclude development. It may simply indicate the need to explore alternative options, such as a parallel bicycle boulevard, or the need to prioritize bicycle and pedestrian travel in a corridor and consider alteration of existing motor vehicle prioritization. The City of Greenville will need to identify the impacts of altering the roadway's existing condition and, as with any roadway retrofit, conduct careful field analyses and detailed traffic engineering studies prior to striping bike lanes.

Retaining a uniform roadway configuration throughout a corridor can simplify travel for motorists and cyclists alike, creating a safer and more comfortable experience for all users. It is recognized that acceptable lane widths vary by functional classification, for example 10 foot travel lanes may be acceptable for a local street, but higher speed arterials may require 11 feet as the minimum lane width. For the purposes of the model, acceptable minimum roadway dimensions were set at the following:

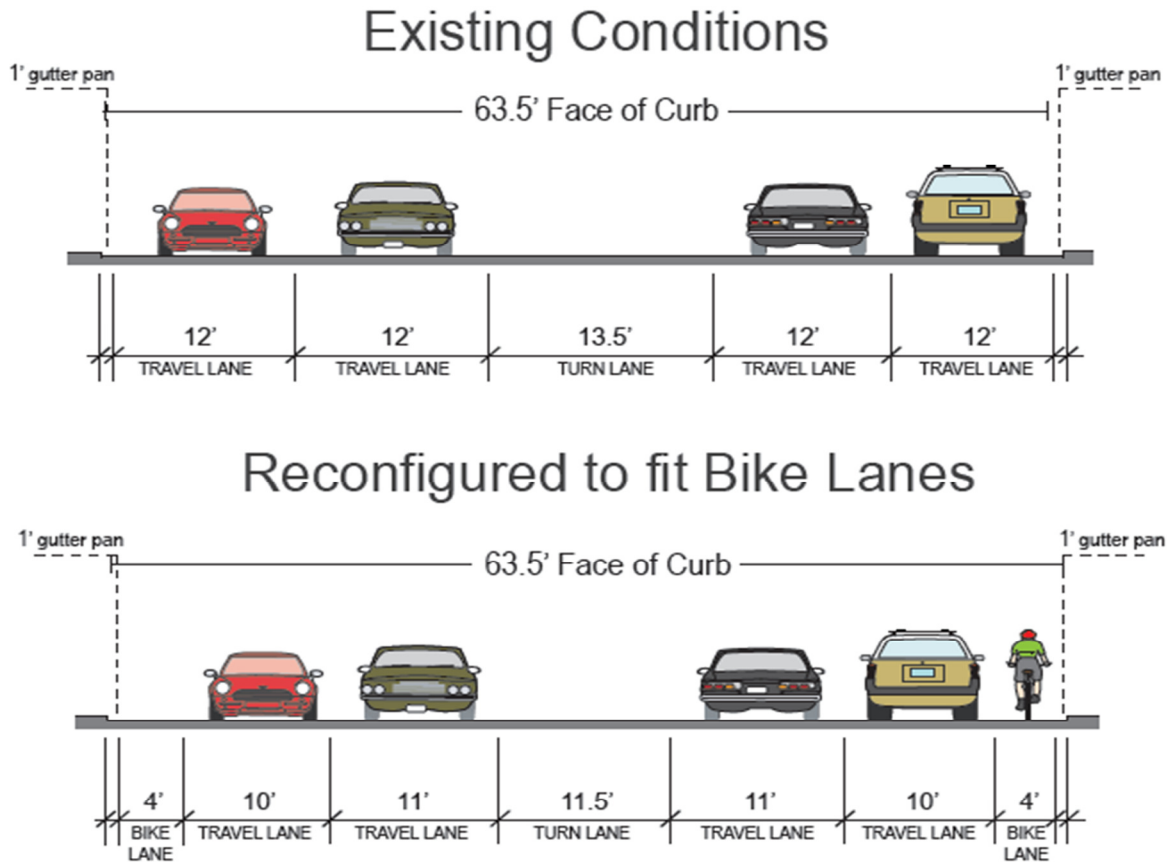
- Travel lane width: 11 feet
- Right turn lane width: 11 feet
- Left or Center Turn Lane width: 11 feet
- Parking lane width: 7.5 feet

Based on the above inputs, the model's results showed many areas requiring an engineering solution to stripe bike lanes, meaning that the corridor would need to be redesigned with a potential for increased capital costs for implementation. However, if the City considered lowering the minimum lane width to 10' or 10.5' it would significantly improve the model's outcomes. At lower lane width thresholds the model would recommend less intensive treatments on many street segments that had formerly required an engineering solution.

### **StreetPlan Outcomes**

Analysis corridors were developed based on previously proposed facilities, a review of existing conditions, field work and discussions with city staff. StreetPlan results were used in combination with existing conditions analysis, speed and volume information, fieldwork, and conversations with city staff to develop the proposed citywide bikeway network. In many instances the StreetPlan model recommends multiple treatments for a given roadway segment. To determine the appropriate treatment, the model organizes its recommendations in order of the *most preferred* facility type. The order uses the first strategy (below) for a given segment of roadway and is given priority over succeeding strategies. Not all of the below options were possible strategies for all segments, but on many segments multiple strategies could be used to implement bike lanes. Each of the specific treatment recommendations is defined in detail below.

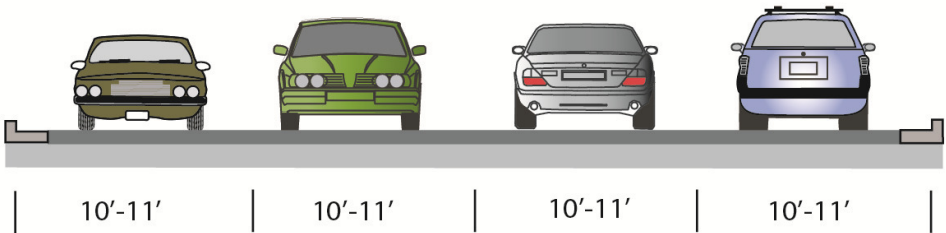
**Bike Lanes Fit With Existing Roadway Configuration** – In this option, enough surplus road space exists to simply add the bike lane stripes and stencils without impacting the number of lanes or configuration of the roadway. This is by far the most desirable and easily implemented option available.



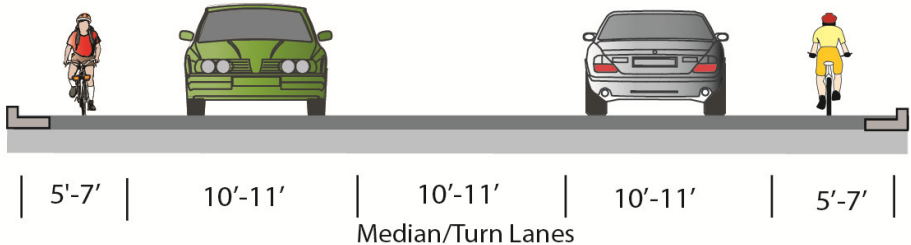
**Remove Underused Parking** – In this option, underused on-street parking on one side of the street is removed to create space for bike lanes. Acceptable situations for this scenario include collector or arterial roadways that pass by back fences of homes rather than the front sides, or areas that have large surface parking lots adjacent to existing on-street parking. A parking utilization study should be conducted prior to removal of on-street parking.

**Consider ‘4 to 3’ Road Diet** – In this option, a reconfiguration of the existing travel lanes may be necessary. In areas with two travel lanes in either direction, it may make sense to remove two travel lanes and use the spare roadway width to stripe a center turn lane and two 5’ bike lanes. This treatment may not be appropriate on roads with ADT’s above 20,000-25,000.

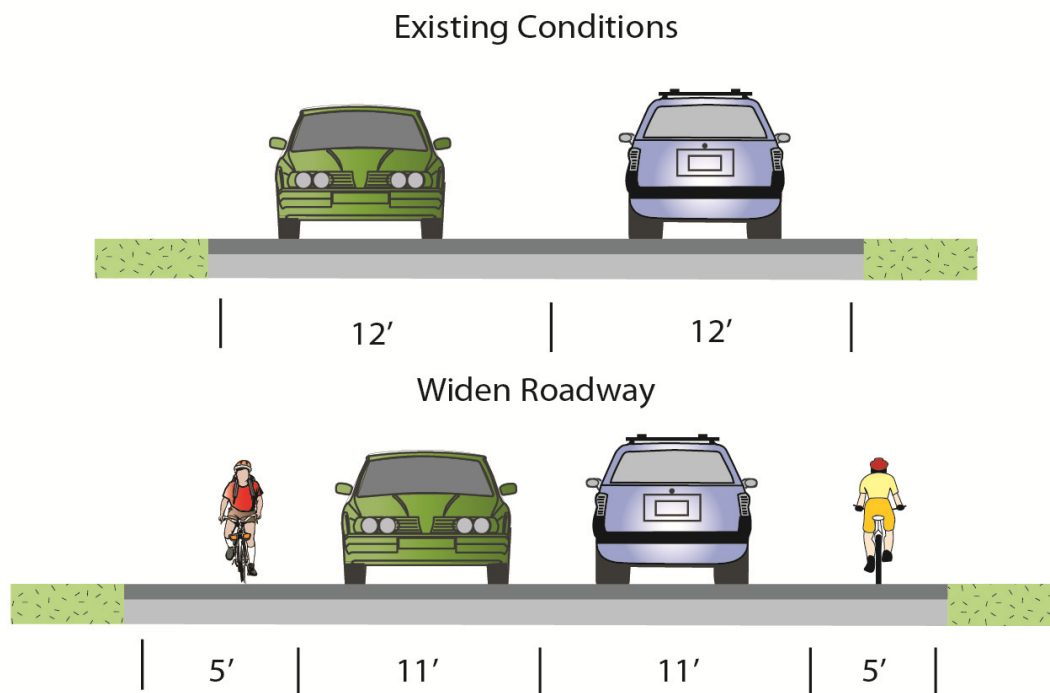
### 4 to 3 Road Diet: Before



### 4 to 3 Road Diet: After



**Add Additional Pavement Width and Stripe Bike Lanes** – In this option, it was determined that additional right-of-way was available along the corridor. Where no curbs exist along the segment it may be possible to pave a new roadway shoulder and stripe bike lanes



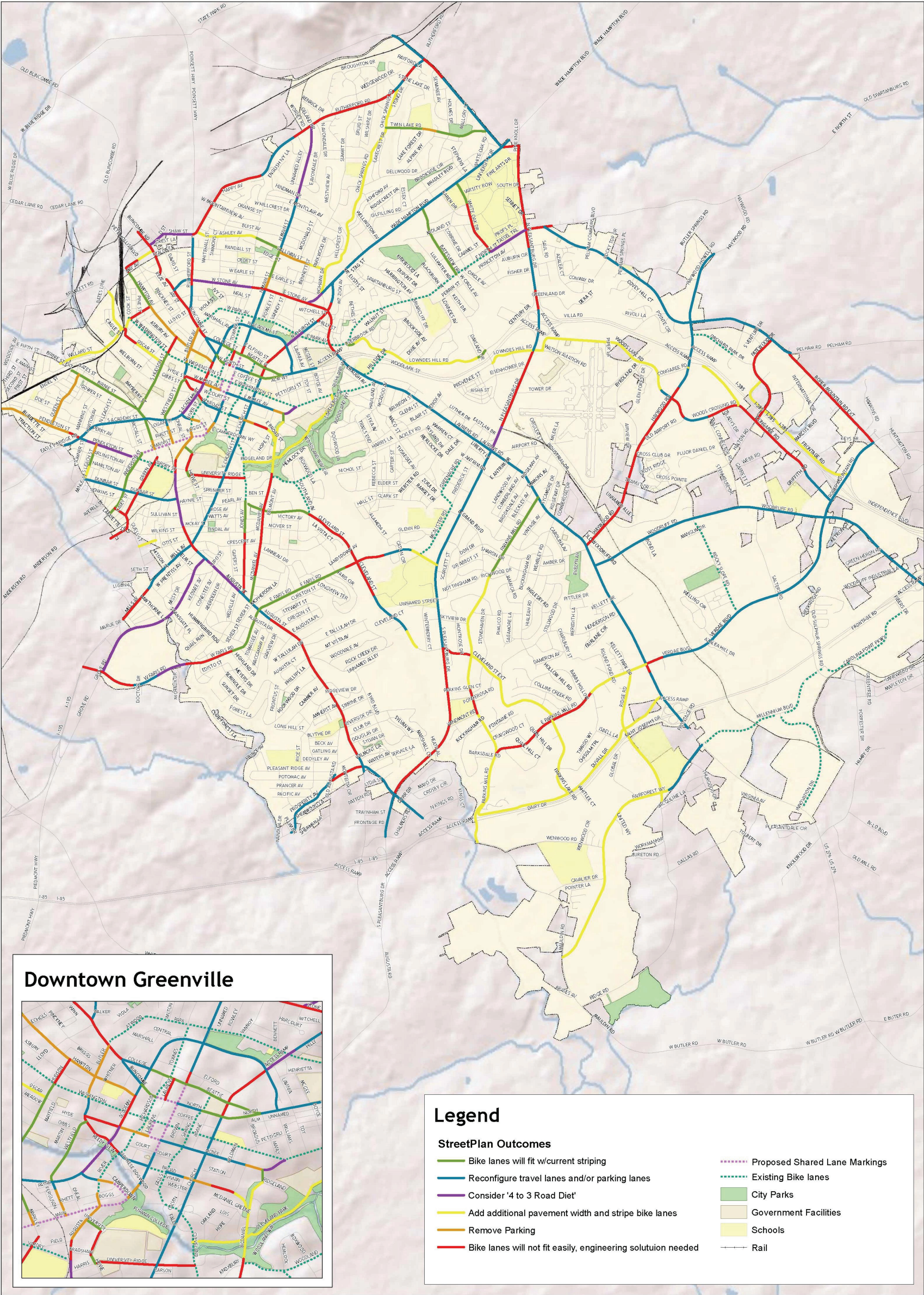
**Remove On-Street Parking** – In this option, on-street parking may be removed on one side of the road. However this on-street parking configuration may currently be utilized in residential or commercial areas. This option is seen as a less desirable option and may only be considered as a last resort in short sections to maintain bike lane continuity. A full parking study should be conducted to determine if excess parking capacity exists before making changes to the roadway configuration.

**Bike Lanes Will Not Fit/Engineering Solution Necessary** – In this last case, the existing roadway geometry will not allow for the addition of bike lanes. Either a bike route or major reconstruction of the roadway may be necessary for bikeway continuity.

The results of the StreetPlan analysis performed for Greenville are presented in the Map 3-14: Greenville StreetPlan Results on the next page.



Map 3-14: Greenville StreetPlan Results



# Greenville StreetPlan Results

Greenville, SC  
City of Greenville Bicycle Master Plan  
Source: Data obtained from Greenville County  
Author: DM  
Date: October, 2010



## 4. Needs Analysis

The City of Greenville's bicyclist needs are diverse, depending on level of experience, confidence, age, trip type, and many other factors. This examination begins with a review of Greenville's first bicycle count. Bicycle collision locations and rates are also reviewed to understand locations likely in need of bicycle related improvements. The section then discusses trip attractors and generators to identify where residents are likely to bicycle to and from. Travel mode choice and typical travel time are then reviewed to understand the current and potential rates of bicycling. The needs analysis concludes with a summary of community input gathered from a community survey and a workshop.

### 4.1. Bicycle Count

#### 4.1.1. Overview

To fully comprehend existing conditions in Greenville, SC, it is important to understand the number of non-motorized users and the patterns in which they interact with the existing roadway network. To do so, a count of bicyclists at three-dozen locations around the City was performed during October 2010. The effort included:

- Careful identification of 36 count locations
- A bicycle count form customized for Greenville
- Two count training sessions
- One weekday and one weekend count at each location
- Data synthesis and analysis

The bicycle count form recorded three different characteristics of the bicyclists counted: helmet use, gender, and sidewalk use. Separately, counters also noted wrong-way riding.

Bicycle counting is important for several reasons. The U.S. Census reports that Greenville has a bicycle mode share less than 1 percent. While this information can be useful for comparative analysis, the data is very limited. The Census measures commute to work trips only, which account for less than 15 percent of all trips taken in the U.S. By conducting its own bicycle counts, the City of Greenville can account for trips taken by bike that are not commute to work trips, as well as better understand where bicycle use is occurring. Counts are also helpful to analyze existing bikeway facility use and where future facilities may be justified.

Greenville's bicycle counts provide a valuable snapshot for the level of bicycling that occurs along major corridors and preferred bicycling routes in Greenville. This serves as baseline data for future comparison and evaluation of trends. Analysis of the counts and count location characteristics additionally provides useful information regarding the relationship between bicycle ridership levels and the bicycling environment.

#### 4.1.2. Process

Tallies at the 36 locations were conducted on two nonconsecutive days in mid October 2010, with one day scheduled for a weekday morning commute and the other scheduled for a weekend mid-day. The weekday morning count was conducted from 7:00 a.m. to 9:00 a.m. and the weekend count from 10:00 a.m. to Noon.

The morning peak period was chosen as the focus because of the variety of trips, such as school-commutes and morning exercise, as well as work-related commutes.

The count times and overall guidelines were developed in conjunction with the National Bicycle and Pedestrian Documentation Project (NBPDP), a joint collaboration between Alta Planning + Design and the Institute of Transportation Engineers. The NBPDP guidelines will be used for all subsequent counts within the City of Greenville and all data from the counts will be forwarded to the NBPDP for further analysis and to add to the growing collection of consistent information about people who are bicycling in different parts of the country.

Each count location was at an intersection (Table 4-1). While this approach is not necessary, intersections were chosen to incorporate counts along two corridors for each counter. Screenline counting is the methodology that is recommended by NBPDP and was determined to be most appropriate for Greenville’s project. Normally, one volunteer would count bicyclists that pass through a single, imaginary line running across the street, thereby capturing all cyclists traveling in either direction along a single corridor. That approach may be useful for Greenville when it uses this methodology to count bicyclists in future years. In 2010, the screenline approach was modified slightly to allow counters to monitor two imaginary lines at a single location. This modification ensured that cyclists traveling in either direction, along either of two perpendicular corridors, would be captured. This modification doubled the number of corridors observed.

Counters noted three different characteristics for every bicyclist: helmet use, gender, and sidewalk use. Additionally, Greenville’s Bicycle Count Form (Figure 4-1. Greenville’s Bicycle Count Form captured helmet use, gender, and sidewalk use.) recorded the following information:

- Location
- Names of the two separate screenlines
- Date
- Start and end time (for each one-hour block of time)
- Weather conditions
- Name of the counter

The “Notes” section of the form provided a space for counters to record other information that may be useful to the City of Greenville. Counters noted wrong-way riders – whether on the sidewalk or within the travel lane – in the “Notes” section.

Counts were conducted by volunteers, who were trained through one of two sessions offered. Training volunteers is essential to ensuring accurate, consistent, and usable data.

Figure 4-1. Greenville’s Bicycle Count Form captured helmet use, gender, and sidewalk use.

**Bicycle Count Form**

Use a different form for each hour. Count using clear, identifiable tally marks. Be specific when naming your location. Make notes of (and count) wrong-way riding or other unusual occurrences in lower box.

**Greenville, SC**

Location: \_\_\_\_\_

(Screenline A) \_\_\_\_\_ (Screenline B) \_\_\_\_\_

Date: \_\_\_\_\_ Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Weather: \_\_\_\_\_ Name: \_\_\_\_\_

	(A) Male	(B) Male	(A) Female	(B) Female	Total
<i>with</i> helmet on street					
<i>with</i> helmet on sidewalk					
<i>without</i> helmet on street					
<i>without</i> helmet on sidewalk					
<b>Total →</b>					

Notes:

Table 4-1. Count locations included two screenlines and a weekend count, as well as a weekday count.

Location	Street Identifier (A)	Street Identifier (B)	Total Weekend Day Count	Total Weekday Count
Location #1	N.Main	Rutherford	16	1
Location #2	Chick Springs	Rutherford	2	0
Location #3	Wade Hampton	Dupont	3	1
Location #4	E. North	Stone	12	4
Location #5	Washington	McBee	N/a	N/a
Location #6	Hillside	Woodlark	3	1
Location #7	E. North	Pleasantburg	3	3
Location #8	Keith	Lowndes Hill	3	3
Location #9	Pelham	Haywood	0	0
Location #10	Ellison at Antrim	Laurens at Antrim	7	2
Location #11	Roper Mountain Rd	Roper Mtn. Ext.	3	0
Location #12	Woodruff	Rocky Slope	0	0
Location #13	Carolina Point Pkwy	Woodruff	2	8
Location #14	Laurens	Haywood	4	0
Location #15	Innovation Way	Millenium Drive	18	28
Location #16	Millenium	Laurens	2	4
Location #17	Laurens	Woodruff	2	0
Location #18	Faris	Cleveland	20	1
Location #19	Woodland	Swamp Rabbit Trail	88	12
Location #20	McDaniel	Ridgeland	100	18
Location #21	Mauldin Rd.	Fairforest	1	0
Location #22	Augusta	Riverside	3	5
Location #23	Augusta	McDaniel	12	2
Location #24	Grove	Henrydale	5	1
Location #25	Augusta	Mills (Church)	22	8
Location #26	Falls	E. Broad	26	25
Location #27	Augusta	Vardry	22	12

Location	Street Identifier (A)	Street Identifier (B)	Total Weekend Day Count	Total Weekday Count
Location #28	Richardson	Washington	40	10
Location #29	W. Washington	Butler	40	7
Location #30	W. Washington	Hudson	12	1
Location #31	Pendleton	Academy	26	9
Location #32	Pendleton	Lois	10	5
Location #33	Swamp Rabbit Trail	Willard	310	39
Location #34	Washington	Mulberry	39	1
Location #35	Poinsett	Rutherford	12	5
Location #36	Buncombe	Atwood	8	10
Location #37	Stone	Townes	11	5
<b>Total Weekend Day and Weekday Counts</b>			<b>887</b>	<b>231</b>

### 4.1.3. Results

The combined total count of bicyclists for both count days was 1,118 (Table-4-2). While this number provides an important snapshot of Greenville's bicycling community, it does not provide a comprehensive count of all bicyclists in Greenville. Instead, the data offers clues as to where and when local bicyclists are out and about.

On the weekday, seven locations counted zero bicyclists and six locations counted more than ten. On the weekend day, two locations counted zero bicyclists and eighteen counted more than ten, including the highest count overall, which reached 310 bicyclists at one location (two screenlines, on the weekend day), as shown in . The average weekday count was six bicyclists and the median weekday count was four. The average weekend day count was 25 and the median weekend day count was ten. Map 4-1 maps each of the bicycle count locations and includes icons that vertically represent the total number of bicyclists counted at that location on the weekend (yellow) and the weekday (purple).

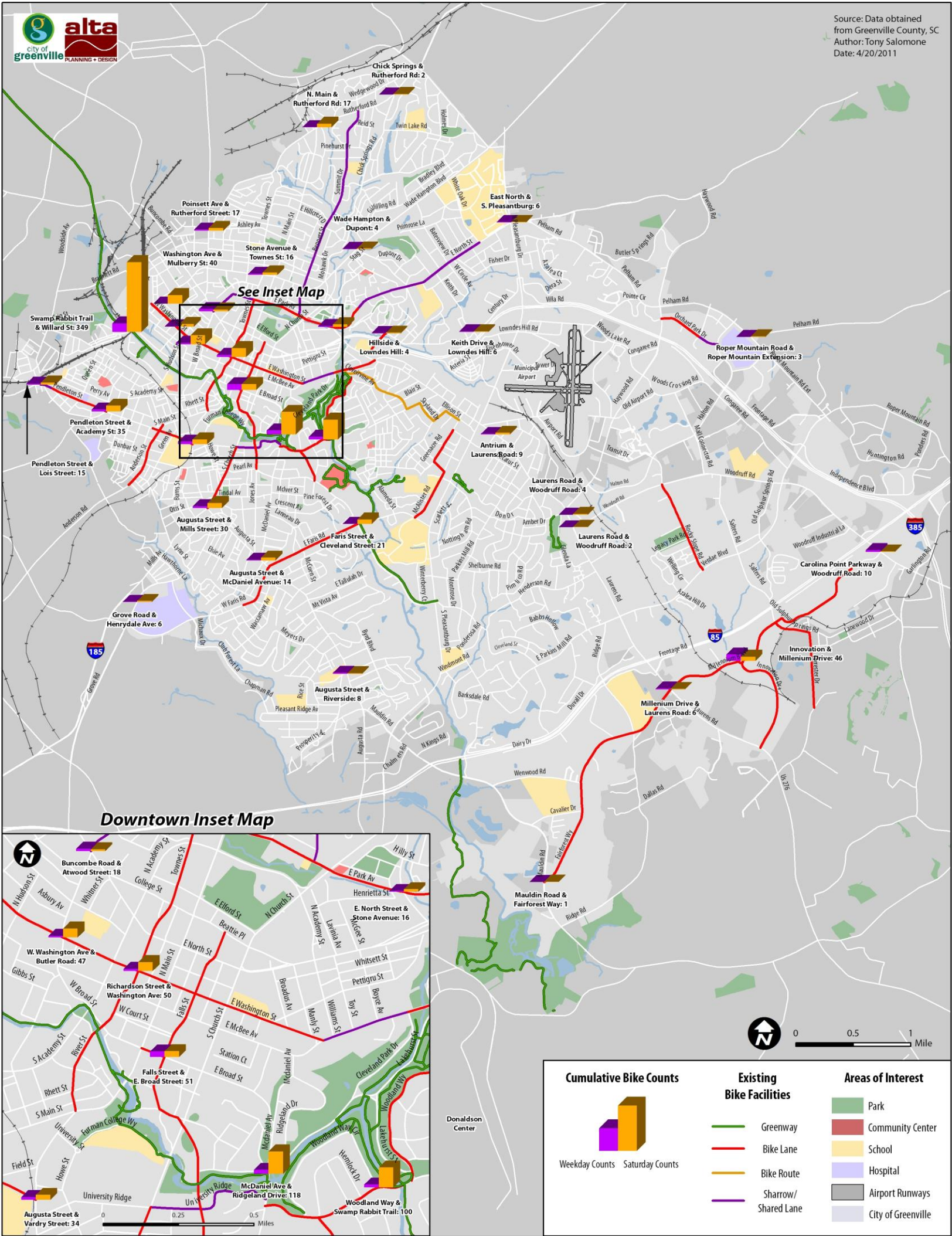
*Table-4-2. A total of 1,118 bicyclists were counted during Greenville's first bicycle count.*

Characteristic	Total Count
Total Bicyclists Combined	1,118
Total Bicyclists Weekday	231
Total Bicyclists Weekend Day	887
Total Males	847
Total Females	271
Total Bicyclists on Street	676
Total Bicyclists on Sidewalk	168 <sup>1</sup>
Total Bicyclists with Helmet	713
Total Bicyclists without Helmet	405
Wrong-way Riding	10

<sup>1</sup> While the total number of bicyclists riding on a sidewalk is recorded as 442, 274 of those bicyclists were appropriately traveling on the Swamp Rabbit Trail. For the purposes of this report, those counts have been removed to more clearly identify bicyclists who are riding on facilities not intended for bicycling.



Map 4-1: The corridors nearest existing bicycle facilities evidenced the highest numbers of bicyclists





#### 4.1.4. Key Findings

The results of Greenville's bicycle count show that:

- The majority of the bicyclists counted were male (76%).
- Most of the bicyclists observed wore a helmet (64%).
- Approximately 15 percent of bicyclists counted used the sidewalk rather than the street.
- Bicycling is more common on the weekend than weekdays.
- Wrong-way riding was observed in less than 1% of bicyclists.
- The most popular areas for bicycling are near Willard Street, at the Swamp Rabbit Trail, and McDaniel Avenue at Ridgeland Street, at Cleveland Park.

Based on the count, Greenville's ratio of male cyclists to female is 3:1. This ratio is consistent with count data and anecdotal evidence from cities throughout the country. While bike-friendly cities in Northern Europe have an even split between men and women (in some cases more women cyclists than men), in North American cities with limited bicycling infrastructure, the number of men is higher in all cases. In cities that strive to create a fully-integrated network of bike facilities such as Portland, Oregon or Montreal, the number of female cyclists has inched closer to male cyclists but continues to be approximately half of the gross number of men. The expectation in Greenville is that the ratio of men to women will, in time, begin to balance out as the number of less traffic-tolerant female cyclists increase as improvements to bicycle infrastructure along important corridors continues.

Greenville boasts a high percentage (64%) of helmet use. According to the National Highway Traffic Safety Administration, only 20 to 25 percent of bicyclists in the country wear a helmet.<sup>1</sup> While the percentage of wrong-way riding is less than one percent, it is important to note that the Collision & Safety Analysis found that bicyclist wrong-way riding made up 12 percent of all bicycle-motor vehicle collisions from 2005 to 2009 (section 4.1.1).

Approximately 15 percent of bicyclists rode on the sidewalk, which is relatively high. This is a reflection of limited bicyclist facilities. Separated bicycle facilities increase bicyclists' perception of safety.<sup>2</sup> Though riding on sidewalks may feel safe, because it gives the sense of separation, it can be more dangerous than riding with traffic and does not serve as an adequate substitute for biking infrastructure.

The bike count data also indicates an association between increased levels of bicycle ridership and proximity to the Swamp Rabbit Trail (Table 4-1). As mentioned, both current and potential bicyclists prefer separated bikeways, and studies have also shown that proximity to a rail-trail spurs bicycling activity.<sup>3</sup> As counts for the Swamp Rabbit Trail are completed in the near future, more can be learned about the relationship between bicyclists on Greenville's roadways and off-road trail users.

<sup>1</sup> National Highway Traffic Safety Administration (NHTSA). January 2008. *Traffic Safety Facts: Laws*. [www.nhtsa.gov](http://www.nhtsa.gov).

<sup>2</sup> Krizek, K., Forsyth, A., and Baum, L. (2009). *Walking and cycling international literature review*. Melbourne, Victoria: Department of Transport.; Pucher, J. Dill, J. and Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: An international review. *Preventative Medicine*, 50. S106-S125.

<sup>3</sup> Xing, Y., Handy, S., and Mokhtarian, P. (2010). Factors associated with proportions and miles of bicycling for transportation and recreation in six small US cities. *Transportation Research Part D* 15, 73–81

## 4.2. Bicycle Collision and Safety Analysis

### 4.2.1. Collision Data

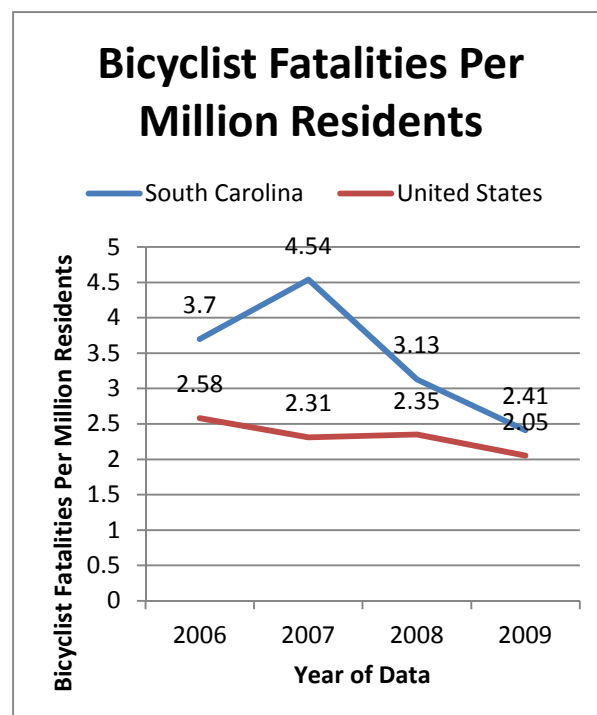
Traffic collision data was analyzed for collisions within the City of Greenville involving both a bicycle(s) and motor vehicle from 2005-2010. The South Carolina Department of Public Safety (SCDPS) manages a statewide database of traffic collisions. To be included in the statewide database, a collision must: 1) involve a licensed motor vehicle such as an automobile, truck or motorcycle (mopeds, go-carts and trains on tracks do not qualify); 2) occur on a public roadway (shopping center parking lots and private roads do not qualify); and 3) involve a reportable injury or at least \$1,000 in total property damage.

The Greenville Police Department (GPD) records any collision to which it responds that meets the three qualifications listed above. The records of the GPD are sent to the SCDPS for inclusion in the statewide database. For the purposes of the Bicycle Master Plan, the inventories of collisions from both SCDPS and GPD were compared to identify data discrepancies. Though the majority of collisions listed in the two databases overlapped, this process identified 16 collisions in the SCDPS report, which were not included in the GPD report. Of the 16, GPD found reporting errors in six of them. Four collisions involved a moped rather than a bicycle and two collisions occurred beyond the Greenville city limits. As a result of this filtering process, ten collisions from the SCDPS report have been added to the GPD collision inventory. The recommendations of the Bicycle Master Plan reflect the need to improve the reliability, consistency, and efficiency of Greenville's collision reporting process.

Currently, the state of South Carolina ranks 45<sup>th</sup> in the nation for levels of bicycling and walking, yet ranks as 2<sup>nd</sup> in the nation for bicycling and walking fatality rates (calculated based on the number of fatalities divided by the number of persons engaging in bicycling and walking, as determined by Census mode share data)<sup>4</sup> and is ranked 39<sup>th</sup> in the U.S. for overall bicycle-friendliness (by the League of American Bicyclists)<sup>5</sup>.

Recently, however, the state did experience an improvement in its level of bicyclist fatalities per million residents. Though South Carolina ranked 5<sup>th</sup> in the U.S. for that metric in 2009 (based on 2008 data), it ranked 11<sup>th</sup> in 2010 (based on 2009 data). Figure 4-2 illustrates the change in bicyclist fatalities per million residents based on data from 2006 to 2009.<sup>6</sup>

Figure 4-2. State and national trends in bicyclist fatalities per million residents from 2006 to 2009



<sup>4</sup> Alliance for Biking and Walking. (2010). *Bicycling and Walking in the United States: 2010 Benchmarking Report*.

<sup>5</sup> Source: <http://www.bikeleague.org/programs/bicyclefriendlyamerica/bicyclefriendlystate/rankings.php>

<sup>6</sup> National Highway Traffic Safety Administration. (2006, 2007, 2008, 2009). *Bicycle Traffic Safety Facts*.

### 4.2.2. Collisions by Year and Injury

Table 4-3 provides a summary of the crash data for each of the past six years. There were 65 *reported* collisions over the 6-year period that involved a bicyclist and a motor vehicle. The number of bicycle crashes reported in Greenville has fluctuated annually from 2005 to 2010. During the six-year period, the average number of collisions annually is 10.8, with a range from 5 to 17. 2008 marked the highest year of collisions during this period, more than doubling the total number of collisions in 2009, and more than three times the number of collisions in 2005, which marked the lowest year.

As a result of the 65 collisions, there were 49 bicycle injuries<sup>7</sup> and 2 fatalities. One fatality occurred in 2005 and another occurred in 2008. As shown in Figure 4-2, the rate of bicycle injuries has fluctuated year to year with the highest rate occurring in 2009 (100%) and the lowest rate occurring 2005 and 2007 (60%). On average, from 2005 to 2010, 78 percent of bicycle collisions in Greenville resulted in an injury or fatality (Figure 4-3). This extremely high injury rate highlights the importance of taking measures to improve safety for bicyclists in Greenville, but may also indicate that non-injury bicycle crashes often go unreported.

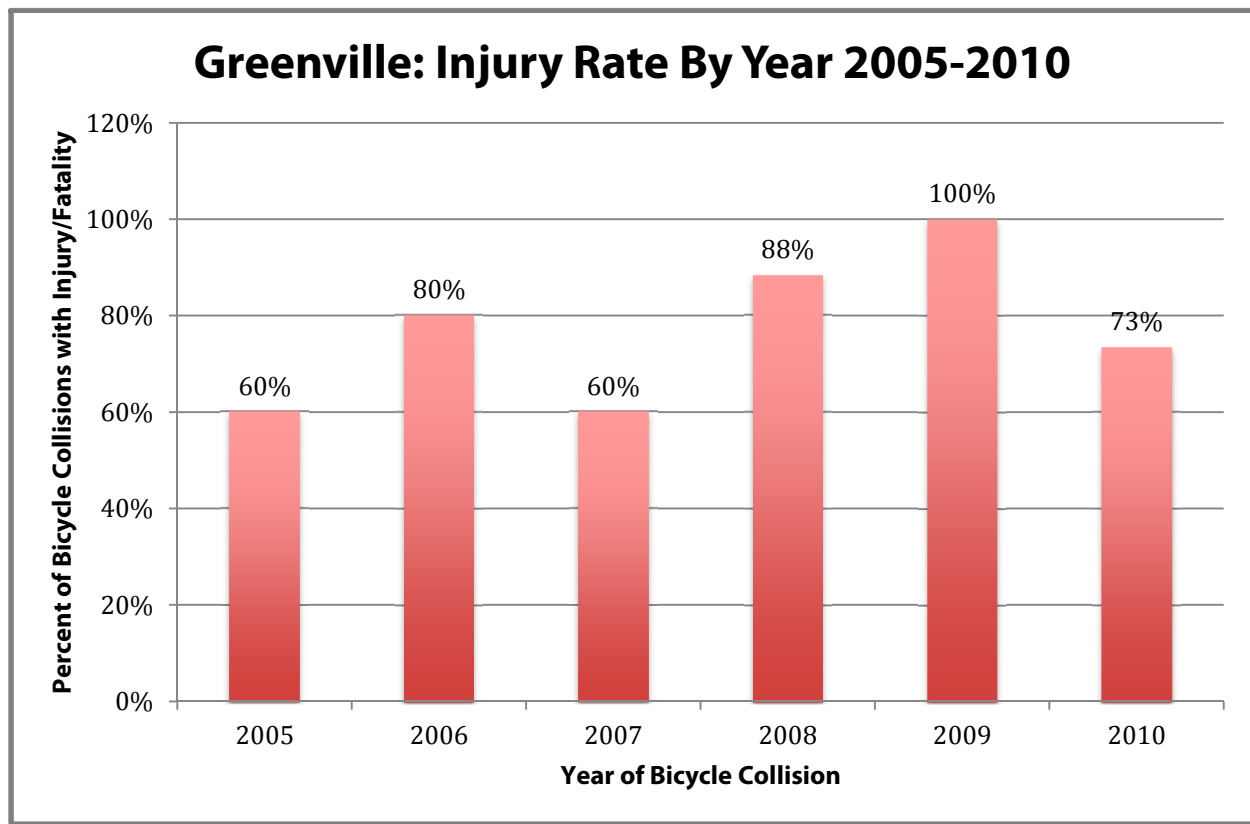
The National Highway Traffic Safety Administration's National Center for Statistics and Analysis provides an annual report of traffic safety facts to provide national and state context for local data. In 2009, bicyclist fatalities in South Carolina made up 1.2 percent of total traffic fatalities, compared to national percentage of 1.9. The state, however, bears a high bicyclist fatality rate (defined as pedalcyclist fatalities per million population) of 2.41 compared to the national average of 2.05. The number of bicyclist fatalities nationally declined significantly in 2009, yet bicyclist fatalities make up the highest percentage of overall traffic fatalities experienced in the last decade.

Table 4-3: Collisions by Year

Year	Number of Collisions
2005	5
2006	10
2007	10
2008	17
2009	8
2010	15
<b>Total</b>	<b>65</b>

<sup>7</sup> This includes all collisions which coded the pedalcycle as incurring an "injury," "possible injury," or "non-incapacitating injury."

Figure 4-3. The average rate of injury for bicyclists involved in collisions is 78%.



#### 4.2.3. Bicycle Crashes By Month and Time of Day

Figure 4-4 shows the number of crashes per month involving bicycles. April and October held the highest number of collisions from 2005 to 2010. Higher numbers of crashes involving bicycles in the spring and fall months likely indicates that cycling is more prevalent during these good weather months.

However, it should be noted that there are crashes involving bicycles throughout the year, indicating that people in Greenville continue to cycle during the winter months. Bicycle counts performed by the City of Portland suggest that winter bicycle ridership levels are approximately half of the summer levels<sup>8</sup>.

<sup>8</sup> Portland Bicycle Counts 2008, Portland Bureau of Transportation  
<http://www.portlandonline.com/shared/cfm/image.cfm?id=217489>

Figure 4-4. Number of vehicular/bicycle collisions by month

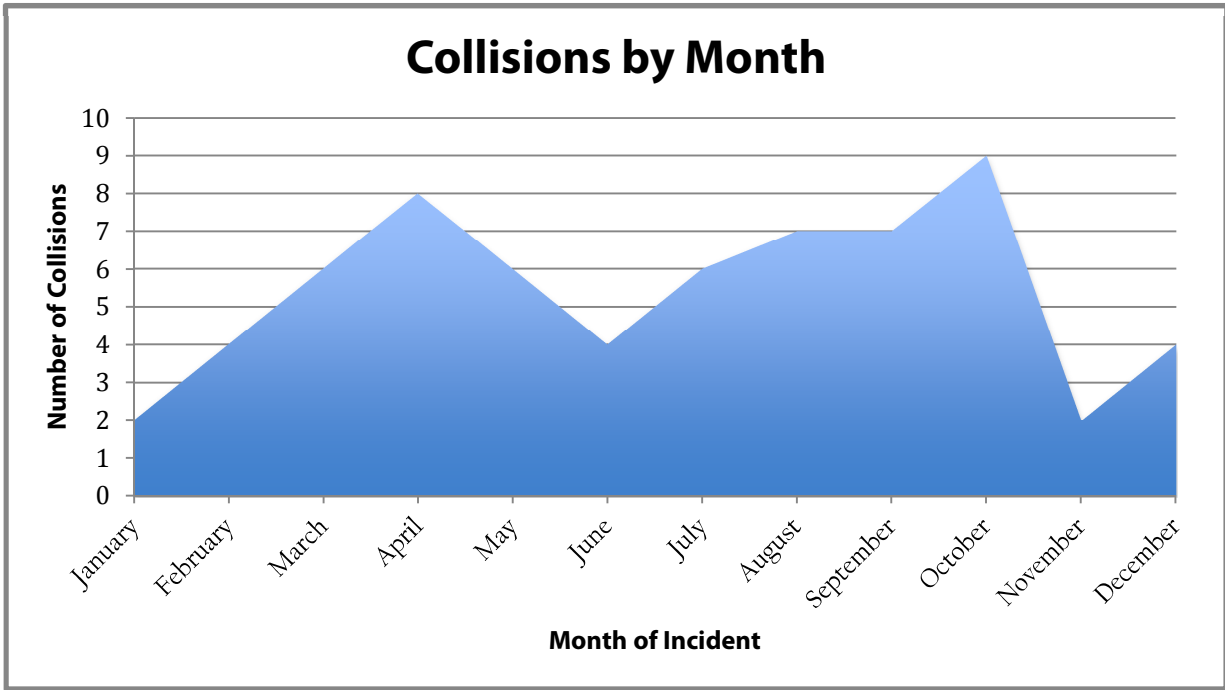


Figure 4-5. Fifty-five percent of all bicycle collisions occur during the afternoon.

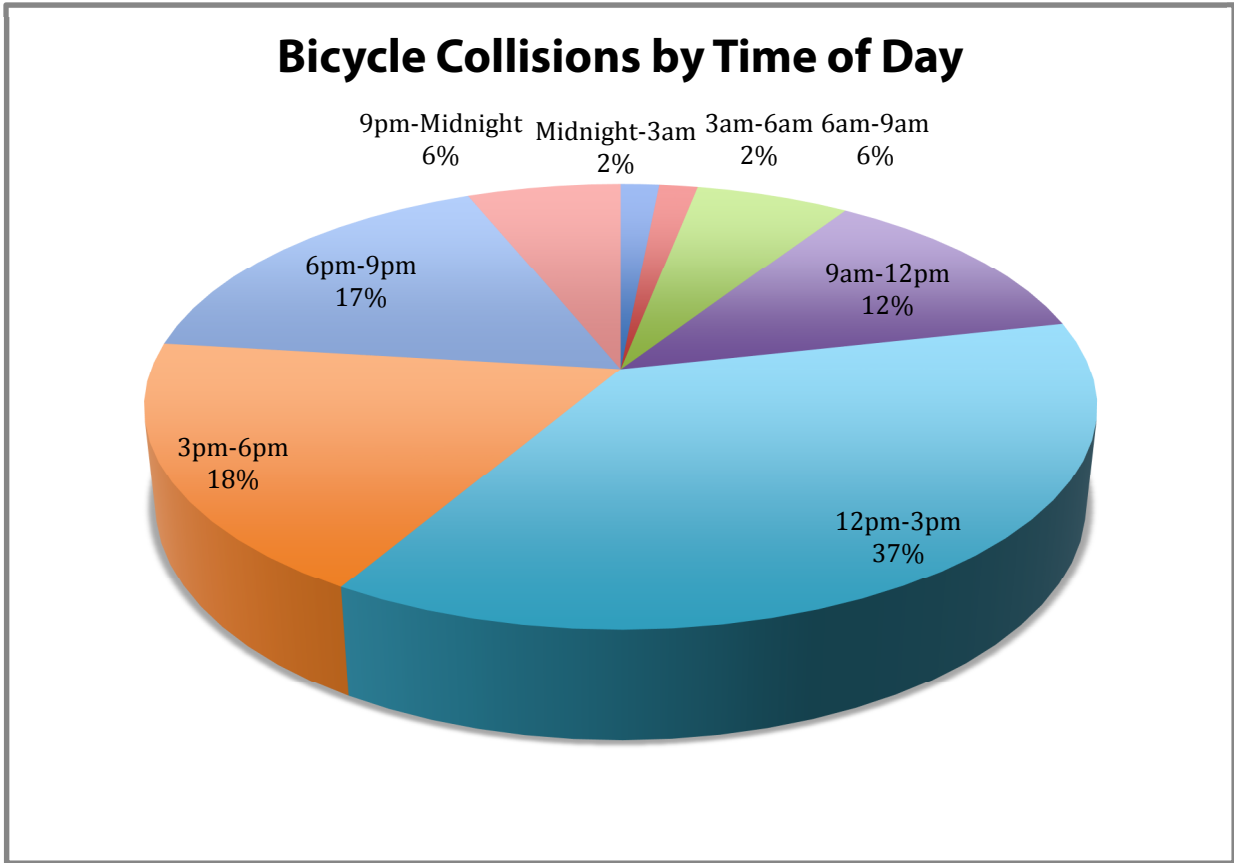
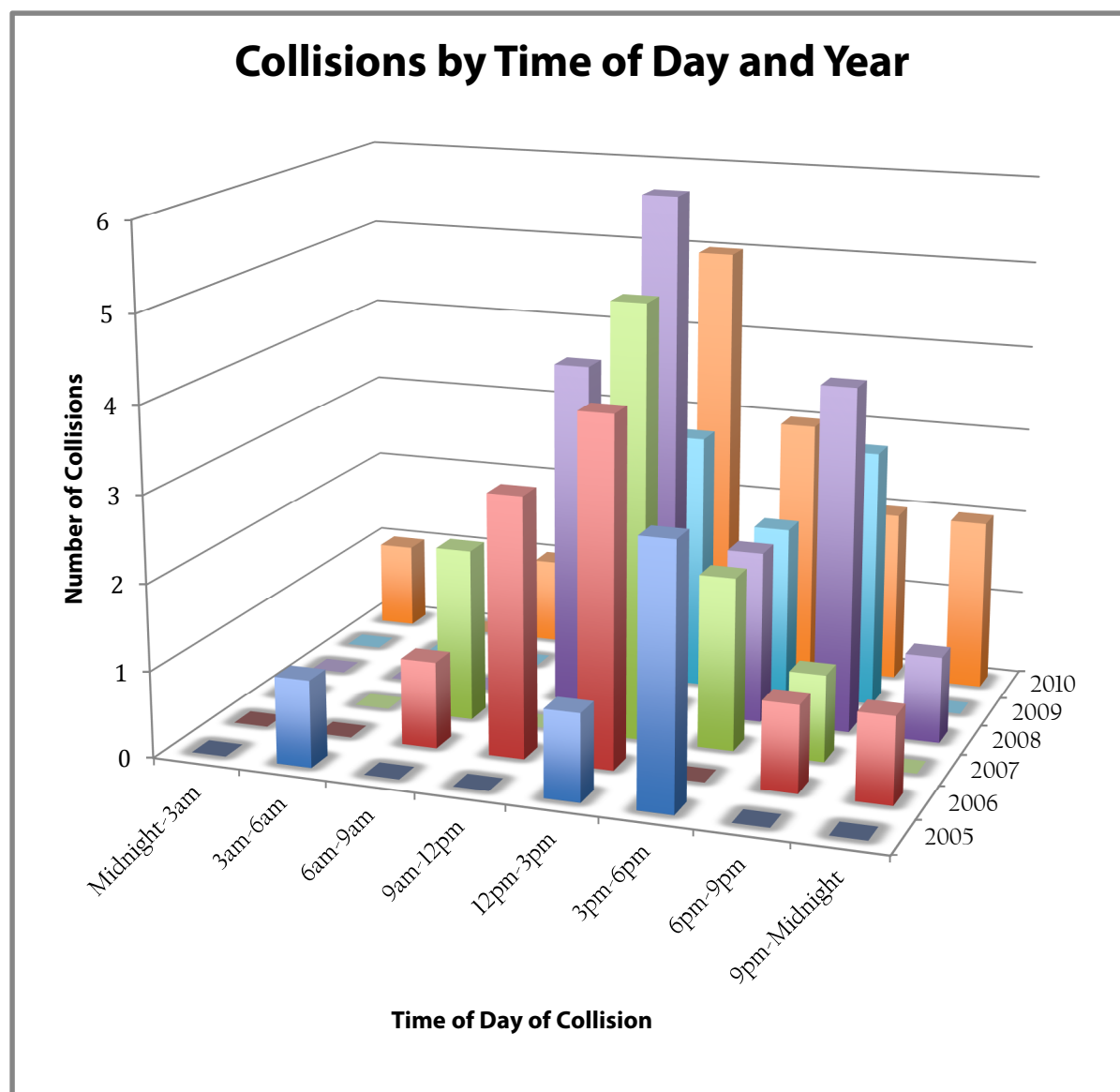


Figure 4-5 shows the number of crashes involving bicycles during eight 3-hour blocks of time for the full six-year period of 2005 to 2010. The data offers some indication as to the hours that people bicycle in Greenville and also those times when crashes are most likely. Crashes are concentrated in the afternoon and evening hours, though there are crashes during the morning peak period as well. Fifty-five percent of all bicycle crashes happened between 12 pm and 6 pm, and a total of 72 percent occurred between 12 pm and 9 p.m.

*Figure 4-6. The number of collisions occurring between Noon and 6 p.m. has remained consistently high since 2005, despite a reduction in mid-afternoon collisions in 2006.*



The evening peak period is an especially common time for bicycle-involved crashes. High numbers of crashes in the late afternoon/early evening reflect both the increased level of bicycle and motor vehicular traffic during the evening peak and reduced visibility during the darker hours. In Greenville, the highest percentage of crashes occurred between Noon and 3 p.m. This may indicate high traffic volumes for both bicycles and motorists during the mid-day rush hour. Mid-day traffic can increase significantly due to lunch-hour travel



and school pick-up times. August Street bears the highest number of bicycle collisions from 2005 to 2010, as shown in section 4.2.4, and is home to three public schools: Greenville Senior High Academy, Augusta Circle Elementary, and Blythe Academy.

Examining the number of crashes by time of day and year reveals annual trends. As Figure 4-6 shows, years 2005 to 2010 each evidenced similar trends, showing relatively low numbers of collisions between Midnight and 6 a.m. In each year, the majority of collisions occurred in the afternoon to early evening time frame. Since 2005, the number of collisions in the 9 a.m. to Noon time frame has gradually diminished, while the number of crashes in the 9 p.m. to Midnight time frame has gradually increased.

#### 4.2.4. Crashes by Street and Intersection

The following figures and tables highlighting the number of crashes on different streets serve as a useful starting point for evaluating the current and future bicycle network in Greenville.

##### High Crash Streets

Table 4-4 shows street corridors in Greenville with 2 or more bicycle-involved crashes from 2005 to 2010. Of these corridors, Augusta Street had the highest number of crashes at a total of 11. The 19 bicycle crashes that occurred on Augusta Street and Highway 276 during the six-year period constitute 29.2 percent of all bicycle collisions during that time period.

*Table 4-4: Corridors in Greenville with 2 or More Collisions*

Roadway	Road Type	2009 Annual Average Daily Traffic	Total Crashes
Augusta Street <sup>9</sup>	Arterial	17,800-20,500	11
Laurens Road (Hwy 276)	Arterial	19,400-24,800	8
Pendleton Street <sup>10</sup>	Collector	7,000-10,400	3
Ashford Avenue	Residential	Local	2
Butler Road (S-79)	Collector	10,500	2
Dunbar Street (S-490)	Collector	2,700-7,200	2
E. Park Avenue (S-94)	Collector	3,700	2
Pleasantburg Drive (Hwy 291) <sup>11</sup>	Arterial	21,200-36,800	2
S. Main Street	Collector	Local	2
Wilkins Avenue	Residential	Local	2

<sup>9</sup> Based on SCDOT counts for S-201 from S. Main Street to Pleasantburg Drive at Mauldin Road.

<sup>10</sup> Based on SCDOT counts for SC 124 from U.S. 25 to SC 20.

Figure 4-7 shows areas with the highest number of collisions that took place between 2005 and 2010. The map indicates that crashes primarily occurred in areas that do not have existing greenway, bike lane, or bike route facilities.

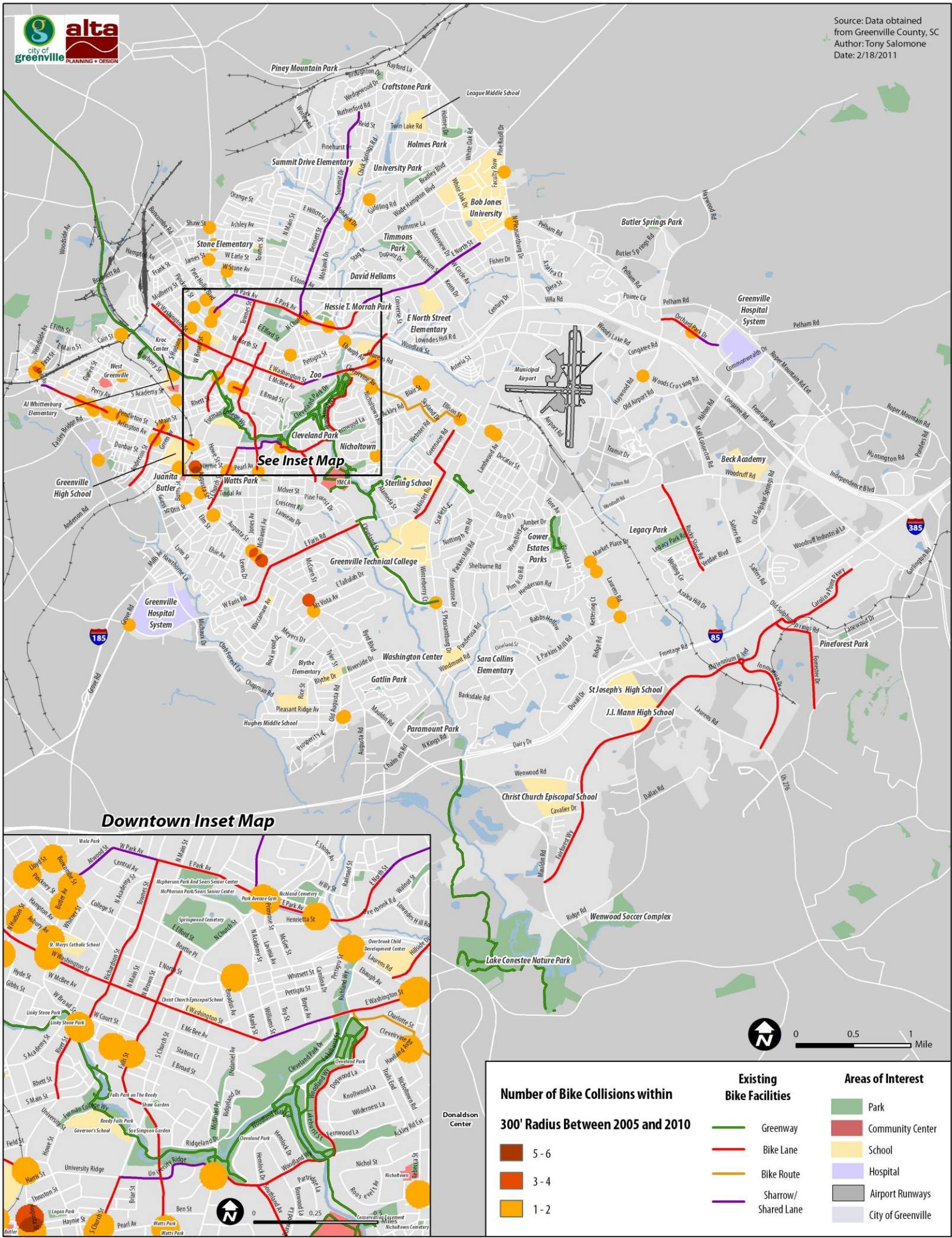
### **High Crash Intersections**

While bicycle crashes appear to be concentrated on certain street corridors as detailed above, crashes at individual intersections in Greenville are more evenly distributed. There are a total of three intersections where more than one bicycle collision occurred between 2005 and 2010. Two collisions occurred at each of the following intersections:

- Augusta Street and Dunbar Street
- Augusta Street and McDaniel Avenue
- Augusta Street and Tallulah Drive

These high crash intersections are located along Augusta Street, which is the corridor with the highest number of bicycle crashes.

Figure 4-7: The highest concentrations of bicycle collisions from 2005 to 2010 exist in locations that do not include a greenway, bike lane, or bike route.

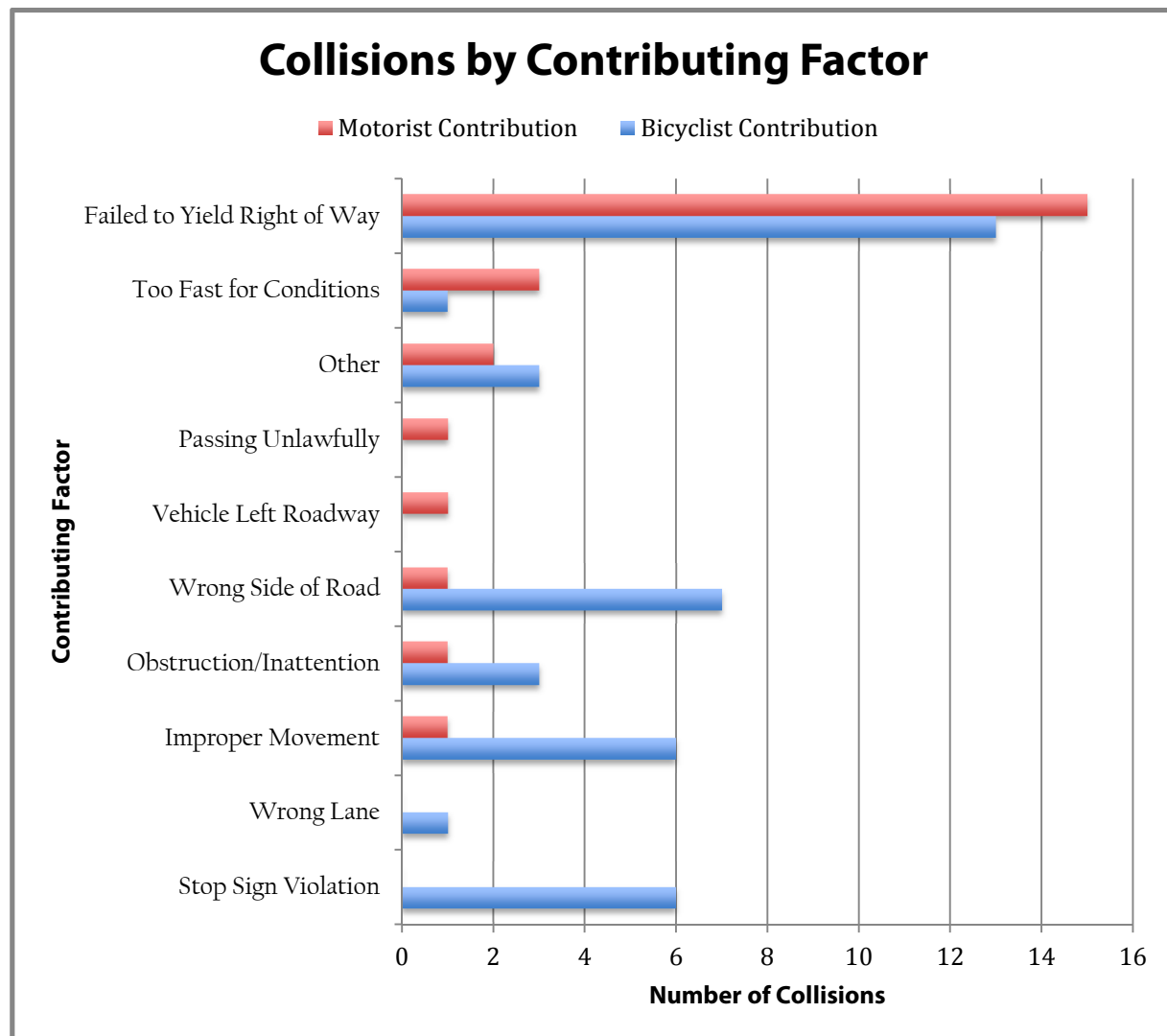


### 4.2.5. Collisions by Contributing Factor

The available data also includes some information about the circumstances of the reported crashes. Figure 4-8 shows the number of crashes for each category of primary factor contributing to the collision. The bicyclist was reported to be a contributor to the collision in 40 of the 65 incidents (61.5%). In seven instances of the bicyclist riding in the wrong direction and on six occasions the bicyclist violated a stop sign.

In 15 reported bicycle crashes, the motor vehicle failed to yield the right of way to the bicyclist and in 13 of the collisions, the bicyclist failed to yield the right of way to the motorist. Note that although this data indicates contributing factors to these incidents, it does not indicate the geometry of the collision, or whether or not a citation(s) was given as a result of the crash.

Figure 4-8: Distribution of Primary Factors Involved in Bicycle-Motor Vehicle Collisions





Identification of the most common violations in bicycle-related collisions can inform the City of possible engineering or education needs. A specific re-occurring violation can be the result of unclear traffic controls or roadways not designed for bicycle use. It can also be the result of bicyclists not aware of or complying with the “rules of the road” or not feeling comfortable riding with traffic.

The most common traffic violation is motorists failing to yield to the right-of-way, and the second most common is the bicyclist failing to do the same. A bicyclist riding on the wrong side of the road is the third most common. Of the seven incidences in which a bicyclist rode the wrong way and contributed to a collision, three of those (or 42.8%) occurred on Augusta Street. These violations may indicate that bicycle signage and/or facilities are need on Augusta Street to indicate proper riding direction.

This analysis of violations informs the Plan’s recommendations. These violations identify the need for bicycle and motorist education, outreach and direct, and logical bikeways on or parallel to busy roadways.

#### 4.2.6. Demographics of Bicyclists in Collisions

As shown in Table 4-5, the average age of bicyclists involved in crashes in Greenville is 36.6 and has an annual variation that ranges between 25.3 and 49 (Figure 4-9). The youngest bicyclist involved in a collision with a motor vehicle was six years old and the oldest was 70. The age of the bicyclist was unknown in two of the 65 collisions.

*Table 4-5: Statistics Related to Age of Bicyclists Involved in Collisions from 2005 to 2010*

2005-2010	Average	Median	Mode	Minimum	Maximum
Age	36.6	36	20	6	70

Bicycle crash data also reveals that 16 percent of reported bicycle-motor vehicle crashes involved bicyclists under the age of 18, and 8 percent of all crashes involved bicyclists aged 11 or younger. Though the average age is 36.6, the majority of bicyclists involved in collisions in Greenville are in their twenties or fifties, as shown in Figure 4-10. The information provided cannot discern whether bicyclists in their twenties and fifties are at greater risk or experiencing a bicycle collision or comprise a significantly higher segment of the bicycling population. However, in either case, the age distribution indicates a need to provide targeted education and outreach to bicyclists in those two age brackets. The age distribution shown in Figure 4-10 also underscores the importance of creating bicycle facilities that are safe for all ages and abilities of bicyclists in Greenville.

Though reports provided by the Greenville Police Department identify gender, those provided by the South Carolina Department of Public Safety do not. In light of that discrepancy, this analysis does not include gender statistics.

Figure 4-9: Average Age of Bicyclists in Collisions, Annually from 2005 to 2010

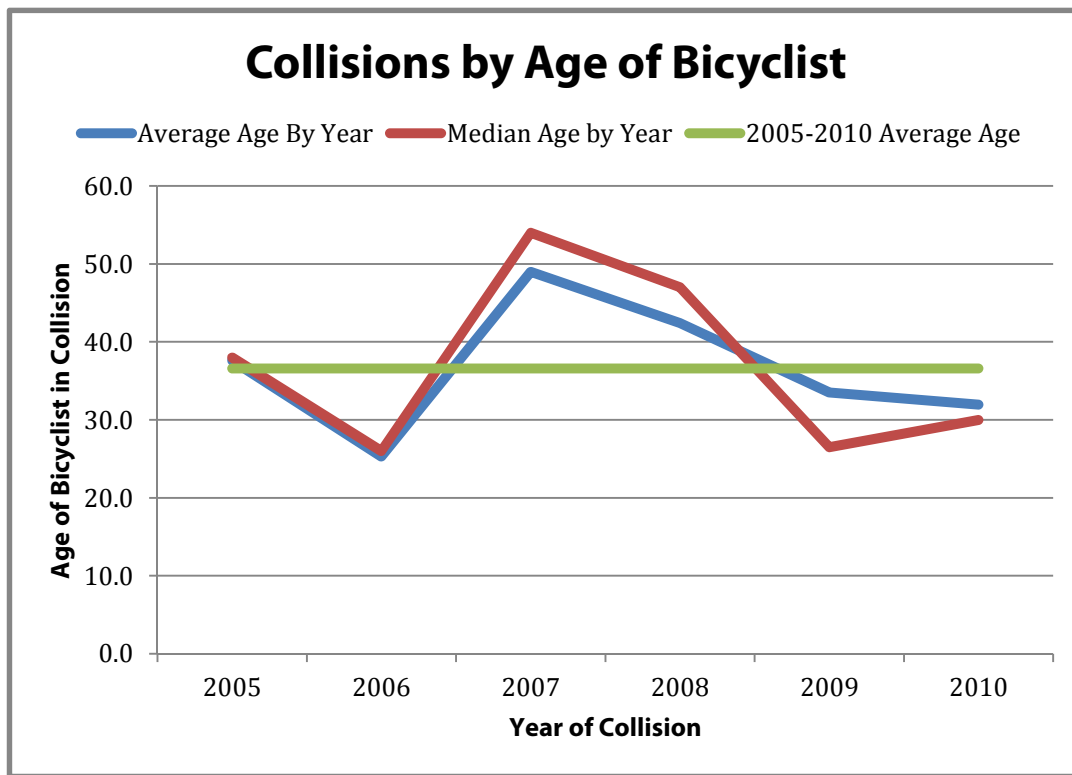
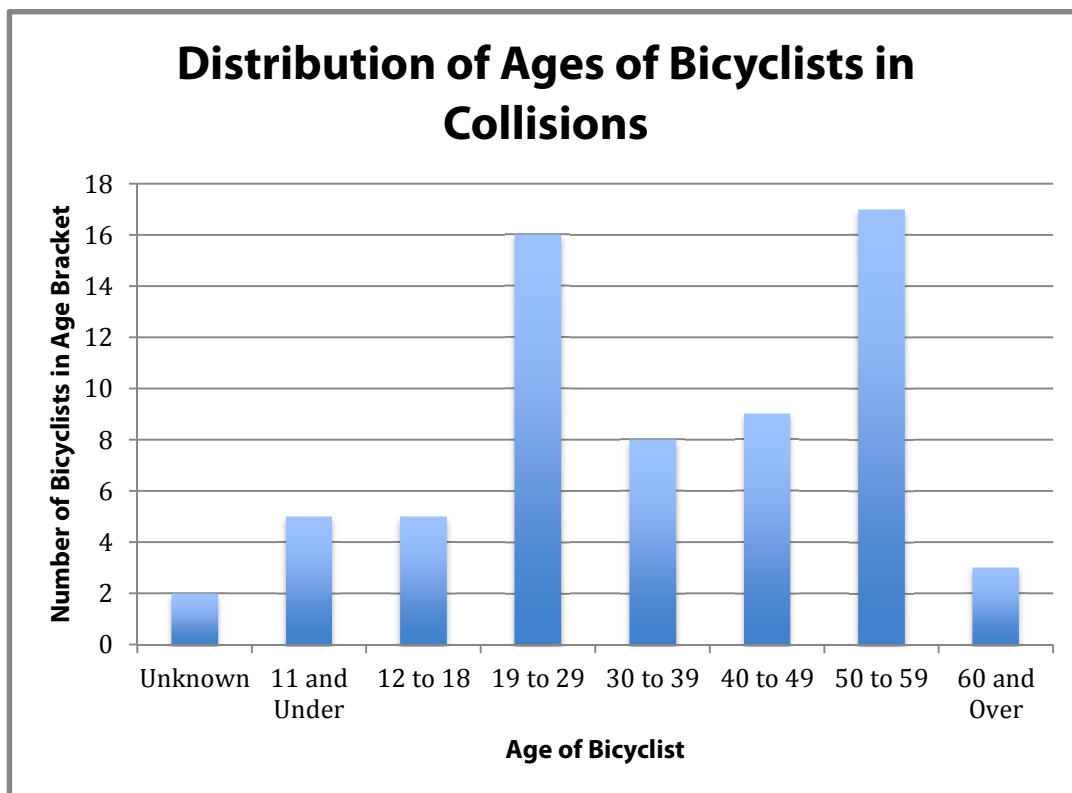


Figure 4-10: Distribution of Ages of Bicyclists in Collisions (2005-2010)





#### **4.2.7. Disclaimer**

While the criteria used for collision data in South Carolina are useful, they do not adequately measure bicycle crashes. Many bicycle collisions are not reported to law enforcement, and the necessary involvement of a motor vehicle excludes any record of bike-to-bike, bike-to-pedestrian, or single-bike crashes.

While this data provides an important sample, it does not fully represent bicycle collisions in the City of Greenville as many bicycle collisions, especially those not involving a motor vehicle, go unreported. Furthermore, the number of bicycle collisions at a given location is an incomplete measure of safety without knowing the approximate number of bicycles that travel in that area. A street or intersection that did not see a crash over the six years examined in this analysis is not an indication that people are not bicycling there or that hazards are not present in those areas.

A high number of crashes do not necessarily make a street or intersection a prime candidate for bicycle improvements. For example, because crashes tend to be infrequent events, the intersections with multiple crashes from 2005 to 2010 may or may not present particularly difficult conditions for bicycles. Furthermore, intersections not listed in the previous figures and tables may serve as important connections along current or proposed bicycle routes and therefore be a higher priority for improvements. However, bicycle crash data presents an objective look at bicycle safety along different corridors, validating known issues or revealing other trends that may not be discovered by other methods such as through surveys or public meetings.

### **4.3. Current and Future Bicycle Demand**

#### **4.3.1. Purpose**

An evaluation of current and future demand for bicycle facilities assisted the City in determining the range and type of facilities most needed in the community. Adequately identifying user needs enables system planners and policy-makers to develop logical solutions for improving the community's bikeway network. Specific projections on existing and future bicycle commuter volumes were developed for establishing a baseline of current bicycling usage and for future use in air quality and Federal funding applications. The user needs assessment and demand analysis of bicyclists in Greenville can also be used to measure how the proposed bicycle system meets the needs of people of all ages and abilities.

The Bicycle Demand Model methodology has been used throughout the country, and has been adopted by the Federal Highway Administration (FHWA). Estimates of benefits, including reductions in vehicle trips and vehicle miles traveled, plus related items such as air quality improvements, economic, and health benefits, were quantified and documented using Alta's Bicycle Demand Model.

#### **4.3.2. Needs and Types of Bicyclists**

It is important to understand that the needs and preferences of bicyclists vary depending on the bicyclist's skill level and the type of trip a rider wishes to take. For example, bicyclists who ride for recreational purposes may prefer scenic, winding, off-street trails, while bicyclists who ride to work or for errands may prefer more direct on-street bicycle facilities. Child bicyclists, seniors, and adults who are new to bicycling may prefer shared-use paths, while adult bicyclists with more experience may prefer bicycle lanes. Cyclists also include utilitarian cyclists who choose to bicycle for transportation purposes and people who ride because they have limited transportation options due to their personal economic situation. A bicycle plan should consider these

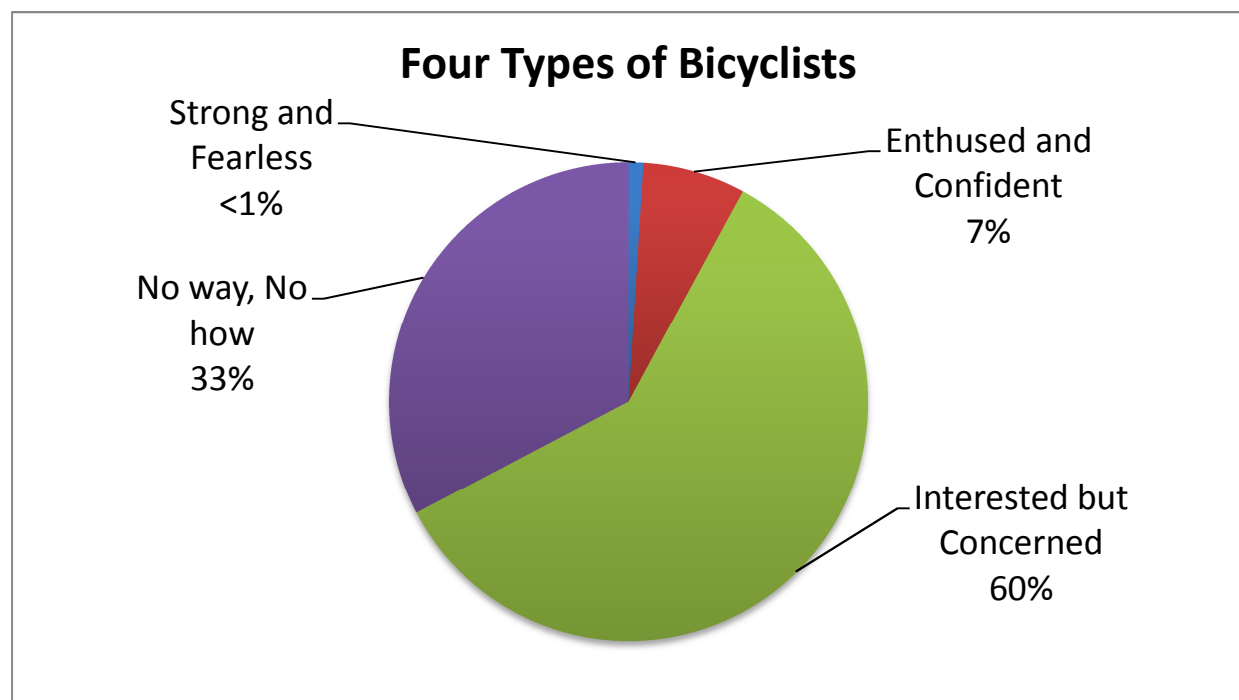
differences when planning a system that serves all user types. The following sections describe the different types of bicyclists, the different reasons for bicycling, and the respective needs of these categories of bicyclists.

### Four Types of Bicyclists

The needs and preferences of Greenville bicyclists vary between skill levels and trip types. The propensity to bicycle varies from person to person, providing insight into potential increases in bicycling rates. Generally, bicycling propensity levels can be classified into four categories (Figure 4-11):<sup>1</sup>

- **Strong and Fearless** bicyclists will ride on almost any roadway despite the traffic volume, speed, and lack of bikeway designation and are estimated to be less than one percent of the population.
- **Enthusied and Confident** bicyclists will ride on most roadways if traffic volumes and speeds are not high. They are confident in positioning themselves to share the roadway with motorists and are estimated to be seven percent of the population.
- **Interested but Concerned** bicyclists will ride if bicycle paths or lanes are provided on roadways with low traffic volumes and speeds. They are typically not confident cycling with motorists. Interested but Concerned bicyclists are estimated to be 60 percent of the bicyclist population and the primary target group that will bicycle more if encouraged to do so.
- **No Way No How** are people that do not consider cycling part of their transportation or recreation options and are estimated to be 33 percent of the population. The percentages shown in Figure 4- reflect a similar split that can be found in Greenville. Notably, when the first public meeting of this Plan included the question “for which type of bicyclist should Greenville plan,” 73 percent of participants voted for the “interested but concerned” category and 24 percent selected the “enthused and confident” group.

Figure 4-11. The Four Types of Bicyclists



<sup>1</sup> Source: Roger Geller, City of Portland, Bicycle Coordinator

### Characteristics of Recreational and Utilitarian Trips

For purposes of this Plan, bicycle trips are separated into two trip types: recreational and utilitarian. Recreational trips can range from a 50-mile weekend group ride along rural roads to a short family outing to a local park, and all levels in between. Many utilitarian trips are made by commuter bicyclists, who are a primary focus of State and Federal bicycle funding, as well as bicyclists going to school, shopping or running other errands. Table 4-6 summarizes general characteristics of recreational and utilitarian bicycle trips.

Recreational bicyclists' needs vary depending on their skill level. Road cyclists out for a 50-mile weekend ride may prefer well-maintained roads with wide shoulders and few intersections, with few stop signs or stop lights. Casual bicyclists out for a family trip may prefer a quiet shared use path with adjacent parks, benches, and water fountains.

Utilitarian bicyclists have needs that are more straightforward. Key commuter needs are summarized below:

- Commuter routes should be direct, continuous, and connected
- Protected intersection crossing locations are needed for safe and efficient bicycle commuting
- Bicycle commuters must have secure places to store their bicycles at their destinations
- Bicycle facilities should be provided on major streets

*Table 4-6. Trip purpose for bicyclists is generally defined as either recreational or utilitarian*

Recreational Trips	Utilitarian Trips
Directness of route not as important as visual interest, shade, protection from wind	Directness of route and connected, continuous facilities more important than visual interest, etc.
Loop trips may be preferred to backtracking	Trips generally travel from residential to shopping or work areas and back
Trips may range from under a mile to over 50 miles	Trips generally are 1-5 miles in length
Short-term bicycle parking should be provided at recreational sites, parks, trailheads and other activity centers	Short-term and long-term bicycle parking should be provided at stores, transit stations, schools, workplaces
Varied topography may be desired, depending on the skill level of the cyclist	Flat topography is desired
Cyclists may be riding in a group	Cyclists often ride alone
Cyclists may drive with their bicycles to the starting point of a ride	Cyclists ride a bicycle as the primary transportation mode for the trip; may transfer to public transportation; may or may not have access to a car for the trip
Trips typically occur on the weekend or on weekdays before morning commute hours or after evening commute hours	Trips typically occur during morning and evening commute hours (commute to school and work); shopping trips also occur on weekends
Cyclists' preferred type of facility varies, depending on the skill level of the cyclist	Generally use on-street facilities, may use trails if they provide easier access to destinations than on-street facilities

The City of Greenville's bicycle system will provide access to major destinations in the city, including parks and recreation areas, schools, shopping areas, and downtown. Bicycle-friendly connections between residential areas and trails and major on-street bike facilities and between residential areas and shopping and

employment centers will likely increase the prevalence of bicycle commuting, as well as increase the prevalence of recreational riding.

### 4.3.3. Active Transportation Demand Model

Bicycling demand potential in Greenville is determined in part by the “relative attractiveness” of key destinations in the area to cyclists. Each attractor will generate demands from within a “comfortable” walking or cycling radius (referred to as the buffer area). The amount of that demand depends on the relative strength of the attractor to cyclists, its geographic proximity to potential users, and conglomerations of multiple attractions.

Relative strength is represented by a multiplier that rates the attraction to cyclists of one destination compared to another and is based on results found in other cities. For example, a recreation center is likely to be more attractive than a government building. Table 4-7 includes a list of attractors and their multipliers.

GIS spatial analysis was used to model areas of high potential bicycle transportation demands in Greenville. Areas of high and low potential demand are shown on Figure 4-13 and Figure 4-14. The areas of highest demand for active transportation and the areas with existing bike lanes and multi-use paths overlap with the existing and potential future bicycle networks overlaid respectively. Not surprisingly, the areas of highest demand are downtown, and to some extent along the arterial road network leading out from the CBD (Figure 4-12).

Figure 4-12. The areas of highest demand for active transportation are in downtown.



Table 4-7: Attractors and multipliers are used to determine active transportation demand potential.

Attractor	Multiplier
Regional Center	5
Commercial Center	4
Commercial Corridor	4
City Park	1.5
Bus Stop	1
Shared-use Trail	1.5
Civic – Justice/Government	1
Civic – Library/Museum	2
Civic – Recreation Center	3
Post-Secondary Institution	4
School (k-12)	2



Figure 4-13. The areas of highest demand for active transportation and the areas with existing bike lanes and multi-use paths overlap.

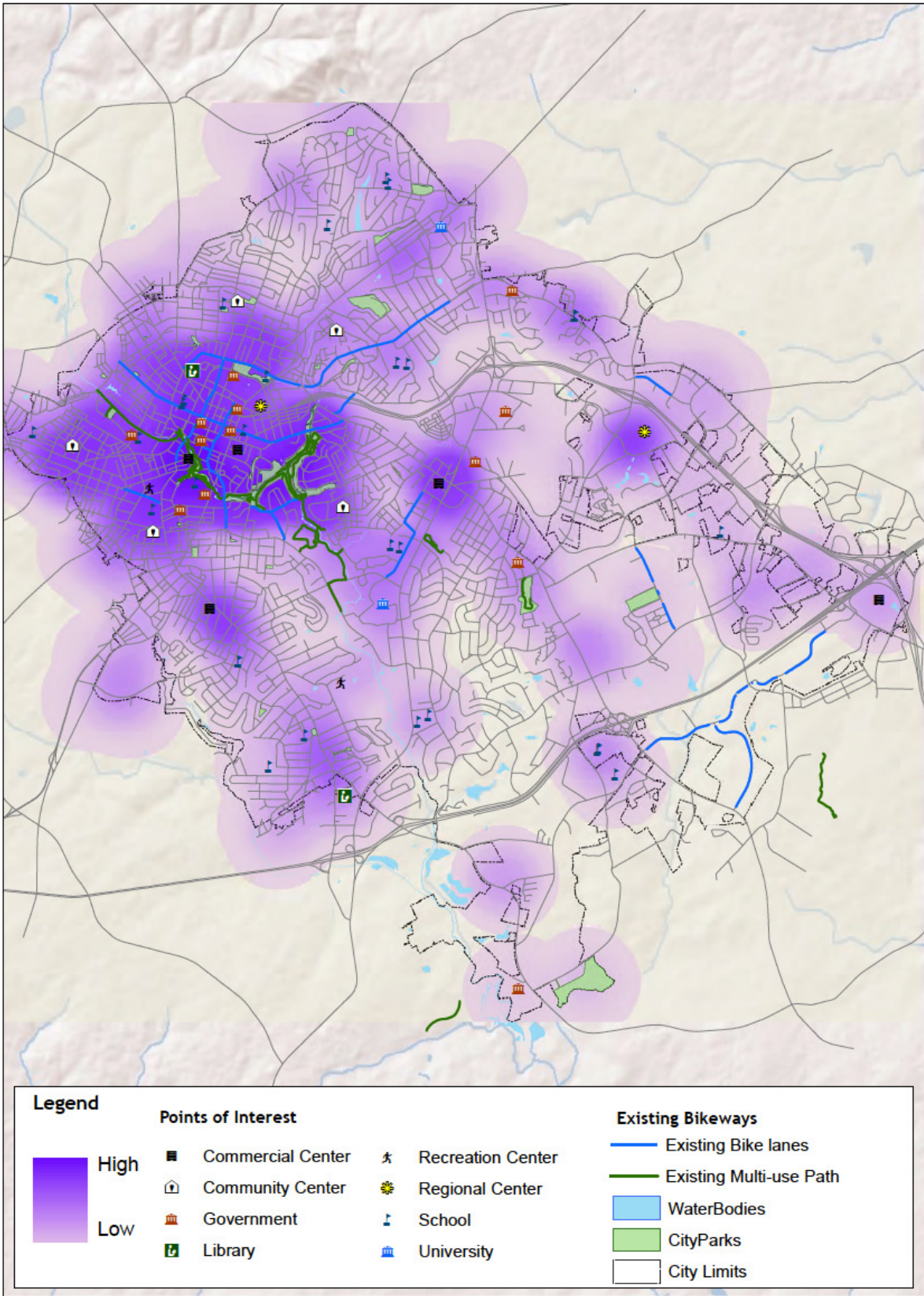
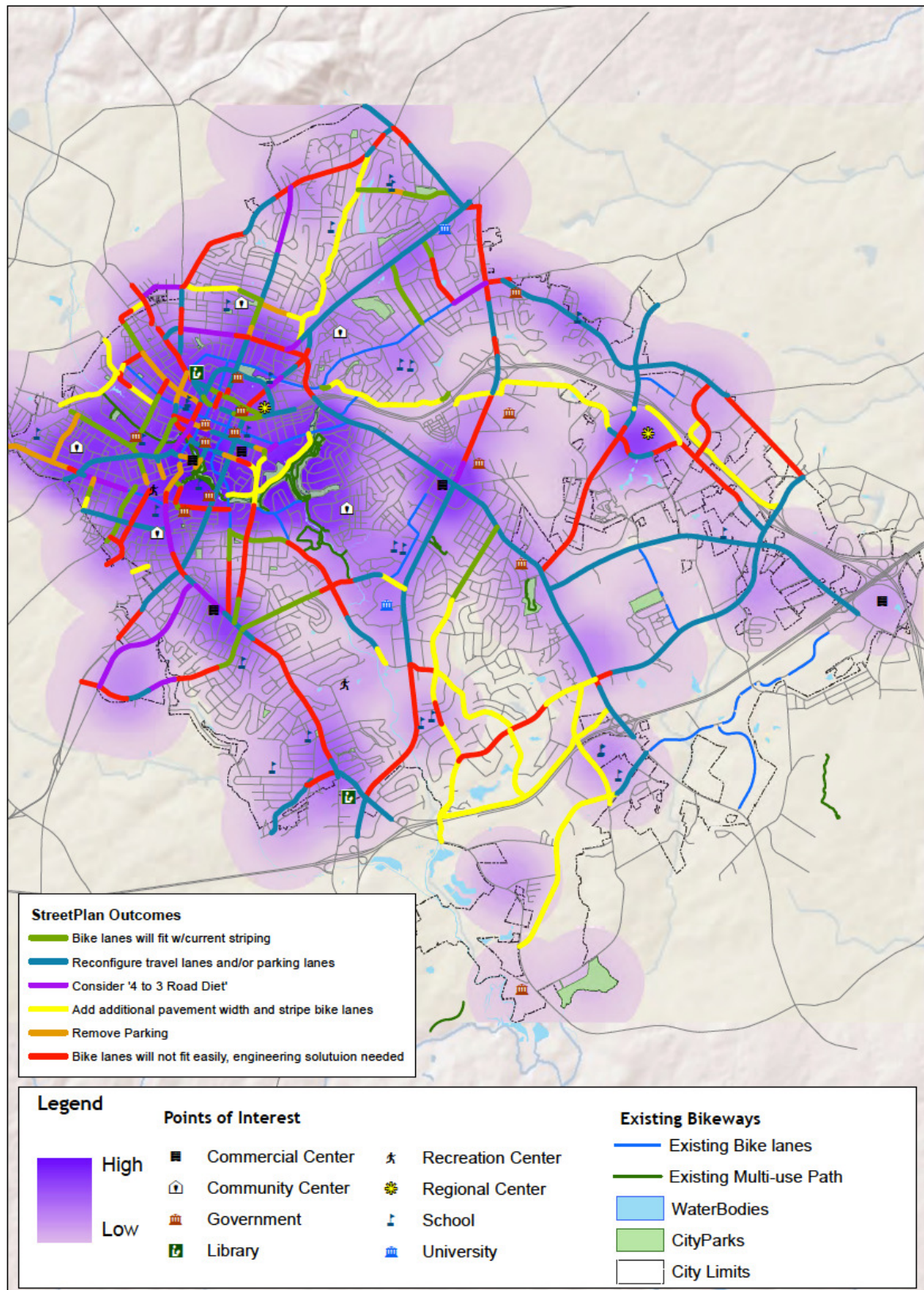




Figure 4-14. Recommended bicycle facilities identified in StreetPlan coincide with areas of high bicycle travel demand.





#### 4.3.4. Current Bicycling Demand Estimates

Higher rates of bicycling have numerous community benefits, including improved air quality, better community health resulting from exercise, and reduced household transportation costs. In order to set goals and measure progress towards increased bicycling in Greenville, it is essential to first establish a baseline of current use.

Journey-to-work information collected by the U.S. Census Bureau's American Communities Survey is the most commonly cited measure of transportation mode split, but commute mode share percentages alone cannot paint a complete picture of walking and bicycling in Greenville. Using recently released data from the 2009 National Household Travel Survey (NHTS 2009) conducted by the U.S. Department of Transportation, Alta Planning + Design has developed detailed estimates of the number of bicycling trips being made in Greenville. By isolating different bicycling user groups (such as workers, school children and college students) and applying trip distance information, it is possible to estimate the total distance Greenville residents travel to work or school by bicycling. But not all bicycling trips are commute trips (Figure 4-15). Trip type multipliers provide an indirect method of estimating the number of bicycling trips made for other reasons, such as shopping and running errands. For example, NHTS 2009 data indicates that for every bicycle work trip, there are slightly more than two utilitarian bicycle trips made. Although these trips cannot be directly attached to a certain group of people (not all of the utilitarian bicycling trips are made by people who bicycle to work) these multipliers allow a high percentage of the community's bicycling activity to be captured in an annual estimate.

Table 4-8 provides baseline data for Greenville's bicycling demand (in 2010), as well as estimates of bicycling demand in 2020, based on a future bicycle mode share goal of four percent. The target mode share was determined based on average mode share of silver and gold level bicycle friendly communities in the U.S., which is 2.82 and 5.2 percent, respectively. Additionally, Table 4-9 includes a summary of the annual number of bicycle trips, number of vehicle trips reduced, and number of bicycling miles for the years 2010 and 2020.

*Figure 4-15. Not all bicycling trips are commute trips.*



Table 4-8. Greenville Bicycling Demand Estimates

Demographic Groups	Baseline 2010	Projection at 4% mode share in 2020	Difference
Population <sup>2</sup>	58,799	62,243	N/A
Employed population <sup>3</sup>	23,730	25,119	N/A
Employed population (% of pop.)	40.36%	40.36%	N/A
College student population	5,970	6,319	N/A
College student population (% of pop.)	10.15%	10.15%	N/A
School children population, K-12	8,205	8,683	N/A
School children population, K-12 (% of pop.)	13.95%	13.95%	N/A
<b>Commute Modeshare</b>			
Employed: Bike <sup>4</sup>	0.50%	4.00%	3.50%
K-12: Bike <sup>5</sup>	0.67%	4.00%	3.50%
College: Bike <sup>6</sup>	0.50%	4.00%	3.50%
<b>Trip Distances (in miles)</b>			
Bicycle Trip Distance: Commute	3.06	3.06	N/A
College	1.52	1.52	N/A
Utilitarian	1.80	1.80	N/A
School (children)	0.80	0.80	N/A
Social/Recreational	2.34	2.34	N/A
Utilitarian Trip Multiplier: Bicycle (as ratio)	2.19	2.19	N/A
Social/Recreational Trip Multiplier: Bicycle (as ratio)	6.45	6.45	N/A
<b>Bicycling Statistics</b>			
Bicycle Commute Trips: Bicycle commuters	119	1,005	886
Weekday bicycle trips	238	2,010	1,772
Weekday miles bicycled	586	4,942	4,356
Bicycle School Trips: K-12 bicycle commuters	55	347	292
Weekday K-12 bicycle trips	110	695	585
Weekday miles bicycled	79	498	419
Bicycle College Trips: College bicycle commuters	30	253	223
Weekday college bicycle trips	60	506	446
Weekday miles bicycled	73	618	545
Utilitarian Bicycle Trips: Adult bicycle commuters	149	1,258	1,109
Daily utilitarian trips	233	1,970	1,737
Daily miles bicycled	337	2,841	2,504
Recreational Bicycle Trips: Daily recreational trips	1,096	9,253	8,157
Daily miles bicycled	2,566	21,653	19,087

<sup>2</sup> Assumes annual population growth of 0.5% (consistent with annual population growth rate 2000-2008; U.S. Census 2000/ACS 2006-2008)

<sup>3</sup> Assumes same population to employment/college/school children ratio as base year

<sup>4</sup> ACS 2006-2008

<sup>5</sup> NHTS 2009, respondent ages 5-18

<sup>6</sup> Assume same mode share as employed journey to work, ACS 2006-2008

Table 4-9. Annual Statistics for utilitarian trips in Greenville

<b>Utilitarian Trips (Work, School, Other) <sup>7</sup></b>			
<b>Year</b>	<b>2010</b>	<b>2020</b>	<b>Difference</b>
Yearly bicycle trips	174,599	1,478,497	1,303,898
Yearly vehicle trips reduced	141,714	1,200,025	1,058,311
Yearly miles bicycled	300,578	2,545,324	2,244,746

### 4.3.5. Air Quality Impact

Based on the estimated current and future bicycling demand, air quality benefits can be calculated. Vehicle Miles Traveled (VMT) can be equated to the per-mileage volume of several pollutants. With an increase in utilitarian bicycle trips, there is a shift away from VMT and toward bicycle miles traveled, which leads to a subsequent reduction in pollutants. Table 4-10 describes the air quality benefits that Greenville can expect to gain through increased bicycle ridership. The table includes pounds-per-year reductions of five pollutants: hydrocarbons, particulate matter, nitrous oxides, carbon monoxide, and carbon dioxide.

The air quality impacts cited in Table 4-10 are particularly important for the Greenville area. Currently, the Greenville-Spartanburg-Anderson area is at risk of being designated as a non-attainment area by the Environmental Protection Agency (EPA). In 2010, the EPA announced intentions to strengthen existing standards, which increases the need for Greenville to find opportunities for improving its air quality.<sup>8</sup>

Table 4-10. Air Quality Benefits

<b>Air Pollutant Reductions<sup>9</sup></b>	<b>2010</b>	<b>2020</b>	<b>Difference</b>
Reduced Hydrocarbons (pounds/year)	901	7,632	<b>6,731</b>
Reduced Particulate Matter (pounds/year)	7	57	<b>50</b>
Reduced Nitrous Oxides (pounds/year)	630	5,331	<b>4,701</b>
Reduced Carbon Monoxide (pounds/year)	8,217	69,582	<b>61,365</b>
Reduced Carbon Dioxide (pounds/year)	244,522	2,070,635	<b>1,826,113</b>

<sup>7</sup> Accounts for five day work week and nine month school year.

<sup>8</sup> For additional information, see [http://www.greenvillegov.org/air\\_quality/](http://www.greenvillegov.org/air_quality/)

<sup>9</sup> Calculations taken from "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks." EPA report 420-F-05-022. Environmental Protection Agency, 2005.

### **4.3.6. Disclaimer**

As with any modeling projection, the accuracy of the result is dependent on the accuracy of the input data and other assumptions. Effort was made to collect the best data possible for input to the model, but in many cases national data was used where local data points were unavailable. Examples of information that could improve the accuracy of this exercise include the detailed results of local Safe Routes to Schools parent and student surveys, a regional household travel survey, and a student travel survey of students at Bob Jones University and Greenville Technical Community College.

## **4.4. Community Identified Needs**

The Bicycle Master Plan development process included a multi-faceted public outreach campaign. Public input provides valuable local knowledge and reveals the needs of bicyclists, motorists, trail-users, and those aspiring to become bicyclists, among others. The public outreach campaign included:

- A community survey
- An e-mail newsletter
- An informative and interactive website
- Stakeholder interviews
- An advisory committee comprised of a diverse group of citizens and community leaders
- A public workshop to gather information about the strengths and opportunities for improvement related to bicycling in Greenville
- A second public workshop to garner feedback related to the preliminary recommendations of the plan

The appendix details the various components used to gain suggestions and feedback from local citizens. This section focuses on the bicycling needs identified by the community through the survey and the initial public workshop.

The survey was distributed in multiple ways to community members including those who bicycle and those who do not. It was open from October 25, 2010 through March 15, 2011. In total, the City received nearly 550 survey responses.

On November 16, 2010, the City held the first Bicycle Master Plan public workshop and more than 65 citizens attended. Following an informational presentation about bicycling facilities and programs, citizens provided comments and suggestions related to Greenville's bicycling environment.

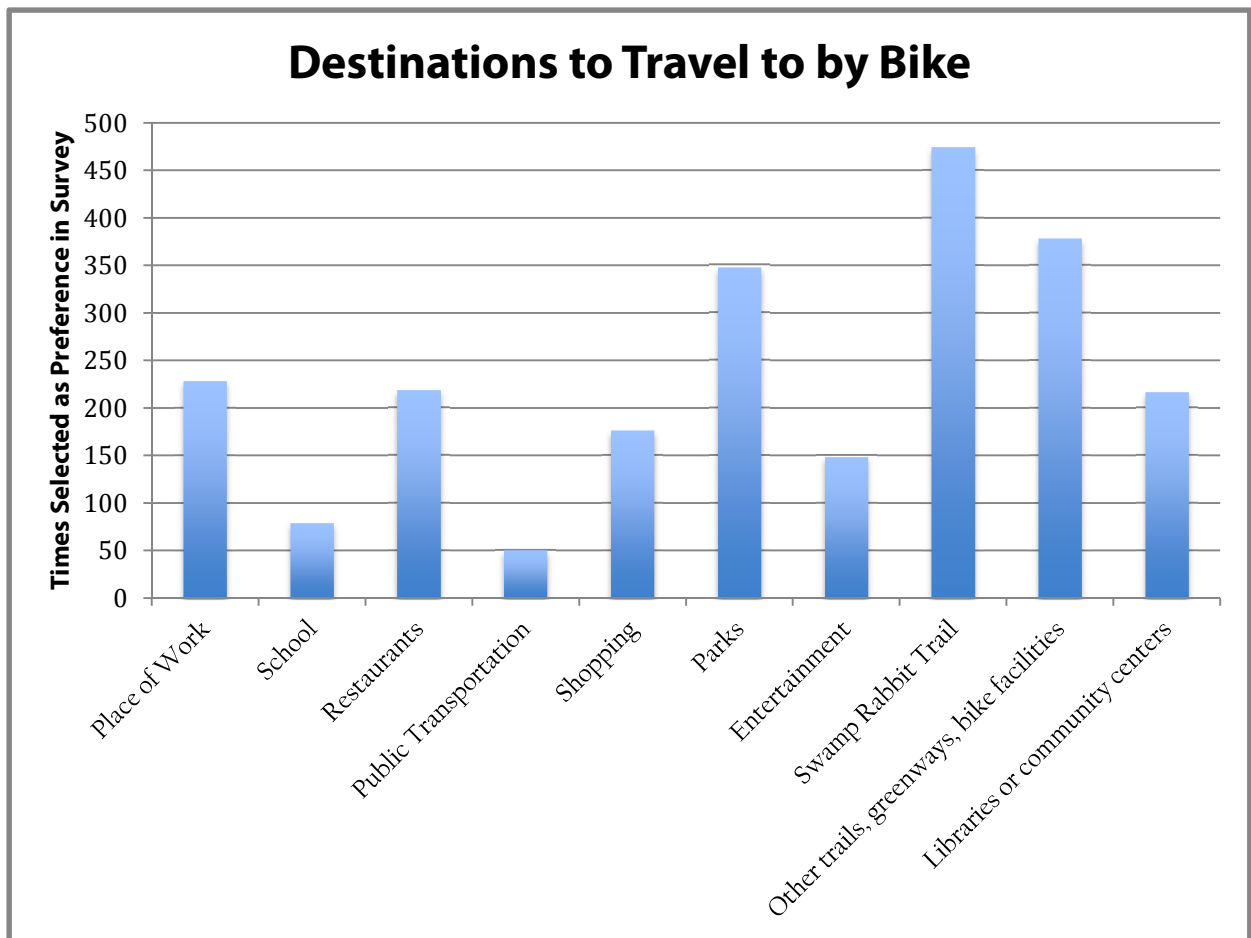
### **4.4.1. Bicycling Environment**

Public comments indicate that Greenville citizens consider bicycling on many of Greenville roads to be to be unsafe or uncomfortable. Feedback centered on major roads and collector streets, in particular. In the explanations of why they recommended certain corridors for bicycling improvements, respondents commonly described the roads using the following terms or phrases: dangerous, heavy traffic, fast traffic, narrow lanes, no bike lanes.

At the first public meeting of the Bicycle Master Plan process, meeting attendees brought up additional concerns. Issues included a lack of law compliance by cyclists, a lack of education of road users, insufficient width for the installation of bicycle facilities, and cost, funding, and usage of bicycle facilities. Audience members also expressed support for the existing bicycle facilities, especially the bicycle lane on East North Street.

The online survey asked respondents to identify, which destinations in Greenville they would most like to travel to by bike. The results (Figure 4-16) show that the Swamp Rabbit Trail and other separated bikeway facilities are leading destinations for Greenville citizens. Parks also ranked high as a bicycling destination. More than 40 percent of survey respondents (45.6%) expressed an interest in commuting to work.

Figure 4-16 Survey respondents identified where they would like to travel to by bike in Greenville.



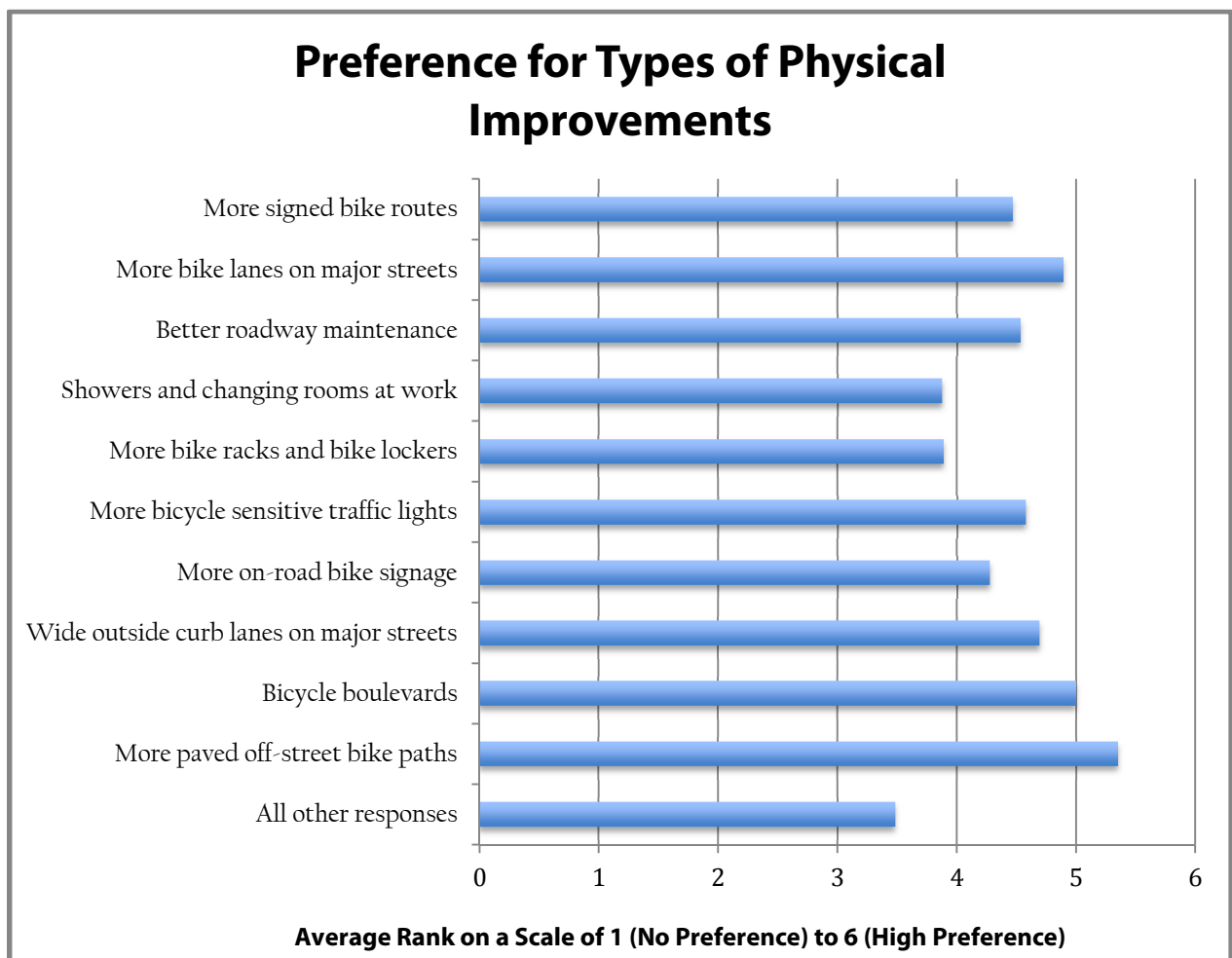
#### 4.4.2. Physical Improvements

##### Community Preferences

The community provided input on suggested physical improvements, areas of opportunities and challenges, and bicycle parking downtown both at the workshop and in the online survey.

Survey respondents identified physical improvements that would influence them to bike more often. Of the 11 improvement options, those that were the most likely to encourage respondents to ride were more paved off-street bike paths (greenway trails), more bike lanes on major streets, and bicycle boulevards (shared roadways designed to give priority to bicycle traffic). Survey respondents also expressed a strong interest in wide outside curb lanes, more bicycle sensitive intersections, and improved bikeway maintenance (Figure 4-17).

Figure 4-17. Recommended physical improvements



### Community Suggested Bikeways

At the first public workshop, attendees provided comments on a large map of Greenville's road network. Additionally, the online survey asked respondents to identify corridors and intersections that are challenging for bicyclists and/or need particular attention for bicycling improvements. Table 4-11 presents the top 5 corridors that survey respondents listed as difficult for bicyclists and subsequently need improvements. In general, community members identified major arterials in Greenville as corridors needing significant bicycling improvements. Respondents classified Augusta St. and Laurens Rd. as the most challenging corridors: 88 people selected Augusta St. and 52 selected Laurens Rd.



Table 4-11. Top five challenging corridors

Rank	Corridor
1	Augusta
2	Laurens
3	Pleasantburg
4	Stone
5	North Main

#### 4.4.3. Bicycle Parking

As Greenville continues to invest in bikeways, it is likely more people will bicycle, making bicycle parking an increasingly important issue. The online survey asked participants to suggest locations for both short-term and long-term bicycle parking. Table 4-12 shows the overall most commonly cited locations for bicycle parking.

Table 4-12. Community preferences for bicycle parking

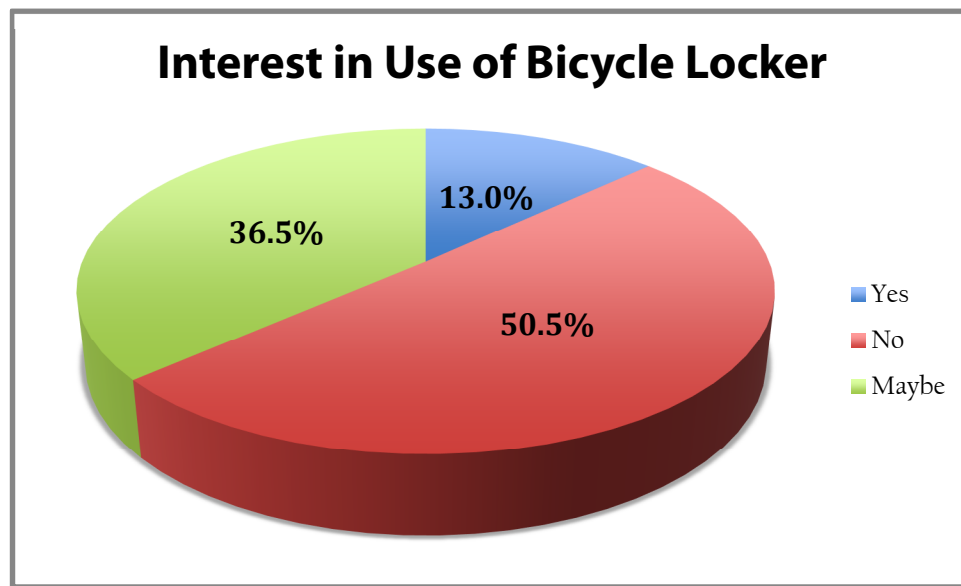
Rank	Bicycle Parking Location
1	Downtown
2	Main Street
3	Falls Park and River Place
4	West End
5	Peace Center
6	Parking Garages

The community recommended the following destinations as high priority locations specifically for long-term parking:

- Vehicular Parking Garages
- Greenville Hospital Campus
- Greenville Technical College Campus
- ICAR Campus
- All Office Complexes
- Transit Centers and Transit Stops
- Hyatt Regency (Downtown)
- Woodruff Road Shopping Centers

The online survey also asked participants to express their level of interest in bicycle lockers. As shown in Figure 4-18, about half of the survey respondents stated interest in using a bicycle locker for long-term parking. Of those, 36.5 percent stated a possible interest by answering “maybe” while 13 percent showed a clear desire for bicycle lockers by answer “yes.” A remaining 50.5% of survey respondents expressed no interest in bicycle lockers.

Figure 4-18. Survey respondents interest in using a bicycle locker



#### 4.4.4. Programmatic Needs

Bicycle programs can complement the bikeway infrastructure with encouragement, education, enforcement and evaluation. At the public workshop, members identified need for the following programs (Table 4-13).

Table 4-13. Community-identified priorities

5 E's	Summary
Education	<ul style="list-style-type: none"> <li>Educate children on safe and proper bicycling</li> <li>Educate bicyclists on bicycling rules and laws</li> <li>Educate motorists on how to interact with bicyclists and bicycle facilities</li> </ul>
Encouragement	<ul style="list-style-type: none"> <li>More events/programs, such as instructional rides</li> <li>Published materials and media, including bike routes maps for commuters</li> <li>Additional facilities, like covered bicycle parking</li> </ul>
Enforcement	<ul style="list-style-type: none"> <li>Enforce traffic violations of both motorists and cyclists</li> <li>Collaborate with police to provide reflective vests, lights, and enforce use of hand signals by bicyclists</li> </ul>
Engineering	<ul style="list-style-type: none"> <li>Improvements, such as better detectors of bicyclists at signals</li> <li>Increased connectivity</li> </ul>
Evaluation/ Planning	<ul style="list-style-type: none"> <li>Collect data and feedback</li> <li>Plan for type B, C, and D bicyclists</li> </ul>

Additionally, the survey asked respondents to classify programs that they would be interested in having implemented in Greenville. Figure 4-19 shows the top five programs identified out of 11 possible choices. The programs that respondents selected overall were informational programs on where to ride and how to ride safely.

*Figure 4-19. Top-Ranked Programs and Resources*

<b>Rank</b>	<b>Program</b>
1	Bicycle Maps and Guides
2	Materials describing bicyclists' rights and responsibilities
3	Bicycling incentive programs at work or school
4	Materials describing safe auto driving practices in relation to bicyclists
5	Route planning services for bicyclists; bicycle information websites

Coordination of transit services and bicycle facilities is important for developing a complete multi-modal transportation network. According to the survey, 22.6 percent of respondents did not know that GreenLink buses offer a bicycle storage rack. Three-quarters of the survey participants (76%) knew of the racks existence, but had not used a bus rack. This community feedback indicates a need for both increased promotion of the racks, as well as information about convenient bike-to-transit routes. While the survey showed limited use of the transit bike racks among survey participants, GreenLink bike-on-bus data shows a clear trend toward increasing usage (see page 3-5).

The combined results of the public outreach campaign reinforce the community's strong interest in education strategies for both bicyclists and motorists and bicycle maps and guides.

## 5. Non-Infrastructure Recommendations

Of the Six Es of bicycle planning, four are related to programs: encouragement, education, enforcement and evaluation. Bicycle-related policies can affect each of the Six Es, but are primarily used as an evaluation and planning tool. Programs will complement engineering improvements such as bike paths, lanes and routes by giving Greenville residents the tools they need to safely and confidently use the bikeway network. The following four vision statements of the Greenville Bicycle Master Plan are particularly relevant to the development and implementation of programs and policies:

- **Education:** Community understanding and respect for the roles and responsibilities of cyclists
- **Encouragement:** Increase bicycle ridership and foster the creation of a strong bicycle advocacy community and bicycle culture.
- **Enforcement:** A safer environment for cyclists and other transport modes
- **Evaluation & Planning:** Institutional support and collaboration for bicycling

All of the Six Es work together to enhance the bicycling experience in Greenville. The following section presents recommended programs and policies to support the vision and goals of this plan. The recommendations include continuation of those administered by the City and other area agencies and organizations and those identified by the community, as well as additional programs that have proven to be popular and effective in other bicycle-friendly cities.

### 5.1. Existing Program Resources

Greenville's recommended bikeway network should be complemented by programs and activities designed to promote bicycling. There are many existing efforts to promote bicycling in Greenville, several that are provided by local agencies, active community groups and individual residents. The Bicycle Master Plan recognizes these efforts and encourages Greenville to support, promote and build upon these efforts.

#### 5.1.1. Maps, Materials, and Webpages:

Greenville offers several bicycling-focused online and print resources. However, the breadth of educational materials and maps for bicyclists is limited.

- Bikeville tri-fold brochure
- Swamp Rabbit Trail Map (available for print, online)
- Bikeville Website: <http://www.bikeville.org>
- City Trails & Greenways Program Website: <http://www.greenvillesc.gov/ParksRec/Trails/>
- Upstate SORBA Website: <http://www.upstatesorba.org/>
- Greenville Spinners Website: <http://www.greenvillespinners.org/>

### 5.1.2. Bicycle Shops

Each of the bicycle shops in Greenville serves as a primary resource for information related to bicycling.<sup>1</sup> They offer occasional bike mechanic clinics. Several shops host events and/or group rides on a regular basis.

### 5.1.3. Sport Clubs and Racing Teams

Several local bicycling clubs have activities aimed at encouraging women riders and young racers. A few of these activities include classes and rides aimed at inexperienced cyclists, but most are designed for experienced riders.<sup>2</sup>

- Greenville Spinners Bicycle Club<sup>3</sup>: road bicycling club
- GS Elan Women's Cycling (Greenville Spinners): women's bicycling club
- Upstate SORBA (Southern Off-Road Bicycle Association): off-road bicycling club
- Greenville Spinners Racing Team: competitive road cycling team
- Trailblazer Adventure Racing Team: competitive mountain bike racing team
- Greenville Women's Cycling Team: competitive women's road cycling team
- TEAM Headstrong: competitive road cycling team
- Team Inertia Racing: competitive mountain bike racing team
- Piedmont Orthopedic Associates (POA) Cycling Team: competitive road cycling team
- Les Amis: amateur competitive road cycling team, includes junior racing
- Donne Pedala: competitive women's road cycling team

### 5.1.4. Organizations and Coalitions

There are a number of existing nonprofit organizations and community coalitions that support active living, outdoor recreation, and/or active transportation. These entities can serve as key partners for bicycling programs.

- Bikeville: a volunteer coalition representing the City of Greenville's bicycle friendly community initiative, with a goal to “increase ridership, encourage bicycle use, expand bicycling facilities, and provide useful educational resources to cyclists and motorists to share the road.” Resource: <http://www.bikeville.org>
- Greenville Spinners Bicycle Safety Foundation: an all-volunteer nonprofit group, which partners with the Greenville Spinners to raise funds for helmets and bicycle safety workshops. Resource: [http://www.greenvillespinners.org/content.aspx?page\\_id=22&club\\_id=296060&module\\_id=40433](http://www.greenvillespinners.org/content.aspx?page_id=22&club_id=296060&module_id=40433)
- Upstate Forever: membership-based nonprofit organization headquartered in Greenville that promotes sensible growth in the ten-county Upstate region of South Carolina. Resource: [www.upstateforever.org](http://www.upstateforever.org)

---

<sup>1</sup> Nearly every stakeholder interviewed for this plan noted the importance of bicycle shops as a source of local bicycling information.

<sup>2</sup> Online resource: <http://carolinacyclingnews.com/resources/clubs/>

<sup>3</sup> Community members indicated that both the online group “E-Ride” and the neighboring Freewheelers of Spartanburg cycling club are accessible to Greenville bicyclists as well.



- LiveWell Greenville: a “partnership of dozens of public and private organizations that aims to make Greenville County a healthier place to live, work, and play.” Resource: [www.livewellgreenville.org](http://www.livewellgreenville.org)
- YMCA of Greenville: a nonprofit organization offering “programs that promote good health, strong families, youth leadership and community and international understanding.” Resource: [www.ymcagreenville.org](http://www.ymcagreenville.org)
- Palmetto Conservation Foundation: a statewide nonprofit organization with a mission “to conserve South Carolina's natural and cultural resources, preserve historic landmarks, and promote outdoor recreation through trails and greenways.” Resource: [www.palmettoconservation.org](http://www.palmettoconservation.org)
- Palmetto Cycling Coalition: a statewide nonprofit organization with a mission to make South Carolina bicycle friendly for everyone. Resource: [www.pccsc.net](http://www.pccsc.net)

## 5.2. Program Recommendations

### 5.2.1. Encouragement

The following programs are designed to encourage community member to ride bicycles. Through the Greenville Bicycle Master Plan public outreach process, community members identified encouragement programs as a way to increase bicycling mode share and reach the goals outlined in this plan. The following section outlines recommended encouragement programs or enhancements to existing programs.

#### Bicycle Resource Website

The City of Greenville hosts a webpage for the bicycling coalition Bikeville on the city website. Visitors to the site can link to the webpage from the site's home page. The page includes dynamic (Google-administered) maps of bicycle facilities, signed bicycle routes, mountain bike trails, and the Swamp Rabbit Trail. Information about Bikeville, the Bicycle Master Plan, the Bicycle Friendly Community designation, the Bicycle Friendly Business program, local clubs and advocacy groups, and bicycle-related City ordinances is provided as well.

This resource would benefit from the following recommended improvements:

- Dynamic bike parking map
- Advertisement of all bikeways before and after implementation
- Bicycling tips for utilitarian cycling, including information on how to:
  - Carry items using baskets and panniers
  - Properly lock a bicycle
  - Ride in the rain with help from fenders and rain gear
  - Tips can also include information on the importance of bicycle lights and reflectors.
- Bikeway maintenance and repair phone number
- Speed feedback sign request forms



*The City dedicates a page of its website to information about the Bicycle Friendly Community initiative.*

- Bicycle events calendar
- Education and skill class information and an opportunity to request such a class
- Request form for route planning assistance or bike mentor requests
- Photo galleries, featuring photos from events and submitted by readers

A one-stop bike website is not difficult to create, but requires dedicated time and should be included in City employee's time and work program. It is important to note, however, that it will only be successful if the site is both easy to use and updated regularly. The bicycle community can assist in keeping the site up-to-date. The website of Upstate SORBA currently includes a comprehensive inventory of area mountain biking trails. The Greenville Spinners' website contains valuable information about weekly local rides and area events. The City should partner with these groups and others, to take advantage of existing online resources by linking to those sites, creating RSS feeds, or choosing other similar approaches to integration.

### **Bicycle Safety Campaign**

A marketing campaign that highlights bicyclist safety is an important part of creating awareness of bicycling in Greenville. This type of high-profile campaign is an effective way to reach the public, highlight bicycling as viable forms of transportation, and reinforce safety for all road users.

A well-produced safety campaign will be memorable and effective. One good example is the Sonoma County Transit "You've got a friend who bikes!" campaign. It combines compelling ads with an easy-to-use website focused at motorists and bicyclists. This type of campaign is particularly effective when kicked off in conjunction with other bicycling events or at back to school time in the fall. The safety and awareness messages should be displayed near high-traffic corridors (e.g., on billboards), printed in local publications, and broadcast as radio and/or television ads.

This Plan recommends the City pursue grant funding to implement a bicycle safety campaign.

Sample program: Sonoma County (CA) Transit: <http://www.sctransit.com/bikesafe/bikes.htm>

### Safe Routes to School Program

Helping children walk and bicycle to school is good for children's health and can reduce congestion, traffic dangers, and air pollution caused by parents driving children to school. Robust Safe Routes to School programs address all of the "Six Es" (Engineering, Education, Encouragement, Enforcement, and Evaluation, and Equity).

The City of Greenville should work with local school districts and SCDOT's Safe Routes to School (SRTS) Program to implement the first phase of a coordinated local SRTS Program. This phase will use a walkabout (also known as a bicycle and pedestrian audit) to assess walking and biking conditions of streets adjacent to elementary schools. Parents, students, neighbors, and city planners and/or traffic engineers should be invited to join in the walkabout. Safety concerns, issues, and ideas should be recorded.

After the bicycle and pedestrian audit is conducted, parent maps for each elementary school showing recommended routes to reach school, along with high-traffic intersections and routes to avoid, should be produced and distributed.

As a final step, an initial infrastructure improvement plan should be produced for each elementary school, including cost estimates and a prioritized project list. This infrastructure improvement plan will serve as a blueprint for future investments, and can be used to apply for further grant funding.

Resource Guide: National Center for Safe Routes to School: <http://www.saferoutesinfo.org/>



*Safe Routes to School programs increase the number of children walking and biking to school and improve traffic safety near schools.*

### Host National Bike Month Activities

Bicycling to work or to other destinations is a great way to get exercise, save money, reduce pollution, and have fun. Cities and towns across the country participate in National Bike Month. The League of American Bicyclists (LAB) hosts a website for event organizers. The website contains information on nationwide and local events, an organizing handbook, and promotional materials.

The City of Greenville recognizes National Bike Month annually with activities such as:

- Valet Bicycle parking
- Bicycle Commuter Course
- Greenways Bike Tour
- Mountain Bike Skills Clinic and Trails Tour
- Ride of Silence
- Downtown Greenville Art Tour By Bike
- Bike-themed Outdoor Movies
- Bike Ride with Mayor
- Promotion of Bike to Work Day and Bike to Work Week

It is recommended that the City of Greenville continue and expand National Bike Month events and activities, with the support of local bicycling groups and shops. Expanded activities may include:

- Bike to Work Day events: morning-commute energizer stations with food, encouragement, information, and sponsored goodies for participants; rally or celebration with raffles, food, and vendors.
- Discounts at local businesses for bicycle commuters.
- Bike vs. Bus vs. Car challenge. This is a fun competition to determine which transportation mode arrives at the city center in the least amount of time.
- Commuter Challenge providing incentives for residents to commute to work. This can be implemented as either a business-based program or a city-wide initiative. As a business-based program, local companies participate by recording the number of employees who bike to work over a given time period. The percentage of bicycle commuters are then compared between participating companies and recognition is awarded through press, trophies or plaques, and a final award party or event. As a city-wide initiative, residents self-report their commuting mileage through an online program, such as WorldCommute.com.

### **Employer Based Encouragement Programs**

In the Bicycle Master Plan survey, City of Greenville residents expressed an interest in employer-based bicycle encouragement programs. Greenville's Bicycle Friendly Businesses, Fluor, TTR Bikes, Great Escape Bicycle Shop, and Upstate Forever, already have programs in place to encourage bicycling.

Though the City cannot host these programs, it can work with or provide information to employers about commuting by bicycle. Popular employer-based encouragement programs include hosting a bicycle user group to share information about how to bicycle to work and to connect experienced bicyclists with novice bicyclists. Employers can host bicycle classes and participate in Bike to Work day. The City can also provide a model for local employers by initiating such programs in-house and encouraging County government staff to do the same.

This Plan recommends the City collaborate with employers to implement bicycle-related programs.

Sample program: Humana Freewheelin Program (Louisville, KY):

<http://trafficsafety.org/safety/sharing/bike/bike-initiatives/humana-freewheelin-program>

### **Promote a Bicycle Friendly Business Program**

The Bicycle Friendly Business designation program of the League of American Bicyclists recognizes businesses who encourage bicycling among their employees and visitors. By implementing a local program to promote the national Bicycle Friendly Business designation, Greenville will encourage businesses to improve the integration of bicycling into their business model and offer resources to businesses as they do so. This program may include a bike-friendly business audit service; annual bike-friendly business honorable mention awards for businesses not yet ready for national designation; public recognition of nationally-designated bike-friendly businesses; staff time, expertise and/or financial support for building facilities and creating incentives; cash awards, credit at a bike shop, or in-kind bicycling items provided to businesses earning bicycle friendly status.

Through promotion of the national bicycle friendly business program, Greenville businesses will be encouraged to add or increase all or some of the following items, as well as supported in their efforts to do so:

- Outdoor bike racks
- Guaranteed Ride Home: Provide a free taxi ride home for bike commuters in the event of family emergency or other extenuating circumstances.
- Promotional information: Company provides bike information through company memo, e-newsletter, website, or brochure/poster display.
- Employee bike training session: Adult bike skills training sessions are available for a nominal fee through League of American Bicyclist certified instructors.
- Bike commuter incentives: Company provides incentives to bike commuters at the same value as those for other commuters.
- Bike Week team entry: Register a company team to participate in a Bike Commuter Challenge.
- Shower facilities: Company provides free showers to employees within own building or at neighboring buildings.
- Company owned bikes for work trips: Bikes (and helmets) available for employee work trips.
- Secure, covered bike parking: Qualified parking includes: secure indoor parking; outdoor covered parking with limited access; outdoor covered parking that is in view of security.

Sample Programs:

- Boston's Bike Friendly Business Program: [http://www.cityofboston.gov/environmentalandenergy/greenawards/pdfs/greenawards08\\_bike.pdf](http://www.cityofboston.gov/environmentalandenergy/greenawards/pdfs/greenawards08_bike.pdf)
- Toronto's Bicycle Friendly Business Awards: [http://www.toronto.ca/cycling/bfba/integrate\\_cycling.htm](http://www.toronto.ca/cycling/bfba/integrate_cycling.htm)
- Portland retailer Rejuvenation: <http://bikeportland.org/2008/01/31/rejuvenation-hardware-launches-employee-bike-program/>

### Car-Free Street Events

Car-free street events have many names: Sunday Parkways, Ciclovias, Summer Streets, and Sunday Streets. Sunday Parkways are periodic street "openings" ("open" to users besides just cars; usually on Sundays) that create a temporary park that is open to the public for walking, bicycling, dancing, hula hooping, roller-skating, etc. They have been very successful internationally and are rapidly becoming popular in the United States. Car-free street events promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. Events can be weekly events or one-time occasions, and are generally very popular and well attended.



*Opening streets for a car-free community event creates a temporary park for walking, cycling, skating, dancing, etc.*



During the Bicycle Master Plan public meetings the community identified interest in a Greenville car-free street event. This Plan recommends the City consider hosting a pilot car-free street event.

Sample Programs:

- Atlanta Streets Alive: <http://www.atlantabike.org/atlantastreetsalive>
- Vancouver LiveStreets: <http://www.livestreets.ca/>
- San Francisco Sunday Streets: <http://sundaystreetssf.com/>
- Oakland's Oaklavia <http://oaklavia.org/media>
- New York City Summer Streets:  
<http://www.nyc.gov/html/dot/summerstreets/html/home/home.shtml>
- Portland Sunday Parkways: <http://portlandsundayparkways.org/>

### Bicycle Sharing

A household's access to a bicycle is the strongest single predictor of bicycling for transportation.<sup>4</sup> Bicycle sharing schemes offer one avenue for increasing opportunities for bicycle travel. In its most broad sense, bicycle sharing is a shared fleet of bicycles used for daily mobility. More recently, bike share systems have been identified by the "third generation" version, which uses smart technology to provide multiple, automated (un-manned) bicycle rental stations available to the public for short-term bicycle use.

The Nicholtown neighborhood (in partnership with LiveWell Greenville and Hope Baptist Church), the Caine Halter YMCA, and Leadership Greenville have each developed proposals for bicycle sharing programs. In concept, the Nicholtown program is intended to operate as a lending library, the YMCA program would operate as a rental service, and the Leadership Greenville project would function as a "third-generation" smart technology bike sharing system.



*Bicycle share programs encourage bicycle ridership by ensuring that every household in the city has access to a bike.*

This plan recommends that the City of Greenville serve as a leading partner in local bicycle sharing schemes. The City can provide a crucial role in seeking federal and state grants to assist in the implementation of such programs as well as permitting use of public right of ways, where appropriate, for bicycle sharing equipment.

---

<sup>4</sup> Cervero, R. et al. (2009). Influences of built environments on walking and cycling: Lessons from Bogota. *International Journal of Sustainable Transportation*, 3(4), 203-226.

Sample programs:

The following programs represent the wide-range of bicycle lending programs that exist around the country. As evidenced by Greenville's current community-led bicycle sharing schemes, bike share programs can vary extensively in their cost, format, and target market.

- Iowa City Bike Library: <http://www.bikelibrary.org/>
- Fort Collins Bicycle Library: <http://www.fcgov.com/bicycling/library.php>
- Spartanburg Hub Cycle: <http://www.active-living.org/Hub-Cycle-2.html>
- Washington, D.C. Capital Bike Share: <http://www.capitalbikeshare.com/>

### Personal Travel Encouragement Program

Personal Travel Encouragement (PTE) programs (also known as individualized social marketing programs) are encouragement programs based on saturating a target geographic area with resources to help residents reduce drive-alone trips and increase biking, walking, transit, and carpool trips. These programs have demonstrated a lasting reduction in drive-alone trips; for example, in Portland, OR, target areas have experienced a 10% reduction in motor vehicle traffic.



*Maps and materials are delivered to interested residents by bike in this SmartTrips program*

Programs offer residents maps, brochures and other printed materials, classes, guided rides and walks, and other tools and programs that make bicycling, walking, and transit usage a more inviting travel option compared to drive-alone trips.

Compared to infrastructure improvements, these programs are scalable, flexible, inexpensive, and site-independent. Once the program has been established for a specific geographic target area, it can be run with low start-up costs in other target areas.

One of the strengths of the individualized marketing model is that it reaches every resident with an appealing invitation to participate, but then focuses the bulk of resources on those who identify themselves as interested. The many classes, rides, and activities continue to be publicized and open to all, so residents have multiple opportunities to opt into the program. This focus allows for both broad reach and strategic investment.

This model is most successful in areas that have made initial infrastructure investments sufficient to provide a functional bicycling, walking, and transit network. It is most effective as an approach that leverages investments in infrastructure, not one that replaces those investments. With Greenville's fast-increasing bicycle facilities network, PTE could build the user base for that network and evidence local demand for such facilities.

This Plan recommends that the City of Greenville implement a pilot Personal Travel Encouragement program in a limited geographic area.

The program may include the following:

- Maps and brochures
- Classes, clinics, workshops
- Guided rides and walks
- Fun social events
- Giveaways (e.g., coupons, pedometers, etc.)
- Targeted outreach (e.g., Women on Bikes, Senior Strolls)
- Route planning help (bike, walking, or transit)

The exact program components and budget should be determined at time of program planning.

Sample program: Portland SmartTrips program:

<http://www.portlandonline.com/transportation/index.cfm?c=ediab>

### **5.2.2. Education**

Education programs are designed to improve safety and awareness. Organizations such as SafeKids Upstate and Greenville Spinners Bicycle Safety Foundation assist in providing safety education and properly fitted helmets to children. The Bikeville coalition's Lights for Life program provides lights and reflective wear for low-income residents who do not have appropriate safety gear.

The needs analysis, including community input and collision analysis, for this Plan identified a need for bicycling education programs. Community members identified education classes as a way to reduce conflict and encourage more bicycling. Bicycle-related collision data shows that in addition to engineering improvements, education about riding on the right side of the road and how to comfortably ride in traffic may reduce bicycle related collisions. Individuals aged in the twenties and fifties are the two age groups most frequently involved in bicycle collisions in Greenville from 2005 to 2010, and, thus, suggest two leading target markets for education efforts. Feedback provided on the Bicycle Master Plan survey suggests a strong interest in adult and youth bicycle safety classes. Some interest was indicated for senior bicycle education, as well, though to a much lesser degree. The following outlines recommended education programs.

### Adult Bicycling Skills Classes

The League of American Bicyclists (LAB) offers a curriculum for Smart Cycling courses that teach adults to ride their bicycles safely and confidently. The Smart Cycling courses are taught by League Certified Instructors (LCIs). Courses cover bicycle safety checks, fixing a flat, on-bike skills, crash avoidance techniques, and traffic negotiation.

There are currently five League-certified instructors in the Greenville area. A limited number of courses have been offered thus far in Greenville.

This Plan recommends the City of Greenville sponsor adult bicycling skills classes in the city on a bi-annual basis, at minimum. The City may also highlight local or nearby courses on its bicycling website and/ or coordinate with and support other local and regional organizations to offer such courses.

Sample programs: League of American Bicyclists <http://bikeleague.org/programs/education/courses.php>



*Adult bicycle skills courses help bicyclists have the information and skills they need to avoid hazards and follow the law.*

### Senior Bicycle Education Classes

Senior bicycle education programs help older adults either re-learn bicycling or learn how to bicycle with less agility. Seniors who are no longer able to drive may still be able to bicycle shorter distances on either a regular two-wheeled bicycle or an adult tricycle. As one example, the Portland Parks and Recreation Department hosts a free senior tricycle program that provides tricycles to senior centers and takes folks on guided rides.

This Plan recommends the City collaborate with interested agencies, health departments, and senior centers to evaluate interest in senior bicycle education classes. If there is an interest in hosting such programs, the City should connect local agencies with partners in the area, such as the Greenville Spinners, the Southeastern Off-Road Bicycle Association, and the Greenville Bike Safety Foundation, who may be able to assist in developing and implementing senior bicycling activities.

Sample Program:

- Portland Senior Tricycle Program  
<http://www.portlandonline.com/transportation/index.cfm?c=34772&a=155167>

### Youth Bicycle Safety Education Classes

Typical school-based bicycle education programs educate students about the rules of the road, proper use of bicycle equipment, biking skills, street crossing skills, and the benefits of biking. Education programs can be part of a Safe Routes to School program. These types of education programs are usually sponsored by a joint City/school district committee that includes appointed parents, teachers, student representatives, administrators, police, active bicyclists, and engineering department staff.

This Plan recommends the City and local partners pursue a Safe Routes to School Program that includes annual youth bicycle safety education classes.

Sample programs:

- League of American Bicyclists: <http://www.bikeleague.org/programs/education/courses.php#kids>
- Bicycle Transportation Alliance – Portland, OR: <http://www.bta4bikes.org/resources/educational.php>

### Family Day/Family Biking Classes

Family Bike Days and Family Biking Classes are great tools for educating and encouraging families to ride bicycles. Education trainings and encouragement events can include:

- "Freedom from Training Wheels" training
- How to carry kids by bicycle classes
- Safety checks and instruction
- Basic bike maintenance classes
- Bicycle Rodeos
- Bicycle Parades around parks and schools
- Organized family rides to child friendly locations such as the zoo or local parks

A family cycling class is organized through the Community Cycling Center in Portland, Oregon. They teach urban riding and bicycle maintenance over five weekly sessions. They work with families to help them achieve the goals of improving fitness, reducing pollution, and having more fun.

The San Francisco Bike Coalition organizes a "Freedom From Training Wheels" event. Families meet at a park and attempt to teach their children to ride their bicycles without training wheels. The fun and encouraging atmosphere helps bring confidence to children learning to ride on two wheels.



*Youth bicycle safety education provides children with knowledge and training about safe and proper bicycle use.*

It is recommended that the City of Greenville develop a family bicycling program.



Sample Programs:

- Portland, Oregon: <http://www.communitycyclingcenter.org/index.php/programs/classes/>
- San Francisco Bike Coalition: [www.sfbike.org/freedom](http://www.sfbike.org/freedom)

### 5.2.3. Enforcement

Enforcement programs enforce legal and respectful use of the transportation network. The bicycle collision analysis and community identified needs indicate enforcement programs will help educate both motorists and bicyclists about the rules and responsibilities of the road.

The Greenville Police Department does not currently emphasize enforcement action against bicyclists, though if a crash involving a bicyclist occurs, the bicyclist may be ticketed. The City has partnered with the Palmetto Cycling Coalition to distribute small flyers that describe South Carolina traffic laws for bicyclists (in both Spanish and English). The following outlines recommended enforcement programs.

#### **Bicycle Patrol**

Police bicycle patrols not only increase the mobility of officers in dense areas but also provide law enforcement officers with an opportunity to display safe and legal bicycle skills. Bicycle patrols also show the community that the City is engaged in sustainable transportation. The Police Department deploys up to two bicycle patrol officers in the Downtown area on a regular basis. This Plan recommends the City continue its bicycle patrol in the Downtown area.

#### **Speed Feedback Signs**

Speed feedback signs display the speed of passing motor vehicles, with the expectation that motorists will slow down if they are aware of their speed. The Police Department operates several mobile speed feedback signs, which are deployed in response to resident complaints about speeding.

This Plan recommends the City include information on how to request a speed feedback sign on its bicycling resource website.

#### **Targeted Enforcement**

Targeted enforcement is focused efforts of police officers. For example, the Police Department conducts pedestrian stings at locations where pedestrians and motorists conflict and do not comply with traffic signals. Similar strategies may be applied to areas with bicycle traffic, however the Police Department has not implemented such strategies.

This Plan recommends the City's Police Department conduct targeted enforcement stings at locations known for noncompliance with traffic laws and at high conflict or high bicycle related collision areas.

#### **Diversion Classes for Motorists and Bicyclists**

Improving driver awareness of bicyclists helps to make a safer and more comfortable road environment for bicycling. Outreach through Drivers Ed classes is a good way to reach beginning drivers, while a diversion class can be offered to first-time offender violations that endanger bicyclists.

A diversion class can be aimed at motorists and bicyclists. In lieu of a citation and/or fine, individuals can take a one-time, free or inexpensive class instead. In Marin County, California, interested citizens can take the class even if they did not receive a ticket. This program is a good way to educate road users about bicycle rights and responsibilities, and can also increase public acceptance of enforcement actions.

Portland, Oregon offers a successful model for providing a diversion program for bicyclists who violate traffic laws, as well as motorists who violate traffic laws in relation to bicyclists.<sup>5</sup> Other programs have been successful in Tempe, AZ; University of California at Davis; Huntington Beach, CA; and in Contra Costa County, CA. Bicyclist-targeted programs typically include the following strategies:<sup>6</sup>

- A bicyclist is ticketed for violating a traffic law.
- The bicyclist is provided information regarding the importance of observing bicycle traffic laws for the sake of safety, and is invited to attend a bicycle safety workshop (if the violator is a child, a letter with the same information is sent to the child's parent).
- If the bicyclist attends the workshop, the traffic ticket is voided.
- If the bicyclist does not attend the workshop (within a specific timeframe), the ticket is activated.

The first step of establishing a diversion program is to collaborate with the local police department and one or more local judges. Bicyclist-related diversion programs can often be developed in a format similar to existing diversion programs targeting other types of violations. Cities commonly use established League of American Bicyclist courses as qualified bicycle traffic safety classes, such as Tucson, Arizona, which refers traffic violators to a League Traffic Skills 101 (previously Road I) course.

Sample programs:

- Marin County, CA: <http://www.marinbike.org/Campaigns/ShareTheRoad/StreetSkills/Index.shtml>
- Tempe, AZ: <http://www.tempe.gov/court/bdc.htm>
- Portland, OR: <http://www.lifesaversconference.org/handouts2009/Morrison2.pdf> and <http://www.pedestrians.org/episodes/details121to150/Episode148.htm>
- Tucson, AZ: <http://www.tucsonaz.gov/prosecutor/Diversion/diversion.html>

### 5.2.4. Evaluation

Evaluation programs help the City measure how well it is meeting the goals of this plan, the Comprehensive Plan, and master plans that address the need to increase bicycle ridership. Evaluation is a key component of any engineering or programmatic investment.

#### Annual Count and Survey Program

Evaluation programs measure and evaluate the impact of projects, policies and programs. Typical evaluation programs range from a simple year over year comparison of U.S. Census Journey to Work data to bicycle counts and community surveys. Bicycle counts and community surveys act as methods to evaluate not only the impacts of specific bicycle improvement projects but can also function as a way to measure progress towards reaching City goals such as increased bicycle travel for trips one mile or less. Through the Bicycle

---

<sup>5</sup> Source: City of Portland Office of Transportation. (2004). Pedestrian and Bicycle Enhanced Enforcement Project: Opportunity Analysis; <http://www.portlandonline.com/transportation/index.cfm?a=99325&c=34811>

<sup>6</sup> Source: [http://www.bicyclinginfo.org/bikesafe/case\\_studies/casestudy.cfm?CS\\_NUM=805](http://www.bicyclinginfo.org/bikesafe/case_studies/casestudy.cfm?CS_NUM=805)

Master Plan process, the City of Greenville has already established baseline data and a tested methodology for collecting annual bicycle counts.

This Plan recommends, at minimum:

- Before and after bicycle and motor vehicle counts on all roadway and bikeway projects.
- Annual bicycle counts conducted at minimum at the 35 locations counted as part of this Master Plan effort.
- Annual community survey to evaluate bicycling activity, impacts of bicycle programs and facilities and to measure the City's progress towards reaching its goals.

### **Bicycle Staff Position**

Because Greenville does not currently have a professional transportation planner on staff, this report recommends that the city hire a full-time transportation planner with expertise in the realm of bicycle and pedestrian planning. Doing so would address multiple high priority objectives for the City, while also taking a step closer to satisfying the need for increased bicycle and pedestrian staff. An in-house transportation planner would provide the City of Greenville with the necessary expertise for successfully finding a balance among all road users. Transportation planners have a unique capacity to address short- and long-term evaluation of infrastructure projects and funding.

Recognizing that bicycling in the City of Greenville is impacted by issues and opportunities in the greater Greenville region, the City should also work with the regional transportation planning agency, Greenville Pickens Area Transportation Study (GPATS), and its member communities to establish at least one position that focuses on active transportation modes for the greater planning area. GPATS's counterpart agency in the Spartanburg region, SPATS, has had at least one full time planner for multi-modal transportation issues since 2005.

### **Permanent Bicycle Advisory Committee**

Many cities have an official Bicycle Advisory Committee made of citizen volunteers, appointed by City Council, to advise the city on bicycling issues. An advisory committee establishes the area's commitment to making bicycling and walking safer and more desirable, and has the potential to assist Greenville in getting funding for bicycle projects. Establishing a committee is also desirable for improving the city's Bicycle Friendly community designation.

The Bicycle Advisory Committee (BAC) should be composed of no more than 15 representatives, and no less than five. Representative bicycling stakeholder groups can include: road bicyclists, greenway cyclists, and mountain bicyclists. Because the needs of bicyclists and pedestrians are often very specific and very different, it is recommended that separate committees be established to focus on bicycle and pedestrian issues in the City. For the City of Greenville, a committee of nine members is recommended with the following breakdown of stakeholder representation:

- 1 - Greenville Spinners Cycling Club member
- 1 - Upstate SORBA member
- 1 - Safe Routes to School volunteer
- 1 - League Certified Instructor

- 1 - Bicycling industry representative
- 1 - Swamp Rabbit Trail user/advocate/liaison
- 2 - Commuter bicyclists with differing levels of cycling confidence/experience
- 1 - Other interest

The final seat of the committee, termed “other interest,” refers to a ninth committee member who may fill an additional niche in stakeholder interest, but who also maintains a strong interest in bicycling. Other stakeholder interests could include: public transit, environmental protection, persons with disabilities, senior citizens or low-income populations. Regardless of the additional stakeholder interest they provide, the final member should be a bicyclist and have knowledge of bicycling concerns and opportunities. The committee should reflect varying levels of bicycling experience and confidence, and, as with any public sector committee, should seek a level of member diversity that reflects the local population.

The charges of the BAC should include some or all of the following:

- Review and provide citizen input on capital project planning and design as it affects bicycling (e.g., corridor plans, street improvement projects, signing or signal projects, and parking facilities)
- Review and comment on changes to zoning, development code, comprehensive plans, and other long-term planning and policy documents
- Participate in the development, implementation, and evaluation of updates to the Bicycle Master Plan and bikeway facility standards
- Provide a formal liaison between local government, staff, and the public
- Develop and monitor goals and indices related to bicycling in the jurisdiction
- Promote bicycling, including bicycle safety and education

Because BAC members are volunteers, it is essential to have strong staffing supporting the committee in order for it to be successful. An agency staff person should be formally assigned to the BAC and should take charge of managing the application process, managing agendas and minutes, scheduling meetings, bringing agency issues to the BAC, and reporting back to the agency and governing body about the BAC’s recommendations and findings. As stated, the committee should be appointed by City Council and officially chartered as a commission of the council. The City of Beaver Creek, Ohio provides a useful example of a successful council-appointed BAC (<http://ci.beavercreek.oh.us/boards-commissions/bikeway-advisory/>).

### **Green Ribbon Advisory Committee**

The Green Ribbon Advisory Committee’s purpose is to: *advise City Council, the City Manager, and other city staff on the development of programs and initiatives*, including the development of a “Sustainability and Climate Action Plan,” which will distinguish Greenville as a leader in sustainability efforts. As such, they have formed a “Mobility” Ad-hoc committee to address transportation issues. This Plan recommends that the Green Committee support bicycling as a valid form of transportation and a viable way to help reduce the City’s carbon footprint.

### **Apply to Become a Silver-Level Bicycle Friendly Community**

As the Greenville bicycling community knows, the League of American Bicyclists has a well-respected Bicycle Friendly Communities (BFC) award program. Communities fill out a detailed application that covers bike-related facilities, plans, education efforts, promotion initiatives, and evaluation work that has been completed by the jurisdiction. The award is designed to recognize progress that has been made, as well as assist communities in identifying priority projects to improve bicycling conditions. Receiving the award is a media-worthy event, and may give elected officials the opportunity to receive media coverage for the positive work they are doing.

Greenville currently holds an award for Bronze BFC status. It is recommended that the City apply for Silver bicycle-friendly community status in 2013, upon making strides to implement the bicycle and trail improvements recommended in this Plan (see Appendix B).



### 5.2.5. Additional Resources

Program development can greatly benefit from examining similar efforts of other cities. Table 5-1 provides links to sample programs that are similar to programs recommended in the Plan.

Table 5-1. Additional program resources

Program Description	Link to sample program(s)
Share the Path event	<a href="http://www.portlandonline.com/shared/cfm/image.cfm?id=161457">http://www.portlandonline.com/shared/cfm/image.cfm?id=161457</a>
Bike kitchen	<a href="http://www.bikekitchen.org/">http://www.bikekitchen.org/</a> <a href="http://www.bicyclekitchen.com/">http://www.bicyclekitchen.com/</a>
Create-a-Commuter program	<a href="http://www.communitycyclingcenter.org/index.php/programs/create-a-commuter/">http://www.communitycyclingcenter.org/index.php/programs/create-a-commuter/</a>
Bike parking at events	<a href="http://www.sfbike.org/?valet">http://www.sfbike.org/?valet</a>
Earn a Bike programs (for low-income kids)	<a href="http://www.experimentalstation.org/blackstone">http://www.experimentalstation.org/blackstone</a> <a href="http://www.recycleabicycle.org/">http://www.recycleabicycle.org/</a>
Police Education Course	<a href="http://www.bicyclinginfo.org/enforcement/training.cfm">http://www.bicyclinginfo.org/enforcement/training.cfm</a> <a href="http://www.massbike.org/police/">http://www.massbike.org/police/</a>
Walking School Buses (stand-alone program or part of SR2S program)	<a href="http://www.walkingschoolbus.org/">http://www.walkingschoolbus.org/</a>
Bike Buddy program	<a href="http://bicycling.511.org/buddy.htm">http://bicycling.511.org/buddy.htm</a>
Family day/family biking classes	<a href="http://www.sfbike.org/?family_day">http://www.sfbike.org/?family_day</a> <a href="http://www.sfbike.org/?freedom">http://www.sfbike.org/?freedom</a>
Women on Bikes program	<a href="http://www.portlandonline.com/transportation/index.cfm?a=iibhg&amp;c=djdaa">http://www.portlandonline.com/transportation/index.cfm?a=iibhg&amp;c=djdaa</a>
I Share the Road campaign	<a href="http://www.isharetheroad.com/">http://www.isharetheroad.com/</a>
Seniors on Bikes program (Safe Routes to Senior Centers, Older Adult Three-Wheeled Bicycle Program)	<a href="http://www.portlandonline.com/transportation/index.cfm?c=eafeg">http://www.portlandonline.com/transportation/index.cfm?c=eafeg</a> <a href="http://www.portlandonline.com/transportation/index.cfm?a=bffbgh&amp;c=dheab">http://www.portlandonline.com/transportation/index.cfm?a=bffbgh&amp;c=dheab</a>
Sunday parkways (Ciclovias)	<a href="http://www.healthystreets.org/pages/sunday_parkways.htm">http://www.healthystreets.org/pages/sunday_parkways.htm</a>
Bicycling Ambassadors	<a href="http://www.bicyclingambassadors.org/">http://www.bicyclingambassadors.org/</a>
Bike Commute Challenge	<a href="http://www.bikecommutechallenge.com/">http://www.bikecommutechallenge.com/</a>
Bike Light Campaign	<a href="http://www.portlandonline.com/transportation/index.cfm?&amp;c=deibb&amp;a=bebfjh">http://www.portlandonline.com/transportation/index.cfm?&amp;c=deibb&amp;a=bebfjh</a>

## 5.3. Policy Recommendations

Policy recommendations for Greenville are informed by a review of existing plans and relevant ordinances (Appendix A), a needs analysis (Chapter 4), an institutional review, and community interests revealed through the public process. The policies of the City of Greenville that support bicycling for transportation and recreation have progressed well beyond many other small cities. The City of Greenville has adopted a strong Complete Streets Resolution, amended engineering design guidelines to properly incorporate bicycling principles, and established a bicycle parking ordinance. As is recommended, Greenville does not have a local mandatory helmet law (such ordinances have been shown to decrease bicycle usage).

In order to maintain the bicycle-friendliness of the community as it grows in size and to achieve a higher-level designation as a Bicycle Friendly Community, Greenville will need to continue to codify its support for accommodating bicyclists on roadways, on trails, and at end-of-trip facilities.

Examples of existing city policies related to bicyclists (cited verbatim, as recorded in *Public Policies for Pedestrian and Bicyclist Safety and Mobility*)<sup>7</sup>:

- **Charlotte, North Carolina** (Zoning Ordinance - Off-street parking and loading): The City will provide bicycle parking in all City garages and encourage bicycle parking in private garages.
- **Portland, Oregon** (Portland Bicycle Plan for 2030): Encourage the provision of showers and changing facilities for commuting cyclists, including the development of such facilities in commercial buildings and at central locations.
- **Minneapolis, Minnesota** (The Metropolitan Council 2030 Transportation Policy Plan): To encourage a strong intermodal link, the policy for all transit modes, including light-rail transit and commuter rail, will be to allow bicycles on board.
- **Seattle, Washington** (Seattle Comprehensive Plan 2004-2024): Develop, apply, and report on walking and bicycling transportation performance measures in the Transportation Strategic Plan to evaluate the functioning of the non-motorized transportation system; to ensure consistency with current industry standards; to identify strengths, deficiencies, and potential improvements; and to support development of new and innovative facilities and programs.
- **Charlotte, North Carolina** (City of Charlotte Bicycle Plan): The City will encourage Mecklenburg County Schools to implement a bicycle education curriculum in local schools.
- **Madison, Wisconsin** (Platinum Biking City Plan 2008): Create a formal bicycle program, with an identified program coordinator, within the Madison Police Department to standardize police bicycle operations and to increase the degree to which bicycles are used as a mode of transport by police personnel for general enforcement as well as for bicycle/pedestrian enforcement.

### 5.3.1. Funding Policy

Public funding for bicycle facilities is a crucial component of local policy. The City of Greenville currently provides annual funding for bicycle projects, though at a limited level. By establishing a funding policy, the City can ensure that consistent funding is available for improving Greenville's bicycle-friendliness. Additionally, such a policy can help to ensure equitable distribution of the funds. In the Visions and Goals of the Bicycle Master Plan, Greenville stated that "equity" in bicycle planning is a central principle.

---

<sup>7</sup> U.S. Department of Transportation. (August 2010). *Public policies for pedestrian and bicyclist safety and mobility*.

**Sample policy:**

Nashville, Tennessee (population over 600,000) recently established a model program for determining local funding allotments. By virtue of a policy established by the metropolitan planning organization (MPO) Executive Board, 15 percent of Surface Transportation Program (STP) funds are set aside annually for active transportation projects. For the current funding cycle (2011 to 2015), that amounts to roughly \$2.5 million that will be used exclusively for bicycle and pedestrian infrastructure and education costs. That figure does not reflect additional funds allotted for bicycle and pedestrian facilities that are incorporated into other, larger projects (such as a road widening project that may include a sidewalk and bike lane).<sup>8</sup>

### **5.3.2. Bicycle Parking Policy**

The City of Greenville's Bicycle Parking ordinance currently requires a minimum of two bicycle parking spaces for all new developments within the City. Additionally, it requires that the bicycle parking spaces provided at the site must equal a minimum of ten percent of the first 100 off-street parking spaces, plus one percent of those spaces exceeding 100. A reduction in automobile parking requirements is available based on additions of bicycle parking spaces. Basic standards for the type and location of bicycle racks is included in the ordinance, as well.

### **5.3.3. Long-Term Bicycle Parking**

Bicycle storage can range from a simple and convenient bicycle rack to storage in a bicycle locker or cage that protects against weather, vandalism, and theft. The latter is generally referred to as long-term bicycle parking, while the former is used for short-term bicycle parking. Greenville's current bicycle parking ordinance does not address long-term bicycle parking needs. Through the Bicycle Master Plan public process, citizens have expressed an interest in using bicycle lockers for long-term bicycle parking and have also suggested specific locations where long-term bicycle parking should be implemented.

The following outlines recommendations related to long-term bicycle parking:

Define the two types of parking. Sample language:<sup>9</sup>

- (a) Long-term Bicycle Parking. Each long-term bicycle parking space shall consist of a locker or locked enclosure, such as a secure room or controlled access area, providing protection for each bicycle from theft, vandalism, and weather. Long-term bicycle parking is meant to accommodate employees, students, residents, commuters, and others expected to park more than two hours.
- (b) Short-term Bicycle Parking. Short-term bicycle parking shall consist of a bicycle rack or racks and is meant to accommodate visitors, customers, messengers, and others expected to park not more than two hours.

---

<sup>8</sup> Nashville Area Metropolitan Planning Organization. (August 2010). *2035 Regional Transportation Plan: Urban Surface Transportation Program Investment Strategy*.

<sup>9</sup> Sample language borrowed from San Mateo, California recommended policies drafted by Alta Planning + Design.

Alternatively, bicycle parking facilities can be classified. Sample language:<sup>10</sup>

- (a) **Class I Facilities.** Intended for long-term parking; protects against theft of entire bicycle and of its components and accessories. The facility must also protect the bicycle from inclement weather, including wind-driven rain. Three design alternatives for Class I facilities are as follows:
- a. *Bicycle Locker.* A fully enclosed space accessible only by the owner or operator of the bicycle. Bicycle lockers may be pre-manufactured or designed for individual sites. All bicycle lockers must be fitted with key locking mechanisms. In multiple-family developments, the Class I bicycle parking and required storage area for each dwelling unit may be combined into one locked multi-use storage facility provided that the total space requirement shall be the sum of the requirements for each use computed separately. The preferred Class I facility is a bicycle locker. Restricted access facilities and enclosed cages may be considered as alternatives to bicycle lockers as indicated below. Class I facilities other than lockers, restricted access rooms, or enclosed cages, but providing the same level of security, may be approved by senior planning staff.
  - b. *Restricted Access.* Class II bicycle parking facilities located within a locked room or locked enclosure accessible only to the owners or operators of the bicycles parked within. The maximum capacity of each restricted room or enclosure shall be ten (10) bicycles. An additional locked room or enclosure is required for each maximum increment of ten additional bicycles. The doors of such restricted access enclosures must be fitted with key locking mechanisms. In multiple-family residential developments, a common locked garage area with Class II bicycle parking facilities shall be deemed restricted access provided the garage is accessible only to the residents of the units for whom the garage is provided.
  - c. *Enclosed Cages.* A fully enclosed chain link enclosure for individual bicycles, where contents are visible from the outside, and which can be locked by a user-provided lock. The locking mechanism must accept a 3/8" diameter padlock. This type of facility is only to be used for retail and service uses and multiple family developments.
- (b) **Class II Facilities.** Intended for short term parking. A stationary object to which the user can lock the frame and both wheels with only a lock furnished by the user. The facility shall be designed so that the lock is protected from physical assault. A Class II rack must accept padlocks and high security U-shaped locks.
- (c) **Class III Facilities.** Intended for short term parking. A stationary object to which the user can lock the frame and both wheels with a user-provided cable or chain (6 foot) and lock. All Class III facilities must be located at street floor level.

---

<sup>10</sup> Sample language borrowed from Oakland, California recommended policies drafted by Alta Planning + Design.

Establish specifications for long-term parking. Sample language:

All required long-term bicycle parking spaces, with the exception of bicycle lockers, shall permit the locking of the bicycle frame and one wheel with a U-type lock and support the bicycle in a stable position without damage to wheels, frame, or components.

Bicycle parking facilities shall be securely anchored so they cannot be easily removed and shall be of sufficient strength and design to resist vandalism and theft.

Long-term bicycle parking shall be covered and shall be located on site or within two hundred (200) feet of the main building entrance. The main building entrance excludes garage entrances, trash room entrances, and other building entrances that are not publicly accessible.

#### **5.3.4. Large Event Bicycle Parking**

Greenville's Bicycle Friendly Community program, Bikeville, provides a bicycle valet service at many downtown events and festivals. Community feedback supports this practice and recognizes bike valet as a successful encouragement program. The City of Greenville should consider an amendment to its existing special event permitting process that incorporates special event bicycle parking as a requirement for permit approval.

The following provides sample language for a special events bicycle parking policy:<sup>11</sup>

Define special event bicycle parking.

"Attended bicycle parking" means a service provided by the event sponsor or qualified bicycle parking service provider where at least one attendant is present throughout the event to receive, return and guard bicycles, and where a safe and sufficiently large area has been set aside for event attendees to leave their bicycles.

Establish conditional special event permitting.

Requiring the event promoter to provide attended bike parking service for events that expect 5,000 or more attendees, and for smaller events at the discretion of the Chief of Police. The promoter must advertise the service to potential attendees in all outreach and advertising materials and media, and place the bike parking area in an accessible location.

---

<sup>11</sup> Sample language borrowed from Palo Alto, California recommended policies drafted by Alta Planning + Design.



## 6 Introduction – Design Guidelines

This chapter discusses recommended design guidelines for Greenville's bicycle system. Design recommendations are proposed for the bicycle facility types proposed in this Plan as well as others that may be contemplated in the future. Providing bicycle facilities on streets designed primarily for motor vehicle traffic can be challenging to implement, depending on the physical layout of the street. In some cases, bicycle facilities may be desirable on streets with higher vehicle speed and volumes. Placing bicycle facilities on these streets allows for a predictable environment for motorists and bicyclists by clarifying the appropriate position for each user on a roadway. Though opportunities to add bicycle facilities through roadway widening may exist in some locations, most major streets pose physical and other constraints requiring street retrofit measures within existing curb-to-curb widths. As a result, it may be necessary to reallocate existing street width through striping modifications to accommodate dedicated bicycle facilities.

Current AASHTO literature, research, and precedent examples support the notion of reducing 12' travel lanes to 10' lanes. The 2004 AASHTO Green Book states that travel lanes between 10 and 12 feet are adequate for urban collectors and urban arterials.<sup>1</sup> At the 2007 TRB Annual Meeting, a research paper using advanced statistical analysis supported the AASHTO Green Book in providing flexibility for use of lane widths narrower than 12 feet on urban and suburban arterials. "The research found no general indication that the use of lanes narrower than 12 feet on urban and suburban arterials increases crash frequencies. This finding suggests that geometric design policies should provide substantial flexibility for use of lane widths narrower than 12 feet." The research paper goes on to say "There are situations in which use of narrower lanes may provide benefits in traffic operations, pedestrian safety, and/or reduced interference with surrounding development, and may provide space for geometric features that enhance safety such as medians or turn lanes. The analysis results indicate narrow lanes can generally be used to obtain these benefits without compromising safety." and "Use of narrower lanes in appropriate locations can provide other benefits to users and the surrounding community including shorter pedestrian crossing distances and space for additional through lanes, auxiliary and turning lanes, bicycle lanes, buffer areas between travel lanes and sidewalks, and placement of roadside hardware."<sup>2</sup>

When the City of Greenville pursues lane narrowing as a means of implementing bike lanes, specific corridor analysis will be necessary. Changing the roadway design may also require a reduction in speed limit or other traffic calming measures. For roadways with higher speed limits and traffic volumes, wider bicycle lanes may be warranted. Further analysis of bicycle lane restriping projects is warranted to determine appropriateness of lane narrowing, bicycle lane widths, and speed limits that impact both motorists and bicyclists.

---

<sup>1</sup> American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, Washington, DC 2004.

<sup>2</sup> Relationship of Lane Width to Safety for Urban and Suburban Arterials, Ingrid B. Potts, Harwood, D., Richard, K, TRB 2007 Annual Meeting

This chapter also discusses other important issues that will be considered as the City improves existing facilities and expands the bicycle network. This detailed summary of design standards includes bicycle facility design standards and policy recommendations from a variety of sources based on local standards and innovations, best practices and research from around the United States, including:

- City of Greenville Design And Specifications Manual  
[www.greenvillesc.gov/publicworks/EngineeringDSM.aspx](http://www.greenvillesc.gov/publicworks/EngineeringDSM.aspx)
- City of Greenville Trails and Greenways Master Plan design guidelines  
[www.greenvillesc.gov/ParksRec/Trails/forms/GreenwaysMasterPlan/Chapter4.pdf](http://www.greenvillesc.gov/ParksRec/Trails/forms/GreenwaysMasterPlan/Chapter4.pdf)
- South Carolina Department of Transportation, Engineering Directive Memorandum 22  
[www.pccsc.net/pdfs/Engineering%20Directive%20Memorandum%2022.pdf](http://www.pccsc.net/pdfs/Engineering%20Directive%20Memorandum%2022.pdf)
- 1999 AASHTO Guide for the Development of Bicycle Facilities (the basis for SCDOT design standards; the AASHTO guide is currently being updated and is expected to be released in 2011)  
[www.sccrtc.org/bikes/AASHTO\\_1999\\_BikeBook.pdf](http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf)
- National Association of City Transportation Officials (NACTO) Cities for Cycling Urban Bikeway Design Guide  
[www.nacto.org/citiesforcycling.html](http://www.nacto.org/citiesforcycling.html)
- National Park Service Rivers and Trails Program  
[www.nps.gov/ncrc/programs/rtca/](http://www.nps.gov/ncrc/programs/rtca/)
- U.S. Forest Service Trail Development Guide  
[www.fs.fed.us/database/acad/dev/trails/TRGenral.pdf](http://www.fs.fed.us/database/acad/dev/trails/TRGenral.pdf)
- Manual on Uniform Traffic Control Devices (2009)  
[mutcd.fhwa.dot.gov/](http://mutcd.fhwa.dot.gov/)
- FHWA/FRA “Best Practices” for Planning and Designing Rails-with-Trails  
[www.altapanning.com/rails\\_with\\_trails\\_+lessons+learned\\_+federal+rwt+study.aspx](http://www.altapanning.com/rails_with_trails_+lessons+learned_+federal+rwt+study.aspx)
- American with Disabilities Act – Trail and Sidewalk Publications  
[www.access-board.gov/ada-aba/final.cfm](http://www.access-board.gov/ada-aba/final.cfm)
- Complete Streets and Context Sensitive Solutions (CSS)  
[contextsensitivesolutions.org](http://contextsensitivesolutions.org)

This plan also recommends that the City continually reference and supplement the design guidance in this chapter with the latest bicycle facility guidelines and best practices, including the revised AASHTO guide (when published) and the NACTO *Cities Urban Bikeway Design Guide*. The NACTO guide represents the most up-to-date expertise in the field of bicycle facility design as implemented by leading agencies and municipalities throughout the United States. It is recommended that the NACTO guide serve as a prioritized reference for developing future bicycle facilities in Greenville.



## 6.1 Designing for Different Types of Cyclists

The skill level of the bicyclist also provides a dramatic variance on expected speeds and expected behavior. There are several systems of classification currently in use within the bicycle planning and engineering professions. These classifications can be helpful in understanding the characteristics and infrastructure preferences of different bicyclists. However, it should be noted that these classifications may change in type or proportion over time as infrastructure and culture evolve. Often times an instructional course can rapidly change a less confident bicyclist to one that can comfortably and safely share the roadway with vehicular traffic. Bicycle infrastructure should be planned and designed to accommodate as many user types as possible with separate or parallel facilities considered to provide a comfortable experience for the greatest number of bicyclists.

The following user types come from an excerpt from the 1999 AASHTO *Guide for the Development of Bicycle Facilities*:

*“Although their physical dimensions may be relatively consistent, the skills, confidence and preferences of bicyclists vary dramatically. Some riders are confident riding anywhere they are legally allowed to operate and can negotiate busy and high speed roads that have few, if any, special accommodations for bicyclists. Most adult riders are less confident and prefer to use roadways with a more comfortable amount of operating space, perhaps with designated space for bicyclists, or shared-use paths that are away from motor vehicle traffic. Children may be confident riders and have excellent bike handling skills, but have yet to develop the traffic sense and experience of an everyday adult rider. All categories of rider require smooth riding surfaces with bicycle-compatible highway appurtenances, such as bicycle-safe drainage inlet grates.*

*A 1994 report by the Federal Highway Administration used the following general categories of bicycle user types (A, B and C) to assist highway designers in determining the impact of different facility types and roadway conditions on bicyclists:*

*Advanced or experienced riders are generally using their bicycles as they would a motor vehicle. They are riding for convenience and speed and want direct access to destinations with a minimum of detour or delay. They are typically comfortable riding with motor vehicle traffic; however, they need sufficient operating space on the traveled way or shoulder to eliminate the need for either themselves or a passing motor vehicle to shift position.*

*Basic or less confident adult riders may also be using their bicycles for transportation purposes, e.g., to get to the store or to visit friends, but prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Thus, basic riders are comfortable riding on neighborhood streets and shared-use paths and prefer designated facilities such as bike lanes or wide shoulder lanes on busier streets.*

*Children, riding on their own or with their parents, may not travel as fast as their adult counterparts but still require access to key destinations in their community, such as schools, convenience stores and recreational facilities. Residential streets with low motor vehicle speeds, linked with shared-use paths and busier streets with well-defined pavement markings between bicycles and motor vehicles can accommodate children without encouraging them to ride in the travel lane of major arterials.”*

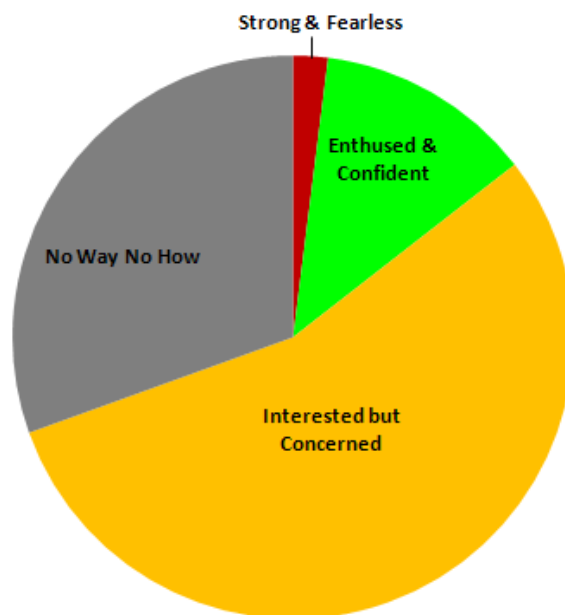
The AASHTO classifications above have been the standard for at least 15 years and have been found to be helpful when assessing existing bicyclists. However, these classifications have not been found to accurately describe all existing types of bicyclists, nor account for the population as a whole, including potential bicyclists who are interested in riding but may not feel existing facilities provide enough safety. Supported by data collected nationally after 2006, alternative categories have been developed to address the ‘attitudes’ of Americans towards bicycling.

Less than 2 percent of Americans comprise a group of bicyclists who are ‘**Strong and Fearless**’. These bicyclists typically ride anywhere on any roadway regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections – even if shared with vehicles – over separate bicycle facilities such as bicycle paths. Another 10 to 13 percent fall under the category of ‘**Intermediate**’ bicyclists who are confident and mostly comfortable riding on all types of bicycle facilities but will usually prefer low traffic streets or multi-use pathways when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists including commuters, recreationalists, racers, and utilitarian bicyclists.

The remainder of the American population does not currently ride a bicycle regularly. 50-60 percent of the population can be categorized as ‘**Interested but Concerned**’ and represents bicyclists who typically only ride a bicycle on low traffic streets or bicycle paths under favorable conditions and weather. These infrequent or potential bicyclists perceive significant barriers towards increased use of bicycling with regards to traffic and safety.

These bicyclists may become more regular riders with encouragement, education and experience. The final 25-30 percent of Americans are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually give bicycling a second look and may progress to one of the user types above. A significant portion of these people will never ride a bicycle under any circumstances.

The purpose of this chapter is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more sensitive to poor facility design, construction and maintenance than motor vehicle drivers because they are physically exposed to the elements and lack the protection provided by the vehicle’s structure and numerous other safety features. By understanding the unique characteristics and needs of bicyclists, the facility designer can provide the highest quality facilities and minimize risk to the bicyclists using them.

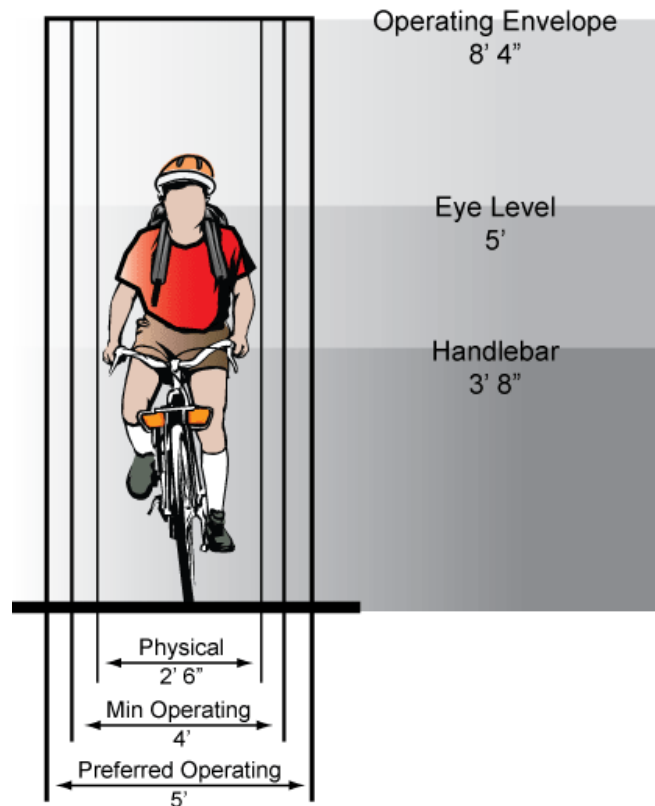


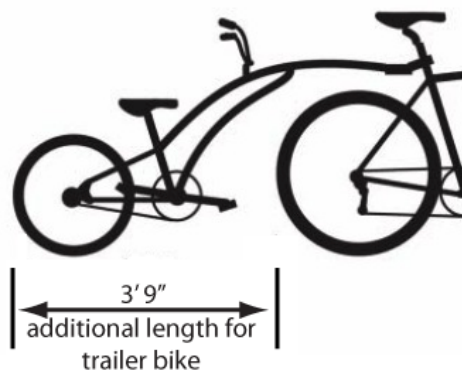
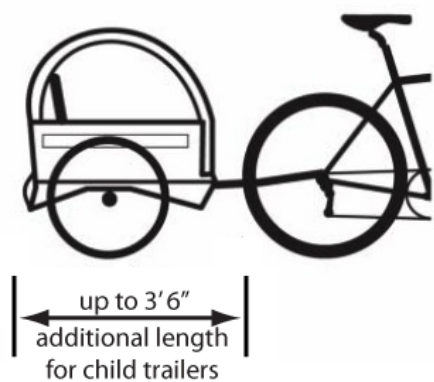
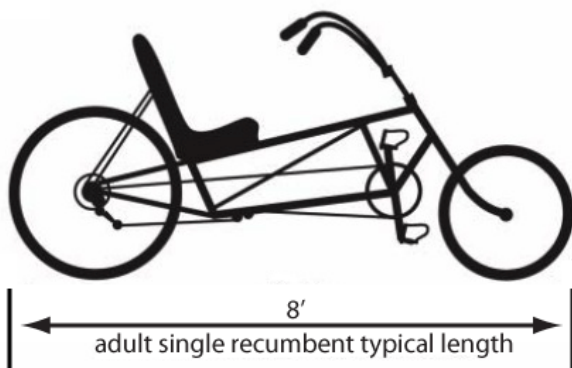
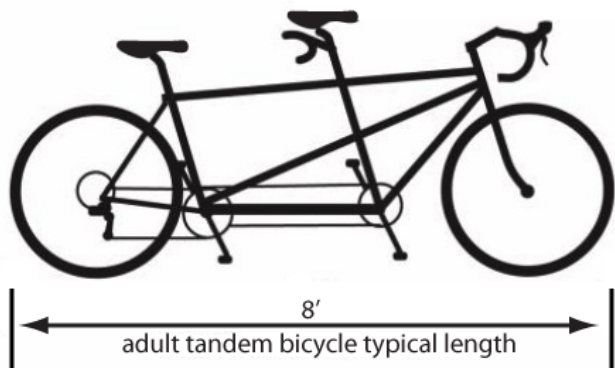
## 6.2 The Bicycle as a Design Consideration

Similar to motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. This variation can take the form of the variety in types of vehicle (such as a conventional bicycle, a recumbent bicycle, or a tricycle), or the behavioral characteristics and comfort level of the bicyclist riding the vehicle. Any bikeway undergoing design should consider what types of bicycles can be expected on the facility and design with that set of critical dimensions in mind.

The operating space and physical dimensions of a typical adult bicyclist are shown below. Clear space is required for the bicyclist to be able to operate within a facility; this is why the minimum operating width is greater than the physical dimensions of the bicyclist. Although four feet is the minimum acceptable operating width, five feet or more is preferred. Other pertinent dimensions are included in the graphic above.

Outside of the design dimensions of a typical bicycle, there are many commonly used pedal driven cycles and accessories that should be considered when planning and designing bicycle facilities. The most common types including tandem bicycles, recumbent bicycles, and trailer accessories are depicted in the graphic on the following page.







The table below summarizes the typical dimensions for most commonly encountered bicycle designs:

Bicycle as Design Vehicle – Typical Dimensions		
Bicycle Type	Feature	Typical Dimensions
Upright Adult Bicyclist	Physical width	2 ft 6 in
	Operating width (Minimum)	4 ft
	Operating width (Preferred)	5 ft
	Physical length	5 ft 10 in
	Physical height of handlebars	3 ft 8 in
	Operating height	8 ft 4 in
	Eye height	5 ft
	Vertical clearance to obstructions (tunnel height, lighting, etc).	10 ft
	Approximate center of gravity	2 ft 9 in to 3 ft 4 in
Recumbent Bicyclist	Physical length	8 ft
	Eye height	3 ft 10 in
Tandem Bicyclist	Physical length	8 ft
Bicyclist with child trailer	Physical length	10 ft
	Physical width	2 ft 6 in

The speed that various types of bicyclists can be expected to maintain under various conditions can also have influence over the design of facilities such as shared use paths. The following table provides typical bicyclist speeds for a variety of conditions.

Design Speed Expectations		
Bicycle Type	Feature	Typical Speed
Upright Adult Bicyclist	Paved level surfacing	15 mph
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5-12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

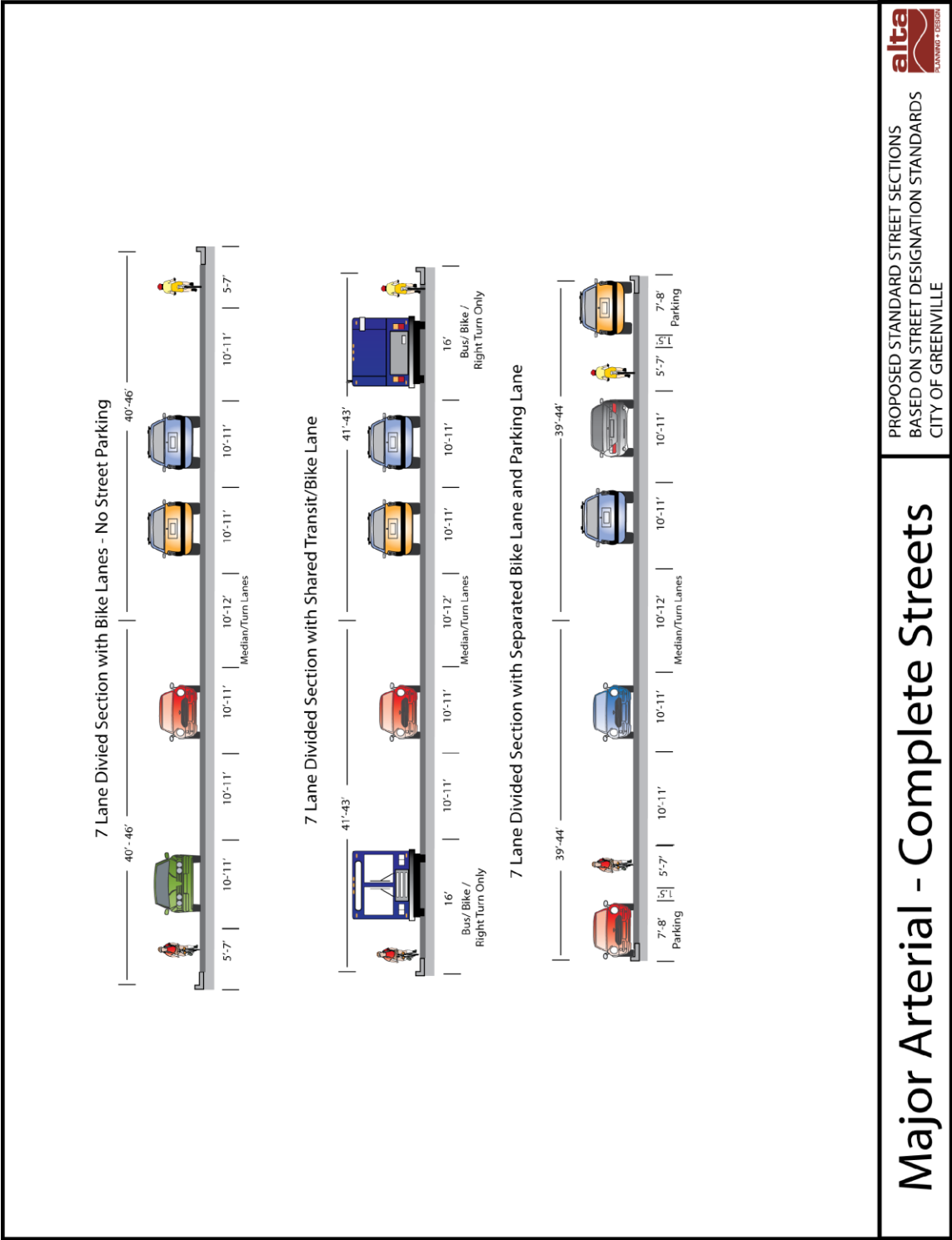
### 6.3 Routine Accommodation of Bicyclists (Complete Streets)

Bicyclists have legal access to all city streets and state roadways (with the exception of limited access freeways). While this Bicycle Plan identifies a specific subset of streets to be included in the Greenville bikeway network, many bicyclists will need to use streets outside of the network in order to reach their destinations. Therefore, it is important that all roadways be designed to accommodate bicyclists.

The following figures provide a series of potential roadway cross sections that include design provisions for bicyclists. These cross sections are not intended to be adopted standards. They are included in order to illustrate possible ways to reconfigure roadways for enhanced bicycle access. In many cases, it may be necessary to use the “absolute minimum” travel and turn lane widths in order to accommodate bicycle lanes. Whether or not “absolute minimum” lane widths are acceptable should be determined on a case-by-case basis (in consultation with SCDOT, where applicable) through sound engineering judgment including an analysis of various site-specific factors including length of roadway segment, traffic speeds, parking turnover, and bus and truck volumes.

THE CROSS SECTIONS ILLUSTRATED IN THE FOLLOWING PAGES ARE NOT INTENDED AS STANDARDS. THEY MERELY ILLUSTRATE SOME EXAMPLES OF HOW BICYCLE TRAFFIC CAN BE ACCOMMODATED WITHIN EXISTING, STANDARD-WIDTH CITY RIGHTS-OF-WAY.

Figure 6.1. Major Arterial - Complete Streets



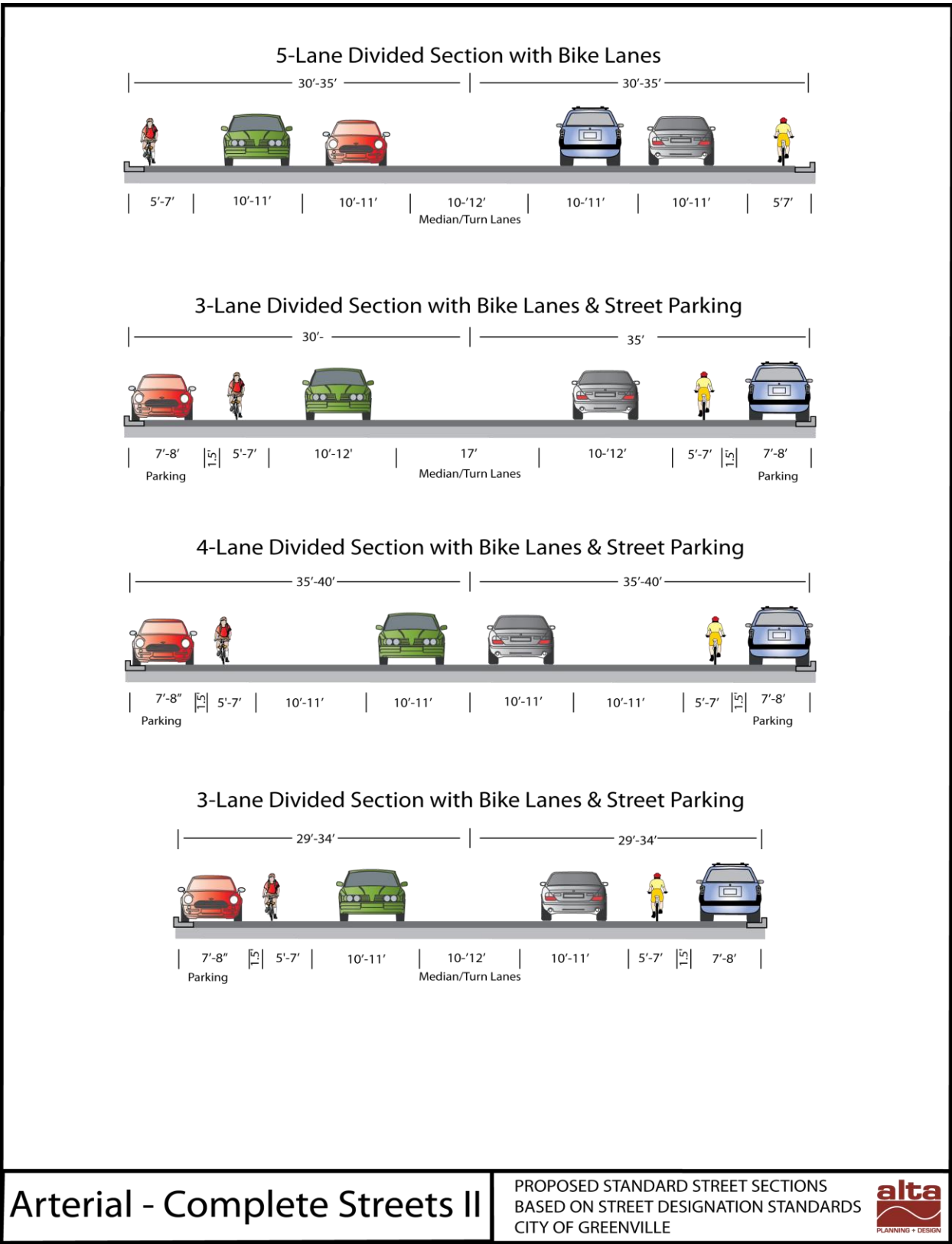
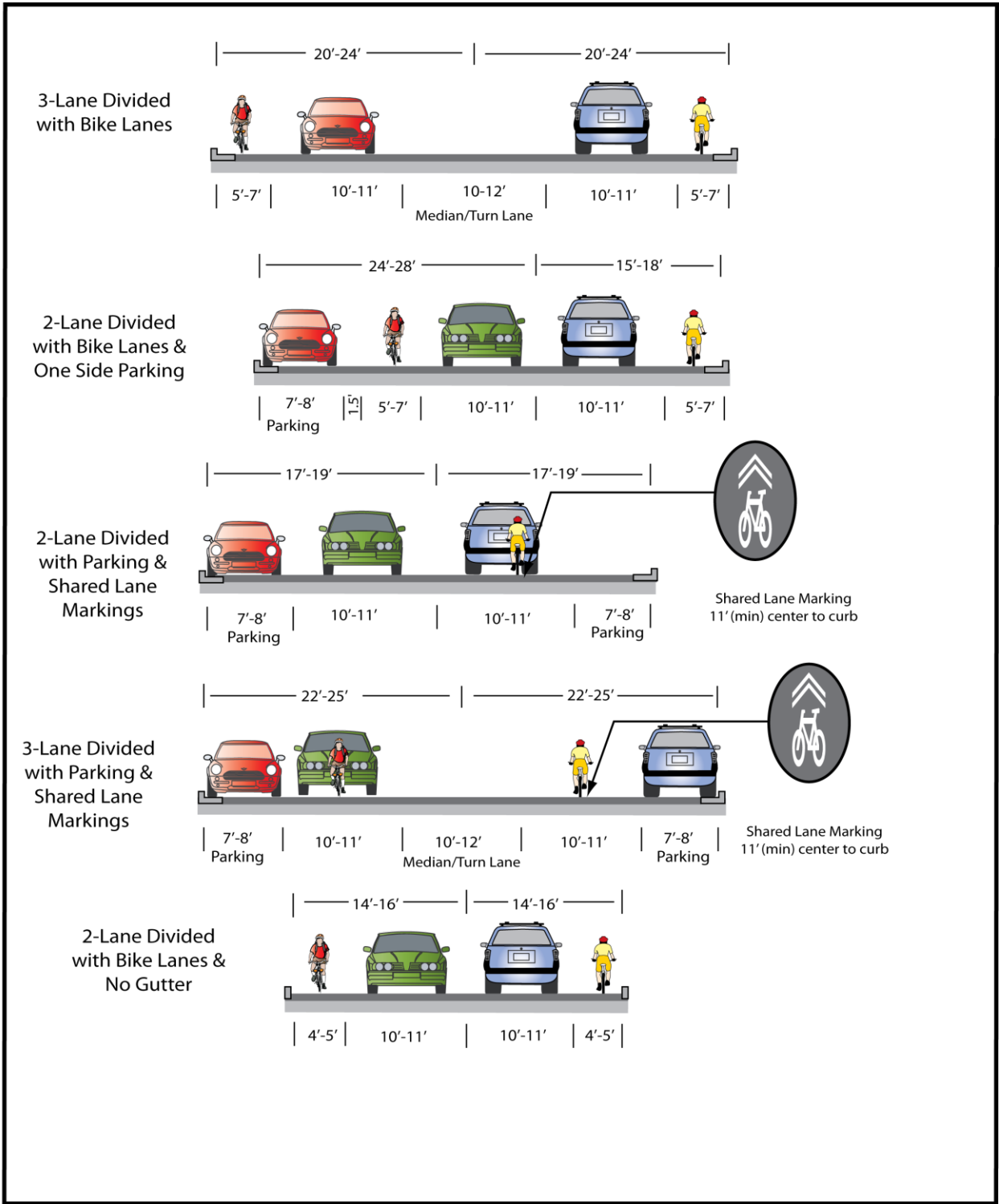


Figure 6.2. Arterial -- Complete Streets II

Figure 6.3. Collector Streets - Complete Streets



<h1>Collector Streets</h1>	<p>PROPOSED STANDARD STREET SECTIONS BASED ON STREET DESIGNATION STANDARDS CITY OF GREENVILLE</p> 
----------------------------	---

# On-Street Facility Design Guidelines

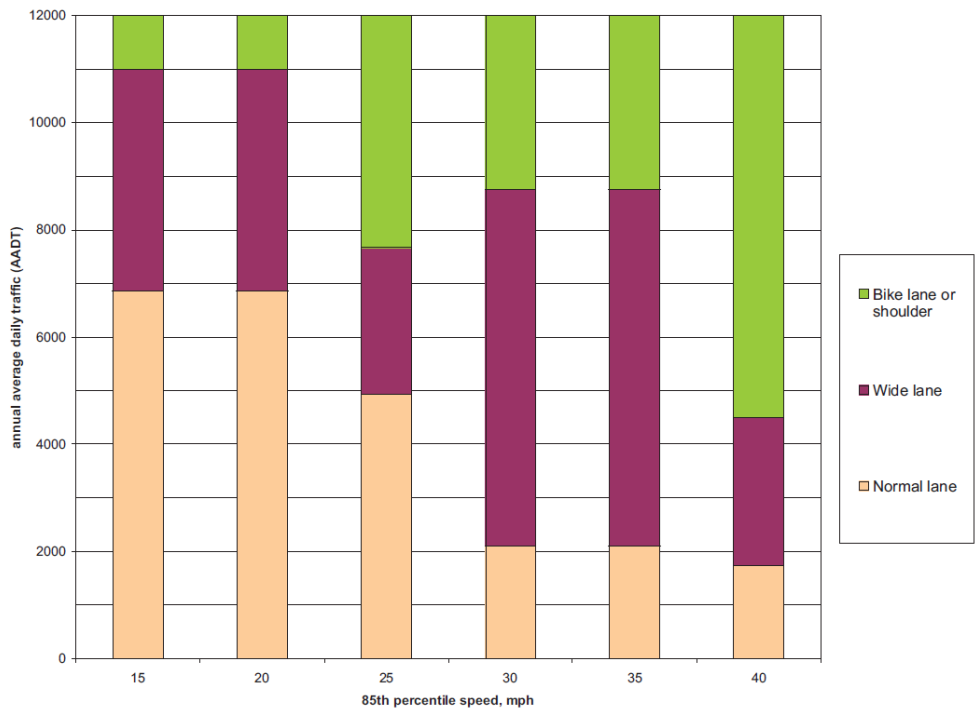
There are a range of different types of bicycle facilities that can be applied in various contexts, which provide varying levels of protection or separation from automobile traffic. This section summarizes best practice on-street bicycle facility design from North America and elsewhere.

## Facility Selection

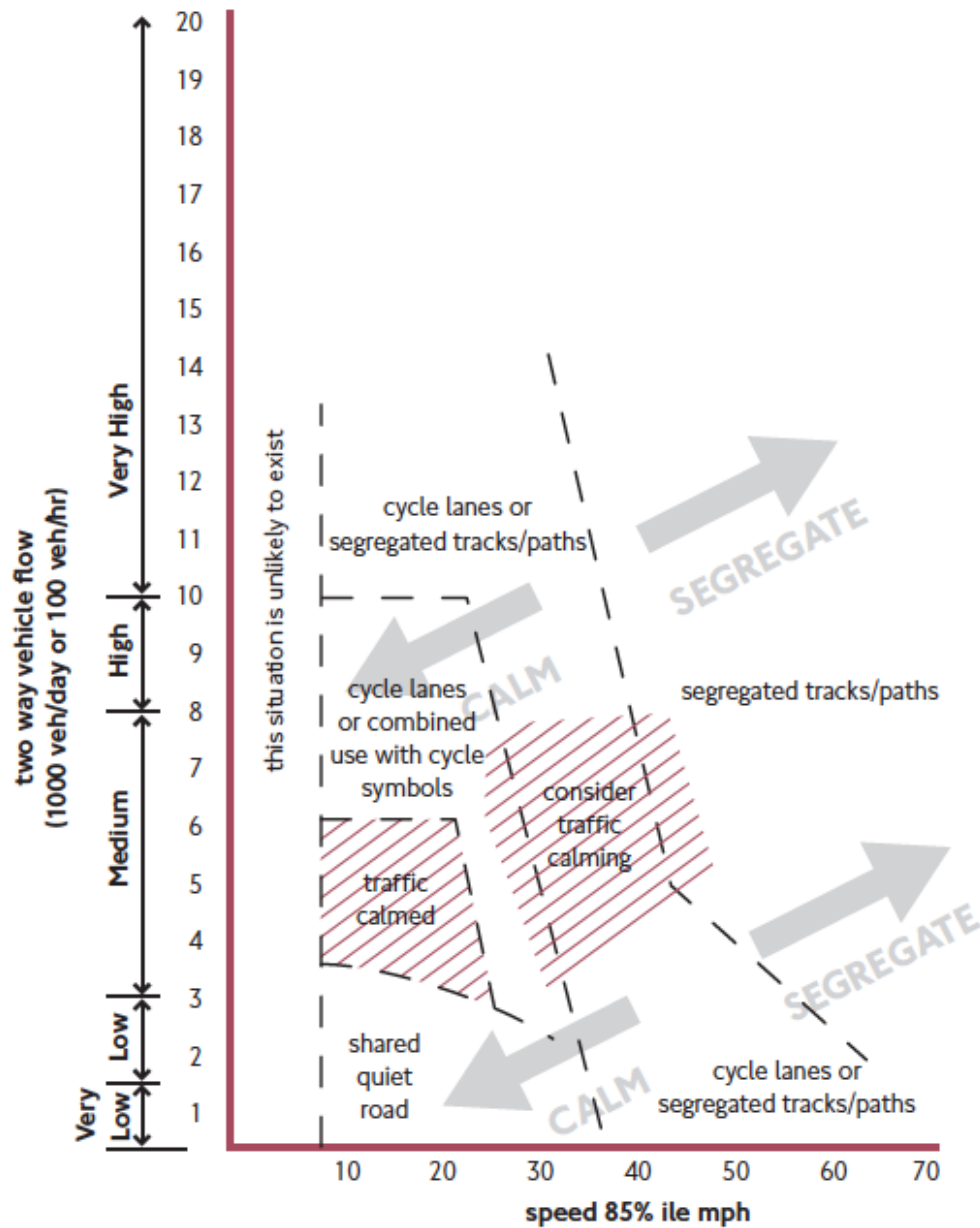
There are a wide variety of techniques for selecting the type of facility for a given context. Roadway characteristics that are often used include: traffic volume, traffic speed, percent truck traffic, travel lane widths, presence of parking, and land use context.

There are no ‘hard and fast’ rules for determining the most appropriate type of facility for a particular location; engineering judgment and planning skills are critical elements of this decision. A 2002 study combined bikeway dimension standards for ten different communities in North America. The goal of the study was to survey the varying requirements available and provide a best practices approach for providing bicycle facilities. The study included a comparison with European standards, and found that “North Americans rely much more on wide vehicular lanes for bicycle accommodation than their counterparts overseas.” The table below shows the results of this analysis, which recommends use of bike lanes or shoulders, wide lanes, or normal lanes. Finally, the study shows the ‘worldwide speed-volume chart,’ which synthesizes findings from Europe and North America. The final chart is useful for the inclusion of separated lanes, or cycle tracks, and generally has a lower threshold for increasing separation than the North America selection (Figure 4).

Figure 4: North American Bicycle Facility Selection Chart  
(King,. Michael. (2002). Bicycle Facility Selection: A Comparison of Approaches. Pedestrian and Bicycle Information Center and Highway Safety Research Center, University of North Carolina – Chapel Hill.)





**Notes:**

1. Each route will need to be judged in the light of its specific situation
2. Cycle lanes or tracks will not normally be required in traffic calmed areas
3. Congested traffic conditions may benefit from cycle lanes or tracks
4. Designs should tend to either calm traffic or segregate cyclists

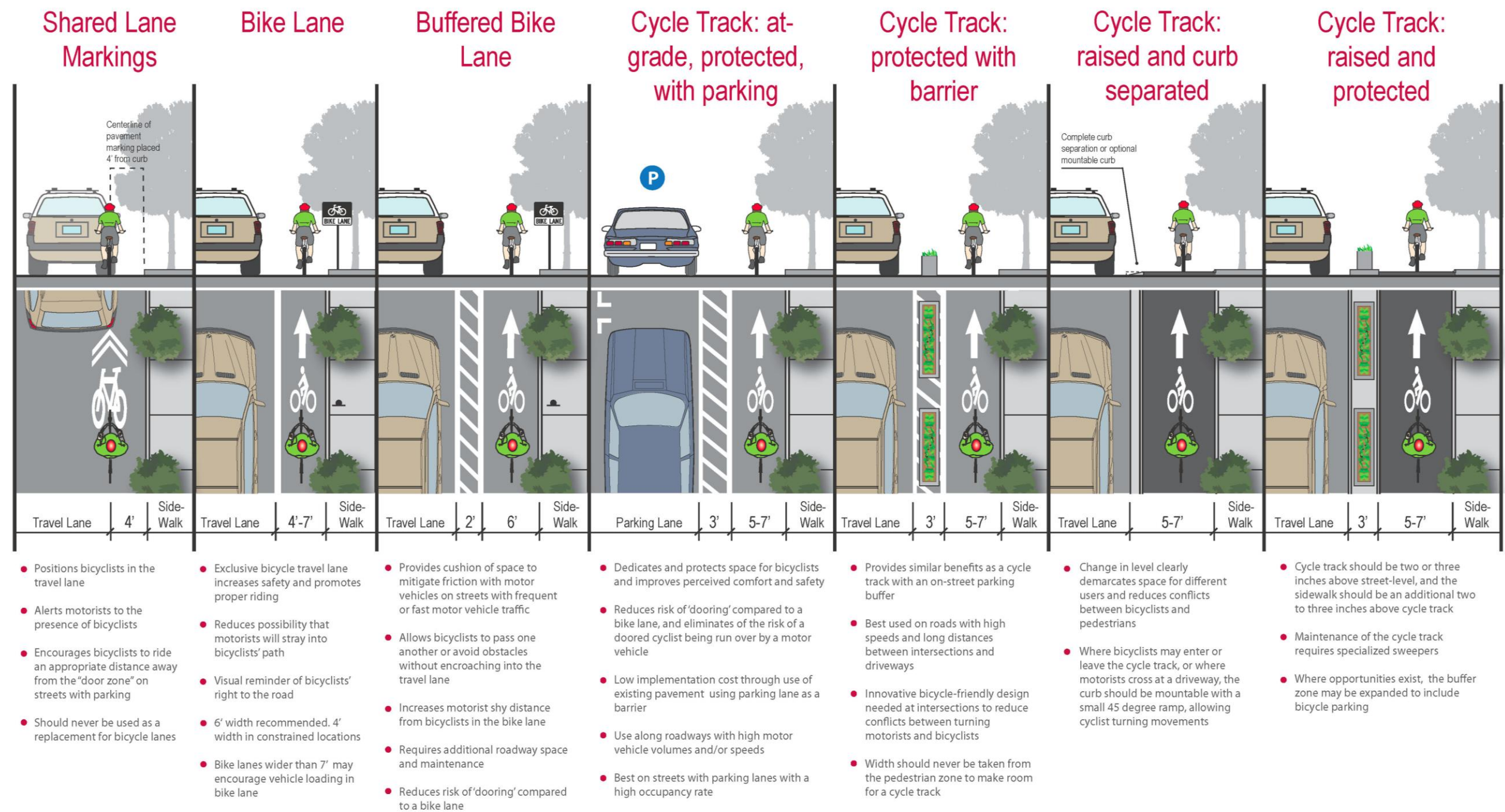
Bicycle facility solutions are based on motor traffic volume and speed. Figure 5 outlines the relationship between street conditions and the appropriate bicycle facility for that street. As traffic speeds increase, the bicycle facility should become more segregated to provide greater relief and separation from differing uses. As road volumes and speeds decrease, bicyclists can more safely operate within the same rights of way as motorists.

On-Street Bikeway Continuum

**alta** | On-Street Marked Bikeway Continuum  
PLANNING + DESIGN

least protected

most protected



## Shoulder Bikeways

### Design Summary

Recommended widths (measured from painted edgeline to edge of pavement):

6' on roadways with posted speed limits of 40 mph or greater.

5' on roadways with posted speed limits of 35 mph or below.

4' may be considered on low-speed, low-volume streets where right-of-way constraints exist.

Can include pavement markings and 'Share the Road' signage.

See bike lane section (p. 6-17) for additional guidance for determining if bike lanes are required.

### Discussion

On streets without adequate space for bike lanes, or on rural roads with a large shoulder, shoulder bikeways can accommodate bicycle travel. Shoulder bikeways are generally used by commuter and long-distance recreational riders, rather than families with children or more inexperienced riders.

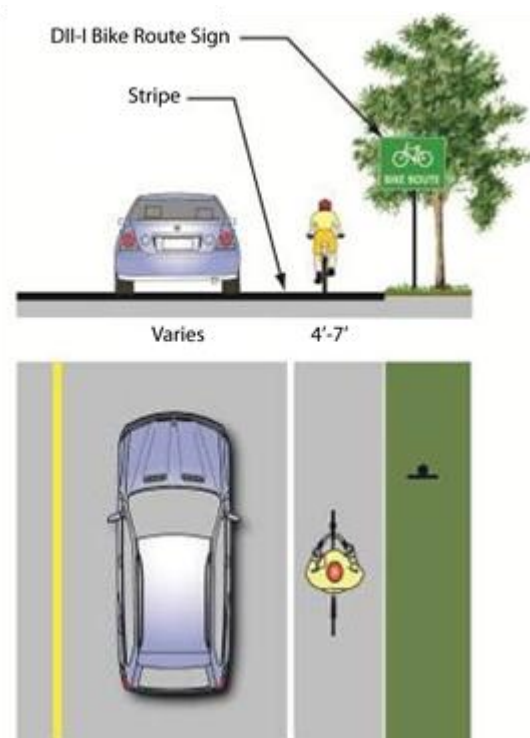
In many cases, the opportunity to develop a full standard bike lane on a street where it is desirable may be many years. It is possible to stripe the shoulder in lieu of bike lanes if the area is 50 percent of the desirable bike lane width and the outside lane width can be reduced to the AASHTO minimum. If the available bike lane width is  $\frac{2}{3}$  of the desirable bike lane width, the full bike lane treatment of signs, legends, and a 4'-6" bike lane line would be provided. Where feasible, extra width should be provided with pavement resurfacing jobs, but not exceeding desirable bike lane widths.

### Guidance

See also: MUTCD Section 9B. 20 Bicycle Guide Signs.



*Recommended shoulder bikeway configuration.*



*Shoulder bikeways are appropriate along roadways with no curb and gutter to provide space for cyclists, breakdown area for motorists, and to extend pavement life.*



## Shared Lane Markings - Sharrow

### Design Summary

Minimum of 11 feet from edge of curb where on-street parking is present. If parking lane is wider than 7.5 feet the sharrow should be moved further out accordingly. The width of the door zone is generally assumed to be 2.5 feet from the edge of the parking lane.

Greenville has already applied the sharrow as an appropriate bicycle facility on several streets, including East North Street, West Park Avenue, and others. Additionally, Greenville has developed signage specific to roadways with sharrows.

If used on a street without on-street parking that has an outside travel lane that is less than 14 feet wide, the centers of the sharrow should be at least 4 feet from the edge of the pavement.

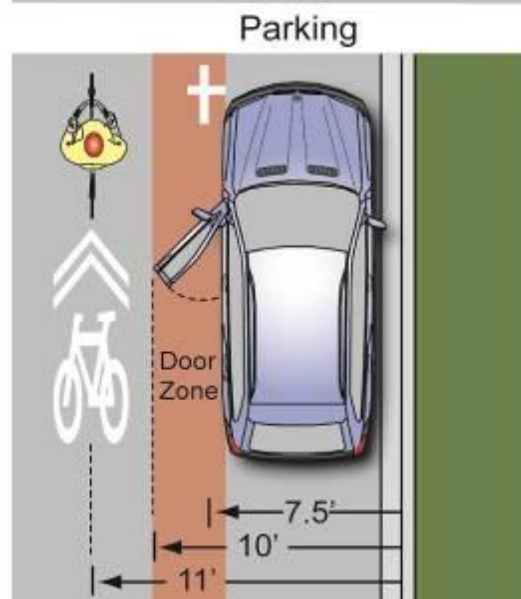
If used, the sharrow should be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter and may be spaced closer together to achieve desired spatial definition.

The sharrow is not recommended on roadways with speeds above 35mph.

### Discussion

Recently, Shared Lane Marking stencils (also called "Sharrows") have been accepted by the MUTCD (Manual on Uniform Traffic Control Devices) for use nationwide as an additional treatment for bike route facilities. The stencil can serve a number of purposes, such as making motorists aware of bicycles potentially in their lane, showing bicyclists the direction of travel, and, with proper placement, reminding bicyclists to bike further from parked cars to prevent "dooring" collisions. Signage used in conjunction with on-street sharrow markings help to clarify their meaning for motorists unfamiliar with them and re-iterate their meaning for motorists who are familiar with them.

Though not always possible, placing the sharrow markings outside of vehicle tire tracks will increase the life of the markings and the long-term cost of the treatment.



### Guidance

The 2009 MUTCD notes that shared lane markings should not be placed on roadways with a speed limit over 35 MPH, and that when used the marking should be placed immediately after an intersection and spaced at intervals no greater than 250 feet thereafter. Placing shared lane markings between vehicle tire tracks (if possible) will increase the life of the markings. (See MUTCD Section 9C.07). However, some cities are using a much closer spacing (as close as 75) for SLMs as well as using SLMs for wayfinding (see Section 3).

## Bike Lanes

### Design Summary

Designated exclusively for bicycle travel, bike lanes are separated from vehicle travel lanes with striping and also include pavement stencils. Bike lanes are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

Recommended minimum bike lane widths of:

5 feet, measured from painted edgeline to edge of gutter, on roadways with posted speed limits of 40 mph or greater.

4 feet, measured from painted edgeline to edge of gutter, on roadways with posted speed limits of 35 mph or less.

However, AASHTO and other guidance recommend a five-foot minimum for bike lanes, with four feet only in restricted corridors. In addition, bike lanes are measured to the inside edge of the gutter pan, ensuring smooth pavement rather than a gutter edge in the bike lane.



*Bike lanes are a popular accommodation for commuter and recreational cyclists.*

### Discussion

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bike lane than if they are expected to share a wide lane. Providing marked facilities such as bike lanes is one way of helping to persuade more tentative riders to try bicycling.

Bike lanes can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the cyclists' path.
- Discouraging bicyclists from riding on the sidewalk.
- Reminding motorists that cyclists have a right to the road.
- Specifying a direction of travel.

In an urban setting, it is crucial to ensure that bike lanes and adjacent parking lanes have sufficient width, so that cyclists have enough room to avoid opened vehicle doors.



*Bike lane pavement markings in Portland, Oregon provide character to the roadway.*

### Additional Guidance

5 foot bike lanes are currently the recommended minimum and recommended on all arterial roads per the *City of Greenville Design and Specifications Manual*. This includes a 1' concrete gutter, thus reducing the rideable bicycle space to 4'. This should be revised so that there is a minimum of 5' of rideable space with an additional 1' gutter.

High-speed traffic (posted speed of 40 mph or greater) and the presence of large vehicles (truck, bus, or recreational vehicle) are significant factors affecting the acceptability of potential bikeway locations. In locations where these conditions exist, bike lane widths of 5-feet or greater are recommended."

The AASHTO *Guide for the Development of Bicycle Facilities* guideline states that "if used, the bicycle lane symbol marking shall be placed immediately after an intersection and other locations as needed... If the word or symbol pavement markings are used, Bicycle Lane signs shall also be used, but the signs need not be adjacent to every symbol to avoid overuse of the signs."

See also MUTCD Section 9C.04 Markings for Bicycle Lanes.

## Guidelines for Bike Lanes

### Bike Lane Adjacent to On-Street Parallel Parking

#### Design Summary

##### Bike Lane Width:

6' recommended when parking stalls are marked.

5' acceptable if parking not marked (drivers tend to park closer to the curb where parking is unmarked).

7' maximum (greater widths may encourage vehicle loading in bike lane).

#### Discussion

Bike lanes adjacent to on-street parallel parking are common in the U.S. and can be dangerous for bicyclists if not designed properly. Crashes caused by a suddenly-opened vehicle door are a common hazard for bicyclists using this type of facility. On the other hand, wide bike lanes may encourage the cyclist to ride farther to the right (door zone) to maximize distance from passing traffic. Wide bike lanes may also cause confusion with unloading vehicles in busy areas where parking is typically full.

Some treatments to encourage bicyclists to ride away from the 'door zone' include:

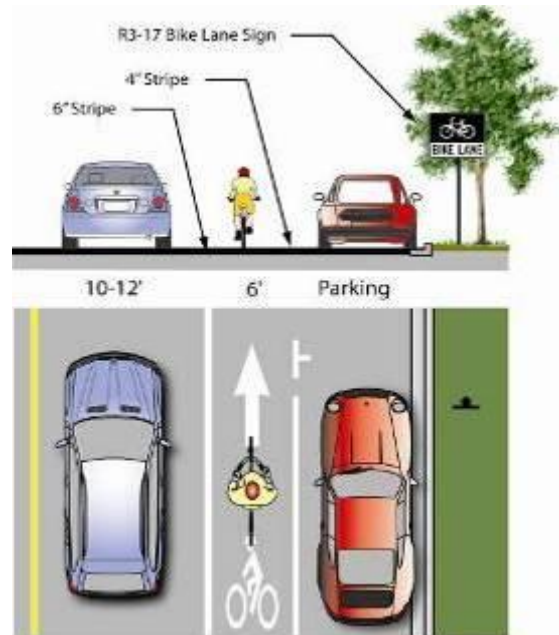
Installing parking "T's" and smaller bike lane stencils placed to the left (see graphic at top).

Provide a buffer zone (preferred design; shown bottom). Bicyclists traveling in the center of the bike lane will be less likely to encounter open car doors. Motorists have space to stand outside the bike lane when loading and unloading.

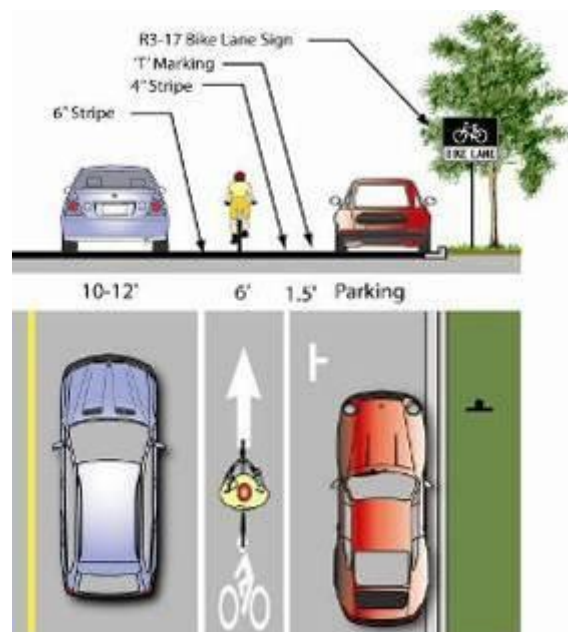
#### Guidance

From *AASHTO Guide for the Development of Bicycle Facilities*:

"If parking is permitted, the bike lane should be placed between the parking area and the travel lane and have a minimum width of 5'. Where parking is permitted but a parking stripe or stalls are not utilized, the shared area should be a minimum of 11' without a curb face and adjacent to a curb face. If the parking volume is substantial or turnover is high, an additional 1'- 2' of width is desirable."



*Parking 'T' bike lane design.*



*Parking buffer bike lane design.*



## Bike Lane Adjacent to On-Street Diagonal Parking

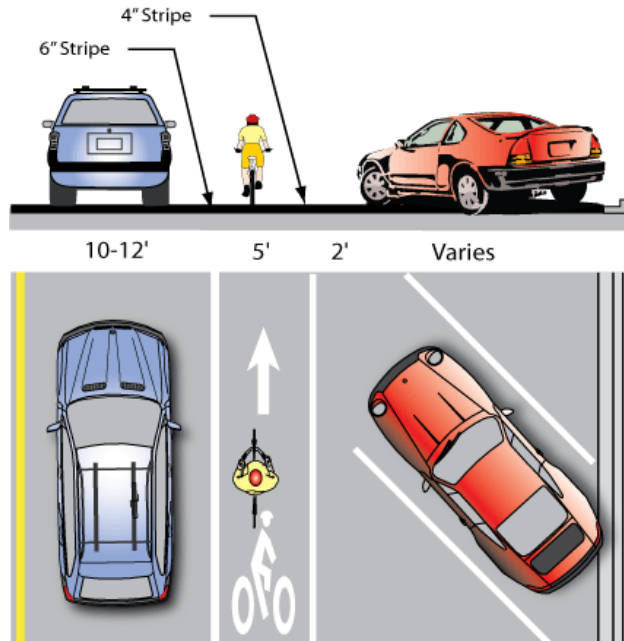
### Design Summary

#### Bike Lane Width:

5' minimum.

White 4" stripe separates bike lane from parking bays.

Parking bays are sufficiently long to accommodate most vehicles (vehicles do not block bike lane).



*Recommended bike lane adjacent to on-street diagonal parking design.*

### Discussion

In areas with high parking demand such as urban commercial areas, diagonal parking can be used to increase parking supply. Conventional "head-in" diagonal parking is not recommended in conjunction with high levels of bicycle traffic or with the provision of bike lanes as drivers backing out of conventional diagonal parking spaces have poor visibility of approaching bicyclists.

The use of 'back-in diagonal parking' or 'reverse angled parking' is recommended over head-in diagonal parking. This design addresses issues with diagonal parking and bicycle travel by improving sight distance between drivers and bicyclists and has other benefits to vehicles including: loading and unloading of the trunk occurs at the curb rather than in the street, passengers (including children) are directed by open doors towards the curb, no door conflict with bicyclists. While there may be a learning curve for some drivers, using back-in diagonal parking is typically an easier maneuver than conventional parallel parking.

### Guidance

This treatment is currently slated for inclusion in the upcoming update of the AASHTO *Guide for the Development of Bicycle Facilities*.



*'Back-in' diagonal parking is safer for cyclists than 'head-in' diagonal parking due to drivers' visibility as they exit the parking spot.*

## Bike Lane Without On-Street Parking

### Design Summary

#### Bike Lane Width:

4' minimum when no curb & gutter is present.

5' minimum when adjacent to curb and gutter.

#### Recommended Width:

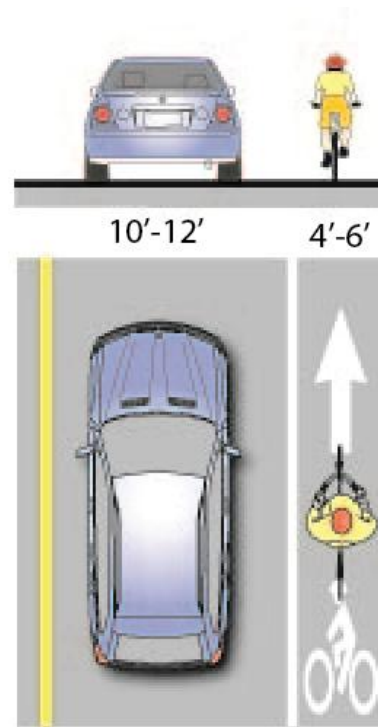
6' where right-of-way allows.

#### Maximum Width:

6-8' Adjacent to arterials with high travel speeds (45 mph+).

### Discussion

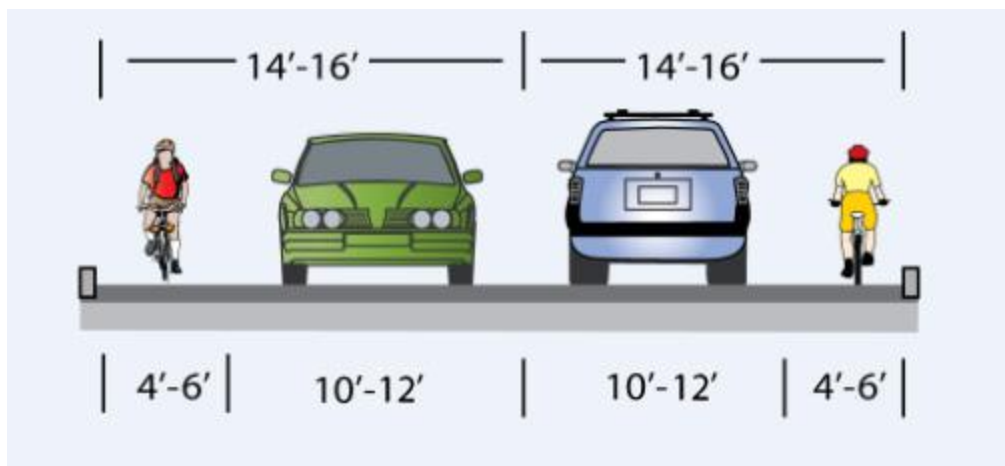
Wider bike lanes are desirable in certain circumstances such as on higher speed arterials (45 mph+) where a wider bike lane can increase separation between passing vehicles and cyclists, bicycle facilities with varying separation from vehicle traffic may be appropriate, depending on the lane configuration and traffic speeds permitted on any given road. Wide bike lanes are also appropriate in areas with high bicycle use. A bike lane width of six to eight feet makes it possible for bicyclists to ride side-by-side or pass each other without leaving the bike lane, increasing the capacity of the lane. Appropriate signing and stenciling is important with wide bike lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane.



*Recommend bike lane without on-street parking design.*

### Guidance

Two Lane Cross-Section with No Parking\*



*\*Bike lanes may be 4' in width under constrained circumstances*

## Bike Lanes at Roundabouts

### Design Summary

Reduce the speed differential between circulating motorists and bicyclists (25 mph maximum circulating design speed).

Design approaches/exits to the lowest speeds possible, to reduce the severity of potential collisions with pedestrians.

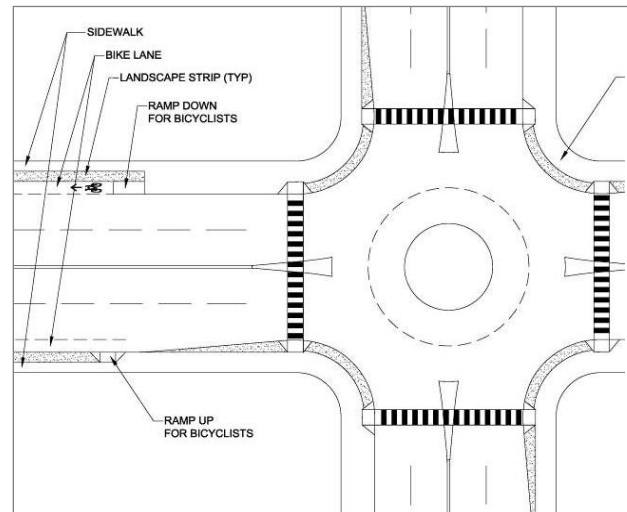
Encourage bicyclists navigating the roundabout like motor vehicles to “take the lane.”

Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.

Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.

Indicate to drivers and bicyclists the correct way for them to circulate through the roundabout through appropriately-designed signage, pavement markings and geometric design elements.

Indicate to drivers, bicyclists and pedestrians the right-of-way rules through appropriately -designed signage, pavement markings and geometric design elements.



*Recommended bike lane at roundabout design.*

*(Source: UC Berkeley Traffic Safety Center for Caltrans, Identifying Factors that Determine Bicyclist and Pedestrian-Involved Collision Rates and Bicyclist and Pedestrian Demand at Multi-Lane Roundabouts, 2009).*

### Discussion

Research indicates that while single-lane roundabouts may benefit bicyclists and pedestrians by slowing traffic, multi-lane roundabouts may significantly increase safety problems for these users. Multi-lane roundabouts pose the following challenges to bicyclists riding in a bike lane:

Bicyclists must take the lane before they enter the roundabout to avoid becoming caught in a “right hook,” a situation in which a motorist turns right, across the path of a bicyclist traveling straight. Entry leg speeds must be slow enough for bicyclists to be able to take the lane safely.

Theoretically, once motor vehicle volumes reach a certain magnitude, there are no gaps in traffic large enough to accommodate a bicyclist.

Bicyclists must be able to correctly judge the speed of circulating motorists to find a gap that is large enough for them to safely enter the roundabout. This task is particularly difficult if the circulating motorists are traveling at a much higher speed than the bicyclists. In addition, if circulating speeds in a roundabout are much higher than 20 mph, drivers behind a bicyclist may become impatient, and may pass the bicyclist and turn in front of him, creating more risks for the bicyclist.

As a circulating bicyclist approaches an entry lane, a driver waiting to enter must notice the bicyclist, properly judge the bicyclist’s speed, and yield to him/her if necessary. In a location where there are few bicyclists, motorists may not even register that there is a bicyclist approaching. If a bicyclist is hugging the curb, s/he may be outside the motorist’s cone of vision.

### Guidance

UC Berkeley Traffic Safety Center for Caltrans, Identifying Factors that Determine Bicyclist and Pedestrian-Involved Collision Rates and Bicyclist and Pedestrian Demand at Multi-Lane Roundabouts, 2009

## Colored Bike Lanes

### Design Summary

#### Bicycle Lane Width:

4' minimum and 7' maximum.

### Discussion

A contrasting color for the paving of bicycle lanes can also be applied to continuous sections of roadways. These situations help to better define road space dedicated to bicyclists and make the roadway appear narrower to drivers resulting in beneficial speed reductions.

There are three colors commonly used in bicycle lanes: blue, green, and red. All help the bicycle lane stand out in merging areas. The City of Portland began using blue lanes and changed to green in April 2008. Green is the color being recommended for use.

Colored bicycle lanes require additional cost to install and maintain. Techniques include:

- Paint – less durable and can be slippery when wet
- Colored asphalt – colored medium in asphalt during construction – most durable.
- Colored and textured sheets of acrylic epoxy coating.

Thermoplastic – Expensive, durable but slippery when worn.

### Guidance

NACTO Urban Bikeway Design Guide: Colored Bike Facilities



*Colored bike lanes are a common treatment in many European Cities and are starting to gain traction in US cities.*



## Colored Bike Lanes at Interchanges

### Design Summary

#### Bicycle Lane Width:

The bicycle lane width through the interchange should be the same width as the approaching bicycle lane (minimum five feet). Cities in the United States have begun to use the color Green to bring attention to potential conflict points in the road system.

### Discussion

On high traffic bicycle corridors non-standard treatments may be desirable over current practices outlined in the MUTCD. Dashed bicycle lane lines with or without colored bicycle lanes may be applied to provide increased visibility for bicycles in the merging area.

### Guidance

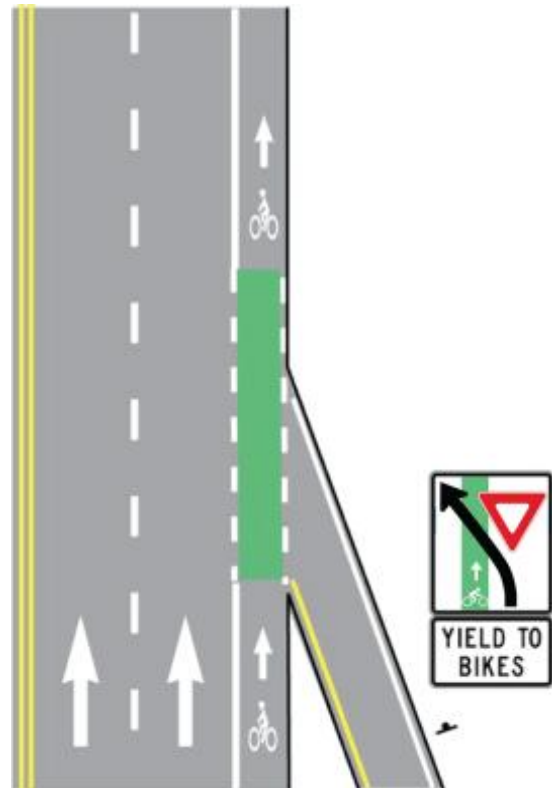
This treatment is not currently present in any State or Federal design standards

City of Chicago - Green Pavement Markings for Bicycle Lanes (Ongoing) - FHWA Experiment No. 9-77(E)

Portland's Blue Bicycle Lanes:

<http://www.portlandonline.com/shared/cfm/image.cfm?id=58842>

"The color green shall be used to minimize confusion with other standard traffic control markings." - **NACTO Urban Bikeway Design Guide**



## Colored Bike Lanes in Conflict Areas

### Design Summary

#### Bicycle Lane Width:

The bicycle lane width through the interchange should be the same width as the approaching bicycle lane (minimum five feet).

### Discussion

Some cities in the United States are using colored bicycle lanes to guide bicyclists through major vehicle/bicycle conflict points.

#### Color Considerations:

There are three colors commonly used in bicycle lanes: blue, green, and red. All help the bicycle lane stand out in merging areas. The City of Portland began using blue lanes and changed to green in April 2008. Green is the color being recommended for use.

### Guidance

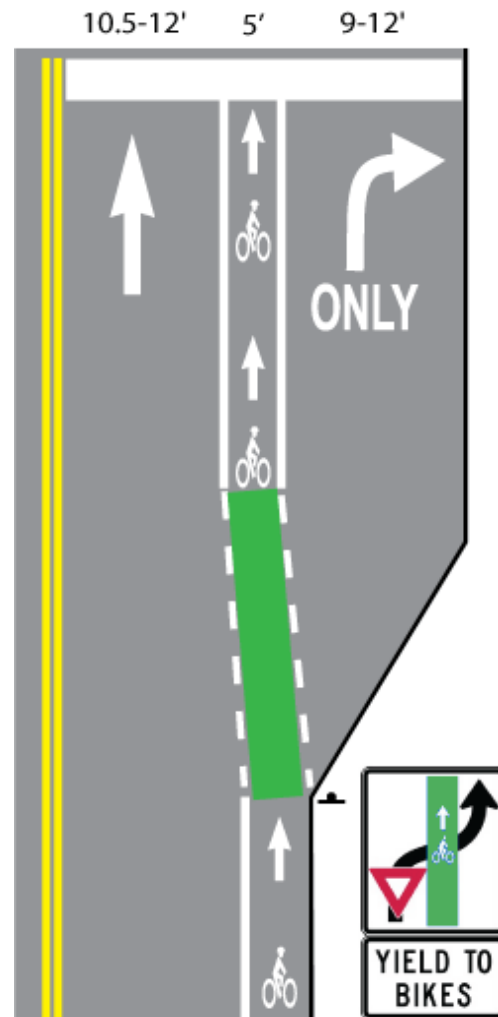
This treatment is not currently present in any State or Federal design standards

City of Chicago - Green Pavement Markings for Bicycle Lanes (Ongoing) - FHWA Experiment No. 9-77(E)

Portland's Blue Bicycle Lanes

<http://www.portlandonline.com/shared/cfm/image.cfm?id=58842>

"The color green shall be used to minimize confusion with other standard traffic control markings." - NACTO *Urban Bikeway Design Guide*





## Retrofitting Existing Streets with Bike Lanes

### Introduction

Most major streets in Greenville are characterized by conditions (e.g., high vehicle speeds and/or volumes) for which dedicated bike facilities are appropriate to accommodate safe and comfortable riding. Although opportunities to add bike lanes through roadway widening may exist in some locations, most major streets in Greenville pose physical and other constraints requiring street retrofit measures within existing curb-to-curb widths. Providing bicycle facilities on streets designed primarily for motor vehicle traffic can be challenging to implement, depending on the physical layout of the street. In some cases, bicycle facilities may be desirable on streets with higher vehicle speed and volumes. Placing bicycle facilities on these streets allows for a predictable environment for motorists and bicyclists by clarifying the appropriate position for each user on a roadway. Though opportunities to add bicycle facilities through roadway widening may exist in some locations, most major streets pose physical and other constraints requiring street retrofit measures within existing curb-to-curb widths. As a result, it may be necessary to reallocate existing street width through striping modifications to accommodate dedicated bicycle facilities. As a result, many of the recommended measures effectively reallocate existing street width through striping modifications to accommodate dedicated bike lanes. The measures covered in this section include addition of a paved shoulder to an existing road, lane narrowing on an existing road, lane reconfiguration on an existing road, and on-street parking reduction,

While largely intended for major streets, these measures may be appropriate on some lower-order streets where bike lanes would best accommodate cyclists.



*Above shows the before and after of lane narrowing along an excessively wide roadway. The resulting configuration not only defines space for bicyclists, but creates a safer environment for motorists and pedestrians as well by reducing the tendency for motorists to drive fast.*

Paved Shoulder

Design Summary

Bike Lane Width

6’ preferred.  
4’ minimum (see bike lane guidance).

Discussion

Bike lanes could be accommodated on several streets with excess right-of-way through shoulder widening. Although street widening incurs higher expenses compared with re-striping projects, bike lanes could be added to streets currently lacking curbs, gutters and sidewalks without the high costs of major infrastructure reconstruction.

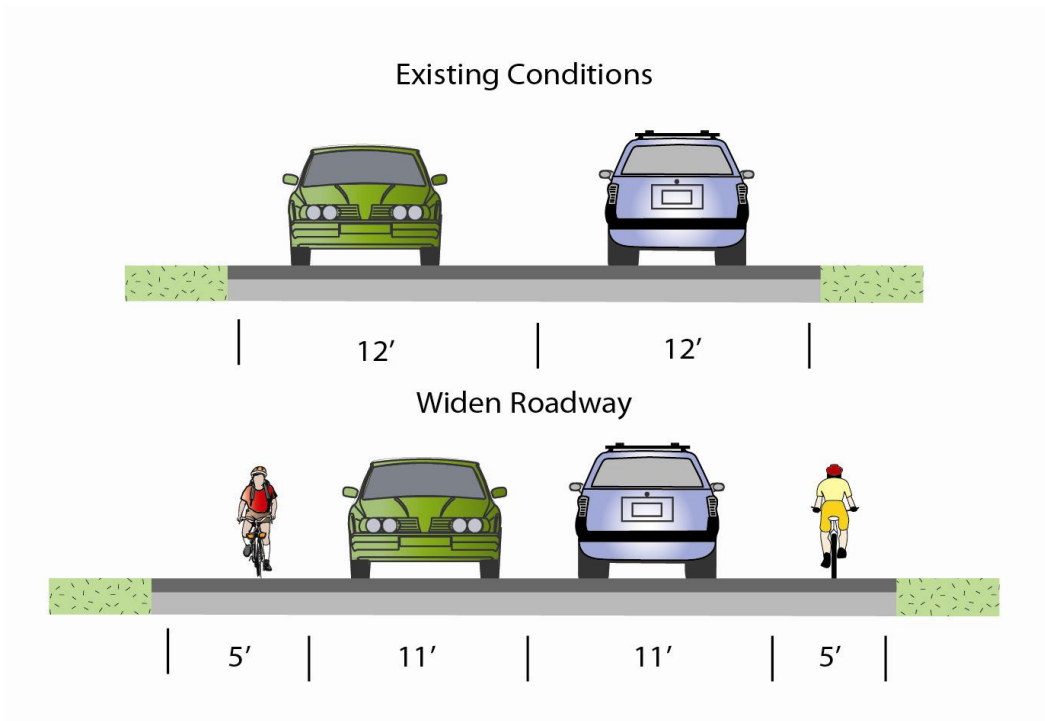
As a long-term measure, the City of Greenville should find opportunities to add bike lanes to other major streets where they are needed. Opportunities include adding bike lanes as streets and bridges are widened for additional auto capacity or as property development necessitates street reconstruction.



*Roadway widening is preferred on roads lacking curbs, gutters and sidewalks*

Guidance

*Example of roadway widening to accommodate bike lanes and street parking*



Lane Narrowing

Design Summary

Vehicle Lane Widths

Before: 12 to 15 feet; after: 10 to 11 feet.

Bike Lane Width

See bike lane design guidance.

Discussion

Lane narrowing utilizes roadway space that exceeds minimum standards to create the needed space to provide bike lanes. Some roadways in Greenville may have existing lanes that are wider than those prescribed in local and national roadway design standards, or which are not marked. Most standards allow for the use of 11-foot and sometimes 10-foot wide travel lanes to create space for bike lanes.

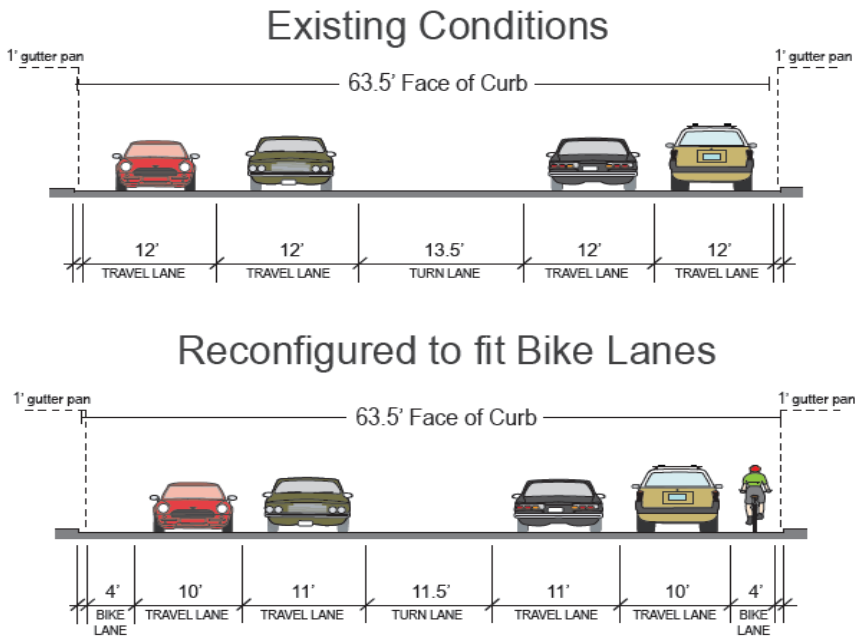
Special consideration should be given to the amount of heavy vehicle traffic and horizontal curvature before the decision is made to narrow travel lanes. Center turn lanes can also be narrowed in some situations to free up pavement space for bike lanes.



This street previously had 13' lanes, which were narrowed to accommodate bike lanes without removing a lane.

Guidance

Example of vehicle travel lane narrowing to accommodate bike lanes.



Road Diet (Lane Reconfiguration)

Design Summary

Vehicle Lane Widths

Width depends on project. No narrowing may be needed if a lane is removed.

Bike Lane Width

See bike lane design guidance.

**Discussion**

In most cases, the removal of a single travel lane will provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects. Depending on a street's existing configuration, traffic operations, user needs, and safety concerns, various lane reduction configurations exist. For instance, a four-lane street (with two travel lanes in each direction) could be modified to include one travel lane in each direction, a center turn lane, and bike lanes. Prior to implementing this measure, a traffic analysis should identify impacts.

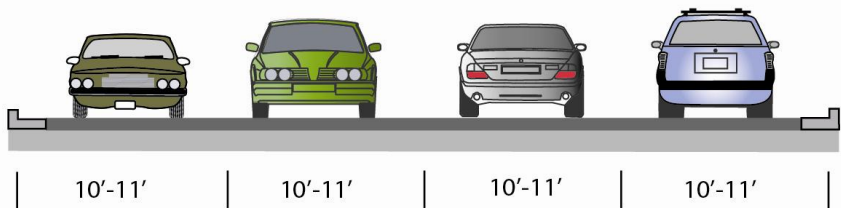
This treatment is slated for inclusion in the update to the AASHTO *Guide for the Development of Bicycle Facilities*.

**Guidance**

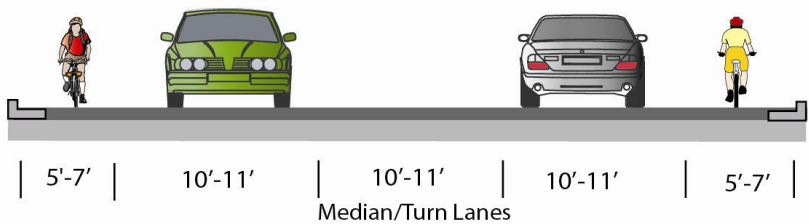


*West Washington Street in Greenville was re-stripped to convert four vehicle travel lanes into three travel lanes with bike lanes.*

**4 to 3 Road Diet: Before**



**4 to 3 Road Diet: After**



*Example of vehicle travel lane reconfiguration to accommodate bike lanes*

**Parking Reduction**

**Design Summary**

Vehicle Lane Widths

Width depends on project. No narrowing may be needed depending on the width of the parking lane to be removed.

Bike Lane Width

See bike lane design guidance.

**Discussion**

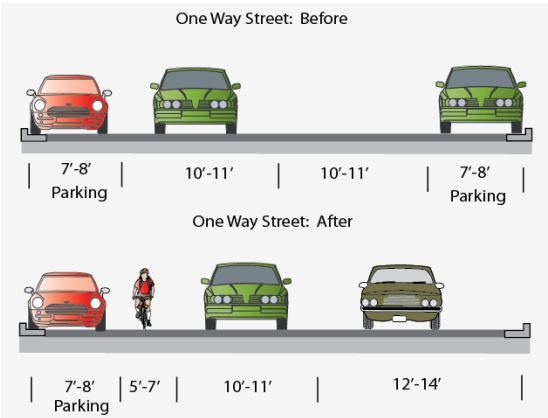
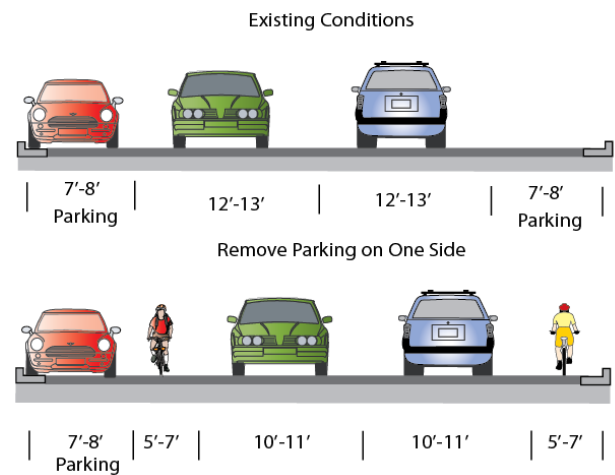
Bike lanes could replace one or more on-street parking lanes on streets where excess parking exists and/or the importance of bike lanes outweighs parking needs. For instance, parking may be needed on only one side of a street (as shown below and at right). Eliminating or reducing on-street parking also improves sight distance for cyclists in bike lanes and for motorists on approaching side streets and driveways. Prior to reallocating on-street parking for other uses, a parking study should be performed to gauge demand and to evaluate impacts to people with disabilities.



*Some streets may not require parking on both sides*

**Guidance**

*Example of parking removal to accommodate bike lanes.*



## Separated Bikeways

### Design Summary

Shared-use paths can provide a desirable facility particularly for novice riders, recreational trips, and cyclists of all skill levels preferring separation from traffic. Shared-use paths should generally provide new travel opportunities.

### Discussion

Shared-use paths serve bicyclists and pedestrians and provide additional width over a standard sidewalk. Facilities may be constructed adjacent to roads, through parks, or along linear corridors such as active or abandoned railroad lines or waterways. Regardless of the type, paths constructed next to the road must have some type of vertical (e.g., curb or barrier) or horizontal (e.g., landscaped strip) buffer separating the path area from adjacent vehicle travel lanes.

Elements that enhance shared-use path design include:

Providing frequent access points from the local road network; if access points are spaced too far apart, users will have to travel out of direction to enter or exit the path, which will discourage use.

Placing directional signs to direct users to and from the path.

Building to a standard high enough to allow heavy maintenance equipment to use the path without causing it to deteriorate.

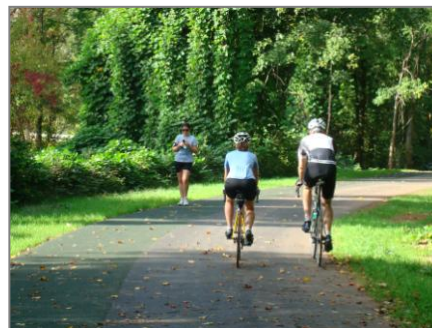
Limiting the number of at-grade crossings with streets or driveways.

Terminating the path where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street. If poorly designed, the point where the path joins the street system can put pedestrians and cyclists in a position where motor vehicle drivers do not expect them.

Identifying and addressing potential safety and security issues up front.

Whenever possible, and especially where heavy use can be expected, separate bicycle and pedestrian ways should be provided to reduce conflicts.

Providing accessible parking space(s) at trailheads and access points.



*Shared-use paths (also referred to as “trails” and “multi-use paths”), such as Greenville’s Swamp Rabbit Trail, are often viewed as recreational facilities, but they are also important corridors for utilitarian trips.*

### Additional Guidance

Shared-use paths should be constructed according to the AASHTO *Guide for the Development of Bicycle Facilities*. Where possible, shared-use paths should be designed according to ADA standards. Constructing trails may have limitations that make meeting ADA standards difficult and sometimes prohibitive. Prohibitive impacts include harm to significant cultural or natural resources, a significant change in the intended purpose of the trail, requirements of construction methods that are against federal, state or local regulations, or presence of terrain characteristics that prevent compliance.



# Cycletrack

## Design Summary

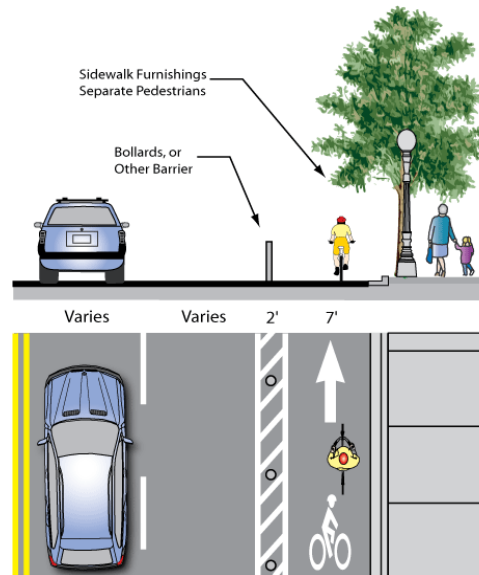
### Cycle Track Width:

7 feet minimum to allow passing and obstacle avoidance

12 feet minimum for two-way facility

## Discussion

A cycle track is a hybrid type bicycle facility that combines the experience of a separated path with the on-street infrastructure of a conventional bicycle lane. Cycle tracks have different forms, but all share common elements. Cycle tracks provide space that is intended to be exclusively or primarily for bicycles, and is separated from vehicle travel lanes, parking lanes and sidewalks. Cycle tracks can be either one-way or two-way, on one or both sides of a street, and are separated from vehicles and pedestrians by pavement markings or coloring, bollards, curbs/medians or a combination of these elements.



## Guidance

NACTO Urban Bikeway Design Guide

Crow Design Manual for Bicycle Traffic - Chapter 5

*Recommended Design – No Parking*



*Recommended Design – Two-Way Cycletrack*

## Raised Bicycle Lanes

### Design Summary

#### Bicycle Lane Width:

5 feet minimum. Bicycle lane should drain to street. Drainage grates should be in travel lane.

#### Mountable Curb Design:

Mountable curb should have a 4:1 or flatter slope and have no lip that could catch bicycle tires.

#### Signage & Striping:

Same as traditional Class II bicycle lanes

### Discussion

Raised bicycle lanes are bicycle lanes that have a mountable curb separating them from the adjacent travel lanes. Raised bicycle lanes provide an element of physical separation from faster moving vehicle traffic. For drivers, the mountable curb provides a visual and tactile reminder of where the bicycle lane is. For bicyclists the mountable curb makes it easy to leave the bicycle lane if necessary, when passing another bicyclist, or to merge to the left for turning movements. The raised bicycle lane should return to level grade at intersections.

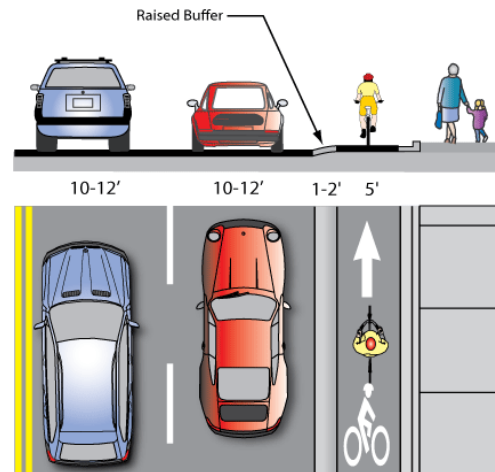
Raised bicycle lanes cost more than traditional bicycle lanes and typically require a separate paving operation. Maintenance costs are lower as the bicycle lane receives no vehicle wear and resists debris accumulation.

Raised bicycle lanes work well adjacent to higher speed roadways with few driveways.

### Guidance

This treatment is not currently present in any U.S. State or Federal design manuals

Crow Design Manual for Bicycle Traffic - Chapter 5



## Buffered Bicycle Lanes

### Design Summary

#### Bicycle Lane Width:

5 feet minimum. Bicycle lane should drain to street. Drainage grates should be in travel lane.

#### Signage & Striping:

Same as traditional Class II bicycle lanes

### Discussion

Provides cushion of space to mitigate friction with motor vehicles on streets with frequent or fast motor vehicle traffic. Buffered Bike lanes allow bicyclists to pass on another or avoid obstacles without encroaching into the travel lane.

These facilities increase motorist shy distance from bicyclist in the bike lane and reduce the risk of "dooring" compared to a conventional bike lane.

Buffered bike lanes require additional roadway space and maintenance.

### Guidance

This treatment is not currently present in any U.S. State or Federal design manuals

Crow Design Manual for Bicycle Traffic - Chapter 5



## Trails Along Roadways

### Design Summary

Where a shared-use path must be adjacent to a roadway, a five foot minimum buffer should separate the path from the edge of the roadway, or a physical barrier of sufficient height should be installed.

Shared use paths may be considered along roadways under the following conditions:

The path will generally be separated from all motor vehicle traffic.

Bicycle and pedestrian use is anticipated to be high.

To provide continuity with an existing path through a roadway corridor.

The path can be terminated at each end onto streets or trails with good bicycle and pedestrian facilities.

There is adequate access to local cross-streets and other facilities along the route.

Any needed grade separation structures do not add substantial out-of-direction travel.



*Trails directly adjacent to roadways, such as the Swamp Rabbit Trail's East Faris Road section, offer advantages, but can be challenging for users at roadway intersections.*

### Discussion

Concerns about shared use paths directly adjacent to roadways (e.g., with minimal or no separation) are:

Half of bicycle traffic may ride against the flow of vehicle traffic, contrary to the rules of the road.

When the path ends, cyclists riding against traffic tend to continue to travel on the wrong side of the street, as do cyclists who are accessing the path. Wrong-way bicycle travel is a major cause of crashes.

At intersections, motorists crossing the path often do not notice bicyclists approaching from certain directions, especially where sight distances are poor.

Bicyclists are required to stop or yield at cross-streets and driveways, unless otherwise posted.

Stopped vehicles on a cross-street or driveway may block the path.

Because of the closeness of vehicle traffic to opposing bicycle traffic, barriers are often necessary to separate motorists from cyclists. These barriers serve as obstructions, complicate facility maintenance and waste available right-of-way.

Paths directly adjacent to high-volume roadways diminish users' experience by placing them in an uncomfortable environment.

As bicyclists gain experience and realize some of the advantages of riding on the roadway, some riders stop using paths adjacent to roadways. Bicyclists may also tend to prefer the roadway as pedestrian traffic on the shared use path increases due to its location next to an urban roadway. When designing a bikeway network, the presence of a nearby or parallel path should not be used as a reason to not provide adequate shoulder or bike lane width on the roadway, as the on-street bicycle facility will generally be superior to the "sidepath" for experienced cyclists and those who are cycling for transportation purposes. Bike lanes should be provided as an alternate (more transportation-oriented) facility whenever possible.

### Guidance

The AASHTO *Guide for the Development of Bicycle Facilities* generally recommends against the development of trails adjacent to roadways.

## Bicycle Boulevards

### Design Summary

Bicycle Boulevards are generally installed on minor or local roadways and serve as bicycle routes. No design standard exists. See following pages for additional guidance.

### Discussion

On Bicycle Boulevards, Neighborhood Greenways, or bicycle routes, it is important to provide a benefit to the bicyclist by choosing the route. Frequently this benefit is composed of reduced travel time, lower motor vehicle traffic volumes and/or reduced motor vehicle speeds. Ideally, the bicyclist should not be making frequent stops. The Bicycle Boulevard should be watched closely following treatment to see if there is an increase in vehicle trips along the route as many motorists may take advantage of fewer stops thereby reducing the effectiveness of the facility for bicycles. If motor vehicle ADT increases, treatments may be considered such as diagonal diverters, one-way closures, chicanes, chokers and other applicable treatments to preserve bicycle permeability and limit through vehicle access.

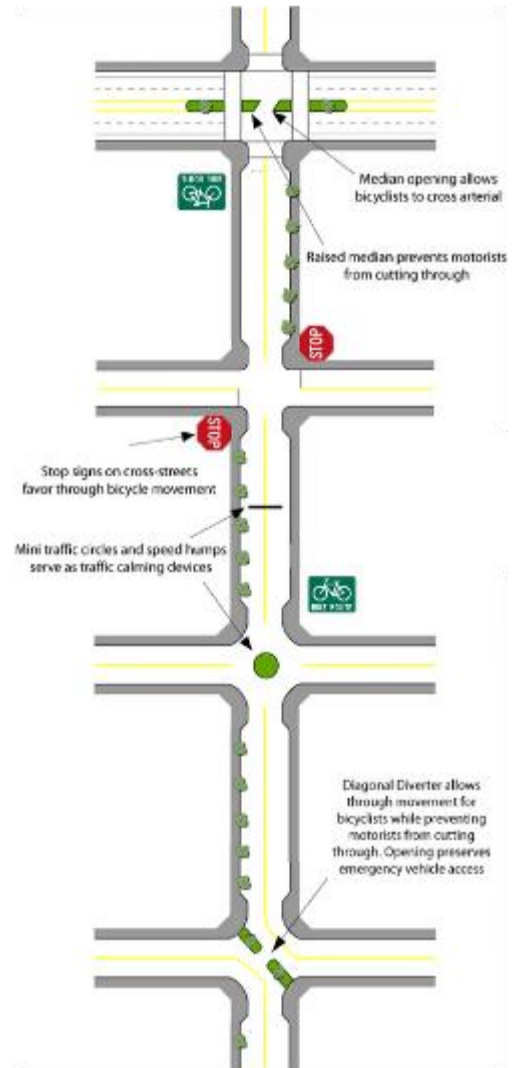
### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. [www.ibpi.usp.pdx.edu/guidebook.php](http://www.ibpi.usp.pdx.edu/guidebook.php)

City of Berkeley. (2000). Bicycle Boulevard Design Tools and Guidelines.

AASHTO Guide for the Development of Bicycle Facilities.

MUTCD.



## Level 1: Signage

### Design Summary

Signing is a cost-effective yet highly-visible treatment that can improve the riding environment on a bicycle boulevard.

The City should maintain consistent signage and paint markings throughout the region.

### Discussion

#### Wayfinding Signs (Can be non-standard treatment)

Wayfinding signs are typically placed at key locations leading to and along bicycle boulevards, including where multiple routes intersect and at key bicyclist “decision points.” Wayfinding signs displaying destinations, distances and “riding time” can dispel common misperceptions about time and distance while increasing users’ comfort and accessibility to the boulevard network.

Wayfinding signs also visually cue motorists that they are driving along a bicycle route and should correspondingly use caution. Note that too many signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards.

#### Warning signs

Warning signs advising motorists to “share the road” and “watch for bicyclists” may also improve bicycling conditions on shared streets. These signs are especially useful near major bicycle trip generators such as schools, parks and other activity centers. Warning signs should also be placed on major streets approaching bicycle boulevards to alert motorists of bicyclist crossings.

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. [www.ibpi.usp.pdx.edu/guidebook.php](http://www.ibpi.usp.pdx.edu/guidebook.php)

City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*.

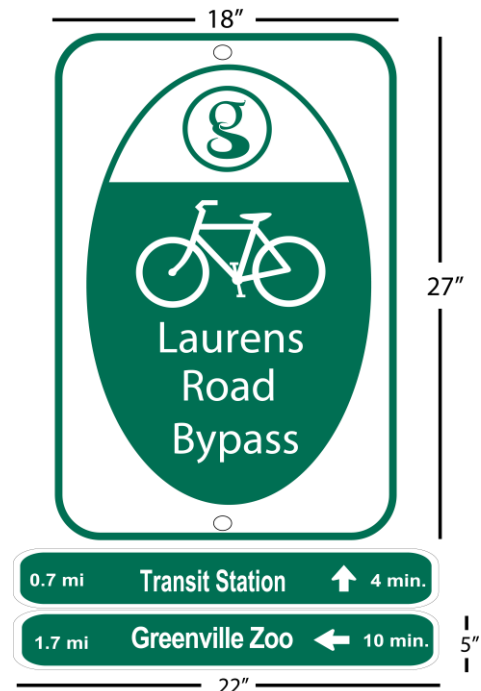
AASHTO Guide for the Development of Bicycle Facilities.

MUTCD.



Sample bicycle boulevard signage.

Below: Wayfinding signs help bicyclists stay on designated bicycle routes.





## Level 1 continued: On-Street Bikeway Signage

### Design Summary

Destinations for on-street signage can include:

On-street bikeways	Civic/community destinations
Commercial centers	Local parks and trails
Regional parks and trails	Hospitals
Public transit sites	Schools

Recommended uses for on-street signage include:

**Confirmation signs** confirm that a cyclist is on a designated bikeway and can include destinations or distances, but not directional arrows.

**Turn signs** indicate where a bikeway turns from one street onto another street. Turn signs are located on the near-side of intersections.

**Decision signs** mark the junction of two or more bikeways. Decision signs are located on the near-side of intersections. They can include destinations and their associated directional arrows, but not distances.

### Discussion

Signage can help by:

- Familiarizing users with the pedestrian and bicycle network
- Identifying the best routes to destinations.
- Addressing misperceptions about time and distance.
- Overcoming a “barrier to entry” for infrequent cyclists or pedestrians
- Bypassing major roadways that lack bicycle facilities

Wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Additional recommended guidelines include:

**Place the closest destination to each sign in the top slot.** Destinations that are further away can be placed in slots two and three. This allows the nearest destination to ‘fall off’ the sign and subsequent destinations to move up the sign as the bicyclist approaches.

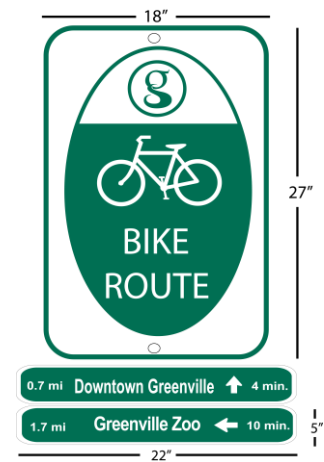
**Use pavement markings to help reinforce routes and directional signage.** Markings, such as bicycle boulevard symbols, may be used in addition to or in place of directional signs along bike routes to help cyclists navigate difficult turns and provide route reinforcement.

### Guidance

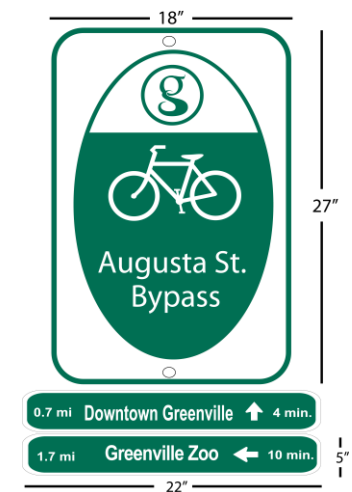
City of Oakland. (2009). *Design Guidelines for Bicycle Wayfinding Signage*.

City of Portland (2002). *Bicycle Network Signing Project*.

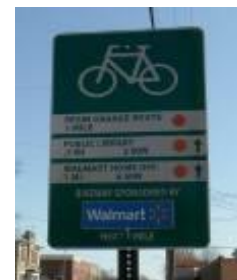
Greenville bike route sign.



Wayfinding that includes distance and time can address misperceptions about time and distance.



Example of sponsored bikeway signs in Bentonville AR.



## Level 2: Pavement Markings & Route Signage

### Design Summary

Pavement markings are used in conjunction with on-street signage to compliment bicycle network wayfinding

Pavement markings should be installed to provide continuity through a route and to alert bicyclists of intersecting bike routes/facilities

### Discussion

Pavement markings have recently been used across the United States as a way to orient bicyclists throughout a city bike route network. These facilities are most frequently used on low-volume, residential streets or in conjunction with the development of a bicycle boulevard or neighborhood greenway.

#### Circle/Arrow

Directional pavement markings provide notification to bicyclists on proper road positioning, and notify users of routing options as routes intersect with the greater bike network.

The first generation of pavement stencils that provided directional route information were 12" circles with an arrow indicating the direction the route followed. These are useful where routes end at a T-junction or as a road "jogs" at intersecting streets.

#### "Broken Sharrow"

The City of Portland has introduced a new treatment, replacing the circle and arrow marker with the "Broken Sharrow." The Broken Sharrow utilizes the stenciling used in the Shared Lane Marking symbol with directional arrow/chevrons that direct bicyclists to adjoining or a continued facility. The added benefit of the Broken Sharrow is that it serves the dual purpose of wayfinding and instruction on ideal lane positioning. Initial feedback indicates that bicyclists find the Broken Sharrow easier to see on the road than the smaller circle/arrow treatments.

### Guidance

Portland Bureau of Transportation  
NACTO Urban Bikeway Design Guide



*Directional pavement marker*



*Basic layout of the Bike Route pavement stencil*



*The City of Portland's updated bicycle route stencil, the "Broken Sharrow"*

## Level 2 continued: Bicycle Boulevard Pavement Markings

### Design Summary

Use pavement markings to designate bicycle boulevards and provide directional/wayfinding information

### Discussion

#### On-Street Parking Delineation

Delineating on-street parking spaces with paint or other materials clearly indicates where a vehicle should be parked, and can discourage motorists from parking their vehicles too far into the adjacent travel lane. This helps cyclists by maintaining a wide enough space to safely share a travel lane with moving vehicles while minimizing the need to swerve farther into the travel lane to maneuver around parked cars.

In addition to benefiting cyclists, delineated parking spaces also promote the efficient use of on-street parking by maximizing the number of spaces in high-demand areas.

#### Centerline Striping Removal

Automobiles have an easier time passing cyclists on roads without centerline stripes for the majority of the block length. If vehicles cannot easily pass each other using the full width of the street, it is likely that there is too much traffic for the subject street to be a successful bicycle boulevard. In addition, not striping the centerline reduces maintenance costs. Berkeley paints a double yellow centerline from 40-50' at uncontrolled or stop-controlled intersections, as well as pavement reflectors to identify the center of the street.

#### Directional Pavement Markings (Non-standard treatment)

Directional pavement markings (also known as “bicycle boulevard markings” or “breadcrumbs”) lead cyclists along a boulevard and reinforce that they are on a designated route. Markings can take a variety of forms, such as small bicycle symbols placed every 600-800 feet along a linear corridor, as previously used on Portland, Oregon’s boulevard network.

Recently, jurisdictions have been using larger, more visible pavement markings. Shared lane markings could be used as bicycle boulevard markings, as Portland, OR has moved towards using. See shared lane marking guidelines for additional information on this treatment.

In Berkeley, California, non-standard pavement markings include larger-scale lettering and stencils to clearly inform motorists and bicyclists of a street’s function as a bicycle boulevard.



*Bicycle boulevard directional marker.*



*City/County proposed pavement markings for on-street bike routes leading to the Swamp Rabbit Trail.*

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. [www.ibpi.usp.pdx.edu/guidebook.php](http://www.ibpi.usp.pdx.edu/guidebook.php)

City of Berkeley. (2000). Bicycle Boulevard Design Tools and Guidelines.

AASHTO Guide for the Development of Bicycle Facilities.

MUTCD.

## Level 3: Bicycle Boulevard Traffic Calming

### Design Summary

Traffic calming treatments reduce vehicle speeds to the point where they generally match cyclists' operating speeds, enabling motorists and cyclists to safely co-exist on the same facility.

### Discussion

#### Chicanes (Non-standard treatment)

Chicanes are a series of raised or delineated curb extensions on alternating sides of a street forming an S-shaped curb, which reduce vehicle speeds through narrowed travel lanes. Chicanes can also be achieved by establishing on-street parking on alternate sides of the street. These treatments are most effective on streets with narrower cross-sections.

#### Mini Traffic Circles

Mini traffic circles are raised or delineated islands placed at intersections, reducing vehicle speeds through tighter turning radii and narrowed vehicle travel lanes (see right). These devices can effectively slow vehicle traffic while facilitating all turning movements at an intersection. Mini traffic circles can also include a paved apron to accommodate the turning radii of larger vehicles like fire trucks or school buses.

#### Speed Humps

Shown right, speed humps are rounded raised areas of the pavement requiring approaching motor vehicles to reduce speed. These devices also discourage thru vehicle travel on a street when a parallel route exists.

Speed humps should never be constructed so steep that they may cause a bicyclist to lose control of the bicycle or be distracted from traffic. In some cases, a gap could be provided, whereby a bicyclist could continue on the level roadway surface, while vehicles would slow down to cross the barrier.

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. [www.ibpi.usp.pdx.edu/guidebook.php](http://www.ibpi.usp.pdx.edu/guidebook.php)

City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*.

AASHTO *Guide for the Development of Bicycle Facilities*.



*Chicanes require all vehicles to reduce their speeds.*



*Traffic circles provide an opportunity for landscaping, but visibility should be maintained.*



*Speed humps are a common traffic calming treatment. Change photo to show a bicycle friendly hump with a gap for bicyclists.*



## Level 3 continued: Minor Unsignalized Intersections

### Design Summary

To encourage use of the boulevard and improve cyclists' safety, reduce bicycle travel time by eliminating unnecessary stops and improving intersection crossings.

### Discussion

#### Stop Sign on Cross-Street

Unmarked intersections are dangerous for bicyclists, because cross-traffic may not be watching for cyclists. Stop sign on cross streets require crossing motorists to stop and proceed when safe. Stop signs are a relatively inexpensive treatment that is quite effective at minimizing bicycle and cross-vehicle conflicts. However, placing stop signs at all intersections along bicycle boulevards may be unwarranted as a traffic control device.



*Stop signs effectively minimize conflicts along bicycle boulevards.*

#### Curb Extensions and High-Visibility Crosswalks

This treatment is appropriate near activity centers with large amounts of pedestrian activity, such as schools or commercial areas. Curb extensions should only extend across the parking lane and not obstruct bicyclists' path of travel or the travel lane. Curb extensions and high-visibility crosswalks both calm traffic and also increase the visibility of pedestrians waiting to cross the street, although they may impact on-street parking.



*Curb extensions can be a good location for pedestrian amenities, including street trees.*

#### Bicycle Forward Stop Bar (Non-standard treatment)

A second stop bar for cyclists placed closer to the centerline of the cross street than the first stop bar increases the visibility of cyclists waiting to cross a street. This treatment is typically used with other crossing treatments (i.e. curb extension) to encourage cyclists to take full advantage of crossing design. They are appropriate at unsignalized crossings where fewer than 25 percent of motorists make a right turn movement.



*Bicycle forward stop bars encourage cyclists to wait where they are more visible.*

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*.

City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*.

AASHTO Guide for the Development of Bicycle Facilities.

MUTCD.

## Level 3 continued: Major Unsignalized Intersections

### Design Summary

Increase crossing opportunities with medians and refuge islands

### Discussion

#### Medians/Refuge Islands

A crossing island can be provided to allow cyclists to cross one direction of traffic at a time when gaps in traffic allow. The crossing island should be at least 8' wide; narrower medians can accommodate bikes if the holding area is at an acute angle to the major roadway. Crossing islands can be placed in the middle of the intersection, prohibiting left and thru vehicle movements.



*Medians on bicycle boulevards can provide space for a bicyclist to wait.*

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*.

City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*.

AASHTO *Guide for the Development of Bicycle Facilities*.

NACTO *Urban Bikeway Design Guide*



## Level 3 continued: Offset Intersections

### Design Summary

Provide turning lanes or pockets at offset intersection, providing cyclists with a refuge to make a two-step turn.

Bike turn pockets - 5' wide, with a total of 11' required for both turn pockets and center striping.

### Discussion

Offset intersection can be challenging for cyclists, who need to transition onto the busier cross-street in order to continue along the boulevard.

#### Bicycle Left-Turn Lane (Non-standard treatment)

Bicycle left-turn lanes allow the crossing to be completed in two phases. The bicyclist executes a right-hand turn onto the cross-street, and then waits in a delineated left-turn lane if necessary. The bike turn pockets should be at least 5' wide, total of 11' for turn pockets and center striping.

#### Bicycle Left Turn Pocket (Non-standard treatment)

A bike-only left-turn pocket permits bicyclists to make left turns while restricting vehicle left turns. Signs should prohibit motorists from turning. Because of the restriction on vehicle left-turning movements, this treatment also acts as traffic diversion.

### Guidance

Alta and IBPI. *Bicycle Boulevard Planning and Design Handbook*.

AASHTO *Guide for the Development of Bicycle Facilities*.



*Example of a bicycle left-turn pocket.*



*This bike-only left-turn pocket guides cyclists along a popular bike route.*

## Level 4: Bicycle Boulevard Traffic Diversion

### Design Summary

Traffic diversion treatments maintain thru-bicycle travel on a street while physically restricting thru vehicle traffic.

Traffic diversion is most effective when higher-order streets can sufficiently accommodate the diverted traffic associated with these treatments.

### Discussion

#### Choker Entrances (Non-standard treatment)

Choker entrances are intersection curb extensions or raised islands allowing full bicycle passage while restricting vehicle access to and from a bicycle boulevard. When they approach a choker entrance at a cross-street, motorists on the bicycle boulevard must turn onto the cross-street while cyclists may continue forward. These devices can be designed to permit some vehicle turning movements from a cross-street onto the bicycle boulevard while restricting other movements.

#### Traffic Diverters (Non-standard treatment)

Similar to choker entrances, traffic diverters are raised features directing vehicle traffic off the bicycle boulevard while permitting thru travel.

#### Advantages:

Provides safe refuge in the median of the major street so that bicyclists only have to cross one direction of traffic at a time; works well with signal-controlled traffic platoons coming from opposite directions.

Provides traffic calming and safety benefits by preventing left turns and/or thru traffic from using the intersection.

#### Disadvantages:

Potential motor vehicle impacts to major roadways, including lane narrowing, loss of some on-street parking and restricted turning movements.

Crossing island may be difficult to maintain and may collect debris.

### Guidance

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. [www.ibpi.usp.pdx.edu/guidebook.php](http://www.ibpi.usp.pdx.edu/guidebook.php)

City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*.

AASHTO *Guide for the Development of Bicycle Facilities*.



*Choker entrances prevent vehicular traffic from turning from a main street onto a traffic-calmed bicycle boulevard.*



*Traffic diverters prevent access to both directions of motor vehicle traffic.*

## General Intersection Design Guidelines

A wide variety of intersection treatments exist, which provide safe crossing and turning movements of bicyclists on bikeways. Treatments specific to particular facility types were previously discussed; this section addresses general guidelines for crossings.

### Bicycle Considerations at Traffic Signals

Bicycles typically travel much slower than motor vehicles and can find themselves without an adequate 'clearance interval', which is the time to clear the intersection between conflicting green phases. The duration of the amber phase of signals is typically determined by the expected motor vehicle speed through an intersection. Bicyclist speeds average 10mph through intersections. Methods for accommodating bicyclists include:

- Lengthening the amber phase of the intersection slightly to allow for the slower speed of bicyclists. This should be part of the solution as longer amber phases can also encourage motor vehicles to enter intersections under this phase.
- Lengthening the 'all red' phase of the intersection. This allows any vehicles or bicyclists still in the intersection to clear it before a green phase is given to opposing traffic. The maximum length of the 'all red' phase should not generally be greater than 3 seconds. Under no circumstances should this time be extended beyond 6 seconds.
- Coordinating signals to allow for the 10-15mph propagation speed of bicyclists. Sometimes it is possible to alter signal timing to provide 'green waves' for bicyclists without significantly impeding motor vehicle flow.
- Increase in the minimum green phase. Bicyclists have slower speeds and accelerations than motor vehicles and even if they are at the stop line when a green light is given, the bicyclist may still lack sufficient time to clear the intersection before a conflicting green phase.
- Use signal detection to detect moving bicyclists. Video detection technology can be programmed to detect the presence of bicyclists and alter the minimum green phase, or the clearance interval based on their presence.

## Loop Detector Signal Detection for Bicyclists

### Design Summary

In order to minimize delay to bicyclists, it is recommended to install one loop about 100 ft from the stop bar within the bike lane, with a second loop located at the stop bar.

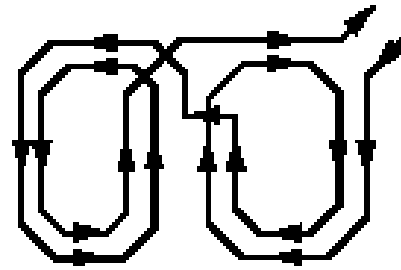
### Discussion

The purpose of bicycle loops is to detect bicyclists waiting at intersections, and to give cyclists extra green time (e.g. five seconds) before the light turns yellow to make it through the light.

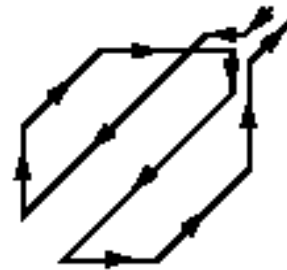
Two loop detector types appropriate for bicycle detection, Type “C” (quadrupole) and Type “D” (diagonal slashed), are shown at right. Details of saw cuts and winding patterns for inductive detector loop types appear on Caltrans Standard Detail ES5B. Loop types B (5’ square diamond), C (quadrupole), D (diagonal-slashed), Q and modified Type E (circle with a slash) can reliably detect bicycles across their full width. Type D loop is preferred as it has a good, fairly uniform response to bicycles across its area. Types A (6’ square) and E (unmodified circle) are not bike-sensitive in their center. Typically signal detection should be located on secondary cross-streets with intersections to primary roadways where signals are demand activated.

### Guidance

2009 MUTCD



*Quadrupole Loop – Type “C”  
Detects most strongly in center  
Sharp cut-off sensitivity  
Used in bike lanes*



*Diagonal Quadrupole Loop – Type “D”  
Sensitive over whole area  
Sharp cut-off sensitivity  
Used in shared lanes*

## Loop Detector Pavement Markings and Signage

### Design Summary

Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the bicyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button.

Most demand-actuated signals in Greenville currently use loop detectors, which can be attuned to be sensitive enough to detect any type of metal, including steel and aluminum. Some bicycles may lack enough detectable material by the loop such as models that are mainly composed of carbon fiber or aluminum.

Current and future loops that are sensitive enough to detect bicycles should have pavement markings to instruct cyclists how to trip them, as well as signage (see right).

### Discussion

Locate Bicycle Detector Pavement Marking over center of quadrupole loop detector if in bike lane, or where bicycle can be detected in a shared lane by loop detector or other detection technology.

### Guidance

2009 MUTCD

*AASHTO Guide for the Development of Bicycle Facilities*



Figure 9C-7 MUTCD



Accompanying  
Signage (R10-22)



## Remote Traffic Microwave Sensor Detection

RTMS is a system developed in China, which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method is marked with a time code which gives information on how far away the object is. The RTMS system is unaffected by temperature and lighting, which can affect standard video detection cameras.

## Bicycle Push Buttons

### Design Summary

Bicycle push buttons can also provide signal actuation and timing adjustments for bicyclists. Push buttons are recommended for use with shared-use paths or other unique interactions with bicycle facilities.

Push buttons are generally unsuitable for conventional bike lane situations as the bicyclist would have to leave the roadway to activate the signal. An acceptable situation exists where a push button can be located closer to the bike lane if no vehicle right turn lane is present so that the bicyclist does not have to dismount to reach the signal.

### Discussion

- Bicycle push buttons may be used where a push button detector has been installed exclusively to activate a green phase for bicyclists.
- The R10-4, R10-24, R10-25, R10-26 and R62C signs should be installed near the edge of the sidewalk, in the vicinity of where bicyclists will be crossing the street.

### Guidance

2009 MUTCD

*AASHTO Guide for the Development of Bicycle Facilities*



## Video Detection

Inductive loop detection technology may not always pick up a bicyclist's presence. If the bicyclist fails to position themselves correctly over the loop or is riding a bicycle made of alternative materials such as carbon fiber the detector may not actuate the signal. Video detection technology can detect a bicyclist's presence over a larger area by using pixel analysis of an image to detect the presence of vehicles or bicycles. Changes to the detection can be made quickly with a few modifications to the software to adjust to a change in lane configuration or the addition of a bike lane.

With video detection, disturbance to the pavement, stenciling, and signage can be avoided. Shortcomings can include poor detection in darkness (a lighted intersection solves this), and the shadows of adjacent vehicles triggering the bicycle area during certain times of day.

Video camera system costs range from \$20,000 to \$25,000 per intersection.



## Bicycle Box – Single Lane – No Vehicle Right Turns

### Design Summary

#### Bicycle Box Dimensions:

The Bicycle Box should be 14' deep to allow for bicycle positioning.

#### Signage:

Appropriate signage as recommended by the MUTCD applies. Signage should be present to prevent 'right turn on red' and to indicate where the motorist must stop.

### Discussion

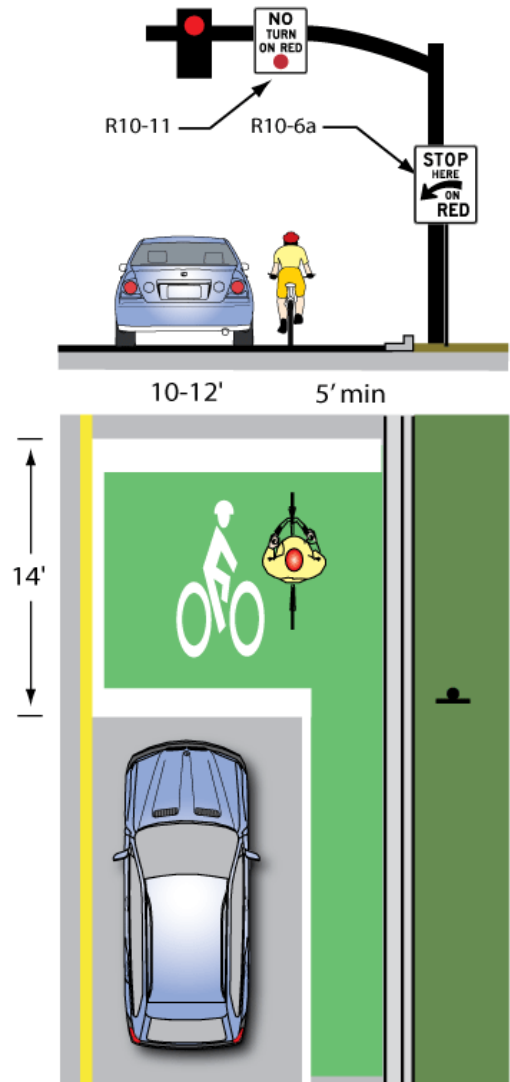
Bicycle boxes provide additional space for bicyclists to move to the front of the vehicular queue while waiting for a green light. On a two-lane roadway, the bicycle box can also facilitate left turning movements for bicyclists as well as through bicycle traffic. Motor vehicles must stop behind the white stop line at the rear of the bicycle box and may not turn right on red.

### Guidance

This treatment is not currently present in any U.S. State or Federal design manuals.

NACTO *Urban Bikeway Design Guide*: Bike Boxes

Examples of this treatment can be found in Cambridge, (Mass.) Portland, Austin, and Vancouver.



## Bicycle Box – Multi Lane – No Vehicle Right Turns

### Design Summary

#### Bicycle Box Dimensions:

The Bicycle Box should be 14' deep to allow for bicycle positioning.

#### Signage:

Appropriate signage as recommended by the MUTCD applies. Signage should be present to prevent 'right turn on red' and to indicate where the motorist must stop.

### Discussion

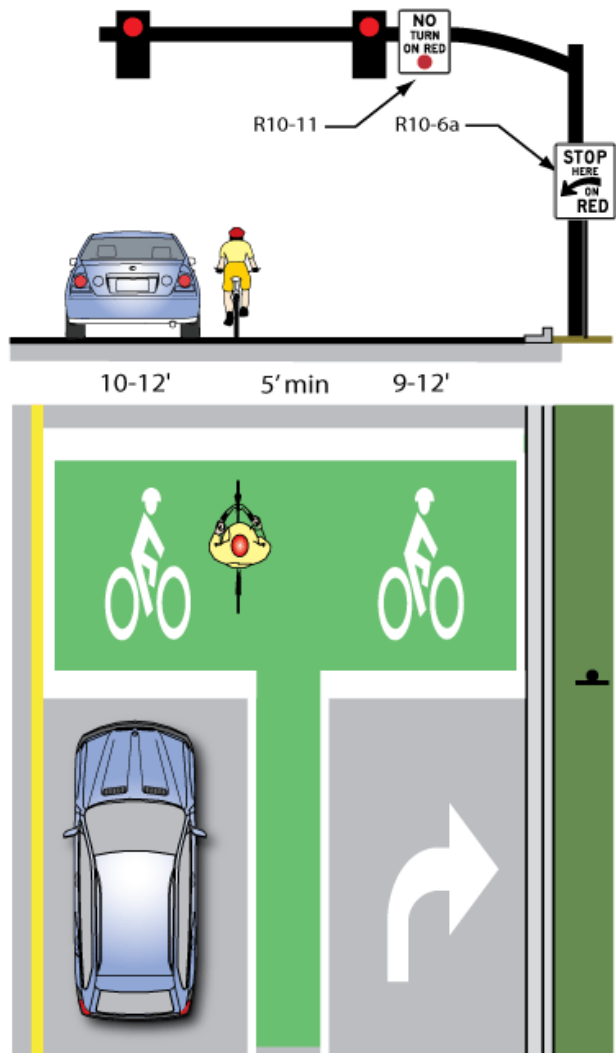
On wider roadways, the Bicycle Box can allow for movements in all directions for bicyclists providing for right turning, through, and left turning movements ahead of traffic. This treatment can be combined with a bicycle signal or an advanced signal phase to clear queuing bicyclists before vehicles are given a green phase.

At multi-lane bicycle boxes there can be a safety issue if a bicyclist is using the bicycle box to maneuver for a left turn just as the signal turns green. This would put the bicyclist possibly in the path of an approaching vehicle. It is recommended that installations wider than one lane across from the access point to the bicycle box be studied carefully before installation.

### Guidance

*NACTO Urban Bikeway Design Guide*

This treatment is not currently present in any U.S. State or Federal design manuals.



## Bicycle Box – Multi Lane – Right Turns Allowed

### Design Summary

#### Bicycle Box Dimensions:

The Bicycle Box should be 14' deep to allow for bicycle positioning.

#### Signage:

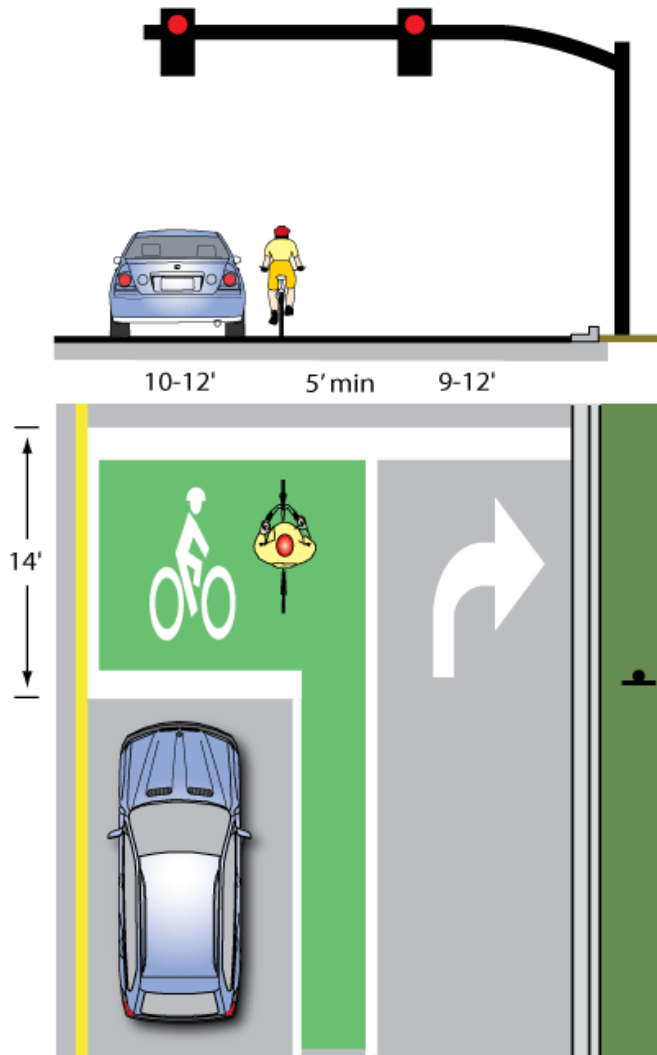
Appropriate signage as recommended by the MUTCD applies.

### Discussion

In some areas there may be a situation where a freeway ramp exists where bicycles are prohibited or areas where bicycles may not need to access such as parking garages. In these limited cases a vehicle right turn only lane may be provided to the outside of the bicycle box. Right turns on red are permitted in these instances.

### Guidance

This treatment is not currently present in any U.S., State, or Federal design manuals.



## Bicycle Parking

### Short Term Parking

#### Design Summary

##### Location

50' maximum distance from main building entrance.

2' minimum from the curb face to avoid 'dooring.'

Avoid fire zones, loading zones, bus zones, etc.

Location should be highly visible from adjacent bicycle routes and pedestrian traffic.

##### Additional Considerations

To allow ample pedestrian movement, a minimum clear distance of 6' should be provided between the bicycle rack and the property line. A clear distance of 5' is the minimum standard.

If two racks are to be installed parallel to each other, a minimum of 3' should be provided between the racks.



*Standard bicycle rack*

#### Discussion

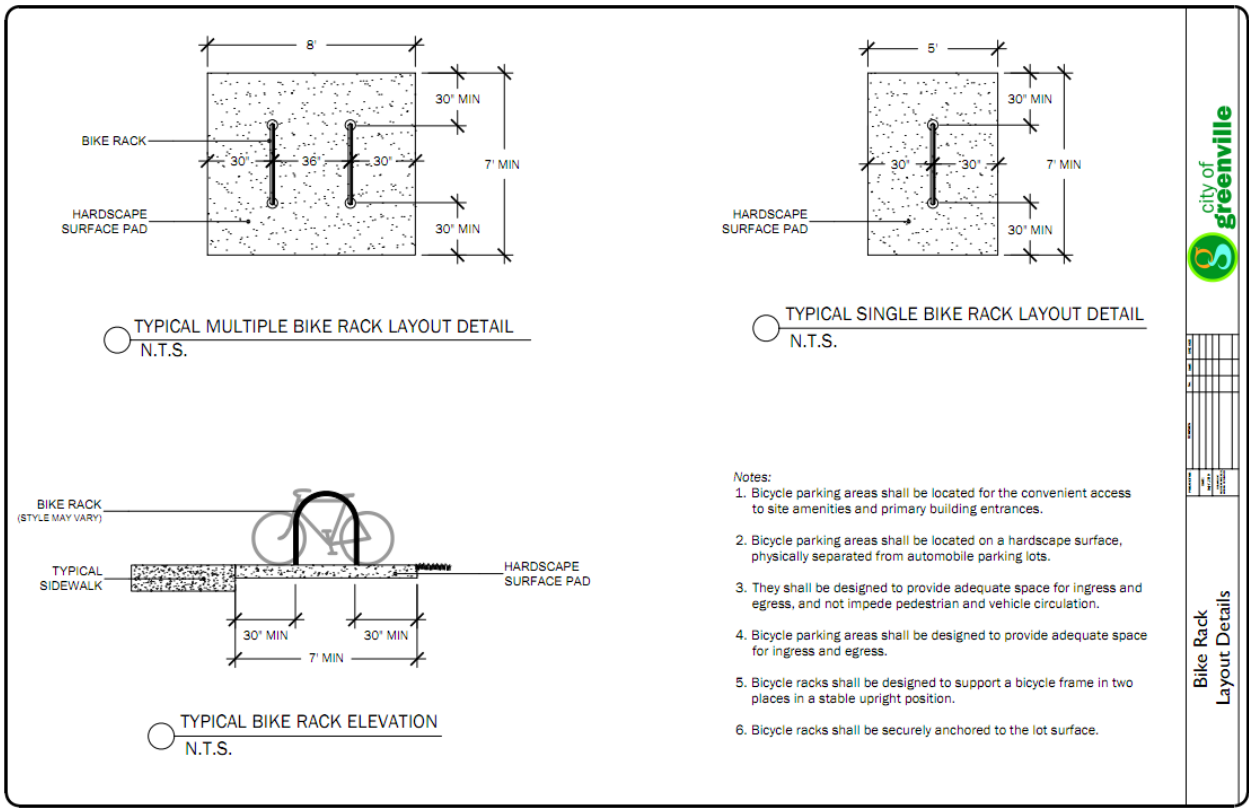
Bicycle racks are generally appropriate for commercial and retail areas, office buildings, healthcare and recreational facilities, and institutional developments such as libraries and universities. On-sidewalk racks should be placed adjacent to the curb in the utility strip, where other street furniture, utility poles, and trees are located. Racks should be oriented so that bicycles are positioned parallel to the curb, where neither the rack nor the bicycle in it impedes pedestrian traffic. Where a clear right-of-way for pedestrians cannot be maintained by installing the rack on the sidewalk, place bicycle racks in curb extensions or on-street (see next page). A certain number of bicycle racks should be weather protected. This may be achieved by simply locating the racks under awnings.

Custom racks using creative designs can double as public artwork or advertising space for local businesses. The "post and ring" style rack is an attractive alternative to the standard inverted-U, which requires only a single mounting point and can be customized to have the City's name or emblem stamped into the rings. Where older-style parking meters have been replaced with newer models but have not been removed, it is possible to retrofit them to provide short-term parking. The meter head is removed, and the post remains. A loop may be attached to the pole, in order to accommodate cable locks and to formalize the meter as bicycle parking.



*Examples of bike parking signage*

Short Term Parking Design Guidance



City of Greenville Bicycle Rack Placement Guidelines

Bike Parking Design Issue	Recommended Guidance
Minimum Rack Height	To increase visibility to pedestrians, racks should have a minimum height of 33 inches or be indicated or cordoned off by visible markers.
Signing	Where bicycle parking areas are not clearly visible to approaching cyclists, signs at least 12 inches square should direct them to the facility. The sign should include the name, phone number, and location of the person in charge of the facility, where applicable.
Lighting	Lighting of not less than one foot-candle illumination at ground level should be provided in all bicycle parking areas.
Frequency of Racks on Streets	In popular retail areas, two or more racks should be installed on each side of each block. This does not eliminate the inclusion of requests from the public which do not fall in these areas. Areas officially designated or used as bicycle routes may warrant the consideration of more racks.
Location and Access	Access to facilities should be convenient; where access is by sidewalk or walkway, ADA-compliant curb ramps should be provided where appropriate. Parking facilities intended for employees should be located near the employee entrance, and those for customers or visitors near main public entrances. (Convenience should be balanced against the need for security if the employee entrance is not in a well-traveled area). Bicycle parking should be clustered in lots not to exceed 16 spaces each. Large expanses of bicycle parking make it easier for thieves to be undetected.
Locations within Buildings	Provide bike racks within 50 feet of the entrance. Where a security guard is present, provide racks behind or within view of a security guard. The location should be outside the normal flow of pedestrian traffic.
Locations near Transit Stops	To prevent bicyclists from locking bikes to bus stop poles - which can create access problems for transit users, particularly those who are disabled - racks should be placed in close proximity to transit stops where there is a demand for short-term bike parking.
Locations within a Campus-Type Setting	Racks are useful in a campus-type setting at locations where the user is likely to spend less than two hours, such as classroom buildings. Racks should be located near the entrance to each building. Where racks are clustered in a single location, they should be surrounded by a fence and watched by an attendant. The attendant can often share this duty with other duties to reduce or eliminate the cost of labor being applied to bike parking duties; a cheaper alternative to an attendant may be to site the fenced bicycle compound in a highly visible location on the campus. For long-term parking needs of employees and students, attendant parking and/or bike lockers are recommended.
Retrofit Program	In established locations, such as schools, employment centers, and shopping centers, the City should conduct bicycle audits to assess bicycle parking availability and access, and add additional bicycle racks where necessary.



## On-Street Corrals

### Design Summary

See guidelines for sidewalk bicycle rack placement and clear zones.

Can be used with parallel or angled parking.

Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Protect bicycles from motor vehicles with physical barriers such as curbs, bollards, or fences or through the application of other unique surface treatments.

Establish maintenance responsibility when facility is built, particularly street sweeping and snow removal.

Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.

Cyclists should be able to access the corral from both the sidewalk and the roadway.

Cyclists should have an entrance width from roadway of 5 – 6’.



*On-street bicycle parking may be installed at intersection corners or at mid-block locations.*

### Discussion

Bicycle corrals (also known as “in-street” bicycle parking) consist of bicycle racks grouped together in a common area within the public right-of-way traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking.

Bicycle corrals move bicycles off the sidewalks, leaving more space for pedestrians, sidewalk café tables, etc. Because bicycle parking does not block sightlines (as large motor vehicles would do), it may be possible to locate bicycle parking in ‘no-parking’ zones near intersections and crosswalks.

Bicycle corrals can be considered instead of other on-street bicycle parking facilities where:

- High pedestrian activity results in limited space for providing bicycle racks on sidewalks.

- There is a moderate to high demand for short-term bicycle parking.

- Sufficient on-street vehicular parking is provided

- The business community is interested in sponsoring the bicycle corral.

In many communities, including Portland, the installation of bicycle corrals is driven by requests from adjacent businesses, and is not a city-driven initiative. In such cases, the City does not remove motor vehicle parking unless it is explicitly requested. In other areas, the City provides the facility and business associations take responsibility for the maintenance of the facility. Many communities, including the City of Portland, establish maintenance agreements with the requesting business.

The bicycle corral can be visually enhanced through the use of attractive planters and vegetation to act as buffers from the motor vehicle parking area as well as the use of creative demarcation elements to separate the corral for motor vehicle traffic.

## Shelters

### Design Summary

See guidelines for sidewalk bicycle rack placement and clear zones.

To be located on-street or off-street, in areas of high potential demand, such as areas in close proximity to major employment areas, schools, or community and recreational facilities.

Recommended height: 8-12'

Roof area: 12-15'.

If the bicycle racks are located perpendicular to a wall, 2' minimum clearance (single-side access); and 2.5 m (double-sided access).

If the bicycle rack is located parallel to a wall, 8' minimum clearance should be provided.

A clear width of 3' should be provided between rack ends to balance the maximization of bicycle parking capacity with the need for adequate bicycle maneuverability.



*Bicycle parking shelter on a sidewalk in downtown Victoria, Canada.*

### Discussion

Bicycle shelters consist of bicycle racks grouped together within structures with a roof that provides weather protection. Bicycle shelters provide convenient short-term and long-term bicycle parking. They also offer extra protection against accidental damages by providing greater separation between the bicycles and the sidewalk or parking lane. Information boards and advertising space can also be incorporated onto the bicycle shelter which is often used to post cycling or bicycle related information. Bicycle shelters provide a high level of aesthetic adaptation as each of its components (shelter, racks, roof) may be enhanced with different shapes, colors and materials.

Bicycle shelters are warranted anywhere that bicycle racks may be located, particularly:

- Major commercial and retail areas, particularly in the major commercial nodes.

- Areas with sufficient space on sidewalks, promenades or public plazas, or curb extensions, so that adequate sidewalk width can be maintained.

- Demand for bicycle parking is oriented more towards long-term parking.

The location chosen for the bicycle shelter should be central to all surrounding activities so cyclists can park and walk conveniently to their final destination.

Bicycle parking area signage should be provide to indicate to cyclists and pedestrians that the bicycle shelter is intended exclusively for bicycle use and to alert pedestrians and motorists that they can expect higher bicycle volumes in the area.

## Long-Term Parking

Long-term facilities protect the entire bicycle, its components and accessories against theft and against inclement weather, including snow and wind-driven rain. Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Potential locations for long-term bicycle parking include transit stations, large employers and institutions where people use their bikes for commuting, and not consistently throughout the day.

### Bike Lockers

#### Design Summary

Place in close proximity to building entrances or transit exchanges, or on the first level of a parking garage.

Provide door locking mechanisms and systems.

A flat, level site is needed; concrete surfaces preferred.

Enclosure must be rigid.

Transparent panels are available on some models to allow surveillance of locker contents.

Integrated solar panels have been added to certain models for recharging electric bicycles.

Minimum dimensions: width (opening) 2.5'; height 6'; depth 4'.

Stackable models can double bicycle parking capacity.



*A bike locker at an office building (shown in 'open' position).*

#### Discussion

Although bicycle lockers may be more expensive to install, they can make the difference for commuters who are deciding whether or not to cycle. Bicycle lockers are large metal or plastic stand-alone boxes and offer the highest level of bicycle parking security available.

Some lockers allow access to two users - a partition separating the two bicycles can help ensure users feel their bike is secure. Lockers can also be stacked, reducing the footprint of the area, although that makes them more difficult to use.

Security requirements may require that locker contents be visible, introducing a tradeoff between security and perceived safety. Though these measures are designed to increase station security, bicyclists may perceive the contents of their locker to be less safe if they are visible and will be more reluctant to use them. Providing visibility into the locker also reduces unintended uses, such as use as homeless shelters, trash receptacles, or storage areas. Requiring that users procure a key or code to use the locker also reduces these unintended uses.

Traditionally, bicycle lockers have been available on a sign-up basis, whereby cyclists are given a key or a code to access a particular locker. Computerized on-demand systems allow users to check for available lockers or sign up online. Models from eLocker and CycleSafe allow keyless access to the locker with the use of a SmartCard or cell phone. With an internet connection, centralized computerized administration allows the transit agency to monitor and respond to demand for one-time use as well as reserved lockers.

Lockers available for one-time use have the advantage of serving multiple users a week. Monthly rentals, by contrast, ensure renters that their own personal locker will always be available. Bicycle lockers are most appropriate:

- Where demand is generally oriented towards long-term parking.

- At transit exchanges and park-and-rides to help encourage multi-modal travel.

- Medium-high density employment and commercial areas and universities.

- Where additional security is required and other forms of covered storage are not possible.

## Bicycle Compounds/Cages

### Design Summary

See guidelines for bicycle rack placement and clear zones.

A cage of 18' by 18' can accommodate up to 20 bicycles and uses the space of approximately two automobile parking spots.

Improve surveillance through public lighting and video cameras.

Bicycle compounds shall have an exterior structure consisting of expanded metal mesh from floor to ceiling.

In an attended parking facility, locate within 100' of an attendant or security guard or must be visible by other users of the parking facility.

Entry doors must be steel and at least 2.5' in width, with "tamper proof" hinges. A window may be provided in the door to provide permanent visual access.

Accommodate a maximum of 40 bicycles or 120 if the room is compartmentalized with expanded metal mesh with lockable industrial-grade doors into enclosures containing a maximum of 40 bicycles.



*This bike cage in Penn Station, New York City provides wave racks and uses a passcard for access.*



*Secure Parking Area (SPA) in Portland, OR use both inverted 'u' racks (right) and racks that stack bicycles.*

### Discussion

Bicycle compounds are fully enclosed, stand-alone bicycle parking structures. Compounds should not only have a locked gate but should also allow for the frame and both wheels to be locked to a rail, as other users also have access to the enclosure. Bicycle compounds are recommended for employment or residential bicycle parking areas, or for all-day parking at transit exchanges, workplaces and schools. They can be located at street level or in parking garages.

Bicycle Secure Parking Areas (SPAs) are a new concept implemented for TriMet (Portland, Oregon's transit agency). They provide high capacity, secure parking areas for 80-100 bicycles at light rail and bus transit centers. The Bicycle SPAs are semi-enclosed covered areas that are accessed by key cards and monitored by security cameras. The increased security measures provide an additional transportation option for those who may not be comfortable leaving their bicycle in an outdoor transit station exposed to weather and the threats of vandalism. They also include amenities that make the Bicycle SPA more attractive and inviting for users such as benches, bicycle repair stations, bicycle tube and maintenance item vending machines, as well as hitching posts which allow people to leave their locks at the SPA.

## Bicycle Rooms

### Design Summary

See guidelines for bicycle rack placement and clear zones.  
 Improve surveillance through public lighting and video cameras.  
 Walls should be solid and opaque from floor to ceiling.  
 Install a panic button so as to provide a direct line of security in the event of an emergency.  
 Accommodate a maximum of 40 bicycles or 120 if the room is compartmentalized with expanded metal mesh with lockable industrial-grade doors into enclosures containing a maximum of 40 bicycles.



*Bike rooms can be provided in office or apartment buildings.*

### Discussion

Bicycle rooms are locked rooms or cages which are accessible only to cyclists, and which may contain bicycle racks to provide extra security against theft. Bicycle rooms are used where there is a moderate to high demand for parking, and where cyclist who would use the bicycle parking are from a defined group, such as a group of employees. Bicycle rooms are also popular for apartment buildings, particularly smaller ones in which residents are familiar with one another.

The bicycle parking facilities shall be no further from the elevators or entrances than the closest motor vehicle parking space, and no more than 150' from an elevator or building entrance. Buildings with more than one entrance should consider providing bicycle parking close to each entrance, and particularly near entrances that are accessible through the bicycle network. Whenever possible, bicycle parking facilities should allow 24-hour secure access.

Dedicated bicycle-only secure access points shall be provided through the use of security cards, non-duplicable keys, or passcode access. The downside is that bicyclists must have a key or know a code prior to using the parking facilities, which is a barrier to incidental use.

## 7. Proposed Network Improvements

This chapter presents proposed bikeways and bicycle support facilities identified through input from the community, the Plan Advisory Committee, and the needs analysis. The proposed improvements are intended to make bicycling more comfortable and accessible for bicyclist of all skill levels and trip purposes. This chapter presents the following improvement types:

- **Network Improvements** include recommendations to expand the bikeway system so the community has a seamless and comprehensive bicycle network.
- **Bikeway Wayfinding Signage Recommendations** identify standard bikeway signage standards for citywide implementation.

### 7.1. Network Improvements

This section includes bikeway network, pavement markings and signage improvements. The bikeway recommendations include over 140 miles of new on-street bikeways (including bike lanes, bike routes and shared lane markings) to increase Greenville's bicycle network connectivity and to create a comprehensive, safe, and logical network. This mileage is in addition to over 60 miles of proposed greenway trails, which includes existing recommendations from the City's *Trail and Greenways Master Plan* and additional mileage proposed through the Bicycle Master Plan process. At full build out of the proposed bikeways, Greenville will have over 190 bikeway miles, improving connections from residential neighborhoods to attractors such as retail, transit, and jobs.<sup>1</sup> Pavement markings and signage will support the bikeway network by providing network identification and wayfinding for cyclists.

Error! Reference source not found. shows the existing and proposed bikeway network and **Table 7-4** through **Table 7-3** list the bikeways by type and mileage. The proposed bikeways were developed with consideration for roadway widths, traffic volumes and speeds, and connections to destinations. This Plan proposes four bikeway types, listed below and described in Sections 7.1.1 through 7.1.5.

- Bicycle Lanes
- Roadways with Shared Lane Markings
- Bicycle Routes (also known as "Neighborhood Greenways" or "Bike Boulevards")
- Multi-Use Paths

Greenville will want to consider the development of a "bicycle boulevard" system designed and developed as this Plan is implemented in conjunction with the City's Neighborhood Traffic Calming program<sup>2</sup> and subject to the City's traffic calming policy and procedures. The design considerations for bicycle boulevards are introduced in this document in the Design Guidelines (Chapter 6).

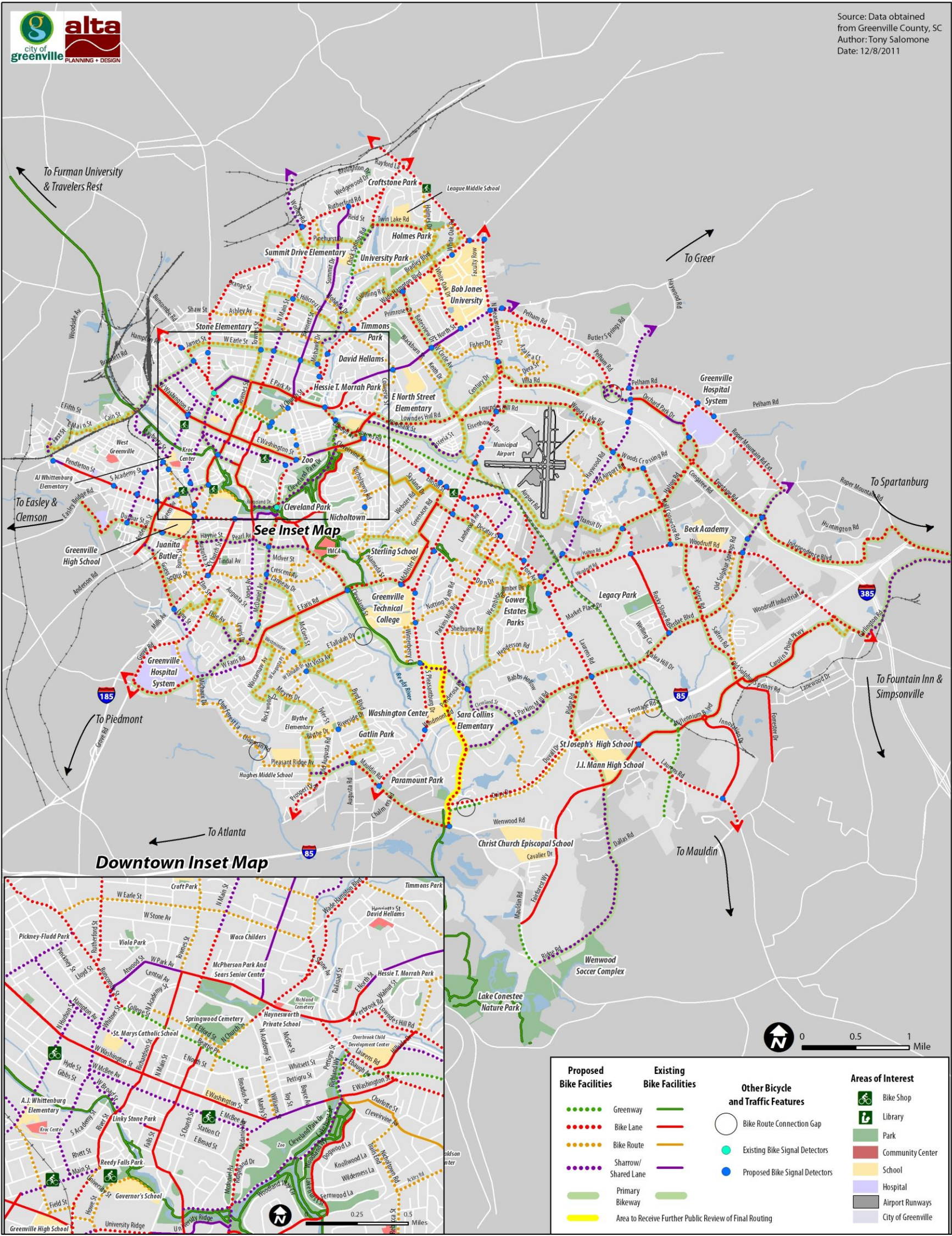
<sup>1</sup> Currently, Greenville has over 400 miles in its roadway network, more than 40 percent of which is owned by SC DOT.

<sup>2</sup> The City of Greenville's Public Works Department webpage provides detailed information on traffic calming policies, procedures and accepted techniques.



Map7-1 Proposed Network Improvements

Source: Data obtained from Greenville County, SC  
Author: Tony Salomone  
Date: 12/8/2011





### 7.1.1. Bicycle Lanes

Bicycle lanes provide a signed, striped, and stenciled lane for one-way travel on both sides of a roadway. Bicycle lanes are often used by commuters, bicycle enthusiasts, and casual riders (if on lower volume and lower speed roadways). Bicycle lanes are often recommended on roadways with moderate traffic volumes and speeds and where separation of users facilitates safer operation.

The recommended Bicycle Lanes are recommended on higher volume roadways that serve as important connections in the bikeway network.

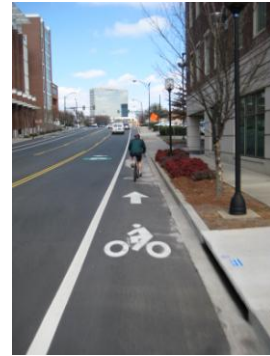


Figure 7-1: Bike Lane

Table 7-1: Recommended Bike Lanes (reference chapter 6 for detailed description of improvement types)

Location	From	To	Length (miles)	# Travel Lanes	Roadway Width (ft)	Improvement Type
Airport Rd	Laurens Rd	Keith Dr	0.41	2	28	Paved Shoulder
Andrew St	Dunbar St	Easley Bridge Rd	0.36	5	62	Road Diet
Antrim Dr	Ellison St	Laurens Rd	0.57	4	42	Road Diet
Augusta St	Field St	University St	0.13	2	46	Parking Reduction
Augusta St	Vardry St	Field St	0.11	4	44	Road Diet
Augusta St	Woodfin Ave	Vardry St	0.42	4	42	Road Diet
Augusta St	Otis St	S Church St	0.2	5	62	Road Diet
Batesview Dr	Wade Hampton Blvd	North St	0.60	2	32	Lane Narrowing
Carolina Point Pkwy	Woodruff Rd	Fibers Dr	0.30	4	86	Road Diet
Chick Springs Rd	Twin Lake Rd	Rutherford Rd	0.32	2	22	Paved Shoulder
Church St	S of E Stone Ave	N of E Stone Ave	0.18	4	50	Road Diet
Church St	N Academy St	S of E Stone Ave	0.31	4/4	63/50	Road Diet
Cleveland St	McIver St	E. Faris Rd	0.54	5	24	Lane Narrowing
Column St	Wade Hampton Blvd	Church St	0.23	4	40	Road Diet
Dunbar St	Leach St	Augusta St	0.75	5	64	Lane Narrowing
Dunbar St	Andrew St	Leach St	0.23	4	54	Lane Narrowing
Duvall Rd	Ridge Rd	Parkins Mill Rd	1.44	2	24	Paved Shoulder
Faris Rd	E of Grove Rd	Grove Rd	0.27	4	46	Paved Shoulder

## Chapter 7 | Proposed Network Improvements

Location	From	To	Length (miles)	# Travel Lanes	Roadway Width (ft)	Improvement Type
Faris Rd	Michaux Dr	E of Grove Rd	0.37	6	75	Lane Narrowing
	E of Swamp					
Faris Rd	Rabbit Trail	Cleveland St	0.22	4	46	Paved Shoulder
		E of Swamp				
Faris Rd	W of McAlister Rd	Rabbit Trail	0.26	5	64	Lane Narrowing
		W of McAlister				
Faris Rd	Pleasantburg Dr	Rd	0.20	5	56	Paved Shoulder
Grove Rd	Augusta St	W Faris Rd	1.28	4	39/46	Road Diet
Guess St	Green Ave	Mills Ave	0.58	2	22	Paved Shoulder
Halton Rd	Mall Connector Rd	Pelham Rd	1.55	5	62	Road Diet
		Mall Connector				
Halton Rd	Haywood Rd	Rd	0.77	3	36	Road Widening
		Roper				
I-385 Frontage Rd	Patewood Dr	Mountain Rd (N)	1.18	2	22	Paved Shoulder
		Roper				
Independence Blvd	Roper Mountain Rd (N)	Mountain Rd (S)	1.66	2	22	Road Shoulder
		N of				
Industrial Dr	Fore Ave	Commercial Dr	0.62	2	22	Paved Shoulder
Laurens Rd	I-385	Park Ave	0.10	6	80	Road Diet
Laurens Rd	Verdae Blvd	I-385	5.27	4/5/6	63/80/82	Lane Narrowing
Laurens Rd	S of Verdae Blvd	Verdae Blvd	0.09	10	110	Paved Shoulder
		S of Verdae				
Laurens Rd	Duvall Dr	Blvd	0.20	7/4	88/76	Road Diet
Legrand Blvd - John McCarroll Way Rte	Don Dr	McAlister Rd	0.38	3	30	Lane Narrowing
Lowndes Hill Rd	Walnut St	North St	0.07	2	38	Lane Narrowing
Lowndes Hill Rd	Walnut St	Oakland Dr	1.07	2	24	Paved Shoulder
Lowndes Hill Rd	Oakland Dr	Keith St	0.08	2	38	Lane Narrowing
Main St	Rutherford Rd	Ashley Ave	0.97	4	52	Road Diet
Main St	Ashley Ave	Academy St	0.70	2/5	52	Road Diet
Mall Connector Rd	Woods Crossing Rd	Woodruff Rd	0.76	3	36	Paved Shoulder
Mauldin Rd	Crystal Ave	N Kings Rd	0.75	5	65	Lane Narrowing
Mauldin Rd	N Kings Rd	Parkins Mill Rd	0.47	5	65	Lane Narrowing
McBee Ave	Academy St	Broad St	0.16	5	60	Road Diet
McDaniel Ave	Augusta St	Camille Ave	0.21	2	40	Lane Narrowing

Location	From	To	Length (miles)	# Travel Lanes	Roadway Width (ft)	Improvement Type
McDaniel Ave	Ridgeland Dr	McBee Ave	0.07	2	28	Lane Narrowing
McDaniel Ave	Broad Street	Ridgeland Dr	0.18	2	28	Paved Shoulder
McDaniel Ave	Woodland Way	Cleveland St	0.30	2	28	Paved Shoulder
Mills Ave	Lynn St	Augusta St	0.45	5/4	63/52	Road Diet
Old Woodruff Dr	Woodruff Rd	Haywood Rd	0.20	2	22	Paved Shoulder
Parkins Mill Rd	Mauldin Rd	Richwood Dr	2.23	2	23	Paved Shoulder
Parkins Mill Rd	Laurens Rd	Richwood Dr	0.74	2	33	Lane Narrowing
Pelham Rd - Roper Mountain Rd Lane	E North St	Pelham Rd	2.32	5	63	Road Diet
Pelham Rd - Roper Mountain Rd Lane	Pelham Rd	Keys Dr/Roper Mountain Rd	0.97	2	21	Paved Shoulder
Pendleton St	Main St	Academy St	0.43	4	43	Road Diet
Pete Hollis Blvd - Buncombe Rd	Margaret Ct	City Limit	0.80	8/7	90/74	Paved Shoulder
Pleasantburg Dr	Rutherford Rd	City Limit	0.31	7	89	Road Diet
Pleasantburg Dr	N of Auburn St	Rutherford Rd	0.21	7	84	Paved Shoulder
Pleasantburg Dr	Wade Hampton Blvd	N of Auburn St	0.71	7	87	Road Diet
Pleasantburg Dr	Crescent Ridge Dr	Wade Hampton Blvd	0.94	7	82	Paved Shoulder
Pleasantburg Dr	Century Dr	Crescent Ridge Dr	0.35	7	110	Parking Reduction
Pleasantburg Dr	S of Century Dr	Century Dr	0.16	7	80	Paved Shoulder
Pleasantburg Dr	Lowndes Hill Rd	S of Century Dr	0.32	9	128	Road Diet
Pleasantburg Dr	BRT Trail	Lowndes Hill Rd	0.66	7	84	Paved Shoulder
Pleasantburg Dr	Cleveland St	BRT Trail	1.86	5/5/6/ 7/7	50/64/78/ 93/86	Road Diet
Pleasantburg Dr	Cleveland St	Mauldin Rd	1.32	7	84	Paved Shoulder
Prosperity Ave	Old Augusta Rd	Shemwood Ln	0.53	2	33	Lane Narrowing
Reid St - Twin Lake Rd	Chick Springs Rd	Holmes Dr	0.50	2/2	40/30	Lane Narrowing
Ridge Rd	Parkins Mill Rd	Fairforest Way	1.14	2/3	24/37	Paved shoulder
Rocky Slope Rd	Woodruff Rd	Halton Rd	0.27	3	36	Road Diet
Roper Mountain Rd	Independence Blvd	Garlington Rd	0.69	2	20	Paved Shoulder

## Chapter 7 | Proposed Network Improvements

Location	From	To	Length (miles)	# Travel Lanes	Roadway Width (ft)	Improvement Type
Rutherford Rd	Rayford La	Pleasantburg Dr	0.10	6	75	Road Diet
Rutherford Rd	Stone Lake Ct	Rayford La	0.09	5	62	Paved Shoulder
Rutherford Rd	Chick Springs Rd	Stone Lake Ct	0.14	5	64	Road Diet
Rutherford Rd	Arcadia Dr	Chick Springs Rd	0.90	5	63	Paved Shoulder
Rutherford Rd	Paris View Dr	Arcadia Dr	0.40	5	64	Road Diet
Rutherford Rd	Poinsett Hwy	Paris View Dr	0.76	5	63	Paved Shoulder
Rutherford St	Croft St	Shaw St	0.18	5	63	Road Diet
Rutherford St	W Stone Ave	Croft St	0.21	5	56	Paved Shoulder
Rutherford St	Buncombe St	W Stone Ave	0.21	5	64	Road Diet
Salters Rd - Old Sulphur Springs Rd - Forrester Dr Lane	Woodruff Rd	Millenium Blvd	1.43	2	17	Paved Shoulder
Townes St	Mountainview Ave	Randall St	0.26	2	33	Lane Narrowing
University Ridge	Howe St	Church St	0.28	5	62	Road Diet
Verdae Blvd - E Parkins Mills Rd Lane	Woodruff Rd	E of Laurens	1.83	5	64	Lane Narrowing
Verdae Blvd - E Parkins Mills Rd Lane	E of Laurens	Isbell Ln	0.63	2	21	Paved Shoulder
Villa Rd	Pleasantburg Dr	bend in Villa Rd	0.93	2	27	Paved Shoulder
Wade Hampton Blvd	N of E Stone Ave	Pleasantburg Dr	1.88	7	90	Road Diet
White Oak Dr	Midland St	North St	0.19	3	49	Lane Narrowing
White Oak Dr	Wade Hampton Blvd	Midland St	0.43	2	27	Paved Shoulder
Woodruff Rd	Laurens Rd	Old Country Rd	2.78	5	64	Road Diet
Woodruff Rd	Old Country Rd	Carolina Point Pkwy	0.21	5	64	Road Diet
Woodruff Rd	Carolina Point Pkwy	Garlington Rd	0.36	5	62	Paved Shoulder
Woods Crossing Rd - Lowndes Hill Rd - Washington St	W of Hayward Rd	Keith Rd	1.65	2	20	Paved Shoulder

Location	From	To	Length (miles)	# Travel Lanes	Roadway Width (ft)	Improvement Type
Woods Crossing Rd - Lowndes Hill Rd - Washington St	Haywood Rd	W of Haywood Rd	0.10	3	62	Road Diet
Woods Crossing Rd - Lowndes Hill Rd - Washington St	Old Airport Rd	Haywood Rd	0.20	5	56	Paved Shoulder
Woods Crossing Rd - Lowndes Hill Rd - Washington St	Mall Connector Rd	Old Airport Rd	0.18	4	52	Road Diet
<b>Proposed Bike Lanes:</b>			<b>62.34</b>			



### 7.1.2. Shared Lane/Shared Lane Markings

Roadways with Shared Lane Markings (SLMs) or Sharrows, are bicycle routes with stencils in the travel lane for bicycle accommodation.

Roadways with Sharrows are proposed on narrow roadways without adequate space for dedicated bike lanes, and roadways with high street-parking turnover in retail districts. Sharrows are not suggested for roadways with speed limits above 35mph. Sharrows will help bicycle mobility and access while increasing driver and bicycle awareness.

This plan recommends sharrows be used on Bicycle Routes where there are narrow travel lanes, high parking turn over, when bicyclists may need assistance with lane positioning, and where drivers may need additional notice to expect bicyclists regardless of the auto parking configuration. This Plan also recommends the sharrows be placed in the center of the travel lane to reduce maintenance and to direct bicyclists outside the door zone.

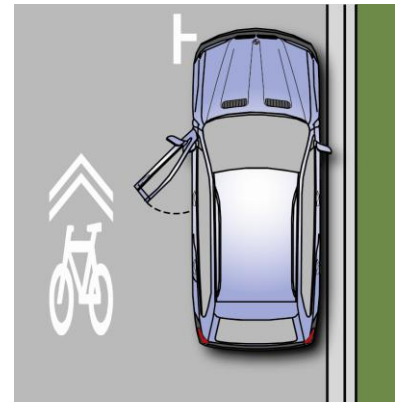


Figure 7-2: Shared Lane Marking

Table 7-2: Recommended Sharrow Routes

Location	From	To	Mileage
Broad St - Butler Ave Lane	Main St	Buncombe St	0.81
Brookwood Dr - Aberdeen Dr	Lewis Dr	Elsie Ave	0.24
Chick Springs Rd	Twin Lake Rd	Gallivan St	0.75
Chick Springs Rd	Northwood Ave	Twin Lake Rd	0.23
Cleveland Park Dr - Lakehurst St Rte	Washington St	Cleveland St	1.07
Cleveland St ext	Pleasantburg Dr	Parkins Mill Rd	0.24
Cleveland St	Southland Ave	Jones Ave	0.54
E Parkins Mill Rd	Parkins Mill Rd	Isbell Ln	0.92
Faris Rd	Highland Dr	Club Forest Lane	0.46
Garlington Rd	Woodruff Rd	Roper Mountain Rd	1.32
Hampton Ave	Academy St	Mulberry St	0.67
Harris St	Augusta St	Howe St	0.12
Haynie St - Pearl Ave Rte	Augusta St	Cleveland St	0.54
Haywood Rd	Laurens Rd	City Limit	2.60
Hudson St	Hampton Ave	Dunbar St	1.35
Jones Ave	University Ridge	August St	0.74
Lois Ave - Woodside Rd Lane	Pendleton St	City Limit	0.25
Lynn St	Mills Ave	Grove Rd	0.28
Main St	Park Dr	Park Ave	0.38
Main St	Anderson St	River St	0.41
McBee Ave	Washington St	Academy St	0.67

Location	From	To	Mileage
McBee Ave	McDaniel Ave	Washington St	0.11
McDaniel Ave.	Camille Ave	Cleveland St	0.52
McDaniel Ave.	E Broad St	Woodland Way	0.20
Melville Ave	Brookwood Dr	Faris Rd	0.45
Mayberry Street	Willard Street	Hudson Street	0.57
Mulberry St.	Pete Hollis Blvd	Hampton Ave	0.23
Mulberry St - Willard St.- Cain St	Hampton Ave	Swamp Rabbit Trail	0.51
Nelson St	Guess St	Anderson St	0.10
North St	White Oak Dr	City Limit	0.53
Pointe Cir - Orchard Park Sharrow	Villa Rd	Haywood Rd	0.57
Potomac Ave	Long Hill St	Augusta Rd	0.42
Richland Way	Washington St	Laurens Road	0.23
Ridge Rd	Mauldin Rd	City Limit	2.01
Roper Mountain Rd	Waterway Ct	Woodruff Rd	0.72
Sevier St	Brookwood Dr	Augusta St	0.19
Simmons Ave – Sycamore Dr – Boland St	Laurens Rd	Airport Rd	0.44
Wardlaw St - Westfield St Rte	Main St	Broad St	0.56
Woodlark St	Hillside Dr	Keith Dt	1.02
Worley Rd	Rutherford Rd	City Limit	0.48
<b>TOTAL</b>			<b>24.45</b>

### 7.1.3. Bicycle Routes

Bicycle Routes provide for shared roadway use and are generally only identified with signing (Figure 7-3). However, Primary Bicycle Routes, identified in the proposed network map, may warrant Level 2 or higher Bicycle Boulevard treatments (see pages 6-38 to 6-44 of this Plan) based on traffic considerations and adjacent land uses. Bicycle Routes may have a wide travel lane or shoulder that allow for parallel travel with automobiles. Or they may be a typical residential street with very low traffic volumes and speeds.

The recommended Bicycle Routes provide connections through residential areas connecting residents to schools, retail districts, and other community destinations, typically without having to travel on main arterial roadways. The bike routes identified in this plan should provide the basis for a comprehensive Bike Boulevard system of low-speed, low-volume bike routes throughout the city.

Figure 7-3. Bicycle Routes are generally only identified with signing.



Table 7-3: Recommended Bike Routes

Location	From	To	Mileage
Ackley Rd - Fernwood Lane - Woodland Way Rte <sup>3</sup>	Beechwood Ave	Cleiveirvine Ave	0.30
Afton Ave - Mclver St Rte	Crescent Ave	Cleveland St	0.42
Alameda St - Hilton St Rte	Clark St	Faris Rd	0.57
Amber Dr	Carolina Ave	Wembley Rd	0.20
Arthur Ave - Prentiss Ave Rte	Keowee Ave	Lynn St	0.53
Ashley Ave - Shaw St Lane	Main St	City Limit	0.69
Augusta St	Augusta Pl	Tallulah Dr	0.12
Augusta St	University St	Main St	0.09
Avondale Dr - Arcadia Dr Rte	Rutherford Rd	end of Arcadia Dr	0.56
Azalea Ct - Dera St - Greenland Dr Rte	Crescent Ridge Dr	Villa Rd	1.07
Blythe Dr	Augusta St	Long Hill St	0.32
Bradley Blvd - Brookside Cir Rte	White Oak Rd	Wade Hampton Blvd	0.80
Bradshaw St	Augusta St	Howe St	0.09
Burns St - Elms St Rte	Dunbar St	Grove Rd	0.66
Byrd Blvd - Gatlin Park Rte	Augusta Ct	Augusta St	1.48
Byrdland Dr	Woods Lake Rd	Old Airport Rd	0.77
Byrdland Dr - Old Airport Rd Rte	Woods Crossing Rd	Proposed Greenway	0.84
Carolina Ave	Laurel Creek Ln	Wembley Rd	0.29
Century Dr	Keith Dr	Pleasantburg Dr	0.65

<sup>3</sup> Note that the abbreviation “Rte” signifies a series of roadways that connect to create a continuous bikeway, rather than a single roadway.

Location	From	To	Mileage
Chick Springs Rd - Mohawk Dr Rte	Wade Hampton Blvd	Summit Dr	0.40
Church St	Academy St	Beattie Place	0.32
Circle Ave	North St	Keith Dr	0.45
Circle Ave - Fisher Dr Rte	North St	Pleasantburg Dr	0.63
Cleveirvine Ave - Haviland Ave - Nicholtown Rd - Alameda St - Rebecca St Rte	Beechwood Ave	Clark St	0.81
Club Forest Lane - Michaux Dr Lane	Chapman Rd	Grove Rd	1.42
Crescent Ave	Church Ave	Cleveland St	1.19
Crescent Ridge Dr - Winthorp Ave Rte	Pleasantburg Dr	600' South of Fisher Dr	0.37
Crystal Ave	Old Augusta Rd	Augusta Rd	0.17
Dairy Dr	Ridge Rd	End of Dairy Dr	1.11
Decatur St	Parkins Mill Rd	Antrim Dr	0.39
Dellwood Dr	Stephens Lane	Chick Springs Rd	0.76
Don Dr	Wembley Rd	Legrand Blvd	0.51
Ebaugh Ave	Traxier St	Richard Way	0.14
Ellford St	Academy St	Church St	0.39
Elsie Ave - Lewis Dr - Brookwood Dr Rte	Cateechee Ave	Faris Rd	0.69
Field St	Augusta St	Market St	0.13
Fore Ave - Waite St Rte	Laurel Creek Lane	Carolina Ave	0.17
Frontage Rd	Laurens Dr	Proposed Greenway Near Millenium Blvd	0.41
Gallivan St	Main St	Mohawk Dr	0.39
Gatlin Park Rte	Sylvan Dr	Granada Dr	0.32
Gilfilling Rd - Essex Ct - Ridgecrest Dr Rte	Brookside Cir	Chick Springs Rd	0.77
Hanover - Bleckley Ave Rte	Sunset Ln	Decator St	0.34
Henderson Rd	Cleveland St	Laurens Rd	1.18
Hillcrest Dr - Orange St Rte	Townes Sr	Mohawk Dr	0.79
Hillside Dr - Prescott St - Harrington Ave Rte	Lowndes Hill Rd	Wade Hampton Blvd	1.08
Howe St - Fruman College Way Rte	University Ridge	End of Fruman College Way	0.53
James St - Earle St Rte	Buncombe St	Wade Thomas Blvd	1.25
Keith Dr - Airport Rd - Transit Dr Rte	North St	Halton Rd	2.95
Keowee Ave	Cateechee Ave	Elsie Ave	0.19
Lanneau Dr	McDaniel Ave	Faris Rd	0.46
Laurel Creek Ln	Laurens Dr	Carolina Ave	0.21
Market Point Connector	Carolina Point Pkwy	Woodruff Rd	0.28
Market St	Vardy St	Hudson St	0.49

Location	From	To	Mileage
McCuen St - Augusta Pl Rte	Faris Rd	Tallulah Dr	0.70
Mohawk Dr	Gallivan St	Wade Hampton Blvd	0.19
Mulberry St - Willard St - Cain St Rte	Swamp Rabbit Trail	2nd St	1.05
Nottingham Rd - Legrand Blvd Rte	Parkins Mill Rd	Pleasantburg Dr	0.54
Old Augusta Rd	Augusta St	Prosperity Ave	0.09
Old Sulphur Springs Rd	Woodruff Rd	Salters Rd	1.10
Otis St	Guess St	Augusta St	0.40
Parkins Lake Rd - Cleveland St Rte	Parkins Mill Rd	Duvall Dr	1.59
Penn St - Mt Vista Ave Rte	Byrd Blvd	Tallulah Dr	0.34
Phillips Lane - Augusta Ct Rte	Meyers Dr	End of Augusta Ct	0.29
Pinehurst Dr - Northwood Ave Rte	Avalon Dr	Chick Springs Rd	0.41
Pleasant Ridge Ave - Penrose Ave - Chapman Rd Rte	Old Augusta Rd	End of Chapman Rd	0.82
Ponderosa Rd	Cleveland St	Parkins Mill Rd	0.28
Primrose Ln - Midland St - Buena Vista Ave Rte	White Oak Dr	Batesview Dr	0.41
Rice St - Long Hill St Rte	Meyers Dr	Prosperity Ave	0.81
Riverside Dr	Byrd Blvd	Augusta St	0.25
Shelburne Rd	Parkins Mill Rd	Wembley Rd	0.40
Skyland Park Rte	175' S of Ackley Rd	230' N of Webster Rd	0.13
St Josephs Dr	Ridge Rd	Laurens Rd	0.51
Stephens Lane - Delwood Dr - Holmes Dr Rte	Wade Hampton Blvd	Pleasantburg Dr	0.96
Tallulah Dr	Augusta Pl	End of Tallulah Dr	0.73
Townes St	Hillcrest Ave	Randall St	0.50
Townes St	Mountainview Ave	Hillcrest Ave	0.08
Villa Rd	bend in Villa Rd	Pelham Rd	0.30
Waccamaw Ave - Meyers Dr Rte	Faris Rd	Augusta Dr	1.20
Webster Rd - Clark St - Greenacre Rd Rte	McAlister Rd	Baxter St	0.76
Webster Rd - Clark St - Greenacre Rd Rte	Skyland Dr	Clark St	0.52
Wembley Rd	Laurens Rd	Henderson Rd	1.10
Westminster Dr	Faris Rd	Augusta Pl	0.31
White Oak Rd - Twin Lake Rd	Wade Hampton Blvd	Holmes Dr	0.58
White Oak Rd Connector Rte	White Oak Rd cul-de- sac	White Oak Rd	0.08
Williams St	Washington St	North St	0.26
Willow Springs Dr	Parkins Mills Dr	Existing Greenway	0.27
Willow Springs Dr - Sunset Ln -	Wembley Rd	Decator St	0.58

Location	From	To	Mileage
Brookdale Ave Rte			
Winterberry Ct	Cleveland St	Pleasantburg Dr	0.49
<b>TOTAL</b>			<b>51.17</b>



#### 7.1.4. Corridor Design Recommendations

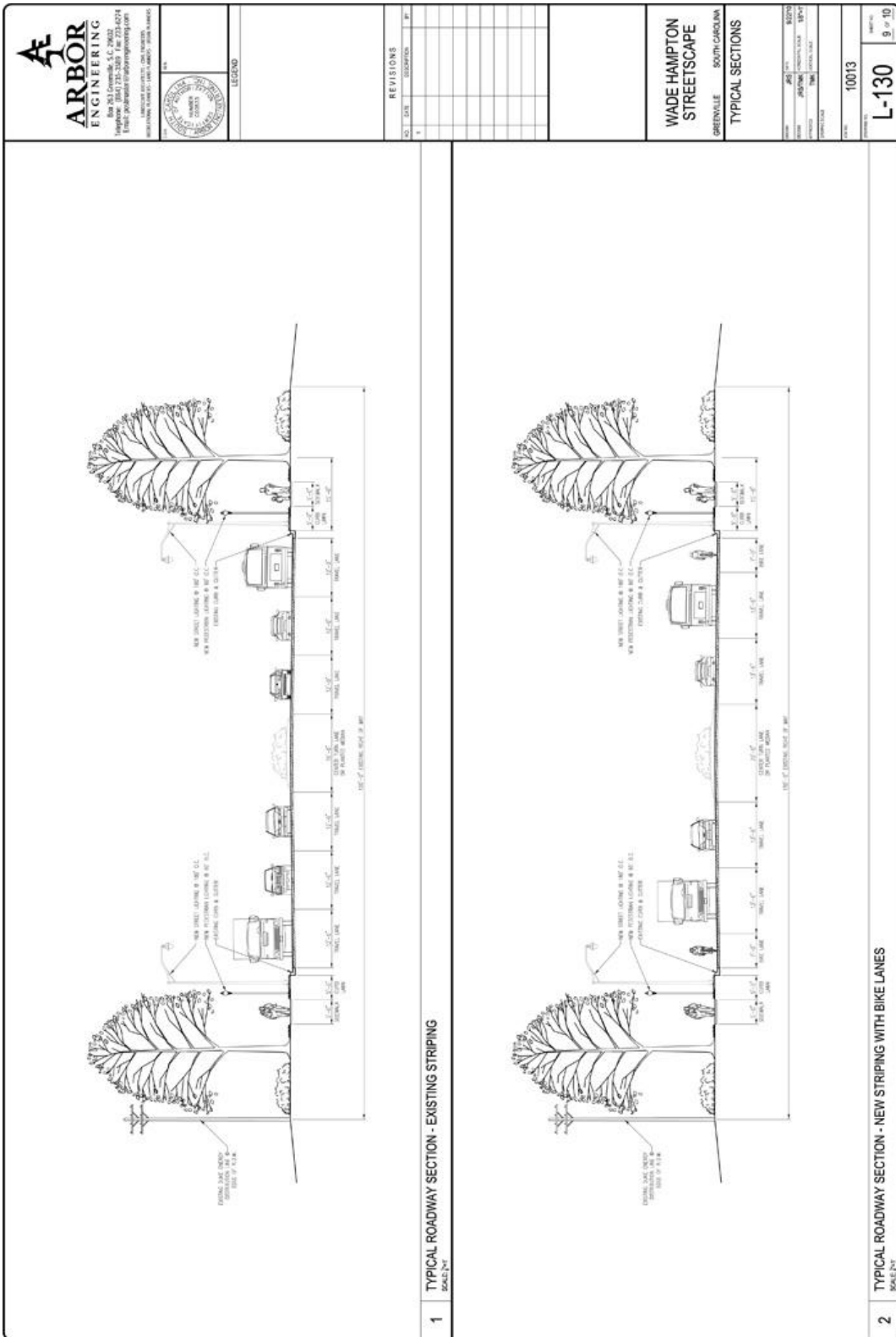
Greenville is bisected by several high-volume, relatively high-speed commercial arterials, which provide challenging conditions for cyclists attempting to move along or across these corridors. The corridors are characterized by 5- to 7-lane cross-sections and are typically signed for speeds in excess of 35 miles per hour. Traffic volumes on these roadways tend to be high. These corridors also are the location of many primary local and regional destinations and provide critical north-south and east-west connectivity. These corridors were also named as priority locations for bicycling improvements by participants in the public input process of this plan (see Chapter 4 for further information). These corridors include:

- Pelham Road
- Roper Mountain Road
- Pleasantburg Drive
- Laurens Road/US 276
- Wade Hampton Boulevard
- Poinsett Highway
- Church Street/Mills Avenue Corridor
- Woodruff Road
- Buncombe Road/Pete Hollis B
- Augusta Street

The Bicycle Suitability Analysis (Chapter 3) rates all of these corridors as very challenging for cyclists due to speeds, volumes, percentage of truck traffic, and number of lanes. These roadways are also difficult for bicycle traffic because of the number of driveways and the general lack of medians that could limit the amount and location of turning traffic.

At a minimum, this plan recommends that bicycle lanes be implemented on these roadways. However, bike lanes alone will provide very little comfort for most cyclists on roadways of this nature. Higher order bicycle facilities that provide greater separation between bicyclists and motor vehicles would be more appropriate (such as buffered bike lanes, cycletracks, or sidepaths). None of these bikeway types are appropriate for these corridors in their current condition, however, until a more comprehensive approach to the corridor design and planning is implemented. Such planning and design would include access management approaches to limit the number and spacing of driveways and turning locations; land use policies to facilitate more bicycle- and pedestrian-friendly development patterns; connectivity improvements to provide additional parallel route options; travelway designs that are more appropriate to an urban context; and speed reduction measures for motor vehicle travel.

The City has already begun such planning and design with a concept to reconfigure Wade Hampton Boulevard to include new streetscaping and a new street cross-section that includes fewer lanes (sufficient to accommodate existing and future traffic), a median, and bicycle lanes (Figure 5-6 on the following page). The City has also developed corridor plans for Woodruff Road and Pleasantburg; however, the plans do not include detailed design concepts for bikeway design along the roadways. Such comprehensive corridor design is recommended for the other corridors noted above.



### 7.1.5. Multi-Use Paths

A Multi-use Path (shown in Figure 7-4) provides for bicycle and pedestrian travel on a paved right-of-way completely separated from streets or highways. These recommended facilities can be popular for recreational bicycling as well as for commuting.

The recommended Multi-use Paths for Greenville include those proposed in the City's *Trails and Greenways Master Plan* as well as new pathway locations and connector trails recommended by this plan. This plan also includes the “urban” multi-use trail recommended for the College/Beattie Street corridor by the recent *Downtown Streetscape Master Plan*.

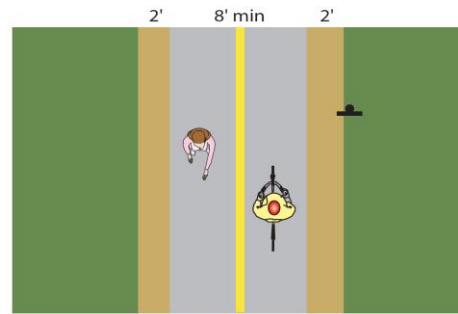


Figure 7-4: Multi-use Path

Table 7-4: Recommended Urban Trails

Location	From	To	Length (miles)
Beattie Pl	Heritage Green Pl	North St	0.68
BRT Trail	Traxler St	Millenium Blvd	4.38
Chick Springs Greenway	Twin Lake Rd	Poinsettia Pl	0.54
Dairy Dr Greenway	End of Dairy Dr	Parkins Mill Rd	0.33
Mauldin Rd Sidepath	Fairforest Way	Ridge Rd	0.43
Millenium Blvd Greenway	Millenium Blvd	Dallas Rd	0.84
Richland Way	Washington St	Laurens Rd	0.24
Tallulah Dr - Cleveland St Connector	Tallulah Dr	Cleveland St	0.15
<b>Proposed Multi-Use Paths:</b>			<b>7.61</b>

### 7.1.6. Wayfinding Signage

Wayfinding signs direct bicyclists along the bicycle network and to community destinations. These signs may also include “distance to” information, which displays mileage to community destinations.

This Plan recommends installation of custom City of Greenville wayfinding signs at decision points and confirmation signs that display destinations and mileage.

Decision signs (Figure 7-5) mark the junction of two or more bikeways. Decision signs are comprised of a Bicycle Route Guide Sign and a Destination Supplemental Sign. Decision signs are located on the near-side of intersections. They include destinations and their associated directional arrows, but not distances.

Confirmation signs (Figure 7-6) confirm that a cyclist is on a designated bikeway. Each confirmation sign includes a Bicycle Route Guide Sign and a Destination Supplemental Sign. Confirmation signs are located mid-block or on the far-side of intersections. Confirmation signs include destinations and their associated distances, but not directional arrows.

Wayfinding signs may follow MUTCD standards, which use additional plaques that display destinations and mileage. The City would mount these plaques under existing bike route and lane signs. Alternatively, the City may decide to design guide signs that exhibit a unique symbol of Greenville. These signs display community's identity and support of local bicycling.

### Wayfinding Sign Placement Principles for Bikeways

The following principles inform the placement of individual signs:

1. A confirmation sign will be located at the beginning of each bikeway.
2. When a bikeway turns, a turn sign will be located in advance of the turn (e.g., near-side of the intersection).
3. When bikeways intersect, a decision sign will be located on the near-side of each intersection approach.
4. To allow adequate notification of left turns, the decision or turn sign should be placed a distance before the intersection based on the number of lanes the bicyclist must merge across in order to make a legal left turn:
  - a. Zero lane merge: 25'
  - b. One lane merge: 100'
  - c. Two lane merge: 200'

The decision or turn sign should always be located in the block immediately preceding the junction or turn.

5. Confirmation signs will be located at intervals of one-half mile to one mile, based on the density of streets and intersecting bikeways (e.g., Downtown will require more signs than residential neighborhoods). It is desirable for confirmation signs to be located following decision signs on the far-side of intersections at the first convenient installation location.
6. Confirmation signs should be located immediately following bikeway junctions on streets that do not have bicycle lanes or shared lane markings (e.g., in Downtown Greenville).

Figure 7-5: Example Decision Wayfinding Sign



### Sign Frequency

In general, there should be three to four bicycle wayfinding signs for each directional mile of bikeway. Each directional mile of bikeway will include two decision signs and one to two confirmations signs per directional mile of bikeway. Based on the specific route, turn signs should be included as needed.

### Supported Destinations

Bikeway wayfinding signage can be organized into three categories based on regional significance and travel distance:

1. Primary destinations include adjoining and/or en route jurisdictions and downtown that are located at distances up to five miles.
2. Secondary destinations consist of transit stations and local shopping or residential districts that are located at distances up to two miles.
3. Tertiary destinations include parks, landmarks, colleges, high schools, hospitals, and bikeways/trails.

### 7.1.7. Bicycle Detection at Traffic Signals

Traffic signals control traffic by either using timers or actuation (detection). Bicycle detection at actuated traffic signals can provide a substantial improvement for bicycle access and mobility.

Currently, Greenville has a few bicycle-actuated signals to detect bicyclists. This plan recommends that the City install bicycle detection at all actuated intersections along existing and proposed bikeways (see signal locations on the proposed bikeways map). Priority locations for bicycle detection at actuated traffic signals are provided in chapter 8 of this Plan. Additionally, the City should consider installing bicycle detection at all actuated intersections. Where loop detection is used (see Chapter 6 Design Guidelines for details) a pavement stencil of the bicycle detection marking and signage should be used to show bicyclists where to position themselves.



### 7.1.8. Intersection Improvements

Development of the Greenville bikeway network will require intersection improvements where bikeway facilities intersect high volume streets and arterials. Figure 7-8 illustrates opportunities for enhancing intersection safety for both bicyclists and pedestrians along a Primary Bike Route. Safely connecting Pete Hollis Boulevard to James Street provides improved access to the Swamp Rabbit Trail.



Figure 7-7: Example of existing bicycle detection symbol in Greenville



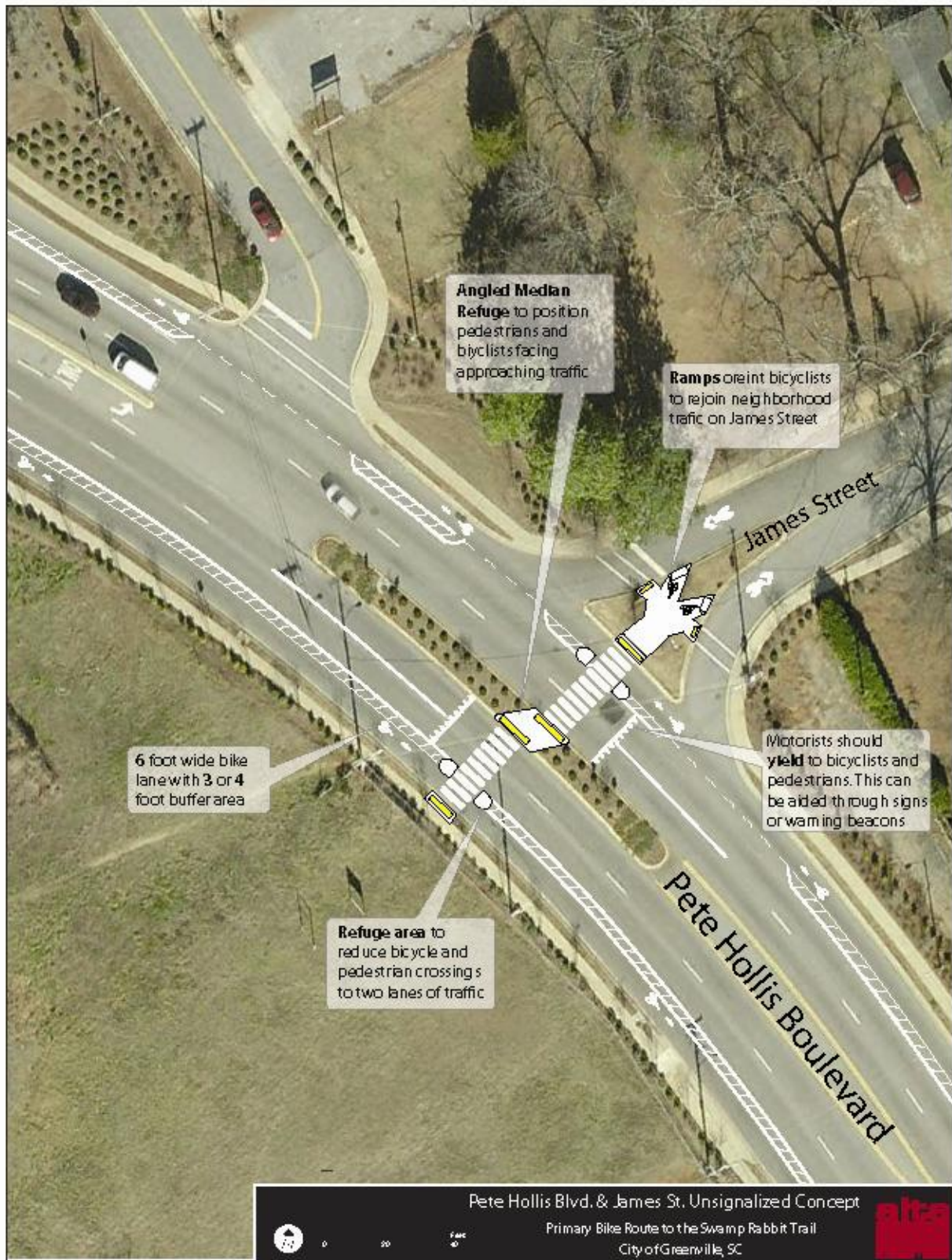


Figure 7-8. Intersection improvements at Pete Hollis Boulevard and James Street along a Primary Bike Route.



## 8. Project Prioritization & Implementation

This chapter presents implementation strategies for the recommended projects of the Plan, and includes a prioritization of recommended projects, based on need (as determined by research and public preference) and project feasibility, particularly cost. Plans the size of Greenville's Bicycle Master Plan are typically implemented over decades using a combination of private, local, state, and federal funding and participation. A deliberate phasing and prioritization strategy is required to effectively focus available funding, maximize funding and implementation, and meet the needs of the community, while also allowing flexibility to maximize projects completed.

The following is a summary of recommended near-term steps to begin implementation of the Plan immediately following adoption:

- **Institutionalize the City's Bicycle Friendly Community goals:**
  - Hire or formally appoint a City staff person as bicycle coordinator.
  - Infuse all City departments with the responsibility that bicycle accommodations and safety is a priority for the City.
  - Fund capital projects related to bikeways.
- **Grow the population of bicyclists:**
  - Expand the Swamp Rabbit Trail and continue to improve the trail's safety and appeal where needed.
  - Create a robust encouragement program of Safe Routes to School, car-free events, and individualized marketing activities.
  - Engage residents on proposed projects at a community and neighborhood level
  - Support local efforts to open a bike station and launch a bike share system
- **Implement the highest priority items within each of the six E's:**
  - Engineering:
    - Include bikeway facilities in annual local and state resurfacing projects
    - Start with high-priority, low-cost projects: Primary Bikeways
    - Prioritize high-priority, low-hanging fruit projects that close network gaps and connect residents to the Swamp Rabbit Trail
  - Education: Launch a bicycle safety campaign to inform the public of the benefits of complete streets
  - Encouragement: Develop bicycle maps and guides
  - Enforcement:
    - Use speed feedback signs to improve safety of bikeways
    - Work with the Police Department to do targeted enforcement of speed limit checks along roadways with bike facilities
  - Evaluation:
    - Hire a multi-modal Transportation Planner
    - Conduct annual bike counts

- Work with the Police Department to develop annual bicycle collision statistics reports
- Equity: Equitably distribute bicycling investments across the City

Public outreach is a key component to the development of this Plan (see Section 4.4). As the City moves forward with implementation of proposed projects, community engagement should continue at the neighborhood level. Some bikeway projects traverse or directly impact a neighborhood. As the opportunity to implement a project arises, the City should provide information about the project to residents directly affected and provide an opportunity for dialogue about the project.

## 8.1. Infrastructure Improvement Prioritization

The infrastructure recommendations of this Plan include over 137 miles of new on-street bikeways (including bike lanes, enhanced bike routes and shared lane markings) to increase Greenville's bicycle network connectivity and to create a comprehensive, safe, and logical network. Pavement markings and signage will support the bikeway network by providing network identification and wayfinding for cyclists. The following basic elements were considered in the development of the phasing and prioritization of the construction improvements and programs.

- **Need:** Based on prior plans, data collection, field observation, and considerable public comment and input from the Project Advisory Committee and Project Team.
- **Feasibility:** Considers the size and corresponding cost of the improvements and the best opportunity for implementation. Infrastructure projects that do not require acquiring right-of-way, such as restriping, are easiest to implement. Easier projects were prioritized higher than projects requiring expensive or potentially controversial right-of-way acquisition.

To gauge the relative importance of recommended improvement projects, the Project Team developed several evaluation criteria to identify and prioritize each proposed project. The criteria highlight the features of a bikeway network most important to Greenville residents and rank projects against each other as an indication of their relative importance. Through this approach, the best possible future bicycle network is determined.

Table 8.1-1 shows the evaluation criteria used to prioritize potential projects, as well as the possible scores (0 – 2), the weighted multiplier, and the total potential values. Scores are assigned to each proposed project based on its alignment with one of the three descriptions shown for each criterion (far right column).

Construction projects were categorized into first-, second-, and third-tier priority projects within each of four categories of recommended bicycle facilities. While all of the projects are important to the development of Greenville’s bicycle network, focusing on the most viable and publicly supported projects can build momentum and set the groundwork for future investments. The categories reflect the prioritization strategy, with previously-determined, publicly supported, easy-to-implement and less-expensive projects designated as first-tier. Any of these projects can proceed when funding and political conditions warrant. It must be recognized that these construction projects, while deemed the most important, may not get implemented within the time periods noted due to fiscal constraints.

Table 8.1-1. Weighted evaluation criteria determine the prioritization of proposed bikeway projects.

Criteria	Score	Multiplier	Total	Description
On a Primary Bikeway	2	3.0	6	Is on a designated primary bikeway
	1	3.0	3	Connects directly to a designated primary bikeway
	0	3.0	0	Does not directly or indirectly connect to a designated primary bikeway
Safety Corridor	2	3.0	6	Proposes a bicycle facility on a corridor with more than 1 reported bike crash (2005-2010)
	1	3.0	3	Proposes a bicycle facility on a corridor with at least 1 reported bike crash (2005-2010)
	0	3.0	0	Corridor does not have a reported bicycle crash (2005-2010)
Ease of Implementation	3	3.0	9	Bikeway project can be constructed/installed with little to no changes to the existing roadway
	2	3.0	6	Bikeway project is along City-owned right of way.
	1	3.0	3	Bikeway project can be constructed/installed with minor alterations to the existing roadway
	0	3.0	0	Bikeway project requires major alterations to the existing roadway or existing land development
Network Gaps	2	2.0	4	Facility fills a network gap between two existing bikeways
	1	2.0	2	Facility fills a network gap between an existing bikeway and a proposed bikeway
	0	2.0	0	Does not directly or indirectly fill a network gap
Destinations	2	2.0	4	Connects to a park, or major employment or commercial destination or hospital, or Swamp Rabbit Trail
	1	2.0	2	Connects to a community center, library, service agency, government facility, or minor commercial area
	0	2.0	0	Does not directly or indirectly connect to a significant destination
Cycle Zone Analysis (CZA) Scoring <sup>1</sup>	2	1.0	2	Bikeway located in zone with highest third of CZA difference (existing vs. proposed)
	1	1.0	1	Bikeway located in zone with middle third of CZA difference (existing vs. proposed)
	0	1.0	0	Bikeway located in zone with lowest third of CZA difference (existing vs. proposed)
Proximity to Schools	2	1.0	2	Direct access to a Greenville school (public, private, and post-secondary)
	1	1.0	1	Secondary access to a Greenville school (within 1/2 mile)
	0	1.0	0	Does not directly or indirectly access a Greenville school.
Transit Access	2	1.0	2	Bikeway connects to 6 or more transit stops
	1	1.0	1	Bikeway connects to 1-5 transit stops
	0	1.0	0	Bikeway does not directly connect to transit stops
Special Emphasis Neighborhoods	2	1.0	2	Bikeway is within special emphasis neighborhood
	1	1.0	1	Bikeway connects to a special emphasis neighborhood
	0	1.0	0	Bikeway is not within and does not connect to a special emphasis neighborhood

<sup>1</sup> See Chapter 3 of this Plan.

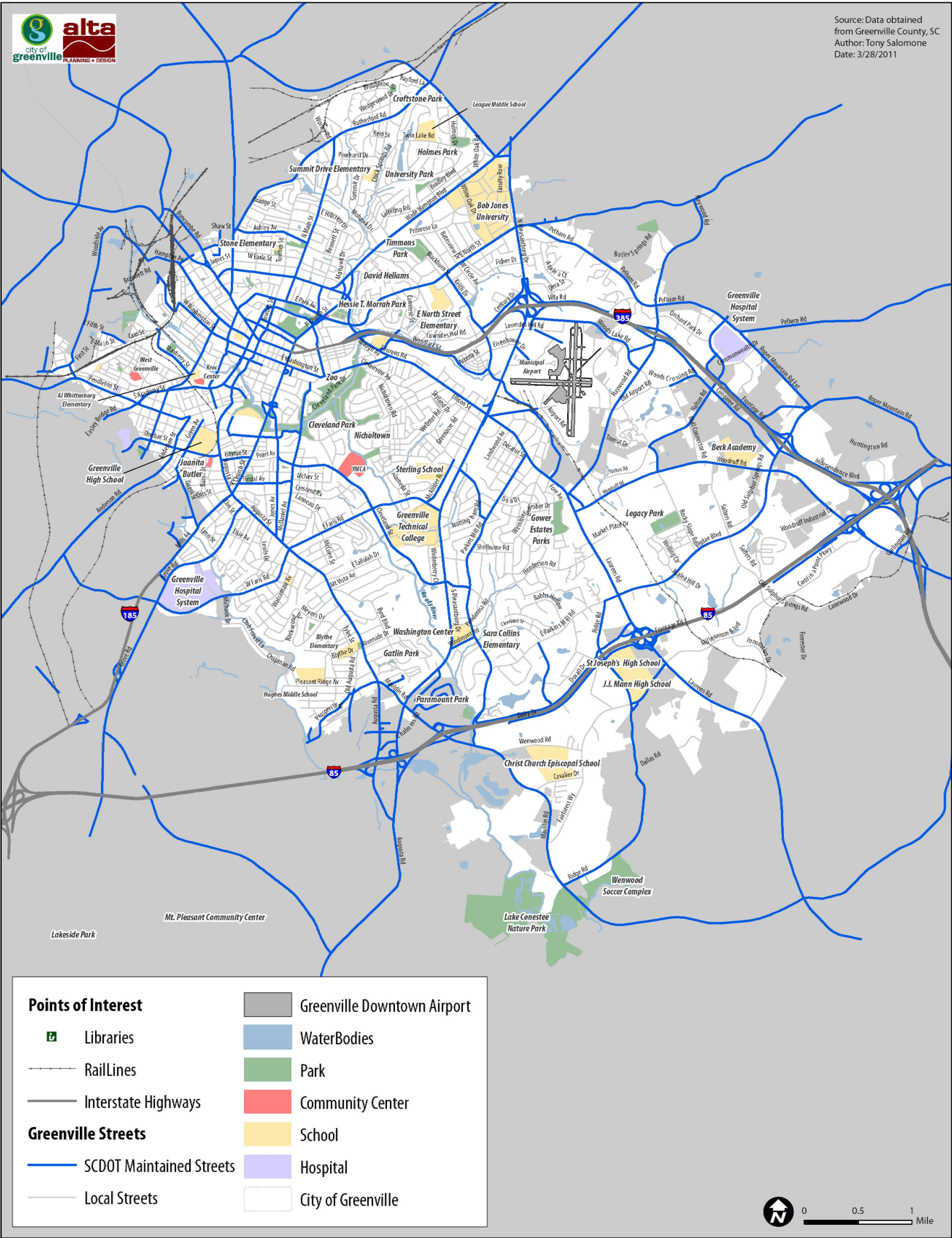
### **8.1.1. Priority Projects**

Based on the evaluation criteria and prioritization matrix described above, this section identifies the high priority projects within each of the four categories of facility type recommended in the Plan. The categories are: bicycle lanes, bicycle routes, multi-use paths, and shared roadways. First- and second-tier projects are described in a table and bulleted list, respectively. All remaining proposed projects not listed below are within the third-tier. Based on extensive research, analysis, and public input in the preparation of this plan, the entire list of projects proposed within this Plan have evidenced merit. Third-tier projects play an important role in completing the vision of the bikeway network, but should be considered long-term projects based on their limited ranking within the prioritization matrix.

The City and SCDOT will be the implementing agencies for bike lanes and shared-lane markings. Most of the streets recommended for these facilities are on streets that are part of the SCDOT maintenance system (see **Map 1** the following page), so the City will coordinate with SCDOT on the design and implementation of these facilities. In most cases, implementation of bike lanes on SCDOT roadways will be completed through scheduled resurfacing projects. SCDOT will incur most of the street resurfacing costs. The added incremental costs for bike lane symbols and signage will be borne by the City of Greenville.



Map 8-1 SCDOT Maintained Streets in Greenville, SC



### 8.1.2. Bicycle Lanes

The bicycle lane projects that received the highest scores are shown in the tables below. Table 8.1-2 shows the highest ranking projects that occur on major arterials in Greenville. Table 8.1-3 shows both the first-tier and second-tier priority projects that occur on local or collector streets. Remaining bicycle lane projects are included in Chapter 7: Proposed Improvements.

Table 8.1-2. Highest priority proposed bicycle lane projects on major arterials.

Rank	Corridor <sup>2</sup>	Length (miles)	From	To	Total Score
1	Laurens Rd	5.67	Park Ave	City Limit	36
2	Pleasantburg Dr	5.52	Cleveland St	City Limit	34
3	Rutherford Rd	2.39	Poinsett Hwy	Pleasantburg Dr	32
4	Augusta St	0.77	University St	Otis St	31
5	Rutherford St	0.60	Buncombe St	Shaw St	30
6	Pete Hollis Blvd - Buncombe Rd Rte	0.80	College St	City Limit	29
7	Wade Hampton Blvd - Church St Rte	2.37	Academy St	Pleasantburg Dr	28
8	Pleasantburg Dr	1.32	Cleveland St	Mauldin Rd	21
9	Pelham Rd - Roper Mountain Rd Rte	3.29	North St	Keys Dr/Roper Mountain Rd	16
10	Mauldin Rd	1.22	Crystal Ave	Parkins Mill Rd	16

Table 8.1-3. Highest priority proposed bicycle lane projects.

Rank	Corridor	Length (miles)	From	To	Total Score
<b>First Tier Priority Projects</b>					
1	Pendleton St	0.43	Vardy St	Academy St	29
2	Dunbar St	0.75	Augusta St	City Limit	27
3	University Ridge	0.28	Howe St	Church St	25
4	Verdae Blvd - E Parkins Mills Rd Rte	2.46	Woodruff Rd	Isbell Ln	24
5	Guess St	0.58	Nelson St	Mills Ave	24

<sup>2</sup> Note that the abbreviation “Rte” signifies a series of roadways that connect to create a continuous bikeway.

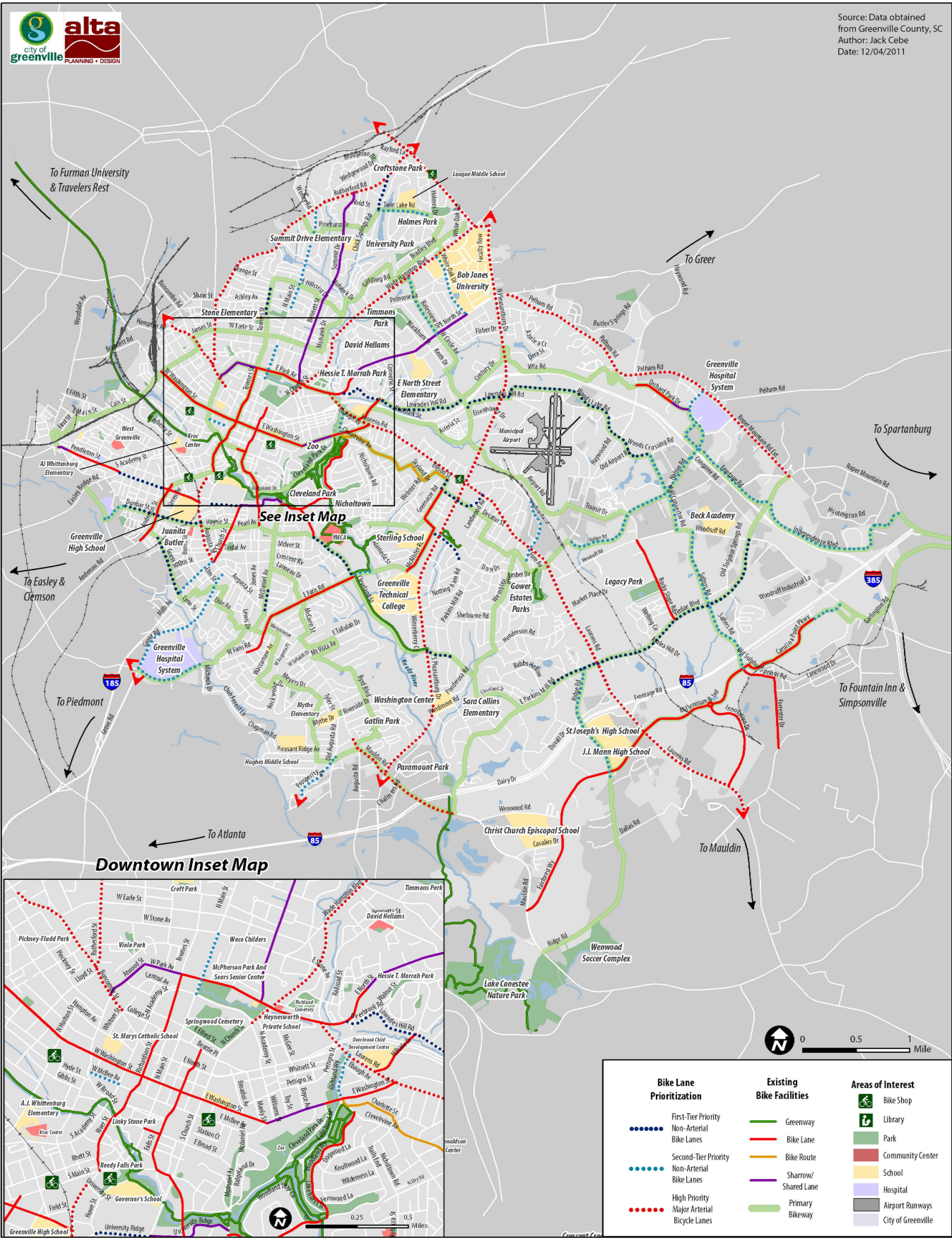
6	Woods Crossing Rd - Lowndes Hill Rd - Washington St Rte	2.13		Congaree Rd	Laurens Rd	23
7	Legrand Blvd - John McCarroll Way Rte	0.38	Don Dr	McAlister Rd	22	
8	Lowndes Hill Rd	1.22	North St	Keith Dr	22	
9	Chick Springs Rd	0.32	Twin Lake Rd	Rutherford Rd	22	
10	Antrim Dr	0.57	Liberty Lane	Laurens Rd	22	
11	McDaniel Ave	0.21	Augusta St	Camille Ave	21	
12	Cleveland St	0.54	McIver St	Parkins Mill Rd	21	
13	Townes St	0.26	Mountainview Ave	Randall St	21	
<b>Second Tier Priority Projects</b>						
14	Halton Rd	2.32	Haywood Rd	Pelham Rd	20	
15	Prosperity Ave	0.53	Old Augusta Rd	City Limit	20	
16	Richland Way	0.23	Washington St	Laurens Rd	20	
17	Main St	0.32	Park Dr	Park Ave	20	
18	Salters Rd - Old Sulphur Springs Rd - Forrester Dr Rte	1.43	Woodruff Rd	Bi-Lo Blvd	19	
19	White Oak Dr	0.62	Wade Hampton Blvd	North St	19	
20	Faris Rd	0.46	Pleasantburg Dr	E of the Swamp Rabbit Trail	19	
21	Batesview Dr	0.60	Wade Hampton Blvd	North St	18	
22	Independence Blvd	2.84	Patewood Dr	Roper Mountain Rd	18	
23	Carolina Point Pkwy	0.30	Woodruff Rd	Fibers Dr	18	
24	McBee Ave	0.16	Academy St	Broad St	18	
25	Mall Connector Rd	0.76	Woods Crossing Rd	Salters Rd	17	
26	Reid St - Twin Lake Rd	0.50	Chick Springs Rd	Holmes Dr	17	
27	Faris Rd	0.64	Club Forest Lane	Grove Rd	17	
28	Dunbar St	0.23	Augusta St	City Limit	17	
29	Industrial Dr	0.62	Fore Ave	Airport Rd	17	

## Chapter 8| Prioritization and Implementation Plan

30	Ridge Rd	1.14	Parkins Mill Rd	City Limit	16
31	Grove Rd	1.28	Augusta St	City Limit	16
32	Main St	0.97	Rutherford Rd	Park Dr	16
33	Mills Ave	0.45	Lynn St	Augusta St	16



Map 8-2 Bike Lane Prioritization



### 8.1.3. Shared Roadways/Shared Lane Markings

The shared lane marking projects that received the highest scores are shown in Table 8.1-4. Remaining shared lane marking projects are included in Chapter 7: Proposed Improvements.

Table 8.1-4. Highest priority shared lane marking projects.

Rank	Corridor	Length (miles)	From	To	Total Score
<b>First Tier Priority Projects</b>					
1	Hudson St	1.35	Hampton Ave	Dunbar St	36
2	Broad St - Butler Ave Lane	0.81	Main St	Buncombe St	35
3	Haynie St - Pearl Ave Rte	0.54	Augusta St	Cleveland St	28
4	Woodlark St	1.02	Hillside Dr	Keith Dr	26
5	Nelson St	0.10	Guess St	Anderson St	26
6	Wardlaw St - Westfield St Rte	0.56	Main St	Broad St	26
7	Main St	0.41	Anderson St	River St	26
8	Hampton Ave	0.67	Academy St	Mulberry St	25
9	McDaniel Ave	0.16	Ridgeland Dr	Broad St	25
10	Lois Ave - Woodside Rd Lane	0.25	Pendleton St	City Limit	25
11	Harris St	0.12	Augusta St	Howe St	24
12	Stone Ave - Mulberry St Rte	0.91	Rutherford Rd	Swamp Rabbit Trail	24
13	North St	0.53	White Oak Dr	City Limit	23
14	Jones Ave	0.74	University Ridge	August St	23
15	Potomac Ave	0.42	Long Hill St	Augusta Rd	23
16	Mayberry St	0.57	Willard St	Hudson St	21
<b>Second Tier Priority Projects</b>					
17	Cleveland Park Dr - Lakehurst St Rte	1.07	Washington St	Cleveland St	20
18	Cleveland St	0.54	Southland Ave	Jones Ave	19
24	Cleveland St	0.24	Pleasantburg Dr	Parkins Mill Rd	18
19	Haywood Rd	2.60	Laurens Rd	City Limit	17
20	McDaniel Ave	0.52	Camille Ave	Cleveland St	17
21	McBee Ave - Washington St Lane	0.11	McDaniel Ave	Cleveland Park Dr	17
22	Lynn St	0.28	Mills Ave	Grove Rd	17
23	McBee Ave	0.67	Washington St	Academy St	16



### 8.1.4. Bicycle Routes

The bicycle route projects that received the highest scores are shown in Table 8.1-5. Remaining bicycle route projects are included in Chapter 7: Proposed Improvements. Though it is beyond the scope of this Plan to determine a preferred facility treatment along each section of bike route, this Plan strongly recommends that Greenville pursue innovative bike route treatments (such as those identified by the *National Association of City Transportation Officials Urban Bikeway Design Guide* and detailed in the Design Guidelines of this Plan). Traffic calming, traffic diversion, trails along roadways, cycletracks and/or sidepaths, wayfinding signs, and bicycle route directional markers are examples of treatments that can enhance bicycle route design where the existing roadway environment is not ideal.

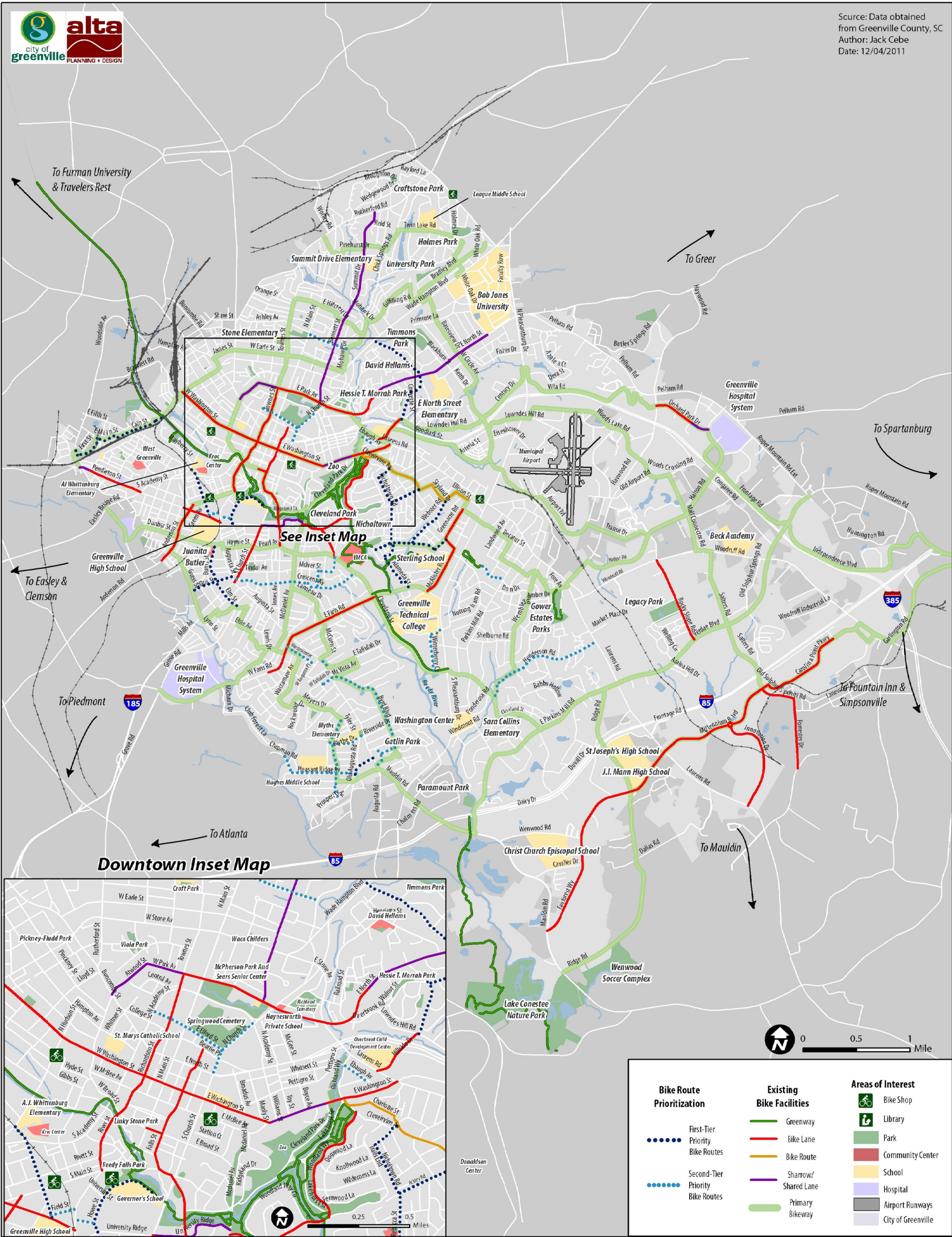
Table 8.1-5. Highest priority proposed bicycle route projects.

Rank	Corridor	Length (miles)	From	To	Total Score
<b>First Tier Priority Projects</b>					
1	Cleveirvine Ave - Haviland Ave - Nicholtown Rd - Alameda St - Rebecca St Rte	0.81	Beechwood Ave	Clark St	34
2	Mulberry St - Willard St - Cain St Rte	1.05	Swamp Rabbit Trail	2nd St	32
3	Alameda St - Hilton St Rte	0.57	Clark St	Faris Rd	32
4	Burns St - Elms St Rte	0.66	Dunbar St	Grove Rd	30
5	Howe St - Furman College Way Rte	0.53	University Ridge	End of Furman College Way	28
6	Market St	0.49	Vardy St	Hudson St	27
7	Webster Rd - Clark St - Greenacre Rd Rte	0.76	McAlister Rd	Baxter St	26
8	Hillside Dr - Prescott St - Harrington Ave Rte	1.08	Lowndes Hill Rd	Wade Hampton Blvd	24
9	Webster Rd - Clark St - Greenacre Rd Rte	0.52	Skyland Dr	Clark St	24
10	Otis St	0.40	Guess St	Augusta St	24
11	Crystal Ave	0.17	Old Augusta Rd	Augusta Rd	24
12	Old Augusta Rd	0.09	Augusta St	Prosperity Ave	23
13	Ackley Rd - Fernwood Lane - Woodland Way Rte	0.30	Beechwood Ave	Cleveirvine Ave	23
<b>Second Tier Priority Projects</b>					
14	Crescent Ave	1.19	Church Ave	Cleveland St	19
15	Rice St - Long Hill St Rte	0.81	Meyers Dr	Prosperity Ave	19

## Chapter 8| Prioritization and Implementation Plan

16	Pleasant Ridge Ave - Penrose Ave - Chapman Rd Rte	0.82	Old Augusta Rd	End of Chapman Rd	19
17	Bradshaw St	0.09	Augusta St	Howe St	19
18	Byrd Blvd - Gatlin Park Rte	1.48	Augusta Ct	Augusta St	19
19	Ellford St	0.39	Academy St	Church St	18
20	Field St	0.13	Augusta St	Market St	18
21	Winterberry Ct	0.49	Cleveland St	Pleasantburg Dr	18
22	Blythe Dr	0.32	Augusta St	Long Hill St	18
23	Augusta St	0.12	Augusta Pl	Tallulah Dr	18
24	Ebaugh Ave	0.14	Traxier St	Richard Way	17
25	Henderson Rd	1.18	Cleveland St	Laurens Rd	17
26	Gallivan St	0.39	Main St	Mohawk Dr	16
27	Willow Springs Dr	0.27	Parkins Mills Dr	Existing Greenway	16
28	Westminster Dr	0.31	Faris Rd	Augusta Pl	16
29	Church St	0.32	Academy St	Beattie Place	16
30	Afton Ave - Mclver St Rte	0.42	Crescent Ave	Cleveland St	16

Map 8-3 Bike Route Prioritization



### 8.1.5. Multi-use Paths

The multi-use path projects that received the highest scores are shown in Table 8.1-6. Remaining multi-use path projects are included in Chapter 7: Proposed Improvements.

Table 8.1-6. Highest priority proposed multi-use paths.

Rank	Corridor	Length (miles)	From	To	Total Score
1	BRT Trail	4.38	Traxler St	Millenium Blvd	22
2	Beattie Pl	0.68	Heritage Green Pl	North St	18
3	Richland Way	0.24	Washington St	Laurens Rd	11
4	Chick Springs Greenway	0.54	Twin Lake Rd	Poinsettia Pl	10



### 8.1.6. Additional Infrastructure Recommendations

This Plan also provides recommendations for additional linear and non-linear infrastructure improvements that are essential to developing a complete and user-friendly bikeway network. These recommendations include:

- Bicycle Detection at Traffic Signals
- Wayfinding Signage
- Bicycle Parking
- Bike Route Connection Gaps
- Major Roadway Corridor Plans

#### 8.1.6.1 Bicycle Detection at Traffic Signals

Proposed locations for including bicycle detection at actuated traffic signals are included in the map of network recommendations. Per guidance in Chapter 7 and the Design Guidelines, this Plan recommends that the City install bicycle detection at all actuated intersections along existing and proposed bikeways. Additionally, the City should consider installing bicycle detection at all actuated intersections. As a first priority, bicycle detection hardware should be installed at the signalized intersections listed in Table 8.1-7. The City should install the bicycle detection hardware on the secondary street (listed in the column labeled “corridor”) as it intersects a primary street (listed in the column labeled “cross street”). Additional bicycle detection should be implemented over time in conjunction with signal upgrade projects and in coordination with SCDOT.

Table 8.1-7. Priority intersections for installation of bicycle detection hardware.

Corridor	Cross Street
Townes Avenue	Stone Avenue
Butler Road	Buncombe Road
Batesview Drive	Wade Hampton Boulevard
Guess Street	Mills Avenue
Antrim street	Pleasantburg Drive
Calhoun Street	Dunbar Street
Calhoun Street	Pendleton Street
McDaniel Avenue	Augusta Street
Phillips Street	Augusta Street
Augusta Street	Augusta Place
Legrand Boulevard	Pleasantburg Drive
Lowndes Hill Drive	Pleasantburg Drive
Transit Drive	Pleasantburg Drive
Parkins Mill Road	Laurens Road

### 8.1.6.2 Wayfinding Signage

Wayfinding signage will enhance the practicality and user-friendliness of Greenville’s bikeway network. Decision point and confirmation signs will boost bicyclists’ confidence in using bikeway facilities, attract new users, and inform bicyclists of key connectors and access points. This Plan recommends that development of the wayfinding signage program begin within twelve months of adoption of the Plan.

The primary bike route network of this Plan provides important cross-town connections and bypass routes for major arterials. The primary bike routes identified on the proposed network map are first-tier priority routes for installation of wayfinding signage.

### 8.1.6.3 Bicycle Parking

Bicycle parking should be expanded as the bikeway network is expanded. Requests by the general public provide an appropriate gauge of bicycle parking needs and unmet demand. This Plan recommends that the City of Greenville prioritize bicycle parking locations requested through Google’s dynamic online mapping service and documented here: [tinyurl.com/GreenvilleBikeRacks](https://tinyurl.com/GreenvilleBikeRacks).

The results of the public outreach process conducted for this Plan reinforce the list of bicycle parking locations requested online. Priority locations for short-term and long-term bicycle parking identified in the public outreach process are shown in Table 8.1-8.

Table 8.1-8. Priority locations for bicycle parking.

Rank	Short-term Bicycle Parking Locations
1	Throughout Main Street’s Entertainment, Restaurant and Retail District
2	Falls Park
3	River Place, Flour Field and other West End destinations
4	Cleveland Park (including the Zoo and the dog park)
5	Government buildings (including libraries, post offices, County offices and schools)
6	University Center
7	Greenville Transit Authority Transfer Center
8	Bi-Lo Center Entertainment Venue
Rank	Long-term Bicycle Parking Locations
1	Downtown Parking Garages
2	Greenville Transit Authority Transfer Center
3	Greenville Technical College Campus
4	Campuses of Greenville Hospital System and St. Francis Hospital System
5	ICAR Campus

### 8.1.6.4 Bike Route Connection Gaps

The Plan identifies gaps in the connectivity of the bike route network due to dead end streets, development patterns, natural barriers, or other features. As the bike route network is developed, the City of Greenville should prioritize and fund the development of connector trails or roadway segments in order to complete the network. Key gaps in the bike route system are listed in Table 8.1-9.



Table 8.1-9. Key connectivity gaps in the bike route network.

Corridor	Connector Street
Fernwood Lane	Ackley Road
Blair Street	Asteria Street
Villa Road	West Orchard Park Drive
Mt Vista Avenue - Augusta Court Rte	Meyers Drive
Waccamaw Avenue	Meyers Drive
Fore Avenue – Evelyn Avenue Rte	Glenda Lane

### 8.1.6.5 Major Corridor Studies

In Chapter 7, this plan recommends a comprehensive approach to corridor design and planning for the City's major roadway corridors. Such planning and design would include access management approaches to limit the number and spacing of driveways and turning locations; land use policies to facilitate more bicycle- and pedestrian-friendly development patterns; connectivity improvements to provide additional parallel route options; travelway designs that are more appropriate to an urban context; and speed reduction measures for motor vehicle travel.

This plan recommends that the City continue to coordinate with SCDOT and GPATS to prioritize, fund, and implement improvements for on these corridors to make them safer and more accessible to all modes of travel, including bicycles. At least one major corridor study and implementation project should be the focus of City and partner agency efforts every two years. Additional planning and implementation opportunities may occur more frequently as resurfacing or other local, state, and/or private investment initiatives occur on these corridors. The corridors recommended for further planning and design and/or implementation include:

- Augusta Street (High priority bikeway corridor per public input and analysis, including collision data analysis)
- Woodruff Road (Corridor study complete; needs detailed plans for bikeway improvements)
- Wade Hampton Boulevard (Draft corridor streetscape concepts completed)
- Pelham Road (SCDOT resurfacing project upcoming for portion of the corridor)
- Roper Mountain Road (SCDOT resurfacing project upcoming for portion of the corridor)
- Pleasantburg Drive (Corridor study complete; needs detailed plans for bikeway improvements)
- Church Street/Mills Avenue Corridor (portions of Church St funded for redesign)
- Laurens Road/US 276 (High priority bikeway corridor per public input and analysis)
- Poinsett Highway
- Buncombe Road/Pete Hollis Boulevard

## 8.2. Infrastructure Improvement Cost Opinions

This section presents planning-level cost opinions for the comprehensive network of on-street bikeways and multi-use paths recommended in the Greenville Bicycle Master Plan. Cost estimates for bikeway facilities are based on cost opinions provided by the City of Greenville. The cost of bikeway facilities significantly varies by facility type, as shown in Table 8.2-1. For example, the addition of shared lane marking (sharrows) to an existing roadway requires few changes to the existing roadway, but provides no exclusive space for bicycle use. By contrast, a separated multi-use path provides a far greater level of separation from the roadway, but at a greater fiscal burden. The following is a summary of the fully burdened costs of different bikeway facility types and their associated costs. All costs are total installed costs that include: planning and engineering, environmental, and contingency.

Table 8.2-1. Planning-Level Cost Estimates for Bicycle Facilities

Facility	Cost	Materials	Implementation Type	Additional Costs*
Multi-use path (per mile)	\$ 800,000.00	Construction, signing	n/a	30%
Bike lanes: restriping (per mile) - retrofit on street	\$ 15,000.00	Striping and signing	Stripe	20%
Bike lane restriping w/ resurfacing project (per mile)	\$ 8,000.00	Striping and signing	Stripe	20%
Bike lane: widening on street with curb & gutter (per mile; minimum)	\$ 250,000.00	Roadway widening	Widen	40%
Bike lane: add pavement; no curb (per mile with resurfacing)	\$ 28,000.00	Asphalt, striping, signing	Widen	20%
Bike route (per mile)	\$ 2,000.00	Signing	n/a	15%
Bike route marking (per mile)	\$ 2,600.00	Pavement stamp	n/a	15%
Shared lane marking (per mile)	\$ 6,500.00	Signing, markings	n/a	15%
Inverted 'U' bicycle rack (ea)	\$ 200.00	Rack	n/a	15%
"Share the Road" signs (ea)	\$ 100.00	Signs, posts	n/a	15%
Bike route marking (ea)	\$ 50.00	Stencils (52 per mile)	n/a	15%
Shared lane marking (ea)	\$ 200.00	Stencils (20 per mile)	n/a	15%
Wayfinding/destination sign (ea)	\$ 150.00	Signs, posts	n/a	15%
Loop detectors (two)	\$1,500.00	Detector, stencil, labor	n/a	\$300 for calibration only
Colored bike lane ( square foot thermoplastic)	\$4.50		n/a	
Traffic circle (ea)	\$40,000.00	Concrete curb, landscaping	n/a	15%
Diverter (ea)	\$15,600.00 - \$40,000.00	Concrete curb, landscaping	n/a	15%

Facility	Cost	Materials	Implementation Type	Additional Costs*
Bike box (ea)	\$5,000.00	Thermoplastic, signs	n/a	15%
Advanced stop line (ea)	\$225.00		n/a	15%
Bicycle/pedestrian bridge (linear foot)	\$150.00		n/a	15%
Grinding and eradicating (linear foot)	\$0.50		n/a	10%

\* Planning and engineering, environmental, and contingency

The total implementation cost of the Greenville Bikeways Master Plan is estimated at approximately \$10.4 million, as shown in Table 8.2-2. Planning-level cost estimates for each recommended facility are included in the Appendix.

Table 8.2-2. Planning-Level Cost Summary

Facility Type	Length (miles)	Planning-Level Cost
Proposed Bike Lane	62.34	\$4,007,000
Proposed Sharrow	24.48	\$173,000
Proposed Bicycle Route	51.17	\$134,000
<b>On-street Facilities Subtotal</b>	<b>137.99</b>	<b>\$4,314,000</b>
Proposed Multi-Use Path	7.61	\$6,083,000
<b>Combined Total</b>	<b>145.55</b>	<b>\$10,397,000</b>

## 8.3. Bicycle Facility Maintenance

This section discusses potential strategies the City of Greenville can employ to facilitate maintenance of on-street bikeways.

### 8.3.1. On-Street Bikeway Maintenance

While implementing bikeway facilities is important, keeping them in good condition is equally important. When a bicycle lane becomes filled with debris, bicyclists are forced into the motor vehicle lane. Poor bikeway maintenance can contribute to accidents and deter potential bicyclists unwilling to risk flat tires and skidding on roadways. Periodic checks should be made of the on-street bikeway network with work being confined to spot fixes and damage response. Street sweeping of on-street facilities will need to be coordinated with the City and SCDOT roadway maintenance program to ensure that roadways are cleared curb to curb. Maintenance activities can also be driven by specific maintenance requests from the public. On-street bikeways should be kept clear of snow and ice (if any) during winter months.

On-street bikeways should be maintained as part of standard City and SCDOT roadway maintenance programs. Extra emphasis should be put on keeping bikeways and roadway shoulders clear of debris and keeping vegetation overgrowth from blocking visibility or creeping into the roadway. Section 32-8 of the City's Municipal Code prohibits the placement of yard debris or other solid waste in a location that impedes vehicular or pedestrian traffic and should be enforced for the benefit of all road users.

Table 8.3-1. Summary of Maintenance Recommendations

Maintenance Activity	Frequency
Inspections	Seasonal – at beginning of Spring and end of Summer
Pavement sweeping/blowing	Weekly/monthly, as needed; clean up in the Spring; weekly in Fall
Pothole repair	1 week – 1 month after report
Culvert and drainage grate inspection	Before Winter and after major storms
Tree/shrub trimming	Every 5 months – 1 year
Pavement markings replacement	Paint: 1 year; thermoplastic: 10-15 years
Signage repair/replacement	As needed (worn signs every 10 years); check signs annually; move as needed
Major damage response (washouts, fallen trees, flooding)	As soon as possible

## 8.4. Bikeway Maintenance Policy Recommendations

The City, in coordination with the SCDOT maintenance program, should establish the following bikeway maintenance protocols by 2013:

- Establish routine maintenance schedules and standards for citywide bikeways.

*Action Items:*

- Conduct regular visual inspections of all bikeways and develop database to track observations.
- Implement maintenance schedule and standards.

- Maintain in good condition striping, surface conditions, lighting and landscaping on and adjacent to bikeways.

*Action Items:*

- Monitor and maintain adequate lighting along City bikeways. Action Item:
- Review lighting conditions and repair lighting system as necessary.

- Address bicyclist safety during construction and maintenance activities.

*Action Items:*

- Develop and implement standard procedures to ensure safe passage of bicyclists through construction zones, and update appropriate manuals.
- Issue public announcements regarding any street or bicycle path closures or detour.
- Minimize street or bicycle path closures and delays along officially designated bikeways.

- Establish routine maintenance program that encourages citizens to report maintenance issues that impact bicyclist safety.

*Action Items:*

- Work with neighborhood organizations, the future Bicycle Advisory Committee, and other groups to promote and expand the City's hazard reporting mechanisms.
- Create hazard reporting banner on homepage of the bicycle program website that links to Service Request Forms for the Department of Public Works.
- Report to the BAC on the number of submitted Service Request Forms.

## 8.5. Non-infrastructure Improvement Prioritization

The programs recommended in this Plan are a relatively inexpensive method for improving and raising public awareness and adding to the safety and enjoyment of bicycling in Greenville. Because of their minimal expense and importance to supporting the bicycle travel and thereby increase usage, all of the recommended programs and policies are designated for short- or medium-term implementation, shown below as first- and second-tier priorities. A comprehensive and diversified approach to programs and policies is essential to growing the bicycling community and culture in Greenville. Thus, both first-tier and second-tier lists include an appropriate combination of mutually reinforcing strategies that reach diverse audiences.

### 8.5.1. First-tier Programs, Policies, and Evaluation

First-tier non-infrastructure recommendations are programs and policies that have the highest impact for the lowest cost. Short-term priority projects are listed below, distinguished by those programs that offer immediate opportunities through continuation and expansion of existing programs and those that will be strategies new to Greenville.

Continued and expanded efforts:

- National Bike Month Activities
- Bicycle Patrol
- Green Ribbon Committee
- Adult Bicycling Skills Classes

New efforts:

- Bicycle Resource Website
- Coordinated Safe Routes to School Program
- Launch Parties for New Bikeways
- Car Free Street Events
- Family Day/Family Biking Classes
- Speed Feedback Signs
- Targeted Enforcement
- Annual Count and Survey Program
- Permanent Bicycle Advisory Committee
- Large Event Bicycle Parking Policy
- Bicycle Staff Position

This Plan recommends implementing first-tier programs, policies, and evaluation within 12 months of adoption of the Bicycle Master Plan.



### **8.5.2. Second-tier Programs, Policies and Evaluation**

Second-tier non-infrastructure recommendations are programs and policies that may take time to plan and implement, due to cost, political will or other factors, or particularly benefit from building upon first-tier successes. Medium-term priority projects include:

- Bicycle Safety Campaign
- Employer Based Encouragement Programs
- Bicycle Friendly Business Program
- Personal Travel Encouragement Program
- Bicycle Sharing
- Senior Bicycle Education Classes
- Youth Bicycle Safety Education Classes
- Diversion Classes for Motorists and Bicyclists
- Increase Bicycle Friendly Community Status
- Funding Policy for Bicycle Program
- Long-Term Bicycle Parking Policy

This Plan recommends implementing second-tier programs, policies, and evaluation one to three years after the adoption of the Bicycle Master Plan.

## 8.6. Non-infrastructure Improvement Implementation

The non-infrastructure recommendations of this Plan are designed for implementation within three years of adoption of the Plan. While the vast majority of infrastructure and policy recommendations fall within the exclusive jurisdiction of the City of Greenville and its governing authority, many program recommendations can, and should, fall under the banner of outside agencies, private sector partners, and nonprofit organizations. In Greenville, nonprofit organizations that may want a role in implementing community programs include: YMCA, LiveWell Greenville, and Upstate Forever. A collaborative approach to implementing and sustaining bicycling programs contributes to the broader vision of fostering a strong bicycle advocacy community and bicycle culture (2.2.3 Encouragement). Additionally, the minimal expense associated with most programs offers the unique opportunity for multiple, varied sectors of the community to contribute to the larger bicycle friendly community campaign.

For each of non-infrastructure recommendation of the Plan, Table 8.6-1 outlines the timeline for implementation and the frequency of the program's occurrence. The entity most appropriate for initiating and overseeing the program or policy is noted as the "Lead Agency" and other groups who should play a central role in guiding and/or implementing the recommendation are shown as "Project Partners." Referencing Chapter 2 of this Plan (2.Recommended Vision, Goals, and Objectives) the second column of Table 8.6-1 clarifies the nexus between the non-infrastructure strategies prioritized in this Plan and the goals and objectives previously established.

Table 8.6-1. Non-infrastructure recommendations are designed for implementation within three years of adoption of the Bicycle Master Plan

Strategy	Vision & Goals Nexus	Commencement	Occurrence	Lead Agency	Project Partners
Bicycle Patrol	Enforcement Goal 1: Increase safety through promoting greater awareness of bike-car issues and conflicts. (Objective 1.1)	Immediate	Ongoing	City Police Department	City Administration
Green Ribbon Committee	Evaluation and Planning Goal 2: Pursue cost-effective multi-modal integration/improvements. (Objective 2.1)	Immediate	Ongoing	City Parks & Recreation Department	City Administration
Launch Parties for New Bikeways	Encouragement Goal 3: Make bicycle travel an integral part of daily life, particularly for trips under 3 miles. (Objective 3.2)	To occur on opening date of next developed bikeway segment	Annual	Bikeville	City Parks & Recreation Department; City Department of Public Information and Events
Adult Bicycling Skills Classes	Education Goal 3: Increase the number of area League Cycling Instructors (LCIs) and frequently offer Smart Cycling courses.	September 2011	Biannual	Bikeville	Local LCIs; Local bike shops
Permanent Bicycle Advisory Committee	Evaluation and Planning Goal 2: Pursue cost-effective multi-modal integration/improvements. (Objective 2.1 and 2.2)	November 2011	Ongoing	City Administration; City Council	City Parks & Recreation Department
Coordinated Safe Routes to School Program	Encouragement Goal 10: Encourage Safe Routes to School	January 2012	Ongoing	Greenville County Schools, PTAs and other parent groups	City Department of Public Works; Bikeville; Local nonprofit; GPATS; SC DOT Safe Routes to School Resource Center
Speed Feedback Signs	Education Goal 1: Establish safety training and accident reduction for entire community. (Objective 1.1)	January 2012	Ongoing	City Public Works Department	Department of Public Information and Events
Car Free Street Events	Encouragement Goal 7: Continue to promote and grow non-competitive cycling events. (Objective 7.1)	April 2012	Biannual	City Parks & Recreation Department	Bikeville; Local nonprofit; City Department of Public Information and Events; Greenville Spinners; SORBA; City Police Department
Bicycle Resource Website	Encouragement Goal 2: Residents have good knowledge of network of bike-friendly roads. (Objective 2.1); Encouragement Goal 3: Make bicycle travel an integral part of daily life; particularly for trips under 3 miles (Objective 3.2)	May 2012	Ongoing	City Parks & Recreation Department	City Department of Public Information and Events; Bikeville; Greenville Spinners; SORBA
National Bike Month Activities	Encouragement Goal 6: Expand Bike Month Programs.	May 2012	Annual	Bikeville	Local nonprofit; Greenville Spinners; SORBA; local bike shops; City Department of Public Information and Events
Large Event Bicycle Parking Policy	Encouragement Goal 8: Encourage the use of bicycles through the provision of convenient and secure bicycle parking and support facilities. (Objective 8.3)	July 2012	Ongoing	City Administration; City Council	City Department of Public Information and Events; City Police Department; Bikeville; local advocate groups for implementation
Employer Based Encouragement Programs	Encouragement Goal 5: Increase ridership and bike mode share. (Objective 5.1); Encouragement Goal 6: Expand Bike Month Programs. (Objective 6.4)	August 2012	Ongoing	Bikeville	Chamber of Commerce; Local nonprofits
Family Day/Family Biking Classes	Education Goal 1: Establish safety training and accident reduction for entire community. (Objective 1.1)	September 2012	Annual	Local Nonprofit	Local LCIs; Bikeville; local bike shops
Annual Count and Survey Program	Evaluation and Planning Goal 2: Prioritize and increase bicycle funding to support facility upgrades, enforcement and education programs. (Objective 2.5); Equity Goal 2: Provide appropriate bicycle facilities in and near Greenville's Special Emphasis Neighborhoods. (Objective 2.2)	September 2012	Annual	City Parks & Recreation Department; City Department of Public Works	Bikeville; GPATS
Targeted Enforcement	Enforcement Goal 1: Increase safety through promoting greater awareness of bike-car issues and conflicts. (Objective 1.3);	October 2012	Every 2 to 4 years	City Police Department	Department of Public Information and Events

<b>Bicycle Staff Position</b>	<i>Evaluation and Planning Goal 2:</i> Prioritize and increase bicycle funding to support facility upgrades, enforcement and education programs. (Objective 2.2)	January 2013	Ongoing	City Administration	City Parks & Recreation Department; City Planning & Development Division; City Public Works; GPATS
<b>Bicycle Sharing</b>	<i>Encouragement Goal 9:</i> Develop a downtown bike share/bike rental program; <i>Engineering Goal 4:</i> Expand bicyclists’ access and mobility through the integration of bicycling into the transit system.	March 2013	Ongoing	Greenville Transit Authority	City Administration; City Economic Development; City Public Works
<b>Bicycle Safety Campaign</b>	<i>Education Goal 1:</i> Establish safety training and accident reduction for entire community. (Objective 1.1);	April 2013	Every 2 to 4 years	Bikeville	Local hospitals; City Police Department; SafeKids Upstate
<b>Senior Bicycle Education Classes</b>	<i>Education Goal 1:</i> Establish safety training and accident reduction for entire community. (Objective 1.1)	May 2013	Annual	City Department of Parks and Recreation; Bikeville	Local LCIs; Local hospitals
<b>Funding Policy</b>	<i>Engineering Goal 5:</i> Fully fund the implementation of the Bicycle Master Plan and Bike Program; <i>Evaluation and Planning Goal 2:</i> Prioritize and increase bicycle funding to support facility upgrades, enforcement and education programs. (Objective 2.1)	June 2013	Ongoing	City Administration; City Council	City Parks & Recreation Department; City Planning & Development Division; City Public Works; GPATS
<b>Increase Bicycle Friendly Community Status</b>	<i>Evaluation and Planning Goal 1:</i> Pursue Silver Level designation from the League of American Bicyclists in the fall of 2013.	July 2013	Every 2 to 4 Years	City Administration; City Parks & Recreation Department	All related City departments and partner groups
<b>Youth Bicycle Safety Education Classes</b>	<i>Education Goal 2:</i> Implement a bike safety education curriculum for elementary, middle, and high schools. (Objective 2.1)	August 2013	Annual	Greenville County Schools	Local LCIs; SafeKids Upstate; City Police Department
<b>Bicycle Friendly Business Program</b>	<i>Encouragement Goal 3:</i> Make bicycle travel an integral part of daily life, particularly for trips under 3 miles. (Objective 3.4)	November 2013	Ongoing	Chamber of Commerce; Bikeville	Bicycle shops; Local nonprofit; City Economic Development Department; League of American Bicyclists
<b>Diversion Classes for Motorists and Bicyclists</b>	<i>Enforcement Goal 2:</i> Engender mutual respect between different transport user groups. (Objective 2.1 and 2.2)	February 2014	Ongoing	Greenville County Solicitor’s Office	Local LCIs
<b>Long-Term Bicycle Parking Policy</b>	<i>Encouragement Goal 8:</i> Encourage the use of bicycles through the provision of convenient and secure bicycle parking and support facilities; <i>Engineering Goal 2:</i> Create and expand a complete and integrated network of bicycle facilities that is safe for all ages and abilities. (Objective 2.8)	April 2014	Ongoing	City Administration; City Council	City Planning & Development Division
<b>Personal Travel Encouragement Program</b>	<i>Encouragement Goal 3:</i> Make bicycle travel an integral part of daily life, particularly for trips under 3 miles. (Objective 3.4)	September 2014	Expanded to new target areas after one year of operation	City Department of Parks and Recreation; Greenville Transit Authority	Bikeville; Local Nonprofit; GPATS

## **A. Appendix A: Summary of Existing Plans**

This Bicycle Master Plan builds on and supports a number of other plans and policies from the City of Greenville and other agencies and organizations. Planning and policy context is important to the successful implementation of this Plan because much of the support for bicycle-related projects will come from local sales tax, and federal and state money administered by regional and state agencies. A clear understanding of the existing policy context will enable Greenville to position projects that fulfill the policies adopted by Council and partner funding agencies.

City of Greenville land use and transportation policy is guided by a variety of plans with varying scopes. The Comprehensive Plan guides future development and sets a foundation for future growth and small area planning. GPATS Long Range Transportation Plan sets the regional vision and priority for area transportation investments. Greenville also has adopted several specific plans establishing land use, transportation and design recommendations for focused geographic areas of the city. The recommendations in this Plan refer to and support relevant goals, policies, programs and guidelines from each of these documents.

Other planning efforts conducted by a variety of public agencies also occur at the county, regional and state levels. This Plan is also consistent with and supports the relevant goals, policies and standards of these documents. Goals and objectives from the two most relevant of these plans are summarized below.

### **A.1.1. Bicycle Friendly Community Program**

The following three documents are relevant to the City's overall Bicycle Friendly Community Campaign. They are the Bicycle Friendly Portfolio, the Bicycle Friendly Community Application, and official feedback regarding the Bicycle Friendly Application.

#### **Greenville Bicycle Friendly Portfolio – City, 2009**

This catalog of collateral pieces highlights the successful programs and infrastructure improvements of Greenville's Bicycle Friendly Community campaign, especially in the vein of bicycling encouragement and education.

Items of note from this document include:

- Greenville has installed bicycle loop indicators at some intersections, including both pavement marking and signage
- Greenville has employed sharrows as a bicycle friendly treatment along bikeway routes
- Augusta Circle Elementary is a Safe Routes to School grant recipient
- Engineering firm Fluor is a bicycle friendly business

#### **Greenville Bicycle Friendly Application – City, 2009**

Greenville has offered significant staff and community training and education over the last eight years. In particular, the City hosted a Bicycle Friendly Community Workshop, led by the League of American Bicyclists, which spurred the creation of Bikeville.

A significant number of bridges are closed or inaccessible to cyclists (16 out of 42, or 38%). However, of the bridges that are accessible by bike, 100% are described as being bicycle-friendly, meaning that they include paved shoulders, bike lanes, wide curb lanes, or multi-use paths.

There is an opportunity to increase the availability of bike parking at schools, recreation centers, government buildings, parks, and commercial developments (according to this 2009 report). All libraries and transit centers offer bike parking.

Notably, Greenville bolstered its “Complete Streets” Policy with specific requirements for bike lanes on every new collector and arterial roadway construction project per its Engineering “Design and Specifications Manual.” Public and private roadways are affected.

Thirty miles of the MPO’s county-wide signed bicycle route system are within the City. The City also developed an Urban Connector Bicycle Route Signage Program, which directs cyclists to bicycle-friendly corridors.

The Lights for Life program and Rack N Ride PSA are excellent examples of Greenville’s initiative toward cyclist safety and outreach. According to the 2009 BFC application, the City is developing a Bicycle Commuter Tax provision to incentivize bike to work trips.

Greenville’s five specialty bike retailers (as reported in 2009) – as well as the newer bike recyclery store – are an important resource for the Bicycle Master Plan and bicycle friendly community efforts.

The City’s comprehensive bicycle plan was completed and adopted in January 2008, according to the 2009 application. It was one component of the City’s Trails and Greenways Master Plan and the BFC application notes that a more detailed study of the bike network is needed.

### **Bicycle Friendly Application Feedback - League of American Bicyclists, 2009**

The League of American Bicyclists is a national bicycling advocacy organization that houses the Bicycle Friendly Community designation program. In reviewing the City of Greenville’s Bicycle Friendly Community application, the League was able to identify existing strengths and opportunities for improvement of the City’s bicycling environment.

Strengths of Greenville’s bicycle friendly community initiative included:

- Vision and support of the mayor and cycling community
- Development of the [Swamp Rabbit] Trail
- Education efforts such as the Lights for Life safety campaign
- Bilingual safety outreach
- Partnership between Safe Kids Upstate and all City schools
- On-going training provide by city planning and engineering staff

The League cited three priority areas for improvements so that Greenville might improve its bicycling environment, and thus progress to the next level of bicycle-friendliness in the future. Those three priority areas are:

- Expand bicycling education for youth and adults as well as motorist education
- Update and fully implement the comprehensive bike plan, including the expansion of all programs, and continue to close gaps in the cycling network and improve access



- Continue to increase the number of arterial streets that have wide shoulders or bike lanes, while also expanding the bicycle network and increasing the network connectivity through bike lanes, shared lane arrows, and signed routes

The LAB's recommended objectives for Greenville to advance to higher levels of Bicycle Friendly Community status are summarized below:

### **Engineering**

- Continue to ensure that new and improved facilities to accommodate bicyclists conform to current best practices and guidelines provided by SCDOT and the *AASHTO Guide for the Development of Bicycle Facilities*
- Promote the bicycle coordinator to full-time employment status
- Continue to increase the amount of secure bicycle parking throughout the community

### **Education**

- Set targeted annual increases in the number of Traffic Skills 101 and other Smart Cycling courses offered each year
- Host a League Cycling Instructors seminar and work to increase the number of local LCIs
- Expand Safe Routes to School programming to all Greenville schools

### **Encouragement**

- Expand Bike to Work Day events in the city
- Continue to promote and grow non-competitive cycling events in the community
- Consider offering a 'Ciclovía' or 'Summer Streets' type of event
- Create a Smart Trips/Travel Smart transportation demand management program to encourage short trips made by bicycle

### **Enforcement**

- Continue to ensure that police officers are aware of the Share the Road message and have general knowledge regarding traffic law as it applies to bicyclists
- Host an Enforcement for Bicycle Safety Seminar
- Encourage police officers to use targeted enforcement to encourage motorists and cyclists to share the road
- Utilize the relevant resources provided by the National Highway Traffic Safety Administration

### **Evaluation/Planning**

- Continue to collect data on bicycle usage and crash statistics and use this data to prioritize improvements to the bicycle network and to target enforcement and education efforts
- Set an ambitious attainable target to increase the percentage of trips made by bike in the city
- Include performance measures within the city's bicycle master plan to track increases in mode share and to track the progress of the plan's implementation
- Continue to integrate the development of the cycling network into larger land-use planning and development projects and plans

### **A.1.2. Bike Network Concept Plan – Greenville Spinners, 2005**

- Goals: integrated, safe, and accessible network and a commitment to promote cycling as part of Greenville’s “branded” image
- Recommended components of the bicycle network:
  - Multi-use greenways
  - Bicycle boulevards
  - Urban bicycle corridors
  - Basic bicycle streets
  - Designated neighborhood routes
  - Blue paint for bike lane intersection crossings
- Proposed Phase One (to be implemented in 2006) was:
  - Downtown Bike Beltway
  - Cultural Connector
  - Ballpark Link
  - Max Heller Greenway
  - Neighborhood Network
- Bike racks along North Main and bike locker at Richardson Street/Buncombe St

The City’s *Trails & Greenways Plan* (2007) integrated the primary recommendations of this plan.

### **A.1.3. Parks, Trails & Greenway Planning**

#### **Greenville County Greenways Plan – County Recreation District, 2010**

Greenville County Recreation District completed a Greenways master plan in the summer of 2010. The plan provides a vision for greenway facilities across the entire county. The plan is particularly timely due to the County’s commitment to extend the development of the Swamp Rabbit Trail rail-to-trail conversion. Connectivity between the City of Greenville’s bicycling and trail facilities and those just beyond the City limits is crucial for establishing a successful bicycling network. The county-wide plan was funded in part through the Greenville Hospital System as part of their commitment to expanding greenways.

#### **Greenville Trails & Greenways Master Plan – City, 2007**

The City of Greenville’s Trails & Greenways Master Plan, adopted in 2007, lays the groundwork for a network of bicycle and pedestrian trails that provide close-to-home and close-to-work access for all Greenville citizens. The City and its consultants undertook a significant public involvement process, including public workshops and an online survey. That process resulted in specific visions and goals for the master plan, which included the following:

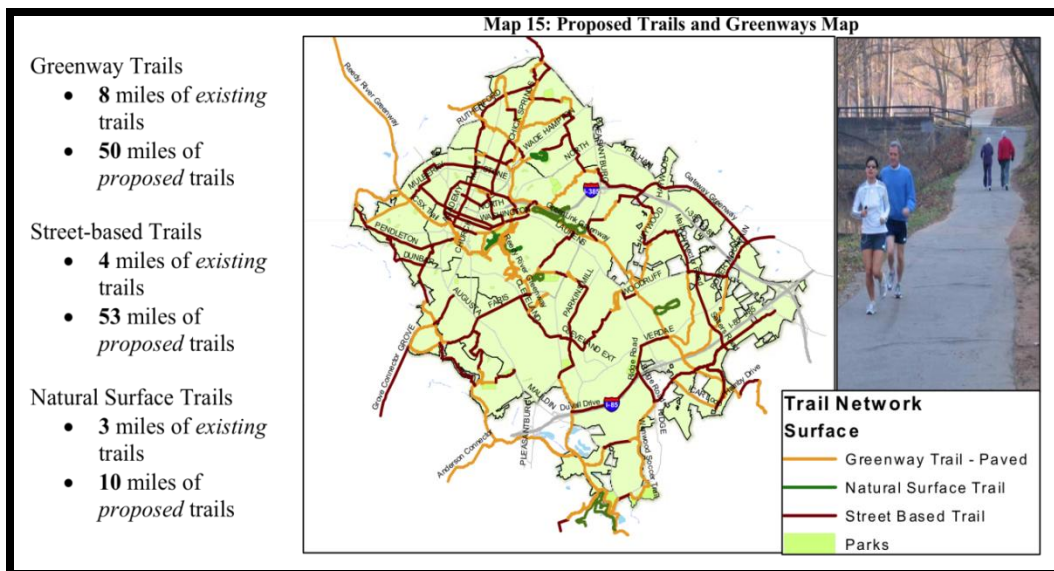
- Develop a safe and interconnected city-wide network of trail facilities that links together destinations and people, both locally and regionally
- Improve the quality of life in Greenville, by developing a trail network that provides facilities and programs designed to expand and encourage active recreation, community strength, and alternative transportation

- Enhance, protect, and preserve the environmental quality of open space, waterways and wildlife habitats
- Stimulate economic growth through increases in tourism and real property value by developing a city-wide trail network
- Conserve and tell the story of local culture, history, and heritage through interpretive trails and signage

### Existing Conditions from The Greenways Master Plan (Chapter 2)

- GTA fleet did not have bicycle racks in 2007 (though each bus now does)
- GTA has limited service area and poor public information (in 2007)
- The Reedy River Trail and the CSX Rail Trail are the two flagship segments of the spine of the future city-wide trail system
- Schools are a major destination yet have significant accessibility concerns:
  - only five of Greenville's schools lie within a half mile proximity of the existing trail system
  - only 10 lie within a mile.
  - 12 schools are outside of a mile
- Employment centers to Greenville's south and east do not have trail access

Chapter 2 also summarized numerous existing plans for the City of Greenville. In those plans, the Reedy River has always claimed primary importance for Greenville. It is also worth noting that the 1996 City Parks & Recreation survey found that the most important recreation facility for Greenville was walking/jogging/fitness/bicycle paths.



### Proposed Greenway Network (Chapter 3)

The proposed Greenway network includes three trail types:

- Type 1 = Greenway Trail (8 to 12 foot wide, paved multi-use trail in green setting)
- Type 2 = Street-based Trail (on-road routes, may include sidepath)

Type 3 = Natural Surface Trail (unpaved)

- Hub & Spoke Model
- Parks and popular destinations serve as hubs
- Five main trail corridors: Reedy River, Brushy Creek, Richland Creek, I-385, and GreenLink Corridor (the main railroad corridor)

This proposed network provides an important step in the right direction for the City. However, the model provides predominantly linear connections rather than an integrated network of trails. The Bicycle Master Plan utilizes the Greenway Plans recommended network as one of the bases for the city-wide bicycle network recommendations.

#### **Design Guidelines (Chapter 4)**

- Wayfinding signage should be seamless between on-road, off-road and transit routes
- Wayfinding examples are provided in Chapter 4 of the Greenway Master Plan, and may relate to any future bicycle wayfinding signage
- On Road Bicycle Facility design guidelines include:
  - 4 to 6 foot bike lane, without on-street parking
  - 5 to 6 foot bike lane, with on-street parking (at 8 feet for parallel parking)
  - Use 4 foot bike lane if speed limit is < 50 mph or truck volume is < 5%
  - Use 6 foot bike lane if speed limit is > 50 mph or truck volume is > 5%
  - Shared travel lane is recommended within a 14 foot traffic lane
  - 4 to 10 foot bike shoulder is also offered
  - Use 4 to 6 foot bike shoulder if speed limit is < 50 mph or truck volume is < 5%
  - Use 8 to 10 foot bike shoulder if speed limit is > 50 mph and truck volume is > 5%.
  - Sharrow specifications included

#### **Action Steps (Chapter 5)**

- Greenville has already successfully fulfilled several recommended steps of the Trails & Greenways action plan. The City approved the plan, hired a coordinator and passed a complete streets resolution.
- The third action step recommends that the Bicycle and Pedestrian Advisory Committee integrate trail & greenway progress with bicycle and pedestrian issues. This new bicycle master plan may assist that group in doing so.
- The ninth action step recommends that greenway planning be integrated with other transportation planning and funding efforts. This should be an action item for the Bicycle Master Plan as well.
- Recommendation 5.7 is for the establishment of regular pedestrian and bicycle data collection. This recommendation is being fulfilled in part by the bicycle count methodology, which will be developed for the Bicycle Master Plan.

#### **Operations & Maintenance (Chapter 6)**

- This chapter suggests that on-road bicycle facilities should be implemented during normal paving or road construction projects.

- On page 13, the plan states that “it is assumed that the current City of Greenville Public Works Department and SCDOT Maintenance Division will be able to maintain the on-roadway bicycle facility system. Some provision should be made, however, for fifteen regular inspections per year, to include minor repair or replacement of signs, vegetation grooming and other items that an inspector could remedy in the field. Additional attention should be paid to any potholes or other pavement damage. Some additional sweeping will be required where bicycle lanes and wider shoulders are provided along roads.”
- On page 14 the plan states that “remedial work for on-road bicycle facilities includes asphalt repaving (5’ on either side of the street for a two-way bike route, total 10’ width) along with curb and gutter, sewer-grate and manhole repair. Pothole and crack repair are considered routine. Pavement markings, such as bicycle lane lines, bicycle stencil markings, and edgelines should be re-installed when other roadway pavement markings are improved. Since this work is done as part of the current street maintenance regime the cost is assumed to be covered.”

Appendices: Engineering schematics are included in Appendix D of the Greenways Plan.

#### **2006-2011 Park Facilities Master Plan – City, 2006**

Key highlights of the City’s 2006 Parks & Recreation Master Plan include:

- Identified ‘more walking and cycling trails as the top major way to improve the Parks & Rec System’
- Out of the five priorities currently accepted by the Mayor, Council and staff, the top one is “Build a bikeway-trail-greenway system along the Reedy River.”
- Establish a “greenbelt” around the downtown consisting of a continuous park setting through Cleveland Park, Falls Park, McPherson Park and Main Street.
- The trail system along the Reedy River will form the spine of the trail network. Linkages from other trails and the proposed bicycle lanes will provide the ribs of the overall walking-bicycling trail system. Specifically, the following routes were identified
  - Complete the trail from Cleveland Park to Greenville Technical College
  - Complete the CSX trail from Linky Stone Park to the western city limits
  - Link Cleveland and McPherson Parks along Park Avenue and Stone Avenue
  - Link McPherson and Falls Parks along Main Street
  - Link Cleveland & Timmons Parks along Richland Creek
  - Link the proposed Gateway Park to Cleveland Park
  - Link the Twin Lakes area to Cleveland Park along the Richland Creek sewer line
  - Link the Wenwood Soccer complex to the proposed Lake Conestee Nature Preserve and the Old City Landfill Park
  - Link the future ICAR Park to the park and open space in Verdae

#### **Complete Streets Resolution & Engineering Design and Specifications Manual - City**

While complete streets resolutions have been passed in many communities around the country, Greenville’s resolution is particularly impressive. It mandates rather than suggests that bicycle, pedestrian, and transit accommodations be provided in all new City transportation improvement

projects. Additionally, that intent must be incorporated into all manuals, rules, and policies, and enforces, as such. The engineering manual requires landscaping and bicycle- and pedestrian-oriented design in all new and reconstructed roadways.

### **Engineering Directive Memorandum 22 (EDM 22), “Consideration for Bicycle Facilities” – State, 2003**

This document provides design guidelines for bicycle facilities within South Carolina Department of Transportation right-of-way. These guidelines are referenced in plans reviewed for this background summary. EDM 22 is based largely upon guidelines from AASHTO’s 1999 *Guide for the Development of Bicycle Facilities*. (The AASHTO guide is currently being updated to reflect more current thinking on bikeway development. The standards in EDM 22 should be considered for revision based on the new AASHTO guide as well as other innovative design guidance such as NACTO’s *Cities for Cycling* design guidelines.)

### **Greenville Bicycle Parking Ordinance (City Off-Street Parking & Loading Ordinance) - City**

Greenville City Council approved a bicycle parking ordinance. This is an important step in ensuring long-term bicycle-friendliness and coordinating policies with programs. The measure has the following elements:

- Requires bicycle parking
- Exempts C-4 and historic properties
- Applies to all constructions, expansions and changes of use
- Minimum: equal to ten percent of the first 100 off-street parking spaces provided on a site, plus one percent of the number of off-street parking spaces exceeding 100
- At least two bike parking spots for every site
- Can replace required off-street vehicular parking by ONE space for every SIX bicycle parking spots provided.

The ordinance also provides appropriate installation guidelines as described below:

“Parking areas shall be located for the convenient access to site amenities and primary building entrances. Parking areas shall be located on a hardscape surface, physically separated from automobile parking lots. They shall be designed to provide adequate space for ingress and egress, and not impede pedestrian and vehicle circulation. Parking areas shall be designed to provide adequate space for ingress and egress. Racks shall be designed to support a frame in two places in a stable, upright position. Racks shall be securely anchored to the lot surface. Parking areas and racks shall be designed and installed as specified in the Design and Specifications Manual.”

## **A.1.4. Comprehensive and Long-Range Planning**

### **Greenville Forward: Vision 2025 – Greenville Chamber of Commerce, 2005**

In 2003, the Greenville Chamber of Commerce launched a long-range visioning process called Greenville Forward. The report involved community-wide input and provided an updated vision from a similar process conducted in 1987. Several long-term goals of the plan relate to Greenville’s bicycling environment.



Bicycling-related goals are primarily included within the healthy community vision and the public sector vision. Broad goals related to the bicycling environment include:

- “A healthy Greenville is supported by programs for community health... bikeway and walkway networks, and a collaborative healthy system.”
- “The County’s Land Use Plan promotes more open space, preservation of farm land, mixed use development, higher densities along future transportation nodes, and encourage developments that address pedestrian needs and adopt ‘Smart Growth’ principles.”
- “In 2025, Greenville County will be a place where parks, greenways, open spaces and other destination points of interest such as residential communities, business and retail centers, hospitals, downtown areas, and multi-modal centers are connected via a system of bikeways and walkways, thereby enhancing the quality of life for all residents of the County while at the same time providing an alternate means of transportation movement within the County.”

The plan also specifically states that bicycling will be “thoroughly integrated into the planning, design and construction of all new transportation facilities,” and that existing facilities will be “retrofitted to better accommodate the needs of bicycle transportation.” Greenville Forward forecasts that in 2025:

- There is a comprehensive plan and strategy for funding and implementation of a bicycle network and related facilities for both on-and off-road systems to interconnect the interest areas and destination points noted above in the vision statement. Integrate this network with the sidewalk system.
- The County, municipalities, and the private sector provide the staff resources and sufficient funding for the maintenance, improvement, and redevelopment of existing and future bikeways throughout the County.
- The bikeway/walkway network is integrated with SCDOT transportation networks.
- There are bike lanes along existing and future roadway with curb access at intersections.
- The Greenville County bicycle network is linked with the Palmetto Trail.
- The County has bicycle/pedestrian access to public parks and places through this linked transportation system.

Greenville Forward also prioritizes a successful marketing and education plan that will promote the use of a multi-modal transportation network. Objectives of future marketing and education include:

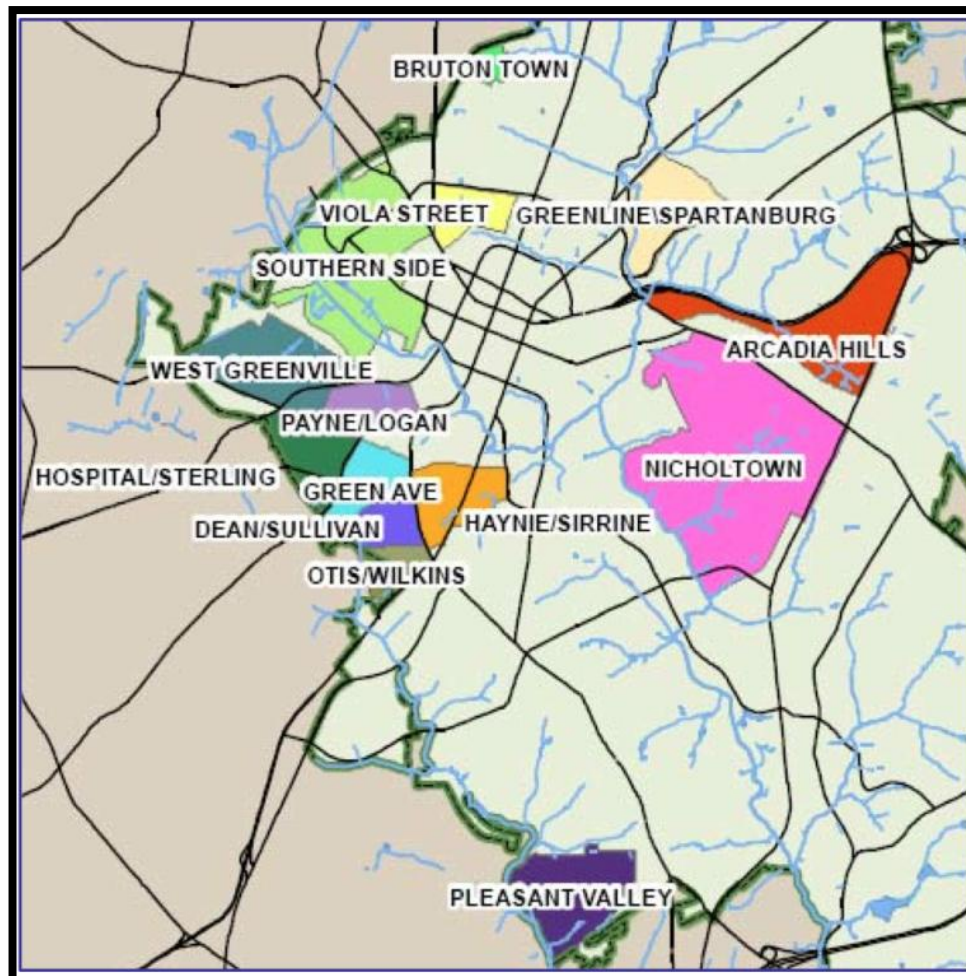
- A comprehensive regional public relations and marketing plan encourages citizens to utilize alternate forms of transportation.
- Students in grades K-12 are educated to use a variety of transportation modes.
- The public knows about the relationship between transportation and air quality and chooses transportation modes accordingly.
- Incentives are in place that makes it advantageous for people to use alternative forms of transportation.
- The economic benefits of having a multi-modal transportation system in the Upstate are well understood and direct transportation developments and improvements.

Overall, the plan propagates several strategies for reducing Greenville residents' dependence on the automobile for daily transportation needs. The report also recommends that Greenville County school systems provide free bicycle helmets to students at least once a year.

### **Greenville Comp Plan (Plan It Greenville) – City, 2007-2009**

The City's Comprehensive Plan was adopted in 2009 and provides an important overview of the community's vision and direction. The following summary provides a chapter-by-chapter look at the elements of the plan, which are relevant to the City's Bicycle Master Plan project.

Special Emphasis Neighborhoods are shown in the map below.



- The need for multi-modal transportation is discussed in the transportation & land use section of the Comp Plan. “From 1999 to 2005, Greenville’s population is projected to have grown at roughly 5%, while traffic counts on select major roads grew at an average of 47%.” (pg 55)
- Current air quality issues provide useful argument for alternative transportation options.

### **Dream (Chapter 3)**

- Results of Public Input Process included:
  - “Transportation – Respondents indicated a strong need for a pedestrian-friendly environment that includes sidewalks in neighborhoods and reduction of congestion on major roads. Individuals were also interested in the construction of bike paths to serve as alternative methods of transportation.”
  - “Walkability and Design – Many individuals were concerned with the national rise in obesity and the relation to traffic congestion. Individuals suggested designing developments to be pedestrian-friendly in order to encourage individuals to use alternative methods of travel such as walking or biking to increase activity, reduce traffic congestion, and reduce their carbon footprints. Many students also found it difficult to get around town, particularly the middle school age students that have not begun driving yet.”

### **Plan (Chapter 4)**

- Objectives determined by Theme Committees (that relate to bicycling):
  - Create safe, walkable spaces and accessible destinations
  - Create a healthy environment for all Greenville citizens including children, youth, and seniors, and residents of all socioeconomic backgrounds
  - Provide a variety of transportation options for all incomes
  - Provide linkages between all transportation options
  - Encourage transit-oriented development in appropriate areas
  - Improve air quality
  - Encourage sustainable growth
  - Encourage a wide variety of transportation modes

### **Appendix – Healthy Living Theme Committee**

- Mobility Strategies:
  - Change shoulder requirements
  - Create Bicycle Boulevards
  - Limit Curb Cuts
  - Construct multi-use trails
- Making the urban environment more bike friendly:
  - Create blue bike lanes (as suggested in the Greenville Spinners bicycle master plan)
  - Set requirements on bicycle parking (Greenville has successfully fulfilled this recommendation)
  - Enforce alternative roadway maintenance requirements

- Institute spot improvement programs (to fix little problems)
- Recognize bicycle and pedestrian needs in a construction zone
- Integrate cycling with transit
- Implement traffic mgmt and traffic calming
- Pursue access management

#### **Appendix – Transportation Theme Committee**

- Safe bicycle and pedestrian environments
  - Limit curb cuts
  - Enhance pedestrian and bicyclist entrances
  - Improve bicycle parking
  - Blue bike lanes
  - Guaranteed ride home programs

#### **Greenville 2030 Long-Range Transportation Plan – GPATS, 2007**

The metropolitan planning organization for the City of Greenville is the Greenville/Pickens Area Transportation Study (GPATS). In 2007, GPATS updated the Long-Range Transportation Plan (LRTP) for the study area. Chapter Six comprises the pedestrian and bicycle element of the plan. The Long Range Transportation Plan of the Greenville Pickens Area Transportation Study (GPATS) provides a broad, overview of a connected bicycle, pedestrian, and trail network throughout the greater Greenville area. The plan offers important linkages across City limit boundaries, as well as extending beyond Greenville County's boundaries. Future efforts to create a connected bicycling network should give strong consideration to these points of connectivity.

The LRTP is updated every five years to reflect the fast-changing landscape of the region. GPATS has begun the process of updating this plan for completion in 2012. The recommendations of the Bicycle Master Plan will be incorporated into the new version.

The LRTP acknowledges and builds upon the 2005 Bike Network Concept Plan developed by the Greenville Spinners and its partners. GPATS solicited public input through surveys, workshops, and a citizen advisory committee. Based on public input, the plan provides recommendations within four "Es" of bicycle planning: Engineering, Education, Enforcement, and Encouragement. Central elements of those recommendations that are relevant to Greenville include:

#### **Engineering**

- Traffic calming on streets with severe safety problems
- Increased use of the "sharrows" or shared-lane markings
- Improved bicycle amenities on transit
- A policy to require bicycle lanes on all 5-lane roads at the time of resurfacing
- New bicycle lanes increasing the total mileage from 7.4 to 120.

#### **Education**

- Publish a bicycle route map
- School-based bicycle safety education
- Public service announcements

### **Encouragement**

- Safe Routes to School program support
- Bicycle to School Day
- Bike to Work Week
- Bike Mentor Program
- Bicycle Rideabout

### **Enforcement**

- Targeted enforcement
- Bicycle licensing program
- Targeted positive reinforcement of safe bicycling behavior

The plan additionally suggests that municipalities pursue Bicycle Friendly Community designation, which the City of Greenville has since achieved. The plan also identifies support facilities as a primary concern for local residents and area cyclists. In response, the plan recommends the following support facilities:

- Comprehensive route system
- Share the Road signage
- Use of the Bicycle Level of Service model for bicycle planning
- Improved maintenance
- Bicycle-sensitive intersections
- Prevention of roadway symbol build-up
- Safety railings along bicycle facilities
- Increased bicycle parking

The LRTP used eleven weighted criteria to prioritize the proposed bicycle infrastructure improvements. The eleven criteria were:

- Public suggestions
- Proximity to schools
- Proximity to parks
- Proximity to libraries
- Proximity to greenways
- Proximity to transit routes
- High poverty households (Traffic Analysis Zones)
- High number of households without access to a vehicle (Traffic Analysis Zones)
- Population density per acre
- Projected population density per acre

of proposed bike lanes, wide outside lanes, four-foot paved shoulders, paved greenways and unpaved greenways are included in the final network map. (There are no four-foot paved shoulders recommended within the City of Greenville.)

### **Greenville Transit Vision & Master Plan – GreenLink, 2010**

The primary transit corridors identified in the Greenville Transit Vision & Master Plan are:

- North Corridor (US 276)
- Northeast Corridor (Wade Hampton Boulevard)
- Southeast Corridor (Laurens Road/Main Street)
- Southwest Corridor (South Church/US 29)
- West Corridor (US 123)

Many goals established in the plan directly support bicycling opportunities in Greenville. They are:

- **Natural Environment** - Enhance important ecological and recreational spaces through the expansion of the well established and expanding City/County parks and greenway system while encouraging land use and transportation activities that positively impact land, air, and water quality.
- **Community Design** - Ensure that development and redevelopment is compatible with adjacent uses, while supporting the community's vision of vibrant pedestrian- and bicycle-friendly nodes surrounded by stable neighborhoods.
- **Transportation** - Increase the viability of all modes of travel through creation of better street connectivity, providing a safer and more comfortable walking/bicycling environment, and positioning future transit investments for successful ridership levels and supportive land uses.
- **Provide Choices** - Transportation choices (such as transit, bicycling, and walking), as well as land use choice in appropriate areas should be enhanced by integrating a wider range of housing, shopping, employment, and recreational opportunities into the community.
- **Integrate Open Space Framework with Transit Corridors** - Building upon the regional greenway master plans, pedestrian and bicycle linkages to the transit corridors and the major activity nodes, as well as outdoor recreational opportunities near or adjacent to the transit corridors, should be reinforced and prioritized.

Additionally, the plan recognized the efforts to link the City's bicycle friendly campaign and transit. The City developed two videos to promote bicycles on buses and to inform the public about the new shelters. The plan recommends that a printed brochure with bicycle rack instructions be developed to complement the video.

No bicycle-friendly improvements are included in the short- to mid-term recommendations. These recommendations include the development of new park and ride lots. That suggestion should be encouraged in the Bicycle Master Plan, along with the inclusion of secure, sheltered and long-term bicycle parking at each park and ride location. Though not mentioned in the plan, the recent discussions regarding a bicycling "hub" within a renovated version of the downtown transit station would fit within this model.



The long-term recommendations include the suggestion that bicycle and pedestrian facilities be created to link to transit stops.

### **Multi-Modal Transit Corridor Alternatives Feasibility Study – GCEDC, 2010**

The Greenville County Economic Development Corporation (GCEDC) commissioned a study of a 3.42-mile segment of the former Greenville & Northern Rail Line south of Pleasantburg Drive. This southern portion of the rail line is owned by GCEDC and extends from approximately Pleasantburg Drive to the north of Forrester Drive. The intent is to provide high capacity transit between Greenville, Mauldin, Simpsonville, and Fountain Inn.

After qualitative and quantitative analysis of each mode, the report found that Bus Rapid Transit would be the ideal provision. The Study also reviewed the potential for bicycle and pedestrian amenities along the corridor. During the public input process, many respondents expressed a desire for bicycle and pedestrian trails in conjunction with transit. The Study presumes transit to be the priority facility within the context of a multi-modal approach.

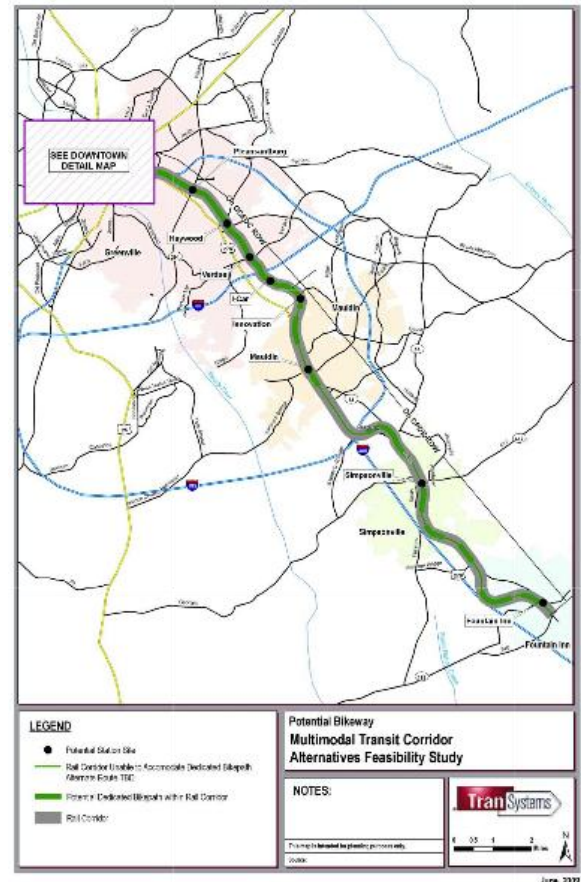
Specific sections of the proposed transit corridor are too narrow for including a bicycle and pedestrian facility. In these instances, the plan recommends continuation of those amenities by way of connections to on-street infrastructure. The following map identifies those segments with a thin green line, while sections capable of including a trail are shown with a thick green line.

Though the report provides cost estimates for implementation of high capacity transit, it does not include bicycle and pedestrian facilities as an additional line item.

There is also the possibility of extending the transit corridor to the North, should Greenville chose to develop this southern portion. In that event, the report identifies the benefit of having the existing Swamp Rabbit Trail within a separate corridor, while still parallel and adjacent to the potential transit corridor extension.

### **Downtown Streetscapes Master Plan - City, 2010**

The City of Greenville commissioned the Downtown Streets Master Plan as a result of the Downtown Greenville Master Plan, completed in 2008. The project's scope includes an overarching streetscape master plan, as well as schematic level planning, design, and engineering. Thirteen street segments, totaling nearly ten miles, are studied in the project. Those segments are:



**North Main St.**  
from Academy St. to Stone Ave

**Academy St. (US 123)**  
from Markley St. to E. North St.

**Church St. (US 29)**  
from Academy St. To Camperdown Way

**Buncombe St./E. North St..**  
from Butler Ave. to Academy St.

**College St./Beattie Pl.**  
from Buncombe St. to E. North St.

**Washington St.**  
from Academy St. to McBee Ave.

**Townes/Richardson/River St.**  
from Park Ave. to S. Main St.

**Spring St./Falls St.**  
from Beattie Pl. to E Camperdown Way

**W. Camperdown Way**  
from Academy St. to S. Main St.

**Augusta St.**  
from S. Main St. to Dunbar St.

**McBee Ave.**  
from W. Broad St. to E. Washington St.

**Elford St.**  
from Academy St. to Church St.

**Broad St.**  
from W. McBee Ave. to River St

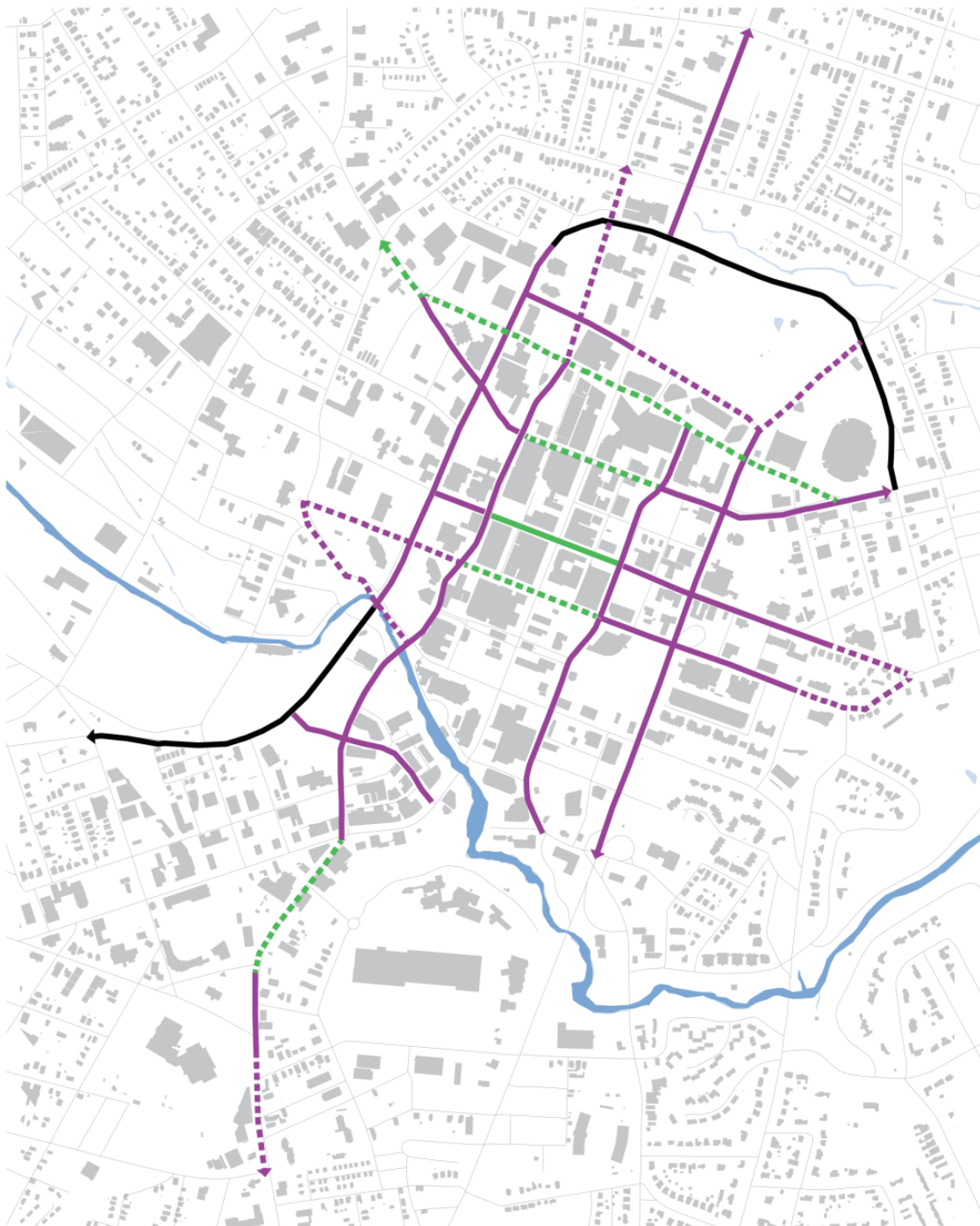
The redesign of Greenville’s downtown streets is intended to “better accommodate new development, transit, pedestrians, bicyclists, parking, and landscape.” The project consultants worked with Greenville citizens and City staff to complete a thorough and multi-faceted analysis of existing conditions. They identified the following re-occurring issues:

- Wide travel lane widths
- Excessive travel lanes
- Sidewalks directly adjacent to travel lanes
- Lack of pedestrian ramps at intersections
- General ADA accessibility issues
- A ‘Concrete Collar’ created by Academy Street, which establishes a physical and psychological connectivity barrier
- Beattie and North Streets are designed as high-capacity, regional roadways within a pedestrian corridor
- The large footprints of Springwood Cemetery and the Bi-Lo Center limit route options for all modes of travel

The recommended designs for downtown streetscapes fell into five categories: Ceremonial Street, Ceremonial Transition Street, Urban Fabric Street, Urban Fabric Transition Street, and Mobility Street. Each typology bears a typical cross-section. Textured turn lanes, storm water planters, parallel parking, a multi-use cultural trail, and five-foot bike lanes are examples of treatments utilized in the roadway typologies.

Two typologies incorporate specific bicycle facilities, while the other three do not. The Ceremonial Street includes a five-foot bike lane (in each direction). The Washington Street segment is a proposed Ceremonial Street. The Ceremonial Transition Street includes a “vibrant, multi-use cultural trail.” The segments along Beattie Place, Buncombe/E. North Street, and McBee Ave are proposed Ceremonial Transition Streets.

The Downtown Streetscapes Master Plan also recommends improved lighting and landscaping treatments. In particular, it specifies environmentally-friendly approaches to those elements.



**Framework Plan**

- Ceremonial Street
- - - Ceremonial Transition Street
- Urban Fabric Street
- - - Urban Fabric Transition Street
- Mobility Street

### **Downtown Greenville Master Plan – City, 2008**

Greenville City Council adopted the Downtown Greenville Master Plan in 2008. This document laid forth a cohesive vision for the heart of the city. While there are limited specific references to downtown’s bicycling environment many elements of the plan will have an impact on Greenville’s bicycle-friendliness and accessibility. The following list outlines bicycling-related information outlined in the plan:

- Should create a “Green Necklace” for downtown (Reedy River park/trail corridor)
- Green Necklace touches each of the five corners
- The document states that “bicycle accommodation should be accomplished through a comprehensive approach, utilizing bike lanes on arterials combined with ‘share the road’ integration of bicycles into vehicular traffic on streets having lower volumes, speeds and street widths.” (page 52 and page 76)
- Church and Academy should remain as major thoroughfares; all other downtown core streets should be “balanced”
- Bike Lanes are proposed on Washington Street and are not shown on Main, Richardson, Spring, or Academy

### **A.1.5. Small Area and Corridor Plans**

#### **Haywood Road Area Master Plan, August 2009**

The Haywood Road Area Master Plan began as a corridor plan. Realizing the many moving parts of this interwoven retail community, however, the project consultants and the City of Greenville ultimately chose to include a broader geographic scope for this plan. The City commissioned the plan in response to declining investment in this particular retail haven.

The plan cited manageable traffic volumes as one of the strengths of this area. However, the consultants identified capacity issues at three intersections. The average annual daily traffic count for Haywood Road is between 25,000 and 28,000, according to SCDOT (2007). The County’s long-range plan does not include any roadway projects in this area, but pedestrian, bike, and transit upgrades are included.

Three relevant guiding principles cited in this plan are respecting human scale, multi-modal access, and balancing needs. Additionally, the existing mix of uses is identified as a strength of the area.

The concept plan for Haywood Road includes sidewalks (five feet), grassy buffers (four feet), narrowed travel lanes (eleven feet) and landscaped medians. The plan does not include bike facilities, but will benefit bicyclists through substantial traffic calming as well as access management, reduction of curb cuts, and improved intersections.

The plan recommends bicycling access to the area. It does not, however, suggest implementing on-road facilities. The plan recommends that the City work with other agencies to identify off-road, multi-use facilities that could provide those connections.

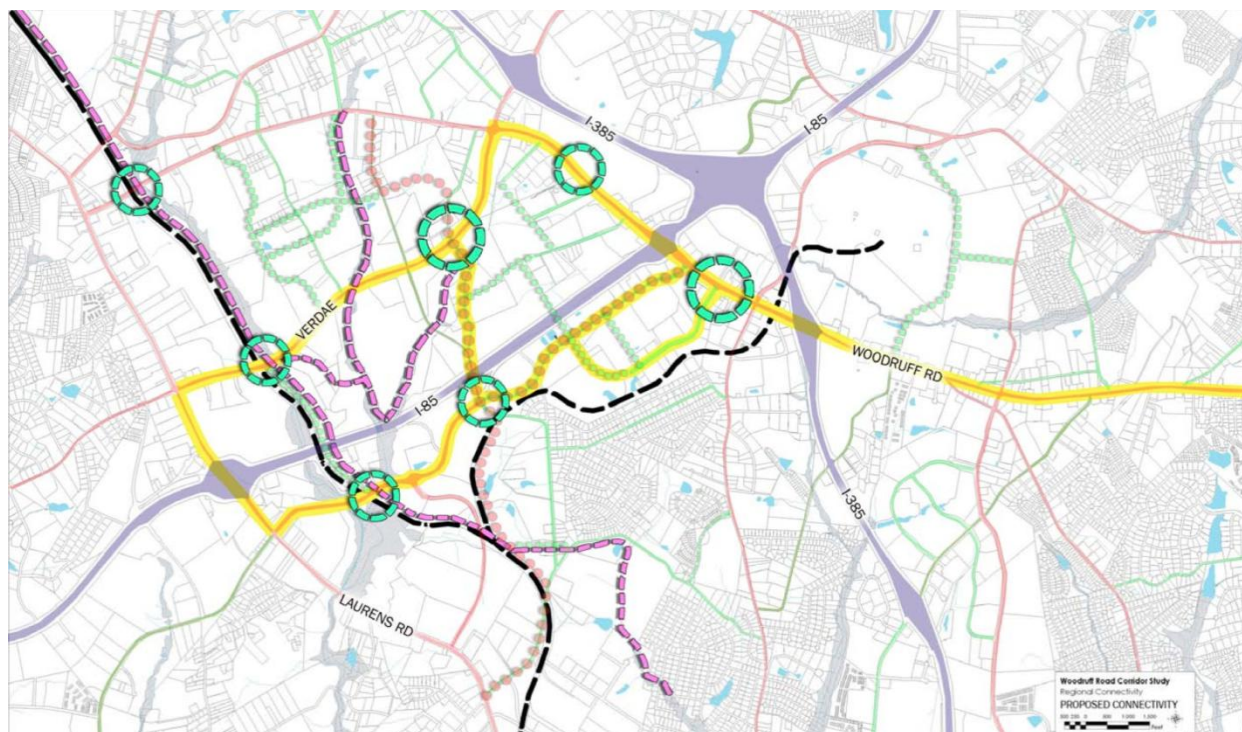
#### **Woodruff Road Corridor Study, July 2007**

The scope of the Woodruff Road Corridor Study extends from Roper Mountain Road to the west, to SC Highway 14 to the east, and Laurens Road to the south. As described in the plan, this corridor “traverses one of the most congested commercial areas in the city, and as a result, traffic patterns are affected not only along



the corridor, but also in the surrounding area.” The plan explores multi-modal access, including transit, bicycling, and pedestrian travel, as one of the solution to these congestion concerns.

The plan proposes new collector streets. These streets would include bike lanes (six feet) with a two-foot buffer between the bike lane and the travel lane. Additionally, the plan proposes new off-road greenway connections, as well. The proposed greenway routes are shown on the following page as dotted purple lines along the map.



Specifically, the plan’s list of short-term implementation priorities includes the construction of a ten-foot multi-use path from Verdae Boulevard to Millennium Point Parkway. The plan suggests using the abandoned SCL rail line and existing underpass located at I-85 and estimates a probable construction cost of \$600,000.

The Woodruff Road Corridor Plan also recommends that the City and County adopt a connectivity ordinance. This ordinance would ensure that linkages for cars, bicyclists, and pedestrians are created between existing and new developments.

#### **Pleasantburg Drive Corridor Master Plan, May 2004**

Pleasantburg Drive is an important corridor for Greenville, not simply for its role as an arterial moving traffic volume, but also for the regional destinations dotted along its path. Those include Greenville Tech, University Center, Carolina First Center, Downtown Greenville Airport, and Bob Jones University. Several neighborhoods border the corridor as well, including Nicholtown and Arcadia Hills.

Strengths of this area include the regional attractions, the overall mix of uses present, and the investment in revitalization in some areas (like the Greenville Housing Authority). Challenges include the lack of connectivity between the different land uses and the street’s function as a through-way.

Pertinent recommendations for the Carolina First Center focus area include:

- Realigning Eisenhower Drive and Tower Drive
- Adding three new roadway linkages
- Creating street network connections between Lowndes Hill Road and Eisenhower Drive
- Providing better 'back' access for the Expo Center to a reconfigured Lowndes Hill Road

Though the cross section for Tower Drive does not include bicycle lanes or sidepaths, the narrowed lanes, access management and landscaping will improve conditions for bicyclists. Additionally, several difficult intersections within this focus area will improve for bicyclists and pedestrians.

Pertinent recommendations for the McAlister Square focus area include:

- Extending Antrim Drive
- Improving spacing of intersection signals
- Increased street grid connectivity

Again, while there is no provision for bicycle lanes or facilities, the recommended improvements to the auto environment and the promotion of mixed uses and connectivity will be an improvement for bicycling.

The plan calls for the narrowing of Pleasantburg Drive. Replacing the outside-most lanes with planting strips will calm traffic and improve the area's image. In relation to Greenville's Bicycle Master Plan, this proposal could improve the environment for bicycling as well.

### **Pete Hollis Gateway Area Plan, March 2006**

The Pete Hollis Gateway Area Plan creates a vision for redevelopment within the area along Pete Hollis Boulevard. It encourages mixed-use development within the study area.

According to this plan, the original bicycle master plan completed by the Greenville Spinners, connects the neighborhoods of the study area with several bike-use streets.

### **Dunbar-West Greenville Revitalization Study – City, 2002**

Completed in 2002, the Dunbar-West Greenville Revitalization Study laid the groundwork for much of what is present and emerging in the West Greenville District today. This community is establishing itself as an arts district, incentivizing new investment and development, and organizing as a cohesive group of proactive residents.

Primary elements of this plan, as it relates to the Greenville Bicycle Master Plan, include:

- Turning Dunbar Street into a boulevard, with narrowed travel lanes and a landscaped center median
- Promoting increased density and mixes of uses in new development
- Investing in streetscapes as a way to attract new business and improve neighborhood perceptions

The study also notes the area's challenges, including low-income residents, high levels of rental housing, and a history of criminal activity (though that has improved substantially since the late 1990s). As a "special emphasis" neighborhood of the City of Greenville, the Dunbar-West Greenville area should be targeted in the Bicycle Master Plan as an area for improved bicycling connectivity.



## B. Appendix B: Bicycle Friendly Community Action Plan

This document provides a Bicycle Friendly Community Action Plan, institutional framework, and collision and safety analysis for Greenville, SC. The process for developing this plan was based on the national Bicycle Friendly Communities (BFC) program of the League of American Bicyclists, the annual national benchmarking report of the Alliance for Biking and Walking, and other national data and standards.

The City of Greenville provided staff and funding support for this project. Greenville Pickens Area Transportation Study (GPATS), South Carolina Department of Transportation, Greenville County, Greenville Spinners, and the dedicated members of the Bicycle Master Plan Advisory Committee provided additional information and resources. The City's leadership allowed for the creation of this document as part of the Bicycle Master Plan. The project's consultant was Alta Planning + Design, with assistance from Darrohn Engineering, Fuss & O'Neill, and DNA Communications. Special thanks are due to all of the community leaders who are helping to transform Greenville into the next level of bicycle friendliness.

### Overview

Greenville is experiencing a growing demand for bicycle and pedestrian facilities due to the City's ongoing campaign to create a high-quality bicycling environment and the advancement of the Swamp Rabbit Trail. Walking and bicycling continue to gain popularity as forms of recreation, exercise, and alternative modes of transportation. In 2009, Greenville earned the designation as a Bronze Level Bicycle Friendly Community.

This Action Plan outlines a strategy for the City to implement the plans and policies laid out in the Greenville Bicycle Master Plan (BMP) while targeting the goal of achieving the Silver, Gold and ultimately Platinum Levels of Bicycle Friendly Community (BFC) recognition. The intent of this effort is to make a case for Greenville's existing bicycle friendliness, while establishing an implementation plan for achieving advanced bicycle friendliness in each of the Five E's.<sup>1</sup>

The BFC campaign is an awards program that recognizes municipalities that actively support bicycling. The League of American Bicyclists (LAB) administers the BFC program. Bicycle-friendly communities are places where people feel safe and comfortable riding their bikes for fun, fitness, and transportation. A BFC provides safe accommodation for cycling and encourages its residents to bike for transportation and recreation. Communities that are bicycle-friendly are seen as places with a high quality of life. This often translates into increased property values, business growth and increased tourism. With more people bicycling, communities experience reduced traffic demands, improved air quality and greater physical fitness.

There are two steps to applying for Bicycle Friendly Community status.

Complete and submit Part 1 of the Application online. After a review of your general community profile, the League will inform you if you have met some of the basic criteria required.

---

<sup>1</sup> For the purposes of the Bicycle Friendly Community application, the League of American Bicyclists suggest that the sixth E, which is equity, should be integrated with the Five Es.

Part 2 is a detailed audit of the engineering, education, encouragement, enforcement and evaluation efforts in your municipality. This comprehensive inquiry is designed to yield a holistic picture of a community's work to promote bicycling.<sup>2</sup>

Greenville has already completed the Bicycle Friendly Community application process in 2008, but expects to submit an updated application to be considered for Silver, Gold, or Platinum BFC status by 2013.

### The Five E's

The core of the BFC program is a balanced approach to Engineering, Education, Encouragement, Enforcement and Evaluation, the Five Es. Each of these categories is scored in the application through a series of detailed questions. A community must demonstrate success in each of these areas in order to be considered eligible for an award. Communities with significant achievements in these areas receive awards, which are given at Bronze, Silver, Gold and Platinum levels. There is also an honorable mention category for communities that do not qualify for a higher level of award, but have demonstrated progress towards future success.

Urban, rural and suburban communities throughout the U.S. have participated in the BFC program. There is a growing interest in using the application process as a benchmarking tool for communities to enhance, develop and manage their local programs. Filling out the BFC application is an education in itself, as communities see their strengths and opportunities in each of these categories. The Five E's are discussed in detail below.

#### ENGINEERING

Communities are asked about what is on the ground; what has been built to promote cycling in the community. For example, questions in this category inquire about the existence and content of a bicycle master plan, the accommodation of cyclists on public roads, and the existence of both well-designed bike lanes and multi-use paths in the community. Reviewers also look at the availability of secure bike parking and the condition and connectivity of both the off-road and on-road network.

#### EDUCATION

The questions in this category are designed to determine the amount of education there is available for both cyclists and motorists. Education includes teaching cyclists of all ages how to ride safely in any area from multi-use paths to congested city streets as well as teaching motorists how to share the road safely with cyclists. Some things that reviewers look at are the availability of cycling education for adults and children, the number of League Cycling Instructors in the community, and other ways that safety information is distributed to both cyclists and motorists in the community including bike maps, tip sheets, and as a part of driver's education manuals and courses.

#### ENCOURAGEMENT

This category concentrates on how the community promotes and encourages bicycling. This can be done through Bike Month and Bike to Work Week events as well as producing community bike maps, route finding signage, community bike rides, commuter incentive programs, and having a Safe Routes to School program. In addition, some questions focus on other things that have been built to promote cycling or a

---

<sup>2</sup> Source: <http://www.bicyclefriendlycommunity.org>

cycling culture such as off-road facilities, BMX parks, velodromes, and the existence of both road and mountain bicycling clubs.

## **ENFORCEMENT**

The enforcement category contains questions that measure the connections between the cycling and law enforcement communities. Questions address whether or not the law enforcement community has a liaison with the cycling community, if there are bicycle divisions of the law enforcement or public safety communities, if the community uses targeted enforcement to encourage cyclists and motorists to share the road safely, and the existence of bicycling related laws such as those requiring helmets or the use of sidepaths.

## **EVALUATION & PLANNING**

Here the community is judged on the systems that they have in place to evaluate current programs and plans for the future. Questions are focused on measuring the amount of cycling taking place in the community, the crash and fatality rates, and ways that the community works to improve these numbers. Communities are asked about whether or not they have a bike plan, how much of it has been implemented and what the next steps for improvement are.

Each of the 5 E's is presented as a section of this document, with specific recommendations for enhancing efforts. These recommendations can be used to create balanced approaches to improving the community. Over time, as these efforts are implemented, conditions for bicycling will improve. Assessment of local bikeways and programs was developed based on the proposed facilities in the City's Bicycle Master Plan (BMP), which is currently being developed. Where programs are not currently available, opportunities were identified to connect local efforts to regional programs that can compliment local efforts.

## Engineering

### Recommended Engineering Actions

The City of Greenville is an advocate of supporting alternative methods of transportation to protect the environment, encourage healthy lifestyles, and to preserve the high quality of life Greenville residents enjoy. The City recognizes that bicycling is an appealing form of recreation and a viable mode of transportation, which has significant health, safety, congestion reduction and air quality benefits.

The primary designated bikeway in the City is the Swamp Rabbit Trail – currently a 13.5-mile long paved rail trail that passes through Greenville for 5.4 miles. Some of the main roads accommodate bicycle travel with shoulders, bike lanes, and shared lane markings. The BMP recommends expansion of the paved trail system, particularly focused on routes to school and connecting downtown.

In addition to implementing the recommendations made in the BMP, the development of a comprehensive system of on-street bikeways will be a key to Greenville improving its BFC status. As Greenville moves forward with its plan for bike facilities, it should consider additional striped lanes and shared lane markings, as well as other innovative treatments such as, bike boxes and colored bike lanes. Additional treatments appropriate to lower speed and volume streets such as Bicycle Boulevards are essential for linking the overall network. Bicycle boulevards are low-cost treatments that greatly improve smaller, quieter streets for bicycling, and designate good routes for bicycling throughout the City (Figure B-1).

Greenville has already employed Shared Lane Markings or “Sharrows” on several downtown streets. For roads with limited space available for bike lane striping, this treatment may be used to identify the presence of bicycles. The primary purpose of the Shared Lane Marking is to provide positional guidance to bicyclists on roadways that are too narrow to be striped

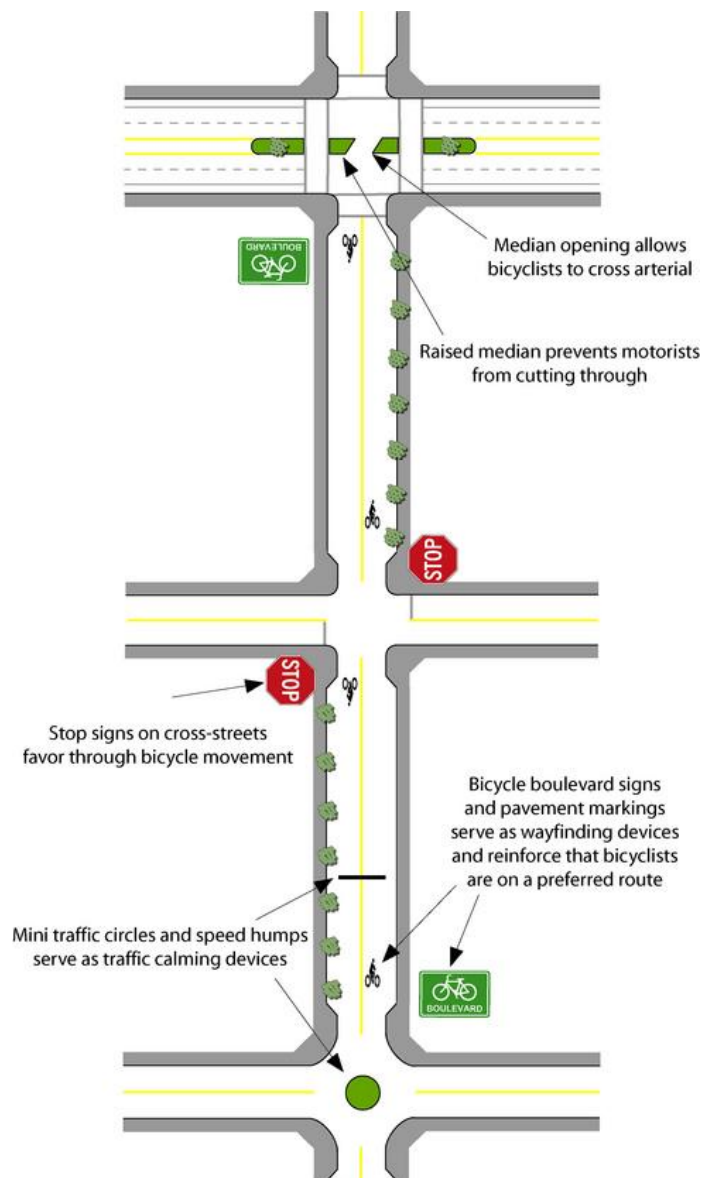


Figure B-1. Bicycle Boulevard treatments calm traffic and provide safe places to bicycle, appealing to tentative or beginning cyclists

with bicycle lanes and to alert motorists of the location a cyclist may occupy on the roadway. Shared Lane Markings are intended to reduce the chance of a cyclist colliding with an open car door of a vehicle parked on-street, parallel to the roadway. Shared Lane Markings are appropriate on bicycle network streets that are too narrow for standard striped bicycle lanes, areas that experience a high level of "wrong-way" riding, along with bicycle network streets that have moderate to high parking turnover, typically commercial areas. Shared Lane Markings are intended for use on roadways without striped bicycle lanes or shoulders.

"Complete Streets" policies are often recommended as an important step toward institutionalizing bicycle-friendly design. Complete streets policies direct transportation planners and engineers to consistently design roadways with all users in mind (e.g., motorists, transit riders, pedestrians, bicyclists, older people, children, and people with disabilities). The City of Greenville passed a resolution in 2006, which clearly states the City's support for and integration of "Complete Streets" in all new City transportation improvement projects. Additionally, the City amended its Engineering Design & Specifications Manual to include bicycle lanes of a minimum five-foot width on all collector and arterial streets.

Bicycle parking facilities will also need to be made available to accommodate increased bicycle use. Public facilities and municipal buildings, and urban streetscape designs are the best place to introduce the installation of bicycle racks. Schools, libraries, transit stations and government buildings should also be evaluated to determine the current bicycle parking available and future needs should be assessed. Bicycle storage can range from a simple and convenient bicycle rack to storage in a bicycle locker or cage that protects against weather, vandalism and theft. Short-term bicycle parking, such as a rack, should be provided for use by visitors and customers at Greenville sites, while long-term bicycle parking, such as a bicycle locker, should be provided for employees at businesses and residents at multi-family developments.

## Specific Recommendations for Engineering

**Question 1 Written Policy:** In 2003, the State of South Carolina became one of the first states in the country to pass a Complete Streets policy. That policy states that:

Bicycling and walking accommodations should be a routine part of the department's planning, design, construction and operating activities, and will be included in the everyday operations of our transportation system, and...that the South Carolina Department of Transportation Commission requires South Carolina counties and municipalities to make bicycling and pedestrian improvements an integral part of their transportation planning and programming where State or Federal Highway funding is utilized.<sup>3</sup>

Additionally, the State adopted "Engineering Directive Memorandum 22" (EDM 22), which establishes design guidelines for bicycle and pedestrian facilities.

Insuring that Bicycle Friendly Communities do not stop at municipal borders is important to the League of American Bicyclists. On October 5, 2010, Greenville County Council considered a Complete Streets resolution, though it failed to gain the requisite votes. As recommended in the BMP, the City of Greenville should support the County's efforts to accommodate bicyclists. Passage of a County Complete Streets Resolution will communicate to motorists that bicycles belong on the road, making conditions for cyclists

---

<sup>3</sup> [http://www.scdot.org/getting/bikeped/bp\\_milestones.shtml](http://www.scdot.org/getting/bikeped/bp_milestones.shtml).

both safer and more enjoyable. A County Complete Streets resolution will also open the door for new miles of bike facilities at minimal added cost, while bringing Greenville County in line with state policy.

**Question 2 Training:** Local officials and engineers should be well versed in the Complete Streets concept as well as the engineering tools available to create non-motorized facilities. Organizations such as the Alliance for Biking and Walking and the Initiative for Bicycle and Pedestrian Innovation have knowledgeable staff that can provide training to local officials and engineers.<sup>4</sup>

Greenville's staff and leadership have engaged in significant training already, ranging from online technical webinars to National Center for Safe Routes to School workshops. This type of field-specific training should continue for each level of City staff member who may have an impact on the City's bicycling environment. Continuing to invite new and different staff members to these training can broaden the base of knowledgeable participants in the bicycle friendly campaign. Additionally, providing regular opportunities for staff, administration, and elected officials to bike as a group along Greenville's bicycle facilities and on streets without bicycle facilities can deepen their understanding of the local bike network and its gaps.

**Question 3 Bridges:** Bridges are long-term infrastructure projects and since they may not be rehabilitated or reconstructed for a number of decades, it is vitally important to insure that all bridges have access for bicyclists. In Greenville, a significant number of bridges are closed or inaccessible to cyclists (16 out of 42, or 38%). The City should set a goal of ensuring that 100 percent of the bridges that are accessible by bike are bicycle-friendly, meaning that they include paved shoulders, bike lanes, wide curb lanes, or multi-use paths.

**Question 4 Parking Ordinance:** Greenville's bicycle parking policy establishes a minimum number of bicycle parking spaces required based on a percentage of automobile parking for all new development. The ordinance insures that at least two bicycle parking spaces are provided at all sites. The policy also includes standards for bicycle parking functionality and location.<sup>5</sup> Recommendations for enhanced bicycle parking standards and requirements are included in Chapter 5 of the Bicycle Master Plan.

**Question 5 Bike Racks:** Bike racks should be made available at public locations and should be incorporated into new developments. Schools, libraries, transit stations, government buildings, community centers, parks, commercial centers and other significant trip generators and destinations should be the first to receive bike racks. The BMP establishes a goal of encouraging the use of bicycles through the provision of convenient and secure bicycle parking and support facilities. To meet that goal, all Greenville County schools will have adequate and convenient bicycle parking by 2013 and places of work will have incentives to provide changing and shower facilities.

A downtown bicycle parking and changing facility is recommended for the BMP, to provide commuters with secure bicycle parking, as well as showers and clothing storage in one central location. The site location should be selected carefully to ensure that its location is convenient to the key bicycling corridors as outlined in the BMP. The City of Greenville should also continue to provide additional downtown bicycle parking during signature events, along with bike valet service.

**Question 6 Transit Access:** Bike racks on buses have become an important tool for improving multi-modal connections. GreenLink has installed bike racks on all buses. Increased promotions and training classes are recommended to ensure that transit riders are confident in using the racks. Additionally, GreenLink should

---

<sup>4</sup> <http://www.peoplepoweredmovement.org/site/> and <http://www.ibpi.usp.pdx.edu>

<sup>5</sup> City of Greenville, Parking & Off-street Loading, Sec. 19-6.1.4(I)



prioritize the provision of bicycle parking at all new or renovated transit facilities, such as the construction of park-and-ride lots or the renovation of the downtown hub. The new park-and-ride lots recommended as short-term improvements in the Greenville Transit Vision and Master Plan should equally serve as bike-and-ride lots.

Greenville should also coordinate with GreenLink to promote the use of bicycle bus racks and to better document bike-boardings on buses. Buses with electronic fare-boxes should program a key to record bike-on-bus occurrences. While user surveys are another available method for tracking bikes-on-buses, this strategy is generally used by agencies that require a permit for use of the bike racks and, thus, have contact information for each bike-on-bus user.

In the Bicycle Master Plan survey, 22.6 percent of respondents did not know that GreenLink buses offer a bicycle storage rack. Three-quarters of the survey participants (76%) knew of the racks existence, but had not used a bus rack. This community feedback indicates a need for both increased promotion of the racks, as well as information about convenient bike-to-transit routes.

**Question 7 Bike Lane Mileage:** Integrating on-street bikeways into repaving and reconstruction projects will offer the opportunity to stripe new bike lanes, and provide innovative solutions such as “bicycle boulevards” and “road diets” that can create needed space for bicycling within existing urban streets. The BMP establishes a draft goal of having a bikeway network link within a quarter mile of every city resident by 2015. Accommodating bicycles on major streets in Greenville will require coordination with the South Carolina Department of Transportation (SCDOT), as described in Question 8, following.

**Question 8 Arterial Access:** The top-level BFC communities report that more than half of their arterial streets have bike lanes, as they provide important connections to other routes and may be the only access to many retail and commercial destinations. Although several of Greenville’s arterial roads already accommodate bicycling (13 percent in 2009), more are needed to significantly improve bicyclist mobility. The BMP establishes a goal of providing bicycle facilities on all major thoroughfares. The majority of arterial street bike lane recommendations require collaboration with SCDOT. Arterials should incorporate striped shoulders at a minimum and bike lanes if possible, and this data should be tracked as a performance benchmark as improvements are made.

**Question 9 Bike Route Signage:** Signing bike routes for both transportation and recreation purposes is a cost effective way to designate desired routes for bicyclists. The routes should include “Share the Road” signage and can also include MUTCD approved wayfinding signs with local branding. Use of a consistent image is important to ensuring the user-friendliness of the wayfinding system. Figure B-2 provides one example of a bicycle stencil used as a directional pavement marking.

As recommended in the BMP goals, new bicycle boulevards will be an important component of the overall bike route network. Additionally, Greenville’s existing Urban Connector Bicycle Routes should be maintained and expanded as part of the total bike route mileage. The BMP also calls for a bicycle route wayfinding signage program, which will enhance and

Figure B-2. NYC Bikestamp



facilitate use of bike routes.

**Question 10 Maintenance:** Bicycles are more susceptible to roadway imperfections and debris than most other road users. Bike lanes and shoulders commonly collect much of the road debris that accumulates during the course of the year and need to be kept clean to insure safety and reduce the risk of punctures. Small potholes and cracks, which would otherwise not affect motor vehicles can pose significant hazards to bicyclists and should be repaired.

Greenville's weekly street sweeping is important to the functionality of the overall bike network, but a formalized maintenance program for existing and future bikeways will be critical. On-line venues and other formalized methods for reporting maintenance concerns is equally important and should be heavily promoted to the bicycling community.

**Question 11 Intersections:** Intersections are typically the most likely crash location for motorized and non-motorized users alike. There are a number of innovative treatments such as bicycle boxes and bicycle-specific traffic lights, which can significantly improve the visibility and safety of cyclists at intersections. Greenville has implemented bicycle signal detection, another innovative treatment, at select intersections. Greenville should increase the number of intersections that receive that treatment and has set the goal of marking twenty bicycle loop detection symbols each year. Through bicycle crash data and bicycle count data, Greenville can determine which intersections warrant further treatment such as bike boxes or bicycle-specific traffic lights based on safety needs and evidenced demand.

**Question 12 Hard Surface Trails:** A former rail bed that has been converted into a paved multi-use trail, the Swamp Rabbit Trail is the predominant bicycling facility in Greenville. The more than 5 miles that lie within Greenville city limits could serve as a spine to connect future bicycle facilities.

**Question 13 Soft Surface Trails:** Cleveland Park currently provides popular mountain biking trails near the Central Business District, namely the Troop 19 Trail, Dog Park Trail, and Eagle Park Trail. The link between those trails and the Swamp Rabbit Trail is important and should be maintained and expanded. Timmons Park offers a 1.5-mile hike and bike trail along a small creek and the relatively new East North Street bike facilities have improved access to that trail. Additionally, a signed bike route connects downtown to the soft surface trails of Paris Mountain State Park, which is beyond the City's limits. Such connectivity should be highlighted and promoted through maps and wayfinding.

**Question 14 Open Space:** Greenville has important public lands that are accessible via bicycle routes, providing transportation options to recreational opportunities. Cleveland Park is a central amenity in the City, which is connected to the Swamp Rabbit Trail and the E. Washington Avenue bicycle route.

**Question 15 Trail Maintenance:** Volunteer stewardship of the Swamp Rabbit should be a significant component to Greenville's BFC program. As Greenville develops additional miles of off-street trails, the City should consider formalizing a trail maintenance strategy, potentially establishing a maintenance endowment. This is a common practice for land trusts, which often include an endowment contribution as part of the acceptance of a new parcel or easement.

**Question 16 Employer Facilities:** Secure bike parking, changing and shower facilities provided by employers allow bicycle commuters to ride to work without concern of bike theft or personal hygiene. The recommended secure bicycle parking facility in the CBD would serve commuters who work in downtown, but other large employers should be encouraged to provide secure bicycle parking to employees. Local codes and

ordinances can specify that employers of a certain size must include bike parking and changing facilities at the place of work.

The League of American Bicyclists has recently initiated a Bicycle Friendly Business program.<sup>6</sup> Greenville has four businesses designated as Bicycle Friendly Businesses. Two local offices, Fluor Engineering Construction (2009) and Upstate Forever (2010), earned Bronze Level designations. The Great Escape Bicycle Store earned an Honorable Mention in 2009. In 2010, TTR Bikes claimed the highest level of Bicycle Friendly Business – earning Platinum status.

Greenville should not only tout the national recognition earned by these businesses, but also establish a program for incentivizing other businesses to follow this path. The City, the Greenville Chamber of Commerce, or another economic development agency (such as the Upstate Alliance) should assist each business that earns this designation in gaining media exposure and local and regional recognition for this accomplishment.

**Question 17 Other/ Recreational Cycling:** Low traffic rural roads and touring routes help support recreational and touring cyclists. The Greenville Spinners Cycling Club organizes numerous recreational and road rides, which they make available for other riders through their online presence, listserv, MapMyRide.com, and other outreach. The City of Greenville should take an organized approach to promoting bicycle tourism through its website, through the Convention & Visitors Bureau, and through other outreach avenues. The economic impacts of cycling in the City should be calculated and touted – with particular attention given to the annual U.S. Pro Cycling Championship. This could be the role of City Special Events staff or tracked in partnership with the Convention & Visitors Bureau.

## **Connections to Regional Programs**

Bikeway projects identified in the BMP, which would require coordination with the South Carolina Department of Transportation (SCDOT), will be noted in this section.

## **Education**

### **Recommended Education Actions**

The collaborative effort between the City of Greenville, the Greenville Spinners Cycling Club, and community volunteers, known as Bikeville, is a key element of educating motorists and bicyclists to share the road. Educating motorists that bicyclists have a right to the road and need a minimum amount of operating space is critical to improving road safety and reducing the number of car-bike collisions. Share the Road signs introduce the message at the road level, but that message must be reinforced to effectively educate the motoring and cycling public. The “Share the Road” theme should be a mandatory component of all drivers’ education classes and the concept needs to be continually enforced on the road by law enforcement officers.

It is equally important to educate bicyclists on vehicle and traffic laws to insure that they are riding as safely as possible. Members of Greenville’s bike clubs could become trained in the bicycle education curriculum, so that they are eligible to attend the League Cycling Instructor (LCI) program, which will then allow them to teach classes on their own. Currently, six LCIs are located in Greenville and more than twenty live in South Carolina. The presence of multiple LCIs teaching classes in the area is an important tool to disseminate basic

---

<sup>6</sup> More information is available from the website: [www.bikeleague.org/programs/bicyclefriendlybusiness/index.php](http://www.bikeleague.org/programs/bicyclefriendlybusiness/index.php).

concepts of safe cycling to the local population. This program could be coordinated throughout the region through a partnership with Upstate cycling clubs and other organizations. The key to success will be reaching a large percentage of motorists and cyclists throughout the community. The City should make a concerted effort to educate motor vehicle drivers as well as bicyclists to safely share the road. This message is vital to increasing actual and perceived safety as more bicyclists take to the road for utilitarian and recreational cycling.

A Bicycle Advisory Committee should be established to coordinate with a certified LCI to offer a variety of training courses to the community. The existing “Road Relations Committee” may serve as an important support network for certified LCIs and the City, as well. Courses could include Traffic Skills 101 and 102, Commuting, Motorist Education, and Kids I and II courses. Motorist Education training would be appropriate for professional drivers, such as school bus drivers, transit bus drivers, taxi drivers, and delivery drivers. Special effort should be made to provide training opportunities for traditionally underserved populations. Additionally, coordination should occur with the Sheriff’s Office and the School Board to evaluate the feasibility for in-school and after school bicycle safety education courses for children. These training courses could also be incorporated into a diversion program that would allow offending cyclists to take the course in lieu of paying a traffic fine.

Safe Routes to School programs also present an opportunity to bring the safe walking and bicycling curriculum back into elementary and middle schools. The National Center for Safe Routes to School, SCDOT and SafeKids offer resources to supplement bicycle rodeos and other education outreach programs.<sup>7</sup>

### Specific Recommendations for Education

**Question 1 Educating Motorists:** Educating motorists on the “Share the Road” message is an important aspect of the education component with the ultimate goal of keeping bicyclists safe on the roadways. SCDOT promotes sharing the road through a specialty license plate program. Additionally, SafeKids Upstate and Hincapie Sportswear jointly produced bicycle safety public service announcements (PSAs) that have aired on Greenville’s access channel. The continuation of these PSAs, as well as any new segments that are produced, could contribute towards a broader citywide safety campaign.

Programs such as the NY Bicycling Coalition’s “Sharing the Road Safely” focus on training the trainers by working with the AAA and drivers’ education instructors.<sup>8</sup> Another excellent example is the “Share the Road” bus wrap media campaign in Des Moines, Iowa, (Figure B-3) where the local transit agency plays a lead role in getting the word out to the general public.<sup>9</sup> Other municipal agencies can help to spread the message by distributing “Share the Road” material and including the message on municipal vehicles.

Implementation of a “Share the Road” awareness campaign in Greenville can be accomplished through:

Variable message boards can be placed at key locations such as near schools, major traffic corridors, or the Swamp Rabbit Trail. The City’s Traffic Engineering Department or County Sheriff’s Office may be able to provide access to these signs, which are a highly effective way to bring attention to motorists that bicycles are sharing the road.

---

<sup>7</sup> National Center for SR2S: [www.saferoutesinfo.org](http://www.saferoutesinfo.org); SCDOT: <http://www.scdot.org/community/saferoutes.shtml>; Upstate SafeKids: [http://www.safekidsupstate.org/at\\_play.php#bike](http://www.safekidsupstate.org/at_play.php#bike)

<sup>8</sup> [www.nybc.net/site/index.php?page\\_id=15](http://www.nybc.net/site/index.php?page_id=15)

<sup>9</sup> <http://www.bikeiowa.com/asp/hotnews/newsdisplay.asp?NewsID=2056>

The City could include information about bicycle awareness in utility bill mailings.

Partner with a local camera production company to create an ongoing television program that teaches a different aspect of bicycling safety each month. Spartanburg, S.C.'s show "Cycle Spartanburg" provides one example of this.<sup>10</sup>

Figure B-3. Des Moines, Iowa used bus wraps to promote a "Share the Road" message.



**Question 2 Other Adult Education:** The League of American Bicyclists has developed adult cycling skills training courses called "StreetSmarts Cycling" where participants can learn how to safely operate a bicycle under various conditions and learn about bicyclists' rights and responsibilities.<sup>11</sup> In order to reinforce the "Share the Road" message, informative pamphlets can be distributed through public agencies and outreach can be accomplished through volunteers and other model programs. Safe Routes for Seniors programs have proven effective about educating the older walking and bicycling crowd.<sup>12</sup>

**Question 3 Training Children:** Safe Routes to School (SR2S) is a national and international movement to create safe, convenient, and fun opportunities for children to bicycle and walk to school. SR2S can include a variety of multi-disciplinary programs aimed at promoting walking and bicycling to school and improving traffic safety around school areas through education, incentives, law enforcement and engineering measures. SR2S Programs typically involve partnerships among municipalities, school districts, community and parent volunteers, and law enforcement agencies. The primary goals of SR2S include improved safety for children, establishing good health and fitness habits for children and decreased traffic and air pollution.<sup>13</sup>

One objective of the BMP is to implement a bike safety education curriculum for elementary, middle, and high schools.

<sup>10</sup> Cycle Spartanburg videos can be viewed at: <http://www.youtube.com/user/ActiveLivingSC>

<sup>11</sup> <http://www.bikexpert.com/streetsmarts/usa/index.htm>

<sup>12</sup> [www.transalt.org/campaigns/pedestrian/safeseniors](http://www.transalt.org/campaigns/pedestrian/safeseniors)

<sup>13</sup> [www.saferoutesinfo.org](http://www.saferoutesinfo.org)

**Question 4 Other Child Education:** Greenville has a history of hosting bike rodeos and helmet fittings for local children. The Greenville Spinners Cycling Club and Bikeville are strong partners in these events. Bicycle rodeos are the most common type of traffic safety training oriented towards children. The rodeos can also be used to distribute free helmets and insure that they are fitted correctly. The John Williams book on bike rodeos is a highly recommended resource.<sup>14</sup>

**Question 5 Public Distribution:** Distribution of safety materials to the public can be accomplished through license renewal mailings, utility bills and local media. Other communities have issued public service announcements (PSAs), created websites and initiated telephone hotlines to make the education material available. The Share the Road safety message could be included in an area-wide map. Additional information on cycling issues can be included in the community's newsletter and/or website. The Bikeville e-newsletter has already established regular communication with the public regarding trails, greenways, and Bikeville related activities. This outlet should be utilized as a tool for safety information, as well.

**Question 6 Bicycling Ambassadors:** Bicycling ambassador programs have become a popular method for encouraging bicycling while teaching safe and effective bicycling procedures. The City of Chicago has an effective and well-established bicycle ambassador program.<sup>15</sup> The Greenville Spinners Cycling Club and Bikeville volunteers already provide time, energy, and expertise for many local bicycling activities, and are natural partners for an ambassador program.

**Question 7 LCIs:** Currently, six LCIs are located in Greenville and more than twenty live in South Carolina. League Cycling Instructors are trained in the League of American Bicyclist's bicycle education curriculum and are certified to teach bike education classes to participants of all ages.<sup>16</sup> Expansion of the local LCI effort in terms of the number of instructors and the number of people trained will be important benchmarks for BFC success.

---

<sup>14</sup> [www.activelivingresources.org/simpleprojects.php](http://www.activelivingresources.org/simpleprojects.php)

<sup>15</sup> [www.bicyclingambassadors.org](http://www.bicyclingambassadors.org)

<sup>16</sup> Additional information is available at: [www.bikeleague.org/programs/education/](http://www.bikeleague.org/programs/education/).



## Encouragement

### Recommended Encouragement Actions

Greenville hosts many large and small scale community events that have a wide draw from throughout the region, including Fall for Greenville, Artisphere, Downtown Farmers Market, Main Street Jazz, and the nationally recognized U.S. Pro Cycling Championship. The City has also received numerous awards and recognitions, including the “Bicycle Friendly Community” designation by the League of American Bicyclists (2009), the “Great Places in America” award from the American Planning Association (2009), the “Great American Main Street” award from the National Trust for Historic Preservation (2003, 2009), “Tree City USA” by the National Arbor Day Foundation, “City at Your Feet” award by American Walks (2003) and more. Establishing more formalized encouragement of bicycling, along with a well-connected bicycle facility network, would promote Greenville as a nationwide destination for cycling and appealing place to live.

### Specific Recommendations for Encouragement

**Question 1 & 2 Bike Month (Numbers Reached):** The “Drive Less. Live More” campaign can encourage residents to seek alternative ways of getting around, including bicycling. This effort can be linked to National Bike Month and Greenville can connect existing and new events into a month long series of events to promote bicycling. A proclamation from the Mayor is a key element to this effort. The League of American Bicyclist has material available to help develop a series of events.

**Question 3 & 4 Bike to Work Day (Numbers Reached):** Greenville can expand its annual Bike to Work Day events, with staging areas set up around town supplying food, coffee and maintenance facilities to encourage commuters and prizes are offered to those who participate. Large employers can provide additional incentives and can compete with one another to see who has the most bike commuters for the day and the week. The City could set a goal of getting 1,000 people to participate, and tracking these numbers each year will gauge long-term success.

**Question 5 Bike Tour:** Bicycle tours have become popular fundraisers and are a good way to show off the local history and scenic natural resources. Cycle South Carolina is a great model for this type of event – a week-long annual event, the ride changes routes to encourage riders to explore different parts of South Carolina.<sup>17</sup> The City could work with the Greenville Spinners Cycling Club to sponsor an organized ride event – a Tour of Greenville or a Mayoral Ride could be part of Greenville’s cycling calendar.

**Question 6 Clubs:** Greenville has both road and mountain bike clubs including the Greenville Spinners Cycling Club and the Southern Off-road Bicycle Association (SORBA). Increasing the number of memberships in these groups and participation in their events is an indicator of growth as a Bicycle Friendly Community.

**Question 7 Retailers:** Greenville’s business community should work to retain and support the City’s bicycle retailers. Independent bicycle shops are trusted retailers of quality built bicycles and also provide much needed knowledge and accessories to the local cycling population. Currently, there are several independently owned bicycle shops that provide an important service to the local biking (and soon-to-be biking) community while also contributing to the area’s economic development. Hincapie Sportswear is a multimillion-dollar

---

<sup>17</sup> <http://www.cyclesouthcarolina.org/>

company employing sales representative throughout the United States and is headquartered in downtown Greenville. From 2003 to 2010, Hincapie increased its local Greenville staff by 87.5%. The company grew at a rate of 30 to 50% each year since 2003. Hincapie Sportswear and the many local bicycle and bicycling gear retailers are capitalizing on the growth of the bicycle industry over the last decade. The Greenville Convention and Visitors Bureau (CVB) and the Greenville Chamber of Commerce should consider fund the development of an Economic Impact Study of Greenville's growing bicycle industry.

**Question 8 BMX:** BMX (bicycle motor cross) is a popular activity with younger riders who may like to ride dirt tracks or hone their bicycle handling skills. Steps can be taken toward encouraging BMX in Greenville or encouraging use of BMX facilities within the broader region.

Other communities have built urban skill parks, flow parks, and other facilities that provide a fun and convenient recreation opportunity. Such facilities focus on skill development and bicycle handling rather than bike riding mileage. One example is the Colonnade Park under Interstate 5 in Seattle.<sup>18</sup>

**Question 9 National Mountain Bike Patrol (NMBP):** IMBA's National Mountain Bike Patrol program organizes and supports more than 60 volunteer bike patrol groups throughout the United States and the world. The NMBP consists of dedicated volunteers partnering with land managers, landowners and emergency personnel, to assist, educate and inform all trail users in order to enhance their recreational experience.<sup>19</sup>

**Question 10 Bike Rentals:** Bike rentals are often provided through local bike retailers although independent rental businesses and bike share operations are often feasible in areas with good access to trails and other recreational facilities. A well-built multi-use trail often encourages the growth of bicycle rental facilities so that travelers and locals alike can take advantage of the facilities even if they don't own a bike.

As recommended in the draft BMP goals, the City should examine the feasibility of implementing a BikeShare program. BikeShare programs offer short-term bicycle rentals via un-manned kiosks and have been employed in major cities around the world.

**Question 11 Safe Routes to School:** The Greenville County School District currently has no formal policy regarding bicycling to school. The goal of the national Safe Routes to School program is to get more kids walking and biking to school more often. The program provides much needed funds to improve the infrastructure within a two mile radius around elementary and middle schools and also offers other means to educate and encourage school age children to safely walk and bike to school<sup>20</sup> and SCDOT's SR2S program are important resources.

Augusta Circle Elementary is the only school within the City of Greenville to receive a Safe Routes to School grant. The BMP establishes the goals of ensuring that every Greenville County school has a bicycle rack by 2013, that public schools are connected to bike facilities, and that safe routes to school and improved health are available to all children.

**Question 12 Youth Recreation:** Youth cycling opportunities can be provided by after school programs, cycling clubs and other local organizations. The Greenville Spinners Cycling Club or SORBA should initiate a

---

<sup>18</sup> <http://evergreenmtb.org/colonnade/>

<sup>19</sup> [www.imba.com/nmbp/](http://www.imba.com/nmbp/)

<sup>20</sup> [www.SafeRoutesInfo.org](http://www.SafeRoutesInfo.org)

BMX program that offers young riders the chance to cycle with other riders and teaches important safety and bike handling information.<sup>21</sup> For teenagers, a junior competitive cycling team should be established to teach handling and safety skills specific to road biking.

**Question 13 Street Map:** A good street map provides riders with an illustrated network of recommended routes and available facilities in the city. The maps should be updated on a regular basis as more facilities come online and can also be coded to indicate “level of service” data such as posted speed limits and average daily traffic. Most high-level Bicycle Friendly Communities publish free bicycle maps. More information about bicycle maps and guides can be found in Chapter 5, Non-Infrastructure Recommendations, of the Bicycle Master Plan.

The City should make available the BMP’s proposed Bicycle User Map in both printed and electronic format. The maps could be available on the City’s website for download. This map serves two main purposes:

- Identifies the suitability of roadways for bicycling based on speed limits, traffic volumes, network connectivity, popular destinations and trip generators.

- Provides bicycle resources and safety information.

**Question 14 Trail Map:** Currently, the only publicly available map of bicycle facilities in Greenville is limited to online web pages. Information about bicycle connections or suggested routes is not available. As recommended in the BMP, a regional bicycling map could be developed in coordination with Greenville County Recreation District, and it should include information about on-road cycling, local retailers and safety information.

## Enforcement

### Recommended Enforcement Actions

Enforcement is an essential part of the five “Es” but it is often the most overlooked. Together, Education, Enforcement and Engineering set the stage for bicycle-friendly communities. Without Enforcement to reinforce the message and to insure that facilities are kept safe, the overall results will be diminished and fewer people will choose to walk or bicycle.

The ‘Share the Road’ programs mentioned previously in the Education section can be geared to the law enforcement community and could be taught by the officers themselves once they become well-versed in the ‘Share the Road’ message. A comprehensive education campaign for law enforcement officers is something that could be implemented on a regional level with members from each bicycle unit around Greenville City and County participating in the training.

### Specific Recommendations for Enforcement

**Question 1 & 2 Police Awareness/Officer Training:** There may be an opportunity to establish a liaison officer to work with the local bicycling community – Greenville Spinners Cycling Club and others – to ensure that the ‘Share the Road’ concepts are implemented in Greenville. Law enforcement agencies in Massachusetts

---

<sup>21</sup> A good example is the Recycle-a-Bicycle program for New York City public schools and after-school programs: [www.recycleabicycle.org](http://www.recycleabicycle.org)

offer programs to ensure that police officers are trained in bicycle-related law enforcement, and the MassBike advocacy group has published a Law Officer's Guide to Bicycle Safety online.<sup>22</sup>

As recommended by LAB, the City of Greenville should continue to ensure that police officers have general knowledge regarding traffic law as it applies to bicyclists by extending one hour bicycle traffic law training to all officers. The city should also consider hosting an Enforcement for Bicycle seminar.

**Question 3 Targeted Enforcement:** Motorists that threaten the safety of non-motorized users should be warned and cited for dangerous behavior. The same method should be employed for bicyclists that break the law or are riding illegally. Chapter 5 of the Bicycle Master Plan provides several recommendations related to increased enforcement and targeted enforcement.

**Question 4 Police on Bikes:** The City of Greenville's bicycle patrol utilizes police bikes in place of driving. In 2009, the City employed eight bicycle patrol law enforcement officers. The Greenville Police Department should consider expanding the roles of these officers as bicycle ambassadors to provide community education and outreach.

The numbers of officers trained, number of bikes available and routinely used on patrol, and breadth of the officers' territory are important benchmarks.

**Question 5 Mandatory Helmet:** Most municipalities have the freedom to pass local laws, which dictate mandatory helmet usage. Most of the mandatory helmet laws around the country are geared to children 14 and under, although there are some municipalities, which include riders of all ages.

**Question 6 Mandatory Sidepath:** Mandatory sidepath laws can dictate that if there is a usable path adjacent to the roadway, that path must be used instead of the road. These types of laws should be discouraged as they limit the options of the cycling public and generally do not address specific user needs. Greenville does not have a mandatory sidepath law.

South Carolina law previously held that bicyclists must utilize a side path if such a facility was provided. Since the passage of the Bicycle Law Reform Bill (H3006) in 2008, cyclists are required to ride as near to the right side of the road as is practicable and may choose to ride in a roadway shoulder, but is not required to do so. The law also states that "bicycles are required to ride in the bicycle lane except when necessary to pass another person riding a bicycle or to avoid an obstruction in the bicycle lane. However, bicyclists may ride on the roadway when there is only an adjacent recreational bicycle path available instead of a bicycle lane."<sup>23</sup>

---

<sup>22</sup> <http://www.massbike.org/projectsnew/law-officer-training/>

<sup>23</sup> <http://www.pccsc.net/bikelaws.php>

## Evaluation

### Recommended Evaluation Actions

Conflicts between vehicles and bicyclists are not uncommon to the State of South Carolina, including the City of Greenville. Collecting use, facility and safety data is essential to being a BFC. This data should be readily available and well monitored on the city or county level. Locations where multiple crashes have taken place warrant greater safety measures. The city should also implement specific targets for mode share and safety, similar to those included in the USDOT National Bicycling and Walking Study, which called for doubling the amount of travel by walking and bicycling and making those modes 10 percent safer.<sup>24</sup> One of the best actions that the City of Greenville could take to improve the Evaluation of bicycling is to implement an annual count of bicycle traffic at a few key locations. The National Bicycle and Pedestrian Documentation Project provides the method and resources to successfully implement bicycle counts.<sup>25</sup>

### Specific Recommendations for Evaluation

**Question 1 Number of Trips by Bike:** US Census 2000 data are available for Greenville, while the more recent American Communities Survey (ACS) 2009 one-year estimates are available for Greenville County. The ACS estimates that 0.1 percent of Greenville County residents commute by bicycle (margin of error is 0.1 percent), although this number does not account for students and people who travel by multiple modes. The 2000 Census data, which is also limited in its scope, shows that one percent of Greenville County residents and 1.2 percent of city residents commute to work by “other means” (bicycle). These data sources show 10-year census trends, and provide a critical benchmark for becoming a BFC. As recommended in the BMP, the City is encouraged to track these numbers and to participate in the National Bicycle and Pedestrian Documentation Project. Greenville has set a goal of increasing bicycle mode share to a level comparable to Silver Level Bicycle Friendly Communities by the year 2013. For comparison, the average bicycle mode share for a Silver-level community that is not a college-town is 2.65%. A handful of Silver-level communities have a mode share near 1.0%. The average bicycle mode share for each level of Bicycle Friendly Community is shown in Table 1.

**Table 1. Average bicycle mode share among designated Bicycle Friendly Communities**

Award Level	Average Bicycle Mode Share
Platinum	9.71%
Gold	5.20%
Silver	2.82%
Bronze	1.10%

<sup>24</sup> Available at: <http://www.fhwa.dot.gov/environment/bikeped/study/index.htm>

<sup>25</sup> <http://bikepeddocumentation.org/>

**Question 2 Fatalities:** Bicycling fatalities should be examined on a regular basis to determine if there are specific locations, which are poorly designed and may result in an unnecessarily dangerous situation for cyclists. A top-level BFC will be able to document and actively pursue a reduction in fatalities over the most recent 5 year period. A related and perhaps more useful measure would be for the City to track the rate of crashes involving bicycles in relation to the numbers of people cycling locally.

**Question 3 Crashes:** Bicycle crash data should be tracked and cross-referenced between sources. Since many bicycle crashes go unreported, it is often difficult to accurately analyze crash data and the causes of the crashes. Hospital records should be checked against police records and the police should be encouraged to fill out collision reports even if the incident did not result in a serious injury or fatality.

**Question 4 Reduction Plan:** With accurate crash data, the community should develop a safety and collision reduction plan, which targets key intersections and locations and makes resources available to improve them on an annual basis.

**Question 5 Public Comment:** Through the Greenville Cares hotline (864-232-CARE), the City of Greenville fields service requests for any service that the City currently provides. The City should continue to support this hotline resource and should promote the service as a specific tool for bicycling-related requests.<sup>26</sup>

**Question 6 Master Plan:** The BMP addresses bicycle travel for both recreational and transportation purposes, and provides recommendations for improving access to outdoor resources and recreational facilities by building a network of off-road and on-road bicycle and pedestrian facilities. The BMP also seeks to provide a safe, integrated network of bicycle facilities in the City that links to Greenville County and beyond. The plan will aid timely implementation of recommended projects and programs.

**Question 7 Trail Plan:** In 2008, the City of Greenville completed a Trails and Greenways Master Plan. This comprehensive document recognizes the importance of the Swamp Rabbit Trail as the central spine of the City's trail network. As a result of this master plan's recommendation, the City hired a Trails & Greenways Coordinator in late 2008. While the Swamp Rabbit Trail should remain a priority, the City should pursue expansion of the trail system beyond the central spine. A "hub and spoke" approach to expanding the network would increase connectivity for a broader geographic area of the City. Improving access to the Swamp Rabbit Trail and spur trails, enhancing wayfinding signage, and increasing amenities on the trail network should be priorities for the City.

**Question 8 Integrated Network:** The overall goal of any well-designed bicycle master plan or trail plan is to create an integrated network of on and off-road facilities. Bicyclists should be able to seamlessly transition from on and off-road facilities and all major destinations should be accessible by bike. While the BMP identified key corridors that would benefit cyclists in Greenville, a comprehensive network should be developed to connect destinations and trip origins and provide access to schools, shopping centers, civic centers, libraries, and parks.

**Question 9 Priority Plan:** The BMP's prioritization matrix will establish a hierarchy of projects and programs to insure the timely implementation of available facilities and the distribution of educational material to promote safety on those facilities. Priorities for Greenville are included in Chapter 7 of the Bicycle Master Plan.

---

<sup>26</sup> Online Resource: [http://www.greenvillesc.gov/PublicInfo\\_Events/GreenvilleCares.aspx](http://www.greenvillesc.gov/PublicInfo_Events/GreenvilleCares.aspx)



As recommended in the BMP, City staff should complete a brief annual evaluation of the implementation of the BMP. This evaluation should be provided to the public and elected officials. The BMP should also be updated on a routine basis not exceeding ten years.

**Question 10 Improvements:** A Spot Improvement Program should be created to fund small-scale projects, which will improve the region's bicycle and pedestrian travel environments through "spot improvements" to the transportation system. The funds can be used to close gaps in the system or to address safety and maintenance concerns in specific areas.<sup>27</sup>

---

<sup>27</sup> An example program can be found at: [www.cdtcmpo.org/spot/info08.pdf](http://www.cdtcmpo.org/spot/info08.pdf)

## Next Steps

This document is the “bike map” for a bicycle-friendly community. Organizing an active bicycle and pedestrian advisory committee, developing the community’s partnerships and implementing the City of Greenville Bicycle Master Plan are important next steps. By focusing on achievable actions in the short term, it will be possible to create success as the longer-term vision develops. With the enthusiasm, creativity, and leadership that developed this Action Plan, there is a great future for bicycling in Greenville.

### Actions:

This section will be updated based on final recommendations of Bicycle Master Plan.

### Action Plan Timeline:

With the tasks identified in this document as a guideline, the following timeline is suggested for implementing the Greenville Bicycle Friendly Community Action Plan:

August 2011:	Adopt Bicycle Master Plan
Early Fall 2011:	Coordinate and host annual bicycle count
January 2012:	Review priority bicycle facility recommendations of the Bicycle Master Plan and develop a strategy for implementing new facilities during 2012 calendar year.
May 2012:	Promote the Bicycle Master Plan during Bike Month activities
August 2012:	In coordination with start of school year and fall weather, launch new programs based on Bicycle Master Plan and Bicycle Friendly Community Action Plan recommendations.
Early Fall 2012:	Coordinate and host annual bicycle count
January 2013:	Review priority bicycle facility recommendations of the Bicycle Master Plan and develop a strategy for implementing new facilities during 2013 calendar year.
March 2013:	Assess progress by reviewing Bicycle Friendly Community application and Bicycle Friendly Community Action Plan and citing changes to the answers for each application question.
May 2013:	Promote the Bicycle Master Plan during Bike Month activities, highlighting, in particular, successful projects implemented since the adoption of the Bicycle Master Plan.
July 2013:	Apply for a higher level of Bicycle Friendly Community designation (August deadline)

## C. Appendix C: Public Outreach Summary

Residents of the City of Greenville had the opportunity to provide input that would be used to develop recommendations for the Bicycle Master Plan in a variety of methods, including attending workshops and through an online survey. This section describes the types of public outreach available, as well as summarized public comments.

### C.1 Advisory Committee

The City of Greenville developed Bicycle Master Plan Advisory Committee to help guide the progress of the Plan. The committee was responsible for establishing visions for the Plan, obtaining community input, and developing recommendations. Table C-1 presents the members of the committee.

Table C-1. Bicycle Master Plan Advisory Committee

Name	Affiliation
Stephen Edgerton	Caine Company
Elise Dunbar	Heritage Neighborhood
Greg Baney	Greenlink
Sgt. J.R. Long	Greenville Police
Jennifer Rigby	City of Greenville
Keith Brockington	GPATS
Will Ravenhorst	City of Greenville
Nancy Fitzer	Upstate Forever
Ronnie Hyatt	Bon Secours St. Francis Health System
Scott McCrary	Greenville Spinners
Stacey Ashmore	Greenville Family Partnership
Yvonne Reeder	Nicholtown Neighborhood President
Dana Souza	City of Greenville
Brian Graham	City of Greenville
Andrew Meeker	City of Greenville

### C.2 Stakeholder Interviews

Seven local stakeholders participated in interviews about Greenville's encouragement, education, and enforcement programs. The stakeholders represented the following affiliations: Miracle Hill Ministries, Blythe Academy Safe Routes to School Program, Hincapie Sportswear, Greenville Bicycle Safety Foundation, LiveWell Greenville, Reedy Rides, and the Southeastern Off-Road Bicycle Association (SORBA). Participants answered the following questions:

Attitudes/Perceptions

- What would the average city resident think of bicycling in your city? Would they feel it is a safe and reasonable activity? Who bicycles regularly?
- What are the barriers to biking more for people in your community?

Resources and programs

- What is currently being done for bike education & encouragement programs in the community? Who is doing it? Is it effective? What is needed for improvement/expansion of existing programs?
- Are there any bicycle programs needs in your community that are not being met? Who might be the appropriate lead to work on this issue?
- Are there individuals or groups who would be interested in working on bicycle programs in the future?
- Are there any regular community events that might be good opportunities to distribute biking materials and/or add a biking component?
- Are you aware of any existing funding sources (such as local grant programs) that could be applied to education/encouragement efforts?

Communications

- How might people find out about biking events and resources in your community?
- Is there currently a 'one-stop-shopping' website for biking or walking & biking? If yes, who runs it? What is your opinion of its effectiveness?
- What messages do you think would be effective in encouraging community members to bicycle more?

In response to the initial question, stakeholders suggested that the “average citizen” in Greenville perceives an unsafe bicycling environment in the City. They generally noted a lack of safe bicycling facilities, lack of facility connectivity, and lack of access to a bicycle as primary reasons that community members do not bicycle.

Each stakeholder described a handful of programs for bicycling in Greenville. The list of successful programs included: Bikeville, the city’s informational webpage, and bike valet. Bike programs that could provide a new opportunity for Greenville included: ongoing partnerships to provide bicycle maintenance services for low-income bicyclists; increased safety education; new recreational bicycling facilities (such as a criterium course, etc); and a broader range of marketing outlets for bicycling resources. All stakeholders supported the concept of a one-stop-shop website for local bicycling information. The group varied in its opinions of whether the one-stop-shop website should include both bicycling and walking resources, or just bicycling.

The fun and convenience of bicycling is the “message” that stakeholders felt would be most important in encouraging community members to bike. The stakeholders cited messages about health, environmental, and quality of life benefits also. Advertising and promotion that conveys the message “you can do this” by clearly identifying safe and convenient routes, bicycle-friendly streets and connectors and dispelling common myths about bicycling could be effective as well. One stakeholder recommended using “average citizens” in

promotional images (such as mothers with children, adults of varying sizes and types, etc) as one way to reinforce the message that anyone can participate in bicycling.

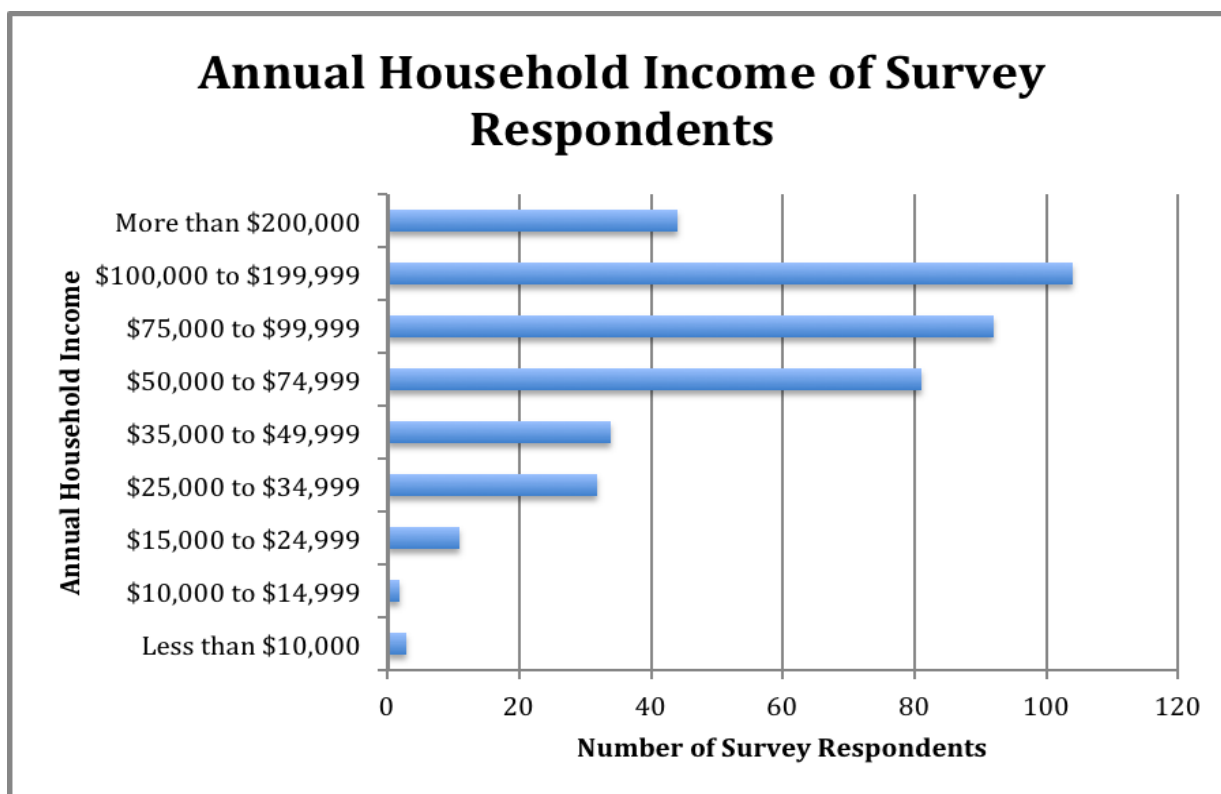
## C.3 Online Survey

### C.3.1 Survey Respondents

Greenville residents had the opportunity to participate in an online survey to provide input for the Bicycle Master Plan. A total of 534 people completed the survey, about 60 percent of which live in the City of Greenville and 60 percent of which are male. The most respondents (32 %) fell in the age group of 41-49 years, followed by 30-39 (25 %), and 50-59 (21 %). The overall findings of the survey are summarized as follows.

The plan reflects input from 44 different zip codes, though more than half of all respondents (57%) identified themselves within one of four zip codes. The top four zip codes represented are: 29601, 29605, 29607, and 29609.

Figure C-1. The majority of survey participants claim more than \$50,000 in annual household income.



Ninety-five percent of survey participants are Caucasian. African-American respondents make up 1.2 percent, Hispanic respondents make up 2.1 percent, and 0.9 percent identify themselves as Native American. The majority of survey participants claim an annual household income of more than \$50,000, and over one-third (36.7%) claim more than \$100,000 in annual income. The single largest income bracket for respondents is \$100,000 to \$199,000 (Figure C-1).

### C.3.2 Bicycling Questions

The majority of those surveyed (52%) classify themselves as bicyclists who prefer to ride on a quiet, residential street or along a bicycle facility, such as a path, greenway, bike lane, or other road treatment. Just over one-third of the respondents (35%) consider themselves to be advanced cyclists, who feel comfortable riding in most traffic situations. While this group represents a significant demographic, bicycle planning professionals estimate that advanced bicyclists actually make up less than ten percent of all bicyclists. The survey garnered opinions from citizens who do not currently bicycle, as well. Five percent of the survey participants do not bicycle, but would like to start, and eight percent have no interest in bicycling.

Nearly three-quarters of Greenville's survey respondents engage in on-road recreational or fitness biking. Additionally, over forty percent engage in off-road recreational or fitness biking. Over fifty percent of respondents use their bike for transportation, whether it is to travel to a transit stop (3%), work or school (21%), or to run errands or visit friends (27%).

Improved health, for individuals and the public as a whole (70%), safer streets (59%), and recreational opportunities (55%) are the most important benefits of Greenville's bicycling network, according to survey participants. The most important destinations to reach by bike are the Swamp Rabbit Trail, parks, and other trails and greenways. The list of preferred destinations reinforces city residents' desire to use bikes for recreation, and also to safely travel to recreational facilities by bike.

50 percent of the survey respondents ride 11 or more miles on a typical ride. About ten percent ride two miles or less, 16 percent ride three to five miles and 13 percent ride six to ten miles. Most respondents ride their bike at least once a week (61%). About 40 percent of survey participants bike one to three days per week and about 20 percent bike four to seven days per week.

More than three-quarters of survey participants (77%) are aware of the bicycle-carrying racks on GreenLink buses, though less than three percent have actually used them. When asked of interest in renting a bike locker for long-term bike storage, half of respondents reported they were not interested and one-third noted that they might have interest. Thirteen percent of respondents indicated a clear interest in using a bicycle locker.

### C.3.3 Improvement Questions

As described in section 4.4.2, the top 5 corridors that survey respondents listed as difficult for bicyclists and that subsequently need improvements are: Augusta Road, Laurens Road, Pleasantburg Drive, Stone Avenue, and Main Street. Table C-2 reports every corridor, intersection, or area that received more than one mention in survey responses.

Table C-2. Corridors recommended for bicycling improvements

Challenging Corridors	Frequency of Recommendation
Augusta Road/Street	88
Laurens Road	52
Pleasantburg	39
Stone Ave (5 identify Stone/Laurens jointly)	30
North main	29
Woodruff Road	25
Main Street	20



Wade Hampton	19
Faris	19
East north Street	17
McDaniel Ave	17
Church	17
Poinsett Highway	13
Pelham	11
Rutherford	11
Chick Springs Road	8
Roper Mountain Road	8
Hudson	7
Cleveland	6
Old Buncombe	5
Mauldin Road	3
State Park Road	2
Butler Road	2
Whitehorse Road	2
Woodland Way	2
Crescent Ave	2
<b>Challenging Intersections</b>	
Swamp Rabbit Trail @ Blue Ridge	3
Swamp Rabbit Trail @ Sulphur Springs	3
E. North Street @ Pleasantburg	3
Poinsett Highway @ Pleasantburg	2
East North Street @ Old Spartanburg	2
E. North Street @ Stone Avenue	2
Poinsett Highway @ Rutherford	2
Cleveland @ Pleasantburg	2
<b>Challenging Neighborhoods/Areas</b>	
Downtown	48
Swamp Rabbit Trail	34
Cleveland Park	10
Augusta Road Area	10
Paris Mountain	9
Furman University	6
North Main Neighborhood	5
Greenville Tech	4
Greenville Hospital	3
Donaldson Center	2

Survey respondents also identified physical improvements that would influence them to bike more often. Of the 11 improvement options, those that were the most likely to encourage respondents to ride were more paved off-street bike paths (greenway trails), more bike lanes on major streets, and bicycle boulevards (shared roadways designed to give priority to bicycle traffic).

The City of Greenville already provides an opportunity for citizens to suggest bicycle parking locations on an interactive Google map. Responses provided in the online survey remain consistent overall with locations recommended on the interactive map. Table C-3 lists locations that received more than one mention.

Table C-3. Recommended locations for bicycle parking facilities

General Bicycle Parking Recommendations	Frequency of Recommendation
Downtown	71
Main Street	36
Falls Park/River Place	26
West End	18
Parking Garages	14
Peace Center	14
All Parks	12
Augusta Shopping	11
Cleveland Park	11
Library/Heritage Green	9
Transit	9
Haywood Mall	7
Flour Field	6
Woodruff Road Shopping Areas	5
McBee/Washington	4
City Hall	3
Government Buildings	3
Stone Ave	3
West Greenville/Pendleton Arts District	3
Dog Park	3
Linkystone Park	2
McBee Station Area	2

The survey asked respondents to classify programs that they would be interested in having implemented in Greenville. Table C-4 shows the top five programs identified out of 11 possible choices. The programs that respondents selected overall were informational programs on where to ride and how to ride safely.

Table C-4. Preferred bicycling programs and resources

Rank	Program
1	Bicycle Maps and Guides
2	Materials describing bicyclists' rights and responsibilities
3	Bicycling incentive programs at work or school
4	Materials describing safe auto driving practices in relation to bicyclists
5	Route planning services for bicyclists; bicycle information websites

## C.4 Online Publicity

In an effort to reach as many segments of the population as possible, residents could elect to receive E-newsletters informing them on the status of the Plan. These newsletters included information, such as the results of the bicycle counts, outcomes of the workshop, and where to find more information.

Those interested also had the opportunity to visit the Bike Master Plan website ([www.bikevillebmp.org](http://www.bikevillebmp.org)). This site provided updates on the Plan, how to get involved with the process, and an interactive map on which people could suggest improvements to existing bikeways, bike facilities, and roadways.

## C.5 Public Workshops

The City of Greenville hosted the first of two public workshops on November 16, 2010 to solicit insights and priorities from the public. Ninety-one people representing a broad cross-section of the city attended. Councilor Amy Ryberg-Doyle presented opening remarks on the Healthy Communities Conference, as well as the City of Greenville's Complete Streets resolution. From the consultant team Alta Planning + Design, principal Jeff Olson and project manager John Cock also made presentations. During their presentations, the audience responded to real-time survey questions. Table C-5 displays the survey results.

Table C-5. Responses to real-time poll question at the first public workshop

Question	Response
Are you a resident of the City of Greenville?	Yes – 66 % No – 44 %
Which of the E's should be a priority for the City of Greenville?	Engineering – 26 % Education – 33 % Encouragement – 19 % Enforcement – 7 % Evaluation/Planning – 5 %
Should the City be promoting bicycling for transportation and recreation?	Yes – 95 % No – 3 % Not Sure – 2 %
Which type of cyclist are you?	Strong and Fearless – 39 % Enthusied and Confident – 39 % Interested but concerned – 20 % No way, no how – 2 %
What type of cyclist should Greenville plan for?	Strong and Fearless – 1 % Enthusied and Confident – 24 % Interested but concerned – 73 % No way, no how – 1 %

Following presentations, audience members participated in a question and answer session. Meeting attendees brought up issues including a lack of law compliance by cyclists; a lack of education of road users; insufficient

width for the installation of bicycle facilities; cost, funding, and usage of bicycle facilities; and support for the existing bicycle facilities, especially the bicycle lane on East North Street.

The workshop ended with stations related to each of the 5 E's at which attendees could provide their comments and feedback on what would improve Greenville's bicycling environment. Table C-6 presents a summary of comments received.

Table C-6. Summary of Comments from Public Workshop Stations

5 E's	Summary
Education	<ul style="list-style-type: none"> <li>Educate children on safe and proper bicycling</li> <li>Educate bicyclists on bicycling rules and laws</li> <li>Educate motorists on how to interact with bicyclists and bicycle facilities</li> </ul>
Encouragement	<ul style="list-style-type: none"> <li>More events/programs, such as instructional rides</li> <li>Published materials and media, including bike routes maps for commuters</li> <li>Additional facilities, like covered bicycle parking</li> </ul>
Enforcement	<ul style="list-style-type: none"> <li>Enforce traffic violations of both motorists and cyclists</li> <li>New laws, such as mandatory bicycle bells and prohibiting riding two abreast</li> </ul>
Engineering	<ul style="list-style-type: none"> <li>Improvements, such as better detectors of bicyclists at signals</li> <li>Increased connectivity</li> </ul>
Evaluation/ Planning	<ul style="list-style-type: none"> <li>Collect data and feedback</li> <li>Plan for type B, C, and D bicyclists</li> </ul>

Following an informational presentation about bicycling facilities and programs, citizens provided comments and suggestions related to Greenville's bicycling environment. The comments are provided below:

### Enforcement

#### Specific Concerns

- Cars don't notice you once they have passed you
- Cars blocking bike lane; cars using bike lane as turning lane
- Motorist harassing cyclists
- Criminals and cop cars on the Swamp Rabbit Trail (SRT) is scary
- Street names and signs along the SRT so you know where you are

#### Recommended Actions

- 25 Bypass and SRT – need better crossing – unsafe – Boston Minutemen Trail
- Hand out reflective vests/ankle straps (very cheap, look to MASSBIKE)
- Blinkie lights and hand signals – need to use! Give to cops to give to cyclists
- Use the police in city to slow car traffic – give tickets so cars will slow down and bikes feel safer
- Restripe Old Buncombe Road – don't ride in center
- High level ticketing to cyclists – high responsibility for cyclists too!!

#### Education with Enforcement

- Police the cyclists; educational materials to all
- Educate cyclists about the law related to waiting/sitting at traffic lights
- Educate cyclists about “on your left” (spandex most of the time)
- Cycling question in DMV tests
- Cyclists shouldn’t hop in front of cars at red lights to be in front
- Share the Road education to motorists, especially Main Street, downtown, sharrow

#### Policy/Law Suggestions

- Bike bell law!!!! Ding, ding (others say - No, Not a law, only recommended)
- Single-file riding (especially on the SRT)
- Law to stop when pedestrian is waiting to cross (in CA)
- Stop as yield (in Portland now) should be a city-wide law, similar to the 2-minute law

#### Other

- Colorado cyclist syndrome – make it better
- Stop sign running – Who decides? How to enforce? Why?
- Move over
- Mention pedestrians - River Street and SRT – stoplight or stop for pedestrians

### Education

#### Children

- Must happen at School, kids teach parents
- Educate parents to teach their kids
- More kids involved in U.S. Pro Event, not just the race
- Bike Club at school, before school day starts (see the running club out there)
- Develop curriculum pilot program
- Spinners Safety Foundation, Helmet Day on trail

#### Poorly Behaved Cyclists

- Actively involve
- Spinners – more than “talk”
- Forceful ride leaders (and influencers) – training for this?
- Bells, lights required
- Enforcement = Education; People know the rules but don’t follow; education isn’t needed

#### Motorists

- Include in driver education courses
- Treat bicyclist as any other slow moving vehicle
- TV commercials
- Radio
- Social Media
- Issue: Bike lane being used as a right turn lane
- Need to educate at trail crossing to yield or not to yield

#### Persons Who Do Not Currently Ride

- Beginners Guide: publish tips, law, rules – offer with bike purchase/rental

- Educational signage on trail
- Rentals – bikes must come with free helmet

#### Others

- Educate businesses to make them advocates; regarding benefit of cycling to their employees – health, quality of life, productivity – economic development
- Educate entire population on benefit of investment: safety, investment in public health, etc, road congestion, parking
- Enlist health providers as encouragers; incorporate into community programs

### Evaluation

#### Collecting Data/Feedback

- Email/Contact when trips are taken
- Garmin/Google safe bike routes
- Where can input be given long-term? Advertise/signage; reporting feature; option to report unsafe and dangerous locations

#### Long-term Goals

- Find ways to bring “C” riders to “B” – ask them!
- Find ways to engage the “C” crowd more directly
- Find ways to convert the “D” crowd
- Design streets so that 30 to 50% of school children could bike or walk to school

### Engineering

#### General Recommendations

- Lights not triggering for riders (also... add pedestrian buttons)
- Integrate underground utilities and other improvements
- Provide connectivity within/across neighboring developments within code
- Greenways to primary destinations
- Box culverts (i.e.: tunnels) under roads
- Ad “mini bridges” to cross rivers, steep ravines in style of Greenville’s Liberty Bridge
- Engineer roads/lights to make riding at night safer
- Connect or acquire green spaces (vacant lots) to Bikeways for picnic/rest areas

#### Location-specific Recommendations

- Bike and walking path on main roads to sub-divisions (like Hudson Road/Haywood Road; Hudson also connects to Haywood Mal and Patewood Hospitals)
- Bike lanes on Academy and Church should be priority

### Encouragement

#### Events/Programs

- Offer rides with experienced riders and newbies – instructional rides
- More family-oriented events



- More events for C-level cyclists; non-competitive
- Offer Ciclovía – like St. Louis
- Art and bike programs
- Bike to Work and Bike to School Days, with incentives, and more than once a year

#### Published materials and media

- Map published with preferred bike routes – many people who would bike commute don't know how to find a safe route to Fluor or GHS or ICAR
- Media support (x2)
- Carolina Cycling News as media outlet

#### Facilities

- Bike parking with covered shelter
- Haywood Road and Roper Mountain Road need a bypass route
- Bike lockers in parking garages – lockers that can be rented by downtown residents
- Connect work and neighborhoods – higher densities



# COMMUNITY WORKSHOP

## Interested in a more bicycle-friendly Greenville?

***You can make a difference*** – attend the City of Greenville’s Bicycle Master Plan Community Workshop. Community input is vital to ensure all ideas are represented and the City of Greenville welcomes input from its residents. The City is committed to sustainable transportation practices. We encourage attendees to bike, walk, take transit, or carpool to this event if possible.

**Tuesday, November 16 – 5:30 p.m.**  
**Hughes Main Library**

25 Heritage Green Place in Downtown Greenville



Visit [bikeville.org/masterplan](http://bikeville.org/masterplan) for Bike Master Plan updates and general information.



# COMMUNITY WORKSHOP #2

## Interested in a more bicycle-friendly Greenville?

*We want to hear from you! Attend the City of Greenville's Bicycle Master Plan Community Workshop which will:*

- Recap the project goals and objectives from the first Public Workshop
- Present the latest results of the public survey
- Provide an overview of the draft bikeway network recommendations
- Detail the critical programs from the Bicycle Friendly Community Action Plan
- Outline the features of the design guidelines

The City is committed to sustainable transportation practices. We encourage attendees to bike, walk, take transit, or carpool to this event if possible.

**Tuesday, March 15 – 6:00 p.m.**

**Hughes Main Library**

25 Heritage Green Place in Downtown Greenville





# share the news



a newsletter for **Greenville's Bicycle Master Plan**

Vol. 1 • Winter 2010 • [bikeville.org/masterplan](http://bikeville.org/masterplan)

## The 6 E's are Essential to the Bicycle Master Plan

In 2009, the City of Greenville received the prestigious Bronze level Bicycle Friendly Community designation from the League of American Bicyclists. The League developed the Bicycle Friendly Community Program (BFC) to provide incentives, hands-on assistance and award recognition for communities that actively support bicycling. A Bicycle Friendly Community designation encourages bicycling for recreation, as well as transportation, and communities that apply for the award are judged in five categories, which the League refers to as the Five E's: Engineering, Education, Encouragement, Enforcement and Evaluation & Planning. The plan will also provide the vision for a Greenville bicycling environment in 2020 that not only takes a comprehensive approach to the Five E's, but also adds a 6th – Equity. Communities must demonstrate achievements in each of the categories to be considered for an award designation.

(cont. on next page...)

## Greenville's Cycling Plans Underway

The City of Greenville and Alta Planning + Design, the firm hired by the City to develop its Bicycle Master Plan, hosted the first of two community workshops on November 16 to discuss the future of bicycling in Greenville. At the workshop, representatives from Alta introduced the project and asked attendees for their input on both the current state of bicycling in Greenville and their vision for future programs and improvements. Maps of the current routes were on-hand for attendees' recommendations and during this interactive workshop, the group, which consisted of members of the general public as well as cycling enthusiasts, had an opportunity to actively participate in the master planning process.

Alta is expected to complete a draft master plan by early spring 2011. The draft plan will incorporate citizen input from the community workshop, the online survey and the project website. Plan recommendations will include both short and long-term goals. A second community workshop will be held to present the draft plan and gather additional feedback from the community.



Councilwoman Amy Ryberg-Doyle

The key to developing a comprehensive bicycle master plan is ensuring that a wide variety of citizens participate in the process. **It's not too late to get involved.** Click [here](#) to view a copy of the presentation that was made at the workshop and take a few moments to complete the online survey [here](#). You can also submit your suggestions for routes and parking options directly on the interactive map [here](#). Visit [www.bikeville.org/masterplan](http://www.bikeville.org/masterplan) for additional information and resources.

## Bicycle Ridership Statistics Identified

If you were bicycling around Greenville the second week of October, there's a chance that you were among those counted in the City of Greenville's first major bicycle count. The count was one component of the Bicycle Master Plan project and was modeled after bicycle counting methods used by other cities across the country. Over the course of two days, local volunteers conducted bike counts at various locations throughout the city to identify current ridership patterns and trends. More than 1,100 bicyclists were counted on Greenville's roadways, and while the bike count only provides a snapshot of Greenville's bicycling community, the data offers clues to where and when local bicyclists are out and about. The counts were conducted during

(cont. on next page...)



(... cont. "The 6 E's are Essential to the Bicycle Master Plan")

In addition to granting Greenville its Bronze designation, the League also provided feedback on what Greenville can do to become even more bicycle-friendly, citing three priority areas for improvement. The Bicycle Master Plan will address the priority areas to help Greenville achieve a higher designation in the future. Below are Greenville's goals for each of the six E's:

### Engineering

- Improve physical infrastructure for bicycling (paths, bike lanes, bike routes, bike parking and bicycle detection devices)

### Education

- Market the benefits of biking
- Promote sharing the road between bicyclists and motorists
- Promote existing bicycling facilities
- Teach bicyclists how to follow the rules of the road and safely operate a bicycle in traffic

### Encouragement

- Increase participation and awareness with special events and contests, outreach campaigns and media coverage
- Target every level of bicyclist

### Enforcement

- Increase awareness of bicyclists and pedestrians
- Improve driver behavior
- Decrease perception of danger

### Evaluation

- Determine if projects and programs are making a difference through various means of analysis

### Equity

- Target outreach with a diversity of programs and events
- Ensure appropriate geographic distribution of bike facilities, programs and educational opportunities



(... cont. "Bicycle Ridership Statistics Identified")

two-hour observation periods on both a weekday and a weekend day at 37 pre-determined locations. In addition to the count, volunteers also recorded a variety of bicyclist characteristics, including gender, helmet use and whether they were riding on the street or the sidewalk. Below are the results:

- 76% of the bicyclists counted were male
- 64% of the bicyclists observed wore a helmet
- More than 60% of the bicyclists counted were riding on the street rather than the sidewalk
- Bicycling was more common on the weekend than during the week
- The most popular areas for bicycling were near Willard Street, the Swamp Rabbit Trail and McDaniel Avenue at Ridgeland Street

**Thank you to all of the volunteers who took part in this year's bike count!**





# share the news



a newsletter for **Greenville's Bicycle Master Plan**

Vol. 2 • Spring 2011 • [bikeville.org/masterplan](http://bikeville.org/masterplan)

## Recommendations for the Six Es

The Bicycle Master Plan employs the concept of 6 Es: Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity. This approach ensures that a high-level Bicycle Friendly Community is the result of a strategic focus on each E. For each of the Es, the plan identifies a series of vision statements, goals, and objectives to strengthen each area in the Greenville community. Through research and information analysis, the team has identified the areas that are the basis for these recommendations. Much of the research was taken from public outreach and input from the survey. Other research done includes bicycle collision analysis from 2005-2010 and bicycle counts at 36 city-wide locations. All of this information compiled allowed the team to make recommendations that reflected community input as well as statistics on the current state of bicycling in Greenville.

The vision statements for each E are as follows:

**1. Engineering:** An inviting network of bicycling facilities for cyclists of all ages and abilities and destinations that support bicycling

(cont. on next page...)

## Greenville's Draft Bicycle Master Plan Presented

The second community workshop, hosted by the City of Greenville and Alta Planning + Design, was held on March 15 to discuss the progress of the Bicycle Master Plan and present the draft plan. The workshop was well attended by cycling enthusiasts as well as the general public, with 60% new attendees from the first workshop. The workshop presented the latest results from the public survey, detailed the critical programs from the bike friendly community action plan, outlined the features of the design guidelines, and provided an overview of the draft bikeway network recommendations.

The draft Bicycle Network Map was displayed for attendees to review and give any additional input. Also up for review were posters showing draft programs, marketing, and education recommendations included in the draft plan. Attendees had the opportunity to vote for areas they feel are a priority. Alta continues to finalize the draft master plan, which will be presented to City Council and GPATS later this spring.



Attendees vote on priority areas.

The key to developing a comprehensive bicycle master plan is ensuring that a wide variety of citizens participates in the process. It's not too late to get involved. Visit the project website at [www.bikeville.org/masterplan](http://www.bikeville.org/masterplan) to download, review, and comment. Click [here](#) to view a copy of the presentation that was made at the workshop.

## Next Steps to Greenville's Bicycle Friendly Community

The City of Greenville has reached the prestigious Bronze level of a Bicycle Friendly Community designation from the League of American Bicyclists. The purpose of the Bicycle Master Plan is for Greenville to earn a Silver, Gold, and eventually, Platinum status by 2020. In the following weeks, the City of Greenville and Alta Planning + Design will continue to finalize recommendations for the draft master plan. The plan will be presented to City Council on May 2. Once this phase is complete, Greenville will begin steps toward implementation. If you would like to get involved, there are still plenty of ways to share your input. Visit [www.bikeville.org/masterplan](http://www.bikeville.org/masterplan) and take a moment to review the plan's goals and objectives to see what you and your organizations can do to help make Greenville even more bicycle friendly.







(... cont. "Recommendations for the Six Es")

- 2. Education:** Community understanding and respect for the roles and responsibilities of cyclists
- 3. Encouragement:** Increased bicycle ridership and support for a strong bicycle advocacy community and bicycle culture
- 4. Enforcement:** A safer environment for cyclists and other transport modes
- 5. Evaluation & planning:** Institutional support and collaboration for bicycling
- 6. Equity:** A community that serves a diverse population and provides for the needs of those who ride out of necessity, as well as those who choose to cycle

The plan consists of non-infrastructure and infrastructure recommendations that address all six Es. The following is a sample of the goal recommendations that support the vision statement of each E:

- 1. Engineering:**
  - a. Create and expand a complete and integrated network of bicycle facilities that is safe for all ages and abilities
  - b. Improve technical engineering standards to improve conditions for bicyclists
- 2. Education:**
  - a. Establish safety training and accident reduction for entire community
  - b. Increase bicycle safety education with law enforcement officer training
- 3. Encouragement:**
  - a. Make bicycle travel an integral part of daily life, particularly for trips under 3 miles
  - b. Develop a Downtown Bike Share/Bike Rental Program

#### **4. Enforcement:**

- a. Increase safety through promoting greater awareness of bike-car issues and conflicts
- b. Engender mutual respect between different transport user groups

#### **5. Evaluation & Planning:**

- a. Pursue cost-effective multi-modal integration/improvements
- b. Develop an action plan for crash reduction to better understand the collection and reporting of Greenville's crash data

#### **6. Equity:**

- a. Increase safety education targeted to low-income bicyclists
- b. Provide appropriate bicycle facilities in and near Greenville's special emphasis neighborhoods

The draft plan proposes an extensive network of new bicycle facilities that connect neighborhoods and major destinations throughout the city, including:

- Bike lanes
- Greenways
- Signed bike routes
- Shared lanes



## D. Funding

Bicycle funding is administered at all levels of government. This chapter begins with explaining the current state of federally-administered funding and the anticipated new transportation bill, which influences State, regional and local funding and is followed by a description of funding sources that may be pursued to implement facilities and programs in this Plan.

The Greenville Transit Authority (GTA) plays a central role in the distribution of transportation funds at the local level. As the officially recognized recipient of all Federal DOT money, GTA makes funding available to the Greenville region. The grant is submitted annually after the apportionment has been announced. At least one percent of the annual total must be used for transit enhancement, one option being bike and bike related projects. However, GTA is not limited to this total should they choose to spend more of their annual apportionment on bicycle related projects. Whereas, most federal funding is available at an 80/20 match (meaning that 80 percent of the cost of a capital item is covered by federal dollars and 20 percent is provided by from local sources), bicycle related transit enhancement projects are reimbursable at 95 percent up to the required one percent of the annual apportionment and at 90 percent for any costs that exceeds this amount.

### D.1. Federally-Administered Funding

SAFETEA-LU, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, is the primary federal funding source for bicycle projects. SAFETEA-LU is the fourth iteration of the transportation vision established by the Intermodal Surface Transportation Efficiency Act (1991). Also known as the federal transportation bill, Congress passed the \$286.5 billion SAFETEA-LU bill in 2005. SAFETEA-LU expired in 2009, at which time Congress approved extending funds through 2010. When the next multi-year federal transportation bill is reauthorized, funding available for bicycle projects is likely to change. Historically, these modes have received larger allocations with each new multi-year transportation bill.

SCDOT and regional planning agencies administer SAFETEA-LU funding. Most, but not all of these funding programs emphasize transportation modes and purposes that reduce auto trips and provide inter-modal connections. SAFETEA-LU programs require a local match of between zero percent and 20 percent. SAFETEA-LU funds primarily capital improvements and safety and education programs that relate to the surface transportation system.

To be eligible for Federal transportation funds, States are required to develop a State Transportation Improvement Program (STIP) and update it at least every four years. A STIP is a multi-year capital improvement program of transportation projects that coordinates transportation-related capital improvements planned by metropolitan planning organizations and the state. Bicycle projects are eligible for inclusion.

The following programs are administered by the Federal government.

#### D.1.1. Transportation, Community and System Preservation (TCSP) Program

- A. The Transportation, Community and System Preservation (TCSP) Program provides federal funding for transit oriented development, traffic calming and other projects that improve the efficiency of the transportation system, reduce the impact on the environment, and provide efficient access to jobs,

services and trade centers. The program provides communities with the resources to explore the integration of their transportation system with community preservation and environmental activities. TCSP Program funds require a 20 percent match. Congress appropriated \$204 million to this program in Fiscal Year 2009. Funding has been extended under a continuing resolution for FY 2010.

Online resource: <http://www.fhwa.dot.gov/tcsp/>

### **D.1.2. Rivers, Trails and Conservation Assistance Program**

The Rivers, Trails and Conservation Assistance Program (RTCA) is a National Parks Service program that provides technical assistance via direct staff involvement, to establish and restore greenways, rivers, trails, watersheds and open space. The RTCA program provides only for planning assistance—there are no implementation monies available. Projects are prioritized for assistance based upon criteria that include conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation and focusing on lasting accomplishments.

Online resource: [http://www.nps.gov/nrcr/programs/rtca/contactus/cu\\_apply.html](http://www.nps.gov/nrcr/programs/rtca/contactus/cu_apply.html)

### **D.1.3. National Scenic Byways Program**

The National Scenic Byways Program identifies roads with outstanding scenic, historic, and cultural, natural, recreational, and archaeological qualities as National Scenic Byways. The program provides funding for scenic byway projects and for planning, designing, and developing scenic byway programs. There is a 20 percent match requirement. National Scenic Byways Program can be used to fund on-street and off-street bicycle facilities, intersection improvements, user maps and other publications. Within Greenville County, Highway 11 is designated as both a National Scenic Byway and a South Carolina Scenic Byway.

Nationally, \$3 million were available each fiscal year between 2006 and 2009. Grant applications for National Scenic Byways Programs are forwarded to the FHWA division office by the state scenic byways coordinator.

Federal Fact Sheet: <http://www.fhwa.dot.gov/safetealu/factsheets/scenic.htm>

National Scenic Byways Program: <http://www.bywaysonline.org/grants/>

## **D.2.State-Administered Funding**

The State of South Carolina uses both federal sources and its own budget to fund the following bicycle projects and programs. It should be noted, however, that transit enhancement funding is the primary means through which the State allocates funding for bicycle related projects. This funding can be ascertained by applying either through the local metropolitan planning organization (Greenville Pickens Area Transportation Study) or GTA as referenced above.

### **D.2.1. Safe Routes to School (SR2S)**

The purpose of the Safe Routes to Schools program is to provide children a safe, healthy alternative to riding the bus or being driven to school. The SR2S Grants were established to address pedestrian and bicycle mobility and safety near schools. SCDOT is responsible for administration of SR2S funding. Application for these funds is open to any public agency. Agencies providing a funding match will be given preference.

Eligible projects may include three elements:

- Engineering Improvements. These physical improvements are designed to reduce potential bicycle and pedestrian conflicts with motor vehicles. Physical improvements may also reduce motor vehicle traffic volumes around schools, establish safer and more accessible crossings, or construct walkways, trails or bikeways. Eligible improvements include sidewalk improvements, traffic calming/speed reduction, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street bicycle and pedestrian facilities, and secure bicycle parking facilities.
- Education and Encouragement Efforts. These programs are designed to teach children safe bicycling and walking skills while educating them about the health benefits, and environmental impacts. Projects and programs may include creation, distribution and implementation of educational materials; safety based field trips; interactive bicycle/pedestrian safety video games; and promotional events and activities (e.g., assemblies, bicycle rodeos, walking school buses).
- Enforcement Efforts. These programs aim to ensure that traffic laws near schools are obeyed. Law enforcement activities apply to cyclists, pedestrians and motor vehicles alike. Projects may include development of a crossing guard program, enforcement equipment, photo enforcement, and pedestrian sting operations.

South Carolina's SR2S funding program, which was updated in 2010, has provided up to \$200,000 per school for infrastructure and non-infrastructure improvement programs. 90% of the funding must be used for infrastructure. Because the grants are competitive and statewide funding limited, only one school in a given municipality is likely to receive funding. All projects must be within two-miles of primary or middle schools (K-8). Project proposals are due in early May.

The Federal Safe Routes to School Program has been extended through December 31, 2010, and may be included in the future federal transportation bill.

Currently, Augusta Circle Elementary and Fountain Inn Elementary are the only two counties in Greenville identified as "partner schools" on the South Carolina Safe Routes to School webpage. The program website provides a strategies manual, links to "success stories" for SR2S, and funding application information.

Online resource: <http://www.scdot.org/community/saferoutes.shtml>

### **D.2.2. Recreational Trails Program**

The Recreational Trails Program (RTP) of SAFETEA-LU allocates funds to states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use, and other non-motorized and motorized uses. The RTP funds are administered by the South Carolina Department of Parks, Recreation, and Tourism. In FY2010, South Carolina received an apportionment of \$1.22 million. A minimum 20 percent local match (in-kind is eligible) is required and grants are awarded annually. State and local agencies are permitted to apply for funds. RTP projects must be ADA-compliant and may be used for:

- Maintenance and restoration of existing trails
- Purchase and lease of trail construction and maintenance equipment
- Construction of new trails, including unpaved trails



- Acquisition of easements or property for trails
- State-administrative costs related to this program (limited to seven percent of a State's funds)
- Operation of educational programs to promote safety and environmental protection related to trails (limited to five percent of a State's funds).

Applicants must submit a Letter of Intent in order to be eligible to apply for a grant. Applications are due in March and awarded in July of each year. Minimum grant amount is \$10,000 with a maximum amount of \$100,000. Applicants can be municipal, state, or federal government, or for- or non-profit organizations. SC's Parks, Recreation, and Tourism grants must be used for construction (no more than 5% for planning or engineering).

Online resource: <http://www.scprt.com/our-partners/grants/trails.aspx>

### **D.2.3. Highway Safety Improvement Program**

The Highway Safety Improvement Program funds are allocated to States as part of SAFETEA-LU. The goal of HSIP funds is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. This program includes the Railway-Highway Crossings Program and the High Risk Rural Roads Program. As required under the Highway Safety Improvement Program (HSIP), the South Carolina Department of Transportation has developed and is in the process of implementing a Strategic Highway Safety Plan (SHSP). A portion of the HSIP funds allocated to each state is set aside for construction and operational improvements on high-risk rural roads. If the state has a Strategic Highway Safety Plan, the remainder of the funds may be allocated to other programs, including projects on bicycle pathways or trails and education and enforcement. A local match of 10% is required.<sup>1</sup>

South Carolina has steadily improved its ratio of obligated HSIP funds to apportioned HSIP funds. In 2006, the state obligated 11.2% of apportioned funds and in 2010, the state obligated 77.2% of funds.<sup>2</sup>

Federal HSIP online resource: <http://www.fhwa.dot.gov/safetealu/factsheets/hsip.htm>

### **D.2.4. Land and Water Conservation Fund**

Land and Water Conservation Fund (LWCF) is a federally funded program, run through the National Park Service that provides grants for planning and acquiring outdoor recreation areas and facilities, including trails. The fund is administered by the South Carolina Department of Parks, Recreation and Tourism (SC PRT). The fund has been reauthorized until 2015.

Cities, counties, and districts authorized to acquire, develop, operate, and maintain park and recreation facilities are eligible to apply. Applicants must fund the entire project, and will be reimbursed for 50 percent of costs. Property acquired or developed under the program must be retained in perpetuity for public recreational use.

In 2011, SC PRT announced that the grant cycle will operate on a bi-annual basis rather than an annual basis. The next Letter of Intent for the solicitation of LWCF applications is anticipated in November 2011, with the next funding cycle to be held in the spring of 2012

---

<sup>1</sup> Additional online resources can be found at: <http://www.bikeleague.org/resources/reports/>

<sup>2</sup> Source: [http://safety.fhwa.dot.gov/hsip/gen\\_info/slorthsip/](http://safety.fhwa.dot.gov/hsip/gen_info/slorthsip/)

National Park Service website: <http://www.nps.gov/lwcf/>

SC PRT online resource: <http://www.scprt.com/our-partners/grants/lwcf.aspx>

### **D.2.5. Community Development Block Grants**

The CDBG program funds projects and programs that develop viable urban communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income. Federal Community Development Block Grant Grantees may use CDBG funds for activities that include (but are not limited to) acquiring real property; building public facilities and improvements, such as streets, sidewalks, and recreational facilities; and planning and administrative expenses, such as costs related to developing a consolidated plan and managing CDBG funds. The state makes funds available to eligible agencies (cities and counties) through a variety of different grant types. The City of Greenville is the designated CDBG grantee for the region. Grantees enter into a contract with the state. Eligible agencies are determined based on a formula, and are listed on the HUD website.

Online resource: <http://www.hud.gov/offices/cpd/communitydevelopment/programs/index.cfm>

Eligible CDBG Agencies in South Carolina: <http://www.hud.gov/local/sc/community/cdbg/#state>

### **D.2.6. South Carolina Department of Transportation – Capitol Projects**

South Carolina Department of Transportation can work closely with the City of Greenville to include bicycle and pedestrian improvements as part of major projects. It is recommended that the two organizations continue to liaise with one another on an ongoing basis to identify opportunities for implementation of the Greenville Bicycle Plan.

### **D.2.7. South Carolina Department of Transportation – Maintenance Program**

South Carolina Department of Transportation carries out a number of road resurfacing projects annually that are geared at maintenance. There may be opportunities for road re-stripping to be completed as part of regular roadway maintenance. This will require coordination between the City, the SCDOT District Traffic Engineer and the local Maintenance office to ensure that the pavement marking design is safe for cyclists or drivers.

### **D.2.8. Statewide Transportation Improvement Program**

The Statewide Transportation Improvement Program (STIP) is SCDOT's short-term capital improvement program, providing project funding and scheduling information for the department and South Carolina's metropolitan planning organizations. The program provides guidance for the next six years and is updated every three years. The South Carolina Department of Transportation Commission, as well as the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) approve the STIP.

In developing this funding program, SCDOT must verify that the identified projects comply with existing transportation and comprehensive plans and SAFETEA-LU planning requirements. The STIP must fulfill Federal planning requirements for a staged, multi-year, statewide, intermodal program of transportation projects. Specific transportation projects are prioritized based on Federal planning requirements and the different State plans.<sup>3</sup>

---

<sup>3</sup> Additional information is available at: <http://www.scdot.org/inside/stip.shtml>



### **D.2.9. South Carolina Transportation Infrastructure Bank**

The South Carolina Transportation Infrastructure Bank (SCTIB) is a statewide revolving loan fund designed in 1997 to assist major transportation projects in excess of \$100 million in value. The SCTIB has since approved more than \$4.5 billion in financial assistance and is arguably the largest and most active State Infrastructure Bank in the country.<sup>4</sup>

## **D.3. Locally-Administered Funding**

Local funding sources are generally administered by Metropolitan Planning Organizations or other regional agencies. Counties or cities may administer some funding sources. These funding sources are supported by federal, state, or local revenue streams.

### **D.3.1. Regional Surface Transportation Program**

The Regional Surface Transportation Program (RSTP) is a block grant program that provides funding for bicycle projects, among many other transportation projects. Under the RSTP, Metropolitan planning organizations, such as the Metropolitan Transportation Commission's (MTC), prioritize and approve project

### **D.3.2. Gas Tax**

Federal and state gas taxes are currently split between capital improvement and maintenance programs. Gas tax funds can be used as the local match to leverage grant monies. In addition, the City could use revenues from a local gasoline tax to fund on-street bikeways and shared-use path improvements. Such a tax would require the state legislature would to give the City the authority to use a local option gas tax, and would require voter approval. Gaining approval can be challenging, especially with the changing cost of gas and ever-increasing maintenance needs. However, once established, the tax would be a relatively stable funding source for improvements.

### **D.3.3. General Fund**

The General Fund is often used to pay for maintenance expenses and limited capital improvement projects. Projects identified for reconstruction or re-pavement as part of the Capital Improvements list should also implement recommendations for bicycle or pedestrian improvements in order to reduce additional costs.

### **D.3.4. Local Improvement Districts (LIDs)**

Local Improvement Districts (LIDs) are most often used by cities to construct localized projects such as streets, sidewalks or bikeways. Through the LID process, the costs of local improvements are generally spread out among a group of property owners within a specified area. The cost can be allocated based on property frontage or other methods such as traffic trip generation.

Several cities have successfully used LID funds to make improvements on residential streets and for large scale arterial projects. LID formed to finance commercial street development can be “full cost,” in which the property assessments are entirely bourn by the property owners.

---

<sup>4</sup> Additional information is available at:  
<http://www.chiplimehouse.net/whisper/graphics/60565Connector%20Fall%202007%2012.pdf>

### **D.3.5. Business Improvement Area (BIA)**

Pedestrian and bicycle improvements can often be included as part of larger efforts aimed at business improvement and retail district beautification. Business Improvement Areas collect levies on businesses in order to fund area-wide improvements that benefit businesses and improve access for customers. These districts may include provisions for pedestrian and bicycle improvements, such as wider sidewalks, landscaping, and ADA compliance.

### **D.3.6. Transportation User Fees**

Transportation user fees are any group of additional fees that could be used to fund maintenance and improvement projects for non-motorized uses. Properties would be assessed fees based on the traffic generation by land use or business activity as published in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

The fee could be a Street Maintenance Fee, to fund maintenance of the existing roadway system to free up dollars from the state gasoline tax for capital projects.

### **D.3.7. Local Bond Measures**

The city could issue bonds to fund bicycle and/or pedestrian improvements. This would spread the cost of the improvements over the life of the bonds. Certain types of bonds would require voter approval. The debt would have to be retired, so funding for repayment on the bond and the interest would be required.

A bond issued in Denver, Colorado funded \$5 million for trail development and also funded the city's bike planner for several years. The City of Albuquerque, New Mexico and Bernalillo County have a 5 percent set-aside of street bond funds for trails and bikeways. This has amounted to approximately \$1.2 million for the City every two years.

### **D.3.8. Tax Increment Financing/Urban Renewal Funds**

Tax Increment Financing (TIF) is a tool to use future gains in taxes to finance the current improvements that will create those gains. When a public project (e.g., shared-use path) is constructed, surrounding property values generally increase and encourage surrounding development or redevelopment. The increased tax revenues are then dedicated to finance the debt created by the original public improvement project. Tax Increment Financing typically occurs within designated Urban Renewal Areas (URA) that meet certain economic criteria and approved by a local governing body. To be eligible for this financing, a project (or a portion of it) must be located within the URA.

### **D.3.9. Street User/Street Utility Fees**

The City could administer street user fees through residents' monthly water or other utility bills. The revenue generated by the street user fee is used for operations and maintenance of the street system, and priorities are established by the Public Works Department. Revenue from this fund could be used to maintain on-street bicycle and pedestrian facilities, including routine sweeping of bicycle lanes and other designated bicycle routes. Additionally, this type of fee may free up more general fund money for off-street projects. Implementation of street user fees would require a public vote.

### **D.3.10. Sales Taxes**

Bicycle and pedestrian projects can be funded by a portion of local sales tax revenue or from a voter-approved sales tax increase. The City of Colorado Springs implemented a TOPS tax (Trails, Open Space and Parks) to administer the ordinance passed by voters in April of 1997. The sales tax, 1/10th of one percent, generates about \$6 million annually for trails, open space and parks.

### **D.3.11. Property Tax Levy**

Seattle, Washington is receiving \$5 million a year for nine years for bicycle and pedestrian projects as a result of a levy (property tax) approved by voters in 2006.

### **D.3.12. Bike Tax**

The City of Colorado Springs has a \$4.00 per bike tax to provide funding for bikeway improvements. The tax generates nearly \$100,000 annually and has been used for both on- and off-street projects. It is used primarily to provide a local match for other grants such as the Colorado State Trails Program or SAFETEA-LU grants. A bike tax is an annual fee; implementation would require a public vote.

### **D.3.13. Developer Impact Fees**

Another potential local source of funding is developer impact fees, typically tied to trip generation rates and traffic impacts produced by a proposed project. A developer may reduce the number of trips (and hence impacts and cost) by paying for on- and off-site bikeway improvements that will encourage residents to bicycle rather than drive. Establishing a clear nexus or connection between the impact fee and the project's impacts is critical in avoiding a potential lawsuit.

### **D.3.14. Latecomer Fees**

Latecomer fees are a mechanism that allows the City to recover pro-rata costs of a duly authorized public improvement from future developers, which receive benefit from the public improvement.

## **D.4. Other Sources**

### **D.4.1. Community Action for a Renewed Environment (CARE)**

CARE is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities get on the path to a renewed environment. Transportation and "smart-growth" types of projects are eligible. Grants range between \$75,000 and \$300,000.

Online resource: <http://www.epa.gov/care/>

### **D.4.2. Bikes Belong Grant**

Bikes Belong is an organization sponsored by bicycle manufacturers with the intent to increase bicycle riding in the United States. Bikes Belong provides grant opportunities up to \$10,000 with a minimum 50 percent

match to organizations and agencies seeking to support facility and advocacy efforts. Eligible projects include bike paths, trails, and bridges, mountain bike facilities, bike parks, and BMX facilities.

Online resource: <http://www.bikesbelong.org/grants>

### **D.4.3. Robert Wood Johnson Foundation Grants**

Robert Wood Johnson Foundation Grants are awarded to promote healthy communities and lifestyles. Most grants are awarded through Calls for Proposals for the seven program areas of the RWJ Foundation. The Berkeley-Charleston-Dorchester Council of Governments was awarded a RWJ Foundation grant to complete a regional bicycle and pedestrian action plan and, more recently, community coalitions in both Spartanburg and Greenville received grants through the Healthy Kids, Healthy Communities grant initiative of RWJ.

### **D.4.4. American Greenways Program**

Administered by The Conservation Fund, the American Greenways Program provides funding for the planning and design of greenways. Applications for funds can be made by local regional or state-wide non-profit organizations and public agencies. The maximum award is \$2,500, but most range from \$500 to \$1,500. American Greenways Program monies may be used to fund unpaved trail development.

Online resource: <http://www.conservationfund.org/node/245>

### **D.4.5. Volunteer and Public-Private Partnerships**

Local schools or community groups may use the bikeway projects as a project for the year, possibly working with a local designer or engineer. Work parties may be formed to help clear the right-of-way where needed. A local construction company may donate or discount services. A challenge grant program with local businesses may be a good source of local funding, where corporations ‘adopt’ a bikeway and help construct and maintain the facility.

### **D.4.6. Adopt a Bikeway, Sidewalk or Trail Program**

A challenge grant program with local businesses may be a good source of local funding, where corporations ‘adopt’ a bikeway, sidewalk or trail and help maintain the facility. Foundation grants, volunteer work, and donations of in-kind services, equipment, labor or materials are other sources of support that can play a supporting role in gathering resources to design and build new bicycle and pedestrian facilities.

Residents and other community members are excellent resources for garnering support and enthusiasm for a bicycle and pedestrian facility, and the City should work with volunteers to substantially reduce implementation and maintenance costs. Local schools, community groups, or a group of dedicated neighbors may use the project as a goal for the year, possibly working with a local designer or engineer. Work parties can be formed to help clear the right-of-way for a new trail or maintain existing facilities where needed. A local construction company could donate or discount services. Other opportunities for implementation will appear over time, such as grants and private funds. The City should look to its residents for additional funding ideas to expedite completion of the bicycle and pedestrian system.

#### **D.4.7. Local Businesses<sup>5</sup>**

There is increasing corporate and business involvement in trail and conservation projects. Employers recognize that creating places to bike and walk is one way to build community and attract a quality work force. Bicycling and outdoor recreation businesses often support local projects and programs. Some examples include:

- In Evansville, Indiana, a boardwalk is being built with corporate donations from Indiana Power and Light Co. and the Wal-Mart Foundation.
- In Arizona, trail directional and interpretive signs are being provided by the Salt River Project — a local utility. Other corporate sponsors of the Arizona Trail are the Hughes Missile Systems, BHP Cooper, and Pace American, Inc.
- Recreational Equipment, Inc. has long been a financial supporter of local trail and conservation projects.
- The Kodak Company now supports the American Greenways Awards program of The Conservation Fund, which was started in partnership with the Dupont company. This annual awards program provides grants of up to \$2500 to local greenway projects for any activities related to greenway advocacy, planning, design or development.

#### **D.4.8. Land Trusts**

Many environmental land trust organizations have raised funds to purchase land where trails are built, especially rail-trails. Upstate Forever serves as land trust for the entire Upstate region, including Greenville. The Palmetto Conservation Foundation is a statewide nonprofit with a history of establishing conservation easements and building trail networks, including the cross-state Palmetto Trail.

---

<sup>5</sup> Information from the Trails and Greenways Clearinghouse at the Rails-to-Trails Conservancy:

**Appendix: E**  
**Greenville, SC Bicycle Master Plan**  
**Alta Planning**  
**June, 2011**



# Table of Contents

<b>3</b>	<b>- A: Sample Bike Coordinator Job Description (Eugene, Oregon)</b>
<b>7</b>	<b>- B: Greenville, SC Complete Streets Resolution</b>
<b>10</b>	<b>- C: 9Wbca JW-a dUWg'cZ6]_Y-bZUgfi Wi fY'Gi fj Ym</b>
<b>%</b>	<b>- D: Greenville, SC Design Specifications Manual</b>
<b>' '</b>	<b>- E: Greenville, SC Bike Parking Ordinance</b>
<b>' +</b>	<b>- F: Greenville, SC Bike Count Form</b>
<b>' -</b>	<b>- G: Greenville, SC City/County Pavement Rehabilitation Program Relationship</b>
<b>) \$</b>	<b>- H: SC State Bicycle Laws (H3006)</b>
<b>) -</b>	<b>- I: SCDOT EDM 22</b>
<b>* -</b>	<b>- J: SCDOT Complete Streets Resolution</b>
<b>+&amp;</b>	<b>- K: SCDOT Design Exception Form</b>
<b>+)</b>	<b>- L: USDOT Bicycle and Pedestrian Policies</b>
<b>, \$</b>	<b>- M: MUTCD Chapter 9 – Traffic Control for Bicycle Facilities</b>
<b>1\$-</b>	<b>- N: FHWA Context Sensitive Solutions for Bicycles</b>

**Document A:**  
**Sample Bike Coordinator Job Description**  
**(Eugene, Oregon)**

# Welcome to Eugene

## City of Eugene Gateway

[City Home](#) [Residents](#) [Businesses](#) [Visitors](#) [Services](#) [City Government](#) [Contact Us](#)

 powered by  
**NEOGOV**
**Job Title:** Transportation Planner**Closing Date/Time:** Fri. 04/29/11 5:15 PM Pacific Time**Salary:** See Position Description**Job Type:** Full-Time Regular**Location:** Eugene, Oregon**Requisition #:** 00933
[Print Job Information](#) | [Apply](#)
**General Statement of Duties**
**Benefits**
**Supplemental Questions**

Provides a variety of professional planning duties within the Transportation Planning Team of the Public Works Department with an emphasis on pedestrian and bicycle planning. Manages update to citywide Pedestrian and Bicycle Master Plan and development of project level plans and conceptual designs to enhance Eugene's pedestrian and bicycle system. Coordinates the Transportation Options team within the Transportation Planning Team of the Engineering Division of the Public Works Department including efforts to encourage greater walking, biking and use of transit within Eugene.

**Depending upon the knowledge, skills, and abilities possessed by the successful applicant, this position may be filled as either an Assistant Transportation Planner or an Associate Transportation Planner.**

**Salary:**

Assistant Transportation Planner: \$49,961-\$62,212 / Annually

Associate Transportation Planner: \$54,496-\$67,912 / Annually

Accepting on-line applications only

**Closing Date:** Friday, April 29, 2011, 5:00pm

**Examples of Duties Performed - Duties may include but are not limited to the following:**

Manages development of Pedestrian and Bicycle Master Plan and other bicycle and pedestrian planning initiatives.

Assists with the Transportation Planning Section of the Public Works Engineering Division's other long-range planning efforts including components of Eugene's comprehensive plan, functional plans (Pedestrian and Bicycle Strategic Plan), and specialized plans (e.g., Arterial and Collector Street Plan).

Manages implementation of the Pedestrian and Bicycle Master Plan including project development and city code updates.

Develops project-level plans, conceptual designs, and environmental assessments for transportation improvement projects with an emphasis on pedestrian, bicycle facilities, and streetscape projects.

Coordinates the Transportation Options Team within the Transportation Planning Team including implementation of the Pedestrian and Bicycle Strategic Plan, promoting alternatives to single occupancy driving, identifying improvements to pedestrian and bicycle facilities, and applying for grants to fund such projects.

Develops and coordinates public participation strategies for transportation planning projects; makes presentations and facilitates meetings as part of these projects.

Helps prepare presentations for public meetings such as task teams, citizen groups, the Planning Commission, and the City Council.

Assists with involvement in plans developed by other departments and agencies (examples: mixed use center plans, special studies, and Springfield, Lane County, and Oregon Department of Transportation plans).

Helps coordinate City's involvement in transportation capital funding/programming by outside agencies (e.g., ODOT Six-Year Program, Lane County CIP, and Federal legislation and lobbying).

Manages consulting contracts for special projects/studies.

Coordinates with internal City teams such as Traffic Operations and Project Teams to assure that pedestrian and bicycle interests are addressed in operations and capital projects.

Works with other City departments, governmental agencies, citizen groups, and local business and industry to implement transportation projects and policies.

Participates as a key member of the Transportation Planning Team including strategic planning, problem-solving, recommendations, and implementation.

Supports and respects diversity in the workplace.

Performs related duties as assigned.

#### **Qualifications:**

##### Knowledge of:

Transportation planning principles, techniques, and practices.

Methods and techniques of effective technical report preparation and presentation.

Research methods and statistical principles related to transportation systems, urban growth, and development.

Recent developments, current literature, and sources of information related to transportation and land use planning including planning for pedestrian, bicycle and transit facilities and systems and methods for encouraging people to increase their use of these modes of transportation.

Public participation techniques for engaging diverse constituencies in planning activities.

GIS and its applications.

Modern office methods, procedures, and computer equipment including MS Office Suite and Adobe Suite.

##### Ability to:

Express ideas clearly; convey complex information effectively, both orally and in writing.

Establish and maintain close, cooperative, and effective working relationships with a variety of people including City staff, the public, other agencies, and elected officials.

Demonstrate excellence in customer service, customer relations, and public presentation skills.

Communicate effectively, both verbally and in writing; speak before large groups.

Work well with other City employees, citizen groups, public agencies, and the public.

Work well with others in a team setting, embracing the City's commitment to customer service and value of employees as a resource.

Learn City laws related to general plans, zoning and, land divisions.

Learn applicable State and Federal laws, regulations, and methods of assessment.

Analyze and compile technical and statistical information of moderate difficulty; prepare reports.

Develop conceptual plans and designs for pedestrian and bicycle facilities and streetscape projects.

Become familiar with current maps, studies, ordinances, and other planning resources.

#### **MINIMUM REQUIREMENTS**

##### **Assistant or Associate Transportation Planner**

###### Education

Bachelor's degree from an accredited college or university with major course work in Transportation Planning, Urban and Regional Planning, Civil Engineering or a related field(s).

###### License or Certificate

A valid Oregon driver's license or, the ability to obtain by date of hire; **must pass driving records check** and, if hired, maintain a driving record that meets the City's standard. *Oregon law requires that an out-of-state license holder must obtain a valid Oregon license (with appropriate endorsements) within 30 days of becoming domiciled in the state (ORS*

803.355).

#### **Assistant Transportation Planner**

##### Experience

One year of urban planning experience.

#### **Associate Transportation Planner**

##### Experience

Three years of professional urban planning experience. Emphasis in transportation planning desired.

##### Education

A Master's degree in a planning-related field is desirable.

Other combinations of experience and education that meet the minimum requirements may be substituted.

#### **Supplemental Information:**

**In addition to the salary listed above, upon eligibility, the City will contribute the employee contribution of 6% and the employer contribution to a retirement program administered by the Oregon Public Employees' Retirement System (PERS). Additionally, for non-represented employees who defer a minimum of 3% of their base salary into the City's deferred compensation plan, the City will reimburse them 2% of their salary through a Deferred Compensation Benefit added to salary.**

##### Selection Process

Applicants are screened based upon their relevant knowledge, abilities, skills, experience, and training. The selection process varies according to the position and can include such things as screening of supplemental questionnaires, written or skill tests, and interviews. Some positions may also require a records check, background investigation, and/or physical examination prior to employment.

**DUE TO THE VOLUME OF APPLICATIONS RECEIVED BY THE CITY, GENERALLY, ONLY APPLICANTS SELECTED FOR FURTHER CONSIDERATION (TESTING, INTERVIEWS) WILL BE CONTACTED.**

The City of Eugene complies with the Americans with Disabilities Act of 1990. Any applicant with a qualified disability under the Americans with Disabilities Act may request accommodation by contacting an employment coordinator at (541) 682-5061.

In compliance with the Immigration Reform and Control Act of 1986, the City of Eugene will request all eligible candidates who accept employment with the City to provide documentation to prove they are eligible for employment in the United States.

The City of Eugene is committed to a work environment which values the cultural, educational, and life experiences of each employee. We believe that a diverse workforce enables us to deliver culturally competent service to all members of our community. As part of our commitment to diversity, the City continues to be an affirmative action/equal opportunity employer. Women, people with disabilities, and persons of color are strongly encouraged to apply.



City of Eugene, 777 Pearl Street Eugene, OR 97401  
USA (541) 682-5010

[Website Policies](#)

**Document B:**  
**Greenville, SC Complete Streets Resolution**



## A RESOLUTION

TO ENDORSE AND SUPPORT A COMPLETE STREETS POLICY TO PROVIDE SAFE AND CONVENIENT ACCESS FOR ALL USERS OF STREETS.

WHEREAS, on April 24<sup>th</sup>, 2006, Resolution 2006-32, Greenville City Council adopted the "Action Plan" to make the City of Greenville a "Bicycle Friendly Community"; and

WHEREAS, increasing walking and bicycling offers the potential for cleaner air, greater health of the population, reduced traffic congestion, more livable communities, less reliance on fossil fuels and their foreign supply sources and more efficient use of road space and resources; and

WHEREAS, the City of Greenville's Downtown Master Plan and Comprehensive Plan call for the planning and development of accessible transportation networks and multi-modal land-use with transportation choices; and

WHEREAS, the City of Greenville's Design and Specifications Manual requires that the inclusion of landscaping, bicycle and pedestrian oriented facilities be included with new and reconstructed roadways; and

WHEREAS, in 2006 crashes involving bicyclists and pedestrians represented eighteen (18%) percent of the traffic fatalities in Greenville County and in 2006 crashes involving bicyclists and pedestrians represented fourteen (14%) percent of the traffic fatalities in South Carolina; and

WHEREAS, the City of Greenville is strongly committed to improving travel conditions and travel choices for people of all ages & abilities; and

WHEREAS, the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU) calls for the mainstreaming of bicycle and pedestrian projects into the planning, design and operation of our nation's transportation system; and

WHEREAS, bicycle and pedestrian projects and programs are eligible for funding from almost all of the major Federal-aid funding programs; and

WHEREAS, the City of Greenville affirms that bicycling and walking accommodations should be an integral part of planning, design, construction and operating activities, and will be included in the everyday operations of our transportation system; and

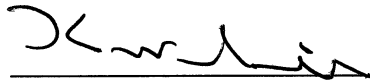
WHEREAS, the City of Greenville endorses the Complete Streets Policy by encouraging the design, operation and maintenance of the transportation network to promote safe and convenient access for all users in a manner consistent with, and supportive of, the surrounding community; and

WHEREAS, the City of Greenville endorses policies and procedures with the construction, reconstruction or other changes of transportation facilities on streets to support the creation of Complete Streets including capital improvements, re-channelization projects and major maintenance, recognizing that all streets are different and in each case user needs must be balanced.

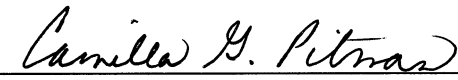
NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF GREENVILLE, SOUTH CAROLINA that the City endorses and supports the Complete Streets Policy as follows:

1. City staff shall enforce existing policies, provide guiding principles and create operating practices as deemed appropriate and if feasible so that transportation systems are planned, designed, constructed and operated to make bicycling and pedestrian movements an integral part of the City's transportation planning and programming while promoting safe operations for all users.
2. City staff shall plan for, design, construct and operate all new City transportation improvement projects to provide appropriate accommodation for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting safe operation for all users, as deemed appropriate and if feasible.
3. City staff shall incorporate Complete Streets principles into transportation strategic planning, transportation plans, manuals, rules, regulations and programs as deemed appropriate and if feasible.

RESOLVED THIS 24 DAY OF NOVEMBER, 2008.

  
\_\_\_\_\_  
MAYOR

Attest:

  
\_\_\_\_\_  
CITY CLERK

**Document C:**  
**Greenville, SC**  
**Economic Impacts of Bicycle Infrastructure Survey**

## Economic Impacts of Bicycle Infrastructure in Greenville, SC [Edit](#)

Default Report

[+ Add Report](#)

### Response Summary

Total Started Survey: 7  
Total Completed Survey: 7 (100%)

PAGE: ECONONICS OF BICYCLING IN GREENVILLE

1. What year did your business open?

[Download](#)

Response  
Count

[Show Responses](#) 7


answered question 7


skipped question 0

2. How many employees do you currently employ?

[Download](#)

Response  
Percent Response  
Count

Part-time  85.7% 6  
[Show Responses](#)

Full-time  85.7% 6  
[Show Responses](#)

answered question 7

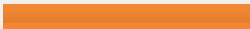
skipped question 0

3. Do you plan to hire additional employees within the next year?

[Create Chart](#) [Download](#)

Response  
Percent Response  
Count






No  28.6% 2

Yes, how many?  71.4% 5  
[Show Responses](#)




answered question 7

skipped question 0

4. From 2006-2010, what was your average annual sales total? [Create Chart](#) [Download](#)  
If you opened more recently than 2006, please provide the most recent annual averages.


		Response Percent	Response Count
\$0 - \$50,000		0.0%	0
\$50,000 - \$100,000		14.3%	1
\$100,000 - \$200,000		0.0%	0
\$200,000 - \$300,000		14.3%	1
\$300,000 - \$400,000		14.3%	1
\$400,000 - \$500,000		0.0%	0
\$500,000 - \$750,000		28.6%	2
\$750,000 - \$1,000,000		0.0%	0
\$1,000,000 - \$1,500,000		0.0%	0
\$1,500,000 - \$2,000,000		28.6%	2
+\$2,000,000		0.0%	0
Other (please specify) <a href="#">Show Responses</a>			2
answered question			7
skipped question			0


5. Over the past 5 years, or since your opening, which of the following sales trends best describes your business's experience? [Create Chart](#) [Download](#)

		Response Percent	Response Count
Increase by 0-5%		0.0%	0
Increase by 6-10%		14.3%	1
Increase by 11-20%		14.3%	1
Increase by more than 20%		71.4%	5
Decrease by 0-5%		0.0%	0
Decrease by 6-10%		0.0%	0
Decrease by 11-20%		0.0%	0
Decrease by more than 20%		0.0%	0
answered question			7
skipped question			0


6. In your opinion, has the expansion of bicycling infrastructure in Greenville increased your business? [Create Chart](#) [Download](#)




	Response	Response
--	----------	----------

	Percent	Count
No	0.0%	0
Yes	 100.0%	7
Please explain if necessary <a href="#">Show Responses</a>		4
answered question		7
skipped question		0

7. Do you have any comments or stories to share about how bike infrastructure  [Download](#) or specifically the Swamp Rabbit Trail has affected your business?

	Response Count
<a href="#">Show Responses</a>	5
answered question	5
skipped question	2

8. What bicycle related projects or programs can Greenville local governments  [Download](#) do to support the bicycle business community?

	Response Percent	Response Count
1. <a href="#">Show Responses</a>	 100.0%	7
2. <a href="#">Show Responses</a>	 85.7%	6
3. <a href="#">Show Responses</a>	 85.7%	6
answered question		7
skipped question		0



**Document D:**  
**Greenville, SC Design Specifications**  
**Manual**



**CITY OF GREENVILLE**

**DESIGN AND  
SPECIFICATIONS  
MANUAL**



## **EXECUTIVE SUMMARY**

Historically the Engineering Division has maintained a book of engineering standards that consisted mostly of detail drawings that apply to the construction of utility and street infrastructure within the City. The latest version of the standards book was issued in 1988. As development requirements changed and new technologies and methods evolved, the manual was updated, or in some cases, sections were simply deemed inadequate and other publically available resources were adopted as policy. For example, the South Carolina Department of Transportation (SCDOT) and the South Carolina Department of Health and Environmental Control (SCDHEC) have stormwater and erosion control details readily available.

With the adoption of the Land Management Ordinance in January 2008 and the adoption of a new stormwater ordinance in February 2008, it became imperative to prepare a new edition of the Design and Specifications Manual. While some inroads were made prior to the adoption of these ordinances, a complete overhaul of the original document was still necessary. All of the bureaus of the Engineering Division (Civil, Environmental, Traffic, and Construction Inspection) have been involved in this effort, and while significant progress has been made, the full manual is not yet complete. However, it is the recommendation of the Engineering Division to adopt sections of this manual as they become available.

The purpose of the Design and Specifications Manual is to establish minimum standards and provide guidance for the design and construction of land development projects and utility installations within the City of Greenville. The manual will assist developers, engineers, surveyors, contractors, inspectors and property owners in the best practical design for site development and redevelopment activities.

This manual is organized to guide one from the conceptual planning stage through construction. The table of contents describes the purpose of each chapter that is currently undeveloped. As each chapter is completed, the table will be modified appropriately. Chapter 1 introduces the purpose and objectives of this manual. Chapters 2 through 6 provide an overview of the permitting process and general development requirements. Chapters 7 through 9 provide specific design criteria for the development of street and utility infrastructure. Chapters 11 through 13 describe the Engineering Division's role in the construction process. The appendices contain information critical to the design professional including pre-approved details and notes, the stormwater design manual, and current engineering forms and checklists.

The Engineering Division recognizes that this manual must be dynamic and must continue to evolve and adapt to new technology, materials, and experiences. As we continue to develop this manual in the light of new developments, we must be satisfied that our decisions are appropriate and will strengthen and enhance engineering. To do so will uphold our tradition of quality in the City of Greenville.



## **chapter 7**

### **STREET DESIGN CRITERIA**

#### **7.1 Overall Design Guidelines**

The minimum design standards for streets and roads in the City of Greenville are presented in this chapter. Design details are included in Appendix A. In all cases not covered under these criteria, AASHTO, "A Policy on Geometric Design of Highways & Streets" latest edition shall rule.



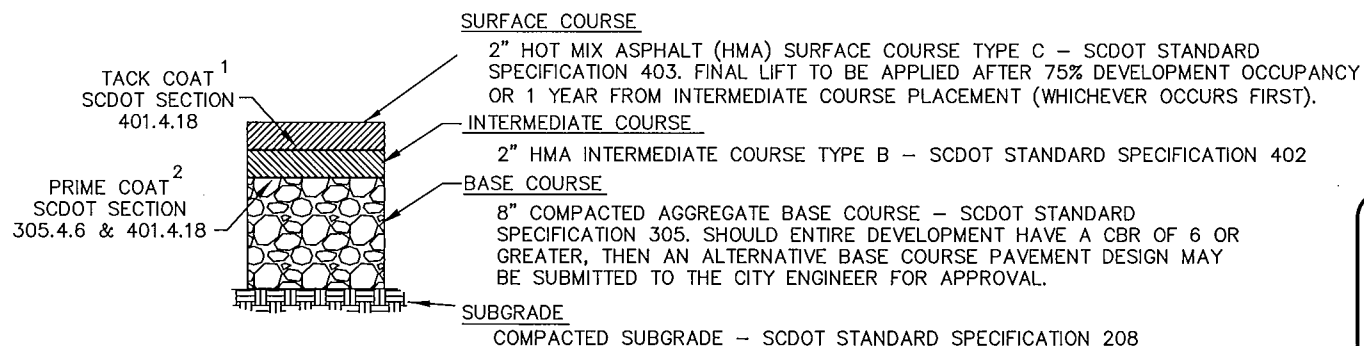
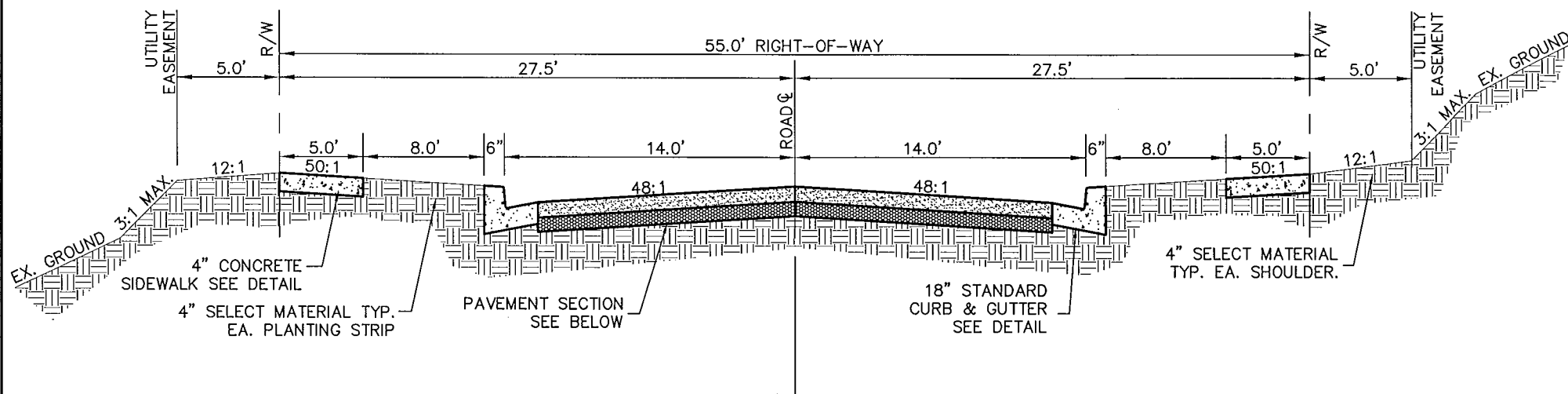
Design Criteria <sup>1,2</sup>	Alley <sup>8,9</sup>	Local Low Volume Residential	Local Residential	Local Residential with On-Street Parking	Collector <sup>10</sup>		Arterial <sup>10</sup>
Estimated Daily Volume <sup>3</sup>	≤ 300	≤ 300	301-1,500	301-1,500	1,501 - 8,000		> 8001
Right of way width	25'	41'	55'	61'	varies <sup>11</sup>		varies <sup>11</sup>
Street pavement width (F/C to F/C)	20'	20'	28'	34'	varies <sup>11</sup>		varies <sup>11</sup>
Minimum Traffic Lane Width	10'	10'	14'	17'	varies <sup>11</sup>		varies <sup>11</sup>
Minimum Centerline Grade	0.5%	0.5%	0.5%	0.5%	0.5%		0.5%
Maximum Centerline Grade <sup>4</sup>	15%	15%	15%	15%	10%		7%
Minimum Design Speed (mph)	15	25	25	25	30	40	45
Minimum Centerline Radius	50'	200'	200'	200'	337'	773'	1055'
Minimum Tangent Length between Horizontal Curves	--	100'	100'	100'	100'	150'	200'
Minimum Stopping Sight Distance	80'	155'	155'	155'	200'	305'	360'
K-value Crest <sup>5</sup>	3	12	12	12	19	44	61
K-value Sag <sup>5</sup>	10	26	26	26	37	64	79
Maximum Algebraic Difference in Centerline Grades without Vertical Curve	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.5%
Minimum Desired Spacing of Breaks in Centerline Grade	100'	300'	300'	300'	300'	350'	400'
Minimum Face of Curb Radius for Radius Returns	15'	20'	20'	20'	25'	30'	30'
Minimum Sight Triangles at Street Intersection	20'	25'	25'	25'	25'	30'	40'
Minimum Intersecting Angle of Centerlines at Intersections	80°	80°	80°	80°	80°	80°	80°
Minimum Block Length	250'	250'	250'	250'	250'	600'	600'
Maximum Block Length	1,800'	1,800'	1,800'	1,800'	1,800'	1,800'	1,800'
Minimum Centerline Offset Jogs	--	125'	125'	125'	200'	200'	300'
Maximum Leveling Grade at Intersections (along centerline) <sup>6</sup>	3.0%	3.0%	3.0%	3.0%	5.0%	5.0%	5.0%
Minimum Leveling Grade Distance from Intersecting of Travelway	50'	50'	50'	50'	75'	75'	75'
Minimum Block Length to Cul-de-sac <sup>7</sup>	--	--	150'	150'	--	--	--
Maximum Block Length to Cul-de-sac <sup>7</sup>	--	--	800'	800'	--	--	--
Minimum Right of Way Radius of Cul-de-sac <sup>7</sup>	--	--	50'	50'	--	--	--
Minimum Pavement Radius F/C to F/C of Cul-de-sac <sup>7</sup>	--	--	42'	42'	--	--	--

Design footnotes next page.  
August 2008



1. In all cases not covered under these criteria, AASHTO, "A Policy on Geometric Design of Highways & Streets" latest edition shall rule.
2. Refer to typical section for utility easement, sidewalk and curb lawn widths.
3. Refer to typical section for additional use criteria.
4. On-street parking is not recommended on grades steeper than 10%.
5. In both crest and sag conditions, minimum length of vertical curves shall be three (3) times the design speed.
6. Per ADAAG, the cross slope of marked pedestrian cross walks at stop conditions shall be a maximum of 2%.
7. Cul-de-sac permitted with Local Residential and Local Residential with On-Street Parking sections. Maximum estimated daily volume is 400 ADT. Block length measured from the edge of intersecting travel way to the center of the turnaround. Refer to cul-de-sac detail for additional right-of-way and design criteria.
8. One-way alley design on a case-by-case basis. Geometry follows that of angled parking. Right-of-way width is typically 5' plus the pavement width.
9. Curb and gutter is omitted from alley section.
10. While a pre-design conference is recommended for all street design, a pre-design conference is required for the design of residential & commercial collectors and arterials. Final determination of appropriate design speed by the City Engineer.
11. Refer to typical section details for cross section zones and design element minimums.

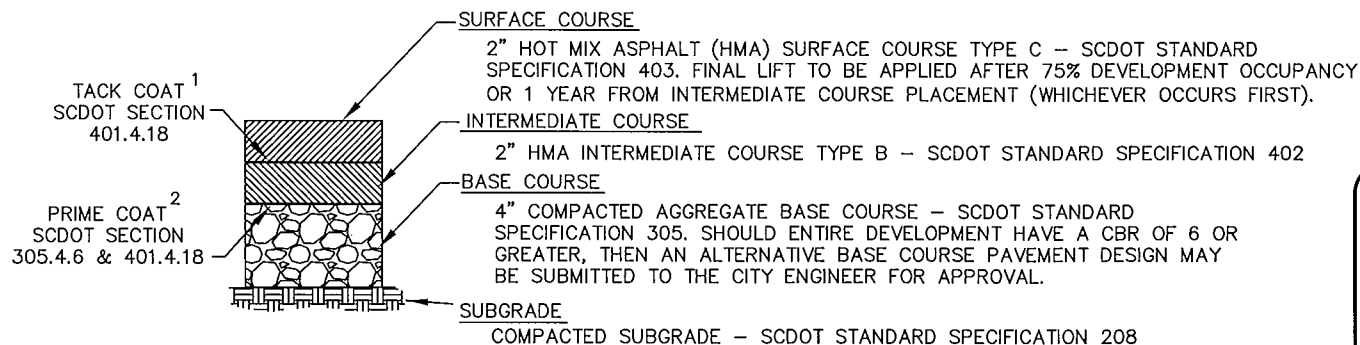
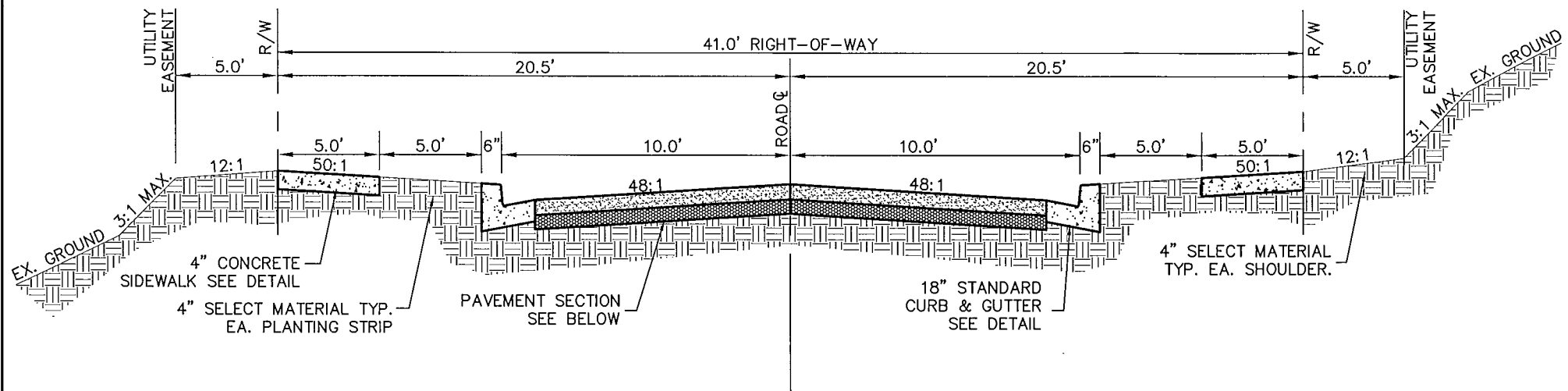




### TYPICAL PAVEMENT SECTION

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

- NOTE**  
THIS TYPICAL SECTION MAY BE USED IF ALL OF THE FOLLOWING CONDITIONS ARE MET:
1. SINGLE FAMILY NET DENSITIES ALONG THE STREET ARE BELOW 15 UNITS PER ACRE.
  2. THERE IS SUFFICIENT ON-SITE PARKING TO ALLOW FOR 2 VEHICLES PER UNIT FOR SINGLE FAMILY DEVELOPMENT AND 1.5 VEHICLES PER UNIT FOR MULTIFAMILY DEVELOPMENTS.
  3. PREDICTED VOLUME IS LESS THAN OR EQUAL TO 1500 VEHICLES PER DAY.



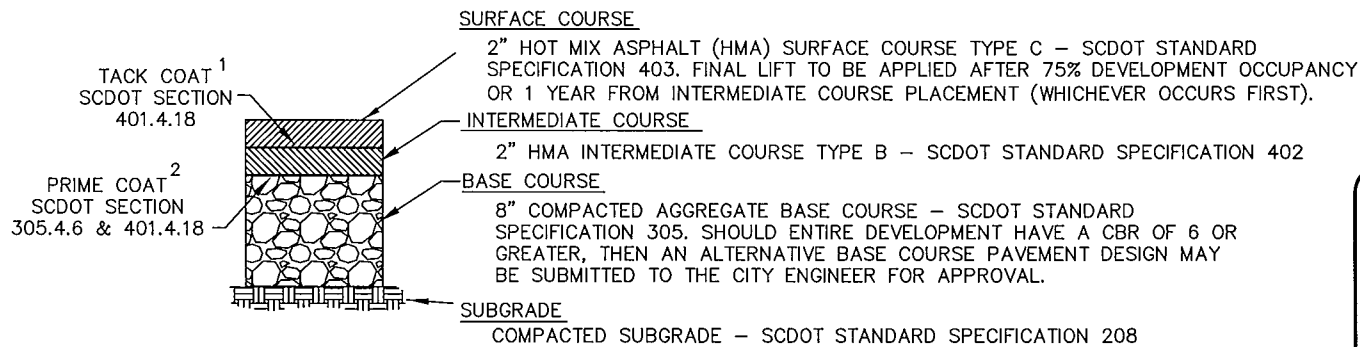
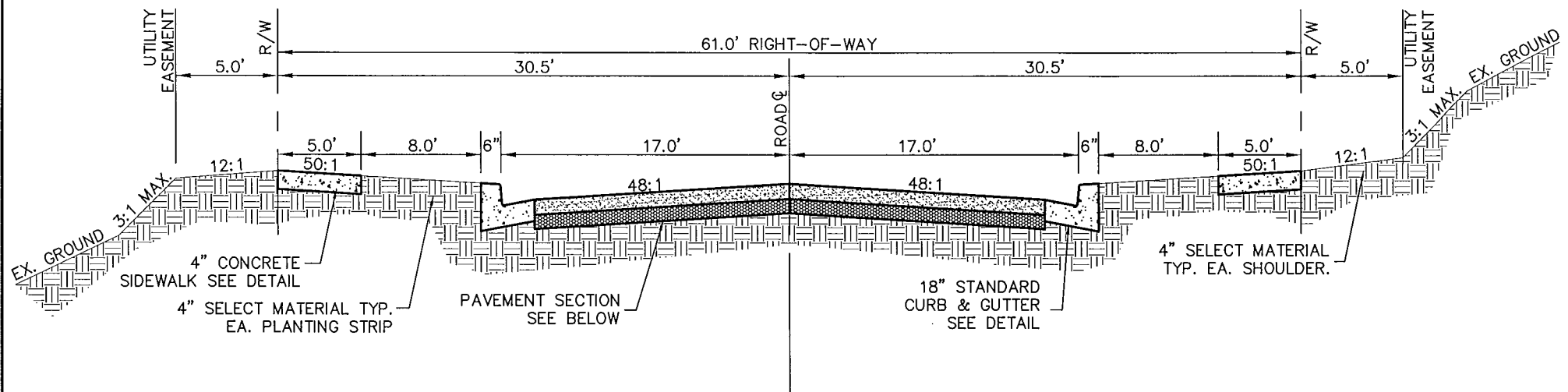
### TYPICAL PAVEMENT SECTION

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 - 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 - 0.30 GAL PER SQUARE YARD

#### NOTE

THIS TYPICAL SECTION MAY BE USED IF ALL OF THE FOLLOWING CONDITIONS ARE MET:

1. SINGLE FAMILY R-9 OR NET DENSITIES ALONG THE STREET ARE BELOW 5 UNITS PER ACRE.
2. LOT FRONTAGE ALONG THE STREET IS AT LEAST 60' WIDE.
3. PREDICTED VOLUME IS EQUAL TO OR LESS THAN 300 VEHICLES PER DAY.
4. LOCAL LOW VOLUME RESIDENTIAL STREETS MAY NOT TERMINATE WITH A CUL-DE-SAC OR EQUIVALENT WITHOUT PRIOR APPROVAL BY THE CITY ENGINEER.



### TYPICAL PAVEMENT SECTION

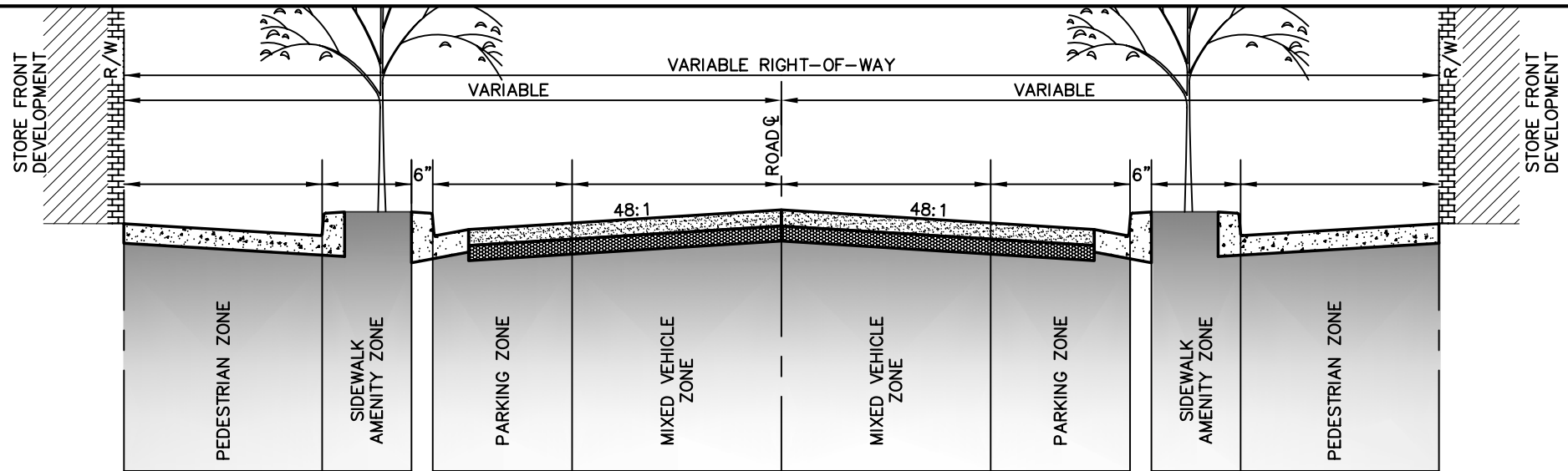
1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD

2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

#### NOTE

THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 1500 VEHICLES PER DAY. THIS TYPICAL SECTION SHALL BE USED WHEN:

1. SINGLE FAMILY NET DENSITIES ALONG THE STREET ARE 15 UNITS PER ACRE OR GREATER.
2. THERE IS NOT SUFFICIENT ON-SITE PARKING TO ALLOW FOR 2 VEHICLES PER UNIT FOR SINGLE FAMILY DEVELOPMENT OR 1.5 VEHICLES PER UNIT FOR MULTIFAMILY DEVELOPMENTS.
3. BUMP OUTS OF THE CURB LINE TO REDUCE IMPERVIOUS SURFACES AND PROVIDE TRAFFIC CALMING ARE ENCOURAGED.



1. THE DESIGN GUIDELINES FOR NON-LOCAL THOROUGHFARES ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH WILL VARY DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

#### MIXED VEHICLE ZONE

3. TYPICALLY HIGHLY URBANIZED MAIN STREETS HAVE ONE TRAVEL LANE IN EACH DIRECTION. HOWEVER IN CERTAIN SITUATIONS THEY MAY HAVE 3 TOTAL LANES DEPENDING ON PREDICTED TRAFFIC VOLUMES. IN ALL CASES, TRAVEL LANE WIDTHS SHALL BE A MINIMUM 11' WIDE. WIDER TRAVEL LANES WILL BE NECESSARY WHERE ON-STREET PARKING IS PROVIDED.

4. WHILE THE 3-LANE CROSS SECTION WITH A CENTER, TWO-WAY-LEFT-TURN-LANE (TWLTL) ARE NOT TYPICALLY EXPECTED ON MAIN STREETS, THEY MAY BE PROVIDED SO LONG AS THE TWLTL IS A MINIMUM 12' WIDE. IF THE CENTER LANE IS PROPOSED TO BE A PLANTED MEDIAN WITH INTERMITTENT TURN LANES, THE CENTER LANE SHOULD TYPICALLY BE 16' WIDE TO PROVIDE A MINIMUM 6' PEDESTRIAN REFUGE AND A 10' TURN LANE. IN NO CASE SHOULD A PLANTED MEDIAN BE LESS THAN 6' WIDE MEASURED FACE-OF-CURB TO FACE-OF-CURB.

#### PARKING ZONE

5. ON-STREET PARKING IS DESIRABLE IN AREAS WITH FRONT FACING COMMERCIAL DEVELOPMENT AND IN HIGH DENSITY RESIDENTIAL AREAS WHERE ON-STREET PARKING IS EXPECTED. ON-STREET PARKING SHOULD BE CLEARLY MARKED. PARALLEL LANES MUST BE A MINIMUM OF 7' WIDE AND MARKED PER THE APPLICABLE DETAIL. ANGLED PARKING SHALL FOLLOW CITY DESIGN GUIDELINES AND DIMENSIONAL STANDARDS.

#### SIDEWALK AMENITY ZONE

6. THIS ZONE ENHANCES THE PEDESTRIAN ENVIRONMENT ALONG A MAIN STREET AND SHOULD INCLUDE STREET TREES, LIGHTS, FURNITURE (LIKE OUTDOOR DINING), AND OTHER AMMENITIES. THE MINIMUM WIDTH PROVIDED SHALL BE 8', UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER AND THE CITY URBAN DESIGNER.

#### PEDESTRIAN ZONE

7. AN 8' WIDE UNOBSTRUCTED SIDEWALK SHOULD BE PROVIDED ON BOTH SIDES OF A MAIN STREET SECTION UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER AND THE CITY URBAN DESIGNER. IN NO CASE SHALL THE UNOBSTRUCTED SIDEWALK WIDTH BE LESS THAN 6'.

#### OTHER CONSIDERATIONS

8. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

9. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

10. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.

 city of  
**greenville**  
ENGINEERING DIVISION

**MAIN STREET**

DATE  
APPROVED: **AUG. 2008**

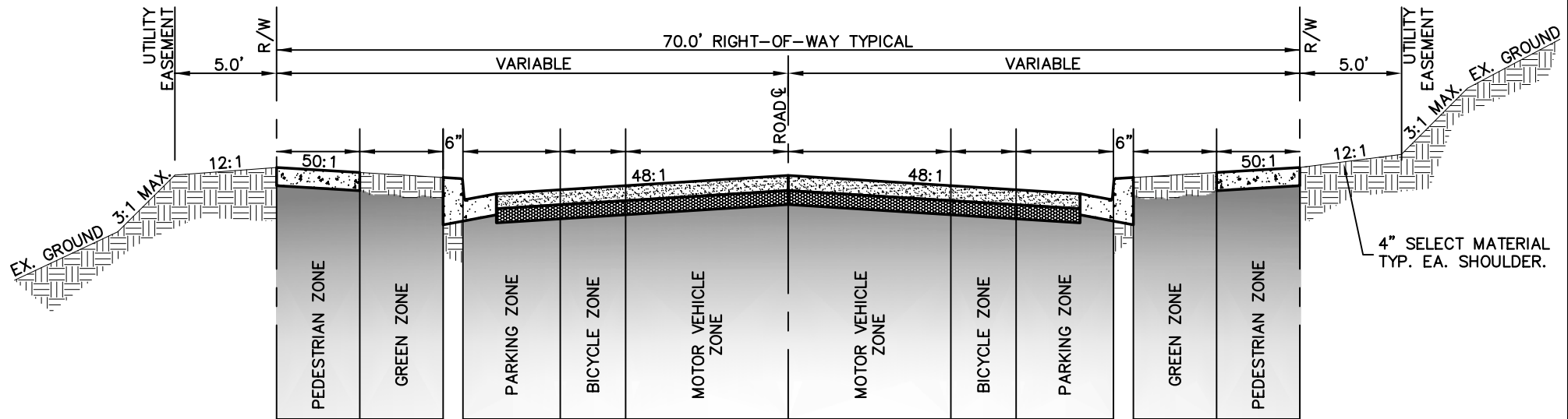
OFFICE OF THE  
CITY ENGINEER:

*Philip B. Lindsey*

SCALE:  
**NO SCALE**

DETAIL :

**10:04**



1. THE DESIGN GUIDELINES FOR NON-LOCAL THOROUGHFARES ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

#### MOTOR VEHICLE ZONE

3. TYPICALLY COLLECTORS HAVE ONE TRAVEL LANE IN EACH DIRECTION, HOWEVER IN CERTAIN SITUATIONS THEY MAY HAVE 3, 4, OR 5 TOTAL LANES DEPENDING ON PREDICTED TRAFFIC VOLUMES. IN ALL CASES, TRAVEL LANE WIDTHS SHALL BE A MINIMUM 11' WIDE.

4. WHILE 3- AND 5-LANE CROSS SECTIONS WITH A CENTER, TWO-WAY-LEFT-TURN-LANE (TWLTL) ARE NOT TYPICALLY EXPECTED ON COLLECTORS, THEY MAY BE PROVIDED SO LONG AS THE TWLTL IS A MINIMUM 12' WIDE. IF THE CENTER LANE IS PROPOSED TO BE A PLANTED MEDIAN WITH INTERMITTENT TURN LANES, THE CENTER LANE SHOULD TYPICALLY BE 16' WIDE TO PROVIDE A MINIMUM 6' PEDESTRIAN REFUGE AND A 10' TURN LANE. IN NO CASE SHOULD A PLANTED MEDIAN BE LESS THAN 9' WIDE MEASURED FACE-OF-CURB TO FACE-OF-CURB.

#### BICYCLE ZONE

5. DEDICATED BICYCLE LANES SHOULD BE PROVIDED ON ALL COLLECTORS. BICYCLE LANES SHALL BE A MINIMUM 5' WIDE. THE DESIGN ENGINEER IS ENCOURAGED TO REVIEW AASHTO'S *GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES* FOR FURTHER DESIGN CONSIDERATIONS.

#### PARKING ZONE

6. ON-STREET PARKING IS DESIRABLE IN AREAS WITH FRONT FACING COMMERCIAL DEVELOPMENT AND IN HIGH DENSITY RESIDENTIAL AREAS WHERE ON-STREET PARKING IS EXPECTED. ON-STREET PARKING, WHEN PROVIDED, SHOULD BE MARKED, PARALLEL LANES A MINIMUM OF 7' WIDE. PLEASE REFERENCE THE TYPICAL PARALLEL PARKING DETAIL FOR THE CITY OF GREENVILLE STRIPING STANDARD.

#### GREEN ZONE

7. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES OF A COLLECTOR. THE MINIMUM PLANTING STRIP WIDTH SHALL BE 8' (MEASURED FROM BACK-OF-CURB TO EDGE OF SIDEWALK), UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. THE TOP 4" OF THE PLANTING STRIP SHALL BE SELECT MATERIAL SUFFICIENTLY CAPABLE OF GROWING AND SUSTAINING VEGETATION.

#### PEDESTRIAN ZONE

8. A MINIMUM 5' WIDE UNOBSTRUCTED SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF A COLLECTOR.

#### OTHER CONSIDERATIONS

9. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

10. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

11. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.



## COLLECTOR

DATE APPROVED: AUG. 2008

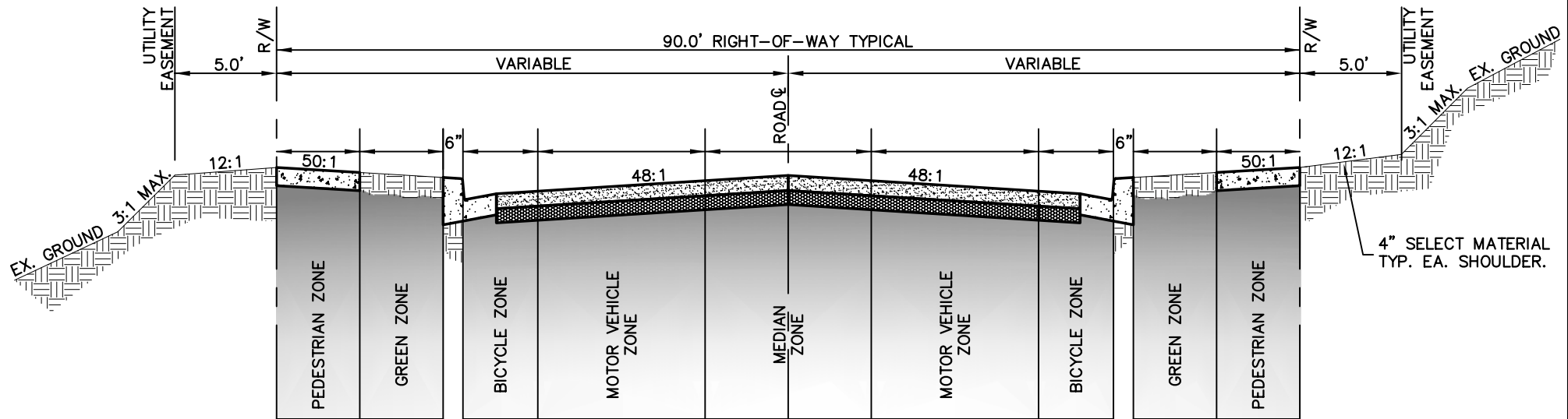
OFFICE OF THE CITY ENGINEER:

*Philip B. Lindsey*

SCALE:  
NO SCALE

DETAIL:

10:05



1. THE DESIGN GUIDELINES FOR NON-LOCAL THOROUGHFARES ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

#### MEDIAN ZONE

3. TYPICALLY A MEDIAN SHOULD BE PROVIDED. A CENTER, TWO-WAY-LEFT-TURN-LANE (TWLTL) SHALL BE A MINIMUM 12' WIDE. IF THE CENTER LANE IS PROPOSED TO BE A PLANTED MEDIAN WITH INTERMITTENT TURN LANES, THE CENTER LANE SHOULD TYPICALLY BE 16' WIDE TO PROVIDE A MINIMUM 6' PEDESTRIAN REFUGE AND A 10' TURN LANE. IN NO CASE SHOULD A PLANTED MEDIAN BE LESS THAN 9' WIDE MEASURED FACE-OF-CURB TO FACE-OF-CURB.

#### MOTOR VEHICLE ZONE

4. TYPICALLY ARTERIALS HAVE TWO TRAVEL LANES IN EACH DIRECTION. TRAVEL LANE WIDTHS SHALL BE A MINIMUM 11' WIDE.

#### BICYCLE ZONE

5. DEDICATED BICYCLE LANES SHOULD BE PROVIDED ON ALL ARTERIALS. BICYCLE LANES SHALL BE A MINIMUM 5' WIDE. THE DESIGN ENGINEER IS ENCOURAGED TO REVIEW AASHTO'S *GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES* FOR FURTHER DESIGN CONSIDERATIONS.

#### GREEN ZONE

6. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES OF AN ARTERIAL. THE MINIMUM PLANTING STRIP WIDTH SHALL BE 8' (MEASURED FROM BACK-OF-CURB TO EDGE OF SIDEWALK), UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. THE TOP 4" OF THE PLANTING STRIP SHALL BE SELECT MATERIAL SUFFICIENTLY CAPABLE OF GROWING AND SUSTAINING VEGETATION.

#### PEDESTRIAN ZONE


7. A MINIMUM 5' WIDE UNOBSTRUCTED SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF AN ARTERIAL.

#### OTHER CONSIDERATIONS

8. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

9. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

10. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.

 <b>city of greenville</b> ENGINEERING DIVISION	ARTERIAL		SCALE: <b>NO SCALE</b>
	DATE APPROVED: <b>AUG. 2008</b>	OFFICE OF THE CITY ENGINEER: <i>Philip B. Lindsey</i>	DETAIL : <b>10:06</b>



**Document E:**  
**Greenville, SC Bike Parking Ordinance**

## City of Greenville, SC

### BICYCLE PARKING ORDINANCE

#### Sec. 19-6.1. Off-street parking and loading

19-6.1.1 *Intent.* The intent of this section is to allow flexible methods of providing an adequate number of parking and loading spaces, while creating or improving a pedestrian-oriented community, and reducing excessive paved surfaces which lead to unnecessary heat buildup and stormwater runoff.

19-6.1.2 *Applicability.*

(A) *General.* The off-street parking, bicycle parking, and loading standards of this section shall apply to any new building constructed and to any new use established.

(B) *Exemptions.* The off-street parking and loading standards of this section shall not apply in the C-4 district. However, prior to issuance of any building permit or certificate of occupancy, whichever is issued first, the owner of any new building constructed or any new use established in the C-4 district shall submit to the administrator an estimate of the parking requirements that the building or use is expected to generate, based on the ratios established in this section, and an indication of where or how that parking will be provided.

The off-street parking and loading standards of this section shall not apply to historic properties or properties located in a preservation overlay district.

The off-street parking, bicycle parking, and loading standards of subsections 19-6.1.2 and 19-6.1.3 shall not apply to parking areas which constitute the principal use of a site (commercial parking lots and parking structures).

The maximum off-street parking standards of subsections 19-6.1.2 and 19-6.1.3 shall not apply to developments which incorporate a parking structure.

(C) *Expansions and alterations.* The off-street parking, bicycle parking, and loading standards of this section shall apply when an existing structure or use is expanded or enlarged. Additional off-street parking, bicycle parking, and loading spaces shall be required to serve on the enlarged or expanded area, provided that in all cases the number of off-street parking, bicycle parking, and loading spaces provided for the entire use (pre-existing plus expansion) must equal at least 75 percent of the minimum ratio established in this section.

(D) *Change of use.* Off-street parking, bicycle parking and loading shall be provided for any change of use or manner of operation that would, based on the minimum ratios established in this section, result in a requirement for more parking or loading spaces than the existing or previous use. Any additional parking required by this section shall be installed prior to issuance of a certificate of occupancy.

(D) *Parking for unlisted uses.* Parking requirements for uses not specifically listed in Table 19-6.1-1 shall be determined by the administrator based on the provisions of Schedule B.

(E) *Reduction of automobile parking for bicycle parking.* The administrator may reduce the required number of off-street parking spaces by one automobile space for every six, or portion thereof, bicycle parking spaces provided.

19-6.1.6 *Parking design and location standards.* In addition to the design standards listed in section 19-6.5, the following shall apply to all parking lots:

(A) *Surfacing and maintenance.* All required parking and vehicular driving surfaces shall be graded for drainage in accordance with section 19-6.8, stormwater management, and shall be surfaced with concrete or bituminous asphalt pavement, except as allowed in (B) and (C) below. Alternative materials may be approved by the administrator. Alternative materials shall only be considered if such material(s) exhibits equivalent load bearing and wear characteristics as concrete or bituminous asphalt. All surfaces shall be maintained in sound conditions free of weeds, dust, trash and debris.

(B) *Overflow parking.* All parking areas above the minimum number of spaces required in Table 19-6.1-1 are considered as overflow parking and shall be turf or an approved pervious paving system. Turf may be used for parking areas and vehicular driving surfaces only for parking areas which are designed not to be used more than ten times per year or for storage lots which generate less than 30 average daily trips.

(C) *Paving exemption for assembly uses.* The administrator may waive the paving requirement for up to 50 percent of the required parking spaces and vehicular driving surfaces for assembly uses (religious institutions, sports facilities, and the like). The waiver may be granted only if evidence is presented to the administrator that these parking spaces and vehicular driving surfaces will be used less than five times per week and are not required for access by emergency vehicles. Parking areas for which paving is waived shall maintain a turf surface and be constructed with proper drainage.

(D) *Markings.* All paved parking spaces shall be identified by surface markings and shall be maintained in a manner so as to be readily visible at all times. Such markings shall be arranged to provide for orderly and safe loading, unloading, parking, and storage of vehicles. Parallel parking spaces shall be marked with standard "cross" and "T" pavement markings as reflected in the design and specification manual. All striping shall be marked with four-inch lines. As appropriate, time and use restrictions may apply and signs shall be posted displaying the required information.

(E) *Backing movements prohibited.* All off-street parking spaces and driveways, with the exception of parking areas for one-family and two-family detached dwellings, shall be arranged to require ingress and egress from the lot to a public street by forward motion of the vehicle. For single-family and two-family residences only, driveways may be used to satisfy minimum off-street parking requirements, provided that sufficient space is available to satisfy the minimum design standards.

(F) *Dimensions of parking stalls and driveways.* All required parking spaces shall be designed to comply with the following minimum standards:

Table 19-6.1-4: Standards for Parking Stalls

TABLE INSET:

Angle of Parking	Stall Width	Stall Depth	Driveway Width	Planting Island Width
0° (Parallel)	8'	22' (length)	12'	N/A
30°	9'	17'	12'	4'
45°	9'	19'	14'	6'
60°	9'	20'	18'	7'
90°	9'	18'	24'	9'

(G) *Overhang protection.* Wheel or bumper guards or curbing shall be provided, located and arranged so that no part of any parked vehicle will extend beyond the boundaries of the parking space and into a pedestrian area, landscape area or beyond the property line of the site.

(H) *Stacked parking.* Generally, no parking spaces shall be located so as to require the moving of any vehicle on the premises in order to enter or leave any other space. However, the administrator may, on a case-by-case basis, allow stacking spaces provided for auto-related uses to count toward the minimum required parking as long as such spaces are not part of areas required for site ingress or egress or areas intended for fueling. For example, stacking spaces may be permitted if the parking is dedicated to one use only.

(I) *Bicycle parking.* Bicycle parking areas shall be located for the convenient access to site amenities and primary building entrances. Bicycle parking areas shall be located on a hardscape surface, physically separated from automobile parking lots. They shall be designed to provide adequate space for ingress and egress, and not impede pedestrian and vehicle circulation. Bicycle parking areas shall be designed to provide adequate space for ingress and egress.

Bicycle racks shall be designed to support a bicycle frame in two places in a stable, upright position. Bicycle racks shall be securely anchored to the lot surface.

Bicycle parking areas and bicycle racks shall be designed and installed as specified in the Design and Specifications Manual.

**Document F:**  
**Greenville Bike Count Form**

# Bicycle Count Form

Greenville, SC

Use a different form for each hour. Count using clear, identifiable tally marks. Be specific when naming your location. Make notes of (and count) wrong-way riding or other unusual occurrences in lower box.

Location: \_\_\_\_\_

(Screenline A) \_\_\_\_\_ (Screenline B) \_\_\_\_\_

Date: \_\_\_\_\_ Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Weather: \_\_\_\_\_ Name: \_\_\_\_\_

	(A) Male	(B) Male	(A) Female	(B) Female	Total
<b>with</b> helmet on street					
<b>with</b> helmet on sidewalk					
<b>without</b> helmet on street					
<b>without</b> helmet on sidewalk					
<b>Total →</b>					

Notes:



**Document : G**

**Greenville, SC City/County Pavement  
Rehabilitation Program Relationship**

*General Question – What is the relationship between the City's Pavement Rehabilitation Program and the City / County Street Rehabilitation Program:*

*The City supplies the list of streets that are to be rehabilitated to the "C" Fund Committee and the list of streets supplied is based on the Pavement Quality Index (PQI) rating. The street segments that are to be rehabilitated are selected based on a priority of "worst to first". This program is administered by a contractor selected by the "C" Fund Committee. The match is usually 1:1 (\$100,000 to \$100,000 for a total of \$200,000 or \$150,000 to \$150,000 for a total of \$300,000). As stated previously this program is administered by a contractor selected by the "C" Fund Committee. Currently this contractor is CoTransCo. However the City handles the public outreach program, provides general oversight, and answers the telephone calls from citizens and motorists prior to construction, during construction, and after construction.*

1. Project Description – see the *Public Works* website
2. Project Managers & Contact Information
  - a. City – *NSTEP* (Eddie Littleton) and *Pavement Rehabilitation* (Bob Manz)
  - b. Other – *Greenville County Match Program* (CoTransCo)
3. Project funding source - *CIP*
4. Annual average project budget: *NSTEP* - \$500,000 and *Pavement Rehabilitation* - \$500,000. Both programs have not been funded the previous two years except for the City's match for the *Greenville County Resurfacing Program*.
5. Persons/organizations responsible for developing project lists: *NSTEP* – Eddie Littleton and *Pavement Rehabilitation* – Bob Manz
6. Copy of Ranking/Criteria forms: *NSTEP* – see attached interoffice memorandum and *Pavement Rehabilitation* – PQI rankings that were established by Stantec Consulting Service (based on 13 criteria) during a 2009 field review.
7. Critical dates when project lists are developed: *Pavement Rehabilitation* – County Match Program (October 15 – 31) and for the City's *Pavement Rehabilitation Program* the development begins on January 2<sup>nd</sup>. *NSTEP* – varies. Engineering has been in a catch-up mode for the past four years. However moving forward Engineering plans to complete the field reconnaissance by December 31<sup>st</sup> so that the surveying and design can be performed in the January – May time frame with the objective of advertising each year's project by mid-July. Prior to the *Pavement Rehabilitation Project* being advertised all of the primary utilities, i.e., the *Greenville Water System*, *Piedmont Natural Gas*, *Duke Energy* and *ReWa* are notified. Streets segments maybe delayed in being rehabilitated if a utility has a project that requires work on a street segment scheduled for rehabilitation.
8. Persons/organizations responsible for reviewing proposed projects: *NSTEP* – Bob Manz. *Pavement Rehabilitation* – Streets scheduled for rehabilitation are reviewed by the *Public Works Department* and input is requested from Wil Ravenhorst (for

striping requirements), Bob Pecqueur (Construction Inspection Bureau), and the City Engineer.

9. Persons/organizations responsible for plan development, bidding, and contracting.

NSTEP – Eddie Littleton working with Purchasing and Legal. Pavement Rehabilitation – Bob Manz working with Purchasing and Legal

10. General timeframe between:

- a. project list development – Pavement Rehabilitation (County Match Program – List needs to be developed by October 31<sup>st</sup> and for the City's Pavement Rehabilitation Program the development begins on January 2<sup>nd</sup> with the objective of advertising the project the first week of July. NSTEP – varies. However the next two streets being considered for sidewalk are Long Hill Street (Rice Street to Deoyley Avenue and East Faris Road (west of Pine Forest Drive Extension to Cleveland Street)
- b. project list approval – Pavement Rehabilitation Program - By April 15<sup>th</sup>. NSTEP – varies (see above)
- c. bidding/letting – Pavement Rehabilitation Program – advertise the project the first week of July with a bid date the third or fourth week of July. NSTEP Round 7 – the target date to advertise this project is the first half of July 2011.

**Document H:**  
**SC State Bicycle Laws (H3006)**

**SECTION 16-13-80. Larceny of bicycles.**

The larceny of a bicycle is a misdemeanor and, upon conviction, the person must be punishable at the discretion of the court. When the value of the bicycle is less than one thousand dollars, the case is triable in magistrate's court and, upon conviction, the person must be fined not more than five hundred dollars or imprisoned not more than thirty days.

**SECTION 16-21-70. Use of bicycle or certain other vehicles without permission.**

Whoever knowingly and wilfully shall take and use any bicycle or other vehicle, except as defined in Section 56-19-10, without the consent of the owner thereof, but without intent to steal such vehicle, shall be guilty of a misdemeanor and, upon conviction, shall be punished by a fine of not more than five hundred dollars or by imprisonment for a period of not more than one year or both fine and imprisonment, in the discretion of the court.

**SECTION 53-1-50. Exceptions to prohibition on Sunday work.**

Section 53-1-40 does not apply to the following:

(1) The sale of food needs, ice, or soft drinks.

*{Some items omitted from this for non-relevance to bicycling}*

(5) The transportation by air, land, or water of persons or property, nor to the sale or delivery of heating, cooling, refrigerating, or motor fuels, oils, or gases, or the purchase or installation of repair parts or accessories for immediate use in cases of emergency in connection with motor vehicles, boats, bicycles, aircrafts, or heating, cooling, or refrigerating systems, nor to the cleaning of motor vehicles.

**SECTION 56-3-4410. "Share the Road" license plates; fees; special fund for bicycling safety and education programs.**

(A) The Department of Motor Vehicles may issue "Share the Road" special motor vehicle license plates to owners of private passenger-carrying motor vehicles or light pickups having an empty weight of seven thousand pounds or less and a gross weight of nine thousand pounds or less registered in their names which may have imprinted on the plate an emblem, a seal, or other symbol of the Palmetto Cycling Coalition, Inc. The Palmetto Cycling Coalition, Inc., shall submit to the department for its approval the emblem, seal, or other symbol it desires to be used for this special license plate. The Palmetto Cycling Coalition, Inc., may request a change in the emblem, seal, or other symbol not more than once every five years. The special license plate must be issued or revalidated for a biennial period which expires twenty-four months from the month it is issued. The fee for this special license plate is the regular motor vehicle registration fee contained in Article 5, Chapter 3 of this title and a special motor vehicle license fee of thirty dollars.

(B) Notwithstanding any other provision of law, from the fees collected pursuant to this section, the Comptroller General shall place sufficient funds into a special restricted account to be used by the Department of Motor Vehicles to defray the expenses of the Department of Motor Vehicles in producing and administering the special license plates. The remaining funds collected from the special motor vehicle license fee must be distributed to the Palmetto Cycling Coalition, Inc., or another nonprofit fund designated by the Palmetto Cycling Coalition, Inc., for the promotion of bicycling safety and education programs. Any remaining

funds must be administered by the Palmetto Cycling Coalition, Inc., used only for efforts to promote bicycle safety and education programs, and deposited in an appropriate nonprofit account designated by the Palmetto Cycling Coalition, Inc.

(C) Before the department produces and distributes a plate authorized under this section, it must receive:

(1) four hundred or more prepaid applications for the special license plate or a deposit of four thousand dollars from the individual or organization seeking issuance of the license plate. If a deposit of four thousand dollars is made by an individual or organization pursuant to this section, the department must refund the four thousand dollars once an equivalent amount of license plate fees is collected for that organization's license plate. If the equivalent amount is not collected within four years of the first issuance of the license plate, then the department must retain the deposit; and

(2) a plan to market the sale of the special license plate that must be approved by the department.

(D) If the department receives less than three hundred biennial applications and renewals for a particular special license plate authorized under this section, it shall not produce additional special license plates in that series. The department shall continue to issue special license plates of that series until the existing inventory is exhausted.

**SECTION 56-5-160. Bicycle.**

A bicycle is a device propelled solely by pedals, operated by one or more persons, and having two or more wheels, except children's tricycles.

**SECTION 56-5-615. Freeway defined.**

A "freeway" is a multilane divided highway with full control of access, and grade separated interchanges, of the type comprising the National System of Interstate and Defense Highways, or other highways built essentially in conformance to the standards of them.

**SECTION 56-5-710. Powers of local authorities.**

Subject to the limitations prescribed in Section 56-5-930, the provisions of this chapter shall not be deemed to prevent local authorities with respect to streets and highways under their jurisdiction and within the reasonable exercise of the police power from:

- (1) Regulating the standing or parking of vehicles;
- (2) Regulating traffic by means of police officers or traffic-control signals;
- (3) Regulating or prohibiting processions or assemblages on the highways;
- (4) Designating particular highways as one-way highways and requiring that all vehicles thereon be moved in one specific direction;
- (5) Regulating the speed of vehicles in public parks;
- (6) Designating any highway as a through highway and requiring that all vehicles stop before entering or crossing it or designating any intersection as a stop intersection and requiring all vehicles to stop at one or more entrances at such intersection;
- (7) Restricting the use of highways as authorized in Sections 56-5-4210 and 56-5-4220;
- (8) Regulating the operation of bicycles and requiring the registration and licensing of them, including the requirement of a registration fee;

- (9) Regulating or prohibiting the turning of vehicles or specified types of vehicles at intersections;
- (10) Altering the prima facie speed limits as authorized herein; or
- (11) Adopting such other traffic regulations as are specifically authorized by this chapter.

**SECTION 56-5-970 (excerpt) Non-responsive Traffic Signals .**

*Certain text not printed for brevity. .*

(5) Notwithstanding any other provision of law, if a driver of a motorcycle or moped, or a bicycle rider, approaches an intersection that is controlled by a traffic-control device, the driver may proceed through the intersection on a steady red light only if the driver or rider, as the case may be:

- (a) comes to a full and complete stop at the intersection for one hundred twenty seconds; and
- (b) exercises due care as provided by law, otherwise treats the traffic control device as a stop sign, and determines it is safe to proceed.

**SECTION 56-5-1560. Minimum speed limits.**

(a) Impeding traffic by slow speed prohibited. --No person shall drive a motor vehicle at such a slow speed as to impede the normal and reasonable movement of traffic except when reduced speed is necessary for safe operation or in compliance with law.

(b) Establishing minimum speed zones; signs. Whenever the Department of Transportation or local authorities within their respective jurisdictions determine on the basis of an engineering and traffic investigation that slow speeds on any part of a highway consistently impede the normal and reasonable movement of traffic, the Department of Transportation or local authority may determine and declare a minimum speed limit below which no person shall drive a vehicle except when necessary for safe operation or in compliance with law, when appropriate signs giving notice thereof are erected along the part of the highway for which a minimum speed limit is established. Also any minimum speed limit adopted by a municipality for a section of the state highway within the municipality shall not be effective until such minimum speed has been approved by the Department of Transportation.

**SECTION 56-5-3230. Drivers to exercise due care.**

Notwithstanding other provisions of any local ordinance, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian or any person propelling a human-powered vehicle and shall give an audible signal when necessary and shall exercise proper precaution upon observing any child or any obviously confused, incapacitated or intoxicated person.

**SECTION 56-5-3310. Electric Personal Assistive Mobility Devices (*aka Segways*). [SC ST SEC 56-5-3310]**

(A) As used in this article, "Electric Personal Assistive Mobility Device" or "EPAMD" means a self-balancing two nontandem wheeled device designed to transport one person, with an electric propulsion system with average power of seven hundred fifty watts (one horsepower), whose maximum speed on a paved level surface, when powered solely by this propulsion system while ridden by an operator weighing one hundred seventy pounds, is less than twenty miles an hour.

(B) The operation of an EPAMD is governed by the

provisions of this article. Notwithstanding another provision of law, an EPAMD is not considered a "vehicle" or "motor vehicle" within the meaning of the laws of this State and no provisions of law relating to vehicles or motor vehicles apply to an EPAMD unless specified in this article.

(C) A person may operate an EPAMD upon sidewalks, roadways, bicycle routes, paths, or trails as contained in this article.

(D) A person operating an EPAMD on a sidewalk, roadway, bicycle route, path, or trail shall exercise due care to avoid colliding with, and shall yield the right-of-way to, pedestrians and human powered devices. A person operating an EPAMD also shall give an audible signal before overtaking and passing a pedestrian or person operating a human powered device.

*(further parts of 56-5-3310 unrelated to bicycling omitted here)*

**SECTION 56-5-3410. Applicability of regulations to bicycles.**

The provisions of this article are applicable to bicycles whenever a bicycle is operated upon any highway or upon any path set aside for the exclusive use of bicycles, subject to those exceptions stated in this article.

**SECTION 56-5-3420. Rights and duties of bicyclists generally.**

A person riding a bicycle upon a roadway must be granted all of the rights and is subject to all of the duties applicable to the driver of a vehicle by this chapter, except as to special provisions in this article and except as to those provisions of this chapter which by their nature can have no application.

**SECTION 56-5-3425. Bicycle lanes.**

(A) For purposes of this section, 'bicycle lane' means a portion of the roadway or a paved lane separated from the roadway that has been designated by striping, pavement markings, and signage for the preferential or exclusive use of bicyclists.

(B) Whenever a bicycle lane has been provided adjacent to a roadway, operators of:

(1) motor vehicles may not block the bicycle lane to oncoming bicycle traffic and shall yield to a bicyclist in the bicycle lane before entering or crossing the lane; and

(2) bicycles are required to ride in the bicycle lane except when necessary to pass another person riding a bicycle or to avoid an obstruction in the bicycle lane. However, bicyclists may ride on the roadway when there is only an adjacent recreational bicycle path available instead of a bicycle lane.

**SECTION 56-5-3430. Riding on roadways and bicycle paths.**

(A) Except as provided in subsection (B), every bicyclist operating a bicycle upon a roadway shall ride as near to the right side of the roadway as practicable. A bicyclist may, but is not required to, ride on the shoulder of the roadway in order to comply with the requirements of this subsection.

(B) A bicyclist may ride in a lane other than the right-hand lane if only one lane is available that permits the bicyclist to continue on his intended route.



(C) When operating a bicycle upon a roadway, a bicyclist must exercise due care when passing a standing vehicle or one proceeding in the same direction.

(D) Bicyclists riding bicycles upon a roadway shall not ride more than two abreast except on paths or parts of roadways set aside for the exclusive use of bicycles.

**SECTION 56-5-3435. Motorists to maintain safe distance to cyclists.**

A driver of a motor vehicle must at all times maintain a safe operating distance between the motor vehicle and a bicycle.

**SECTION 56-5-3440. Manner of riding bicycles; number of persons which may be carried.**

A bicyclist propelling a bicycle may not ride other than upon or astride a permanent and regular seat attached to the bicycle. No bicycle may be used to carry more persons at one time than the number for which it is designed and equipped.

**SECTION 56-5-3445. Harassment of cyclists.**

It is unlawful to harass, taunt, or maliciously throw an object at or in the direction of any person riding a bicycle. A person who violates the provisions of this section is guilty of a misdemeanor and, upon conviction, must be fined not less than two hundred fifty dollars or imprisoned not more than thirty days, or both.

**SECTION 56-5-3450. Clinging to vehicles prohibited.**

A person riding upon any bicycle, coaster, roller skates, sled, or toy vehicle may not attach it or them or himself to a vehicle upon a roadway.

**SECTION 56-5-3460. Carrying articles.**

A bicyclist operating a bicycle may not carry any package, bundle, or article that prevents the rider from keeping at least one hand upon the handle bars.

**SECTION 56-5-3470. Lamps and reflectors on bicycle.**

A bicycle when in use at nighttime must be equipped with a lamp on the front which must emit a white light visible from a distance of at least five hundred feet to the front and with a red reflector on the rear that must be visible from all distances from fifty feet to three hundred feet to the rear when directly in front of the lawful upper beams of head lamps on a motor vehicle. A lamp emitting a red light visible from a distance of five hundred feet to the rear may be used in addition to the red reflector.

**SECTION 56-5-3480. Signaling**

(A) (1) A bicyclist shall indicate a right turn by extending the left arm upward, by raising the left arm to the square, or by extending the right arm horizontally to the right.

(2) A bicyclist shall indicate a left turn by extending the left arm horizontally.

(3) A bicyclist shall indicate stopping or decreasing speed by extending the left arm or the right arm downward.

(B) A bicyclist is not required to give signals provided for in subsection (A) continuously if the hand or arm is needed to control the bicycle.

(C) A violation of this section is punishable by a fine of twenty-five dollars.

**SECTION 56-5-3490. Brake on bicycle.**

Every bicycle shall be equipped with a brake which will enable the operator to make the braked wheels skid on dry, level, clean pavement.

**SECTION 56-5-3500.**

(A) Except as otherwise provided, in the absence of another violation being cited, a violation of this article by the driver of a motor vehicle is subject to a civil fine of up to one hundred dollars unless a bicyclist is injured as a result of the violation.

(B) In the absence of another violation being cited, a person driving a motor vehicle who violates a provision of this article and the violation is the proximate cause of a:

(1) minor injury to a bicyclist, must be assessed a civil fine of up to five hundred dollars; or

(2) great bodily injury, as defined in Section [56-5-2945](#), to a bicyclist, must be assessed a civil fine of not more than one thousand dollars.

**SECTION 56-5-3515. Authorized police patrol bicycles; operating as emergency vehicles.**

(A) An authorized police patrol bicycle used as a part of a police bicycle patrol may exercise the privileges of an emergency vehicle provided in Section [56-5-760](#).

(B) An authorized police patrol bicycle may be equipped with a siren or the officer may utilize a whistle in the performance of his duties, or both.

(C) Notwithstanding the provisions of Section [56-5-760](#)(C), an authorized police patrol bicycle acting as an emergency vehicle is entitled to the exemptions of an authorized emergency vehicle if it makes use of an audible signal meeting the requirements of Section [56-5-4970](#) or visual signals meeting the requirements of Section [56-5-4700](#).

**SECTION 56-5-3860. Animals and certain vehicles prohibited on controlled-access highways; exceptions.**

(A) No person, unless otherwise directed by a law enforcement officer, shall occupy any space within the limits of the roadway and shoulders of the main facility of a freeway with an animal-drawn vehicle, a ridden or led animal, herded animals, a pushcart, a bicycle, a bicycle with motor attached, a motor-driven cycle with a motor which produces not to exceed five brake horsepower, an agricultural tractor or other farm machinery, except in the performance of public works or official duties.

The prohibitions imposed by this subsection on the use of freeways do not apply to service roads alongside the highways.

(B) A person who violates the provisions of this section is guilty of a misdemeanor and, upon conviction, must be fined not more than one hundred dollars or imprisoned not more than thirty days.

**SECTION 56-7-10. Uniform traffic ticket shall be used by all law-enforcement officers; effect of service; forms.**

There will be a uniform traffic ticket used by all law enforcement officers in arrests for traffic offenses and for the following additional offenses:

*{Some items omitted from this for non-relevance to bicycling}*

Larceny of a Bicycle Valued at Less Than One Hundred Dollars Section 16-13-80

No other ticket may be used for these offenses. The service of the uniform traffic ticket shall vest all traffic, recorders', and magistrates' courts with jurisdiction to hear and to dispose of the charge for which the ticket was issued and served. This ticket will be designed by the department (SC Dept. of Public Safety) and approved by the Attorney General within thirty days of submission by the department. A law enforcement agency may utilize computers and other electronic devices to issue uniform traffic citations and store information resulting from the issuance of a traffic citation if this method of issuing a citation has been approved by the Department of Public Safety.

#### **SECTION 56-16-10. Definitions.**

As used in this chapter (CHAPTER 16. REGULATION OF MOTORCYCLE MANUFACTURERS, DISTRIBUTORS, DEALERS, AND WHOLESALERS):

- (a) "Motorcycle" means every motor vehicle having a seat or saddle for the use of the rider and designed to travel on not more than two wheels in contact with the ground. This section shall not apply to bicycles with helper motors or vehicles defined in Section 56-5-3510 (repealed).

*{Some items omitted from this for non-relevance to bicycling}*

#### **SECTION 56-19-10. Definitions.**

For the purposes of this chapter and Chapter 21 of Title 16, the following terms are defined as follows:

*{Some items omitted from this for non-relevance to bicycling}*

- (2) 'Bicycle' means a device propelled solely by pedals, operated by one or more persons, and having two or more wheels, except children's' tricycles.

(11) "Identifying number" means the numbers and letters, if any, on a vehicle designated by the department for the purpose of identifying the vehicle.

(16) "Motor vehicle" means every vehicle which is self-propelled, except mopeds, and every vehicle which is propelled by electric power obtained from overhead trolley wires, but not operated upon rails.

(17) "Motorcycle" means every motor vehicle having no more than two permanent functional wheels in contact with the ground or trailer and having a saddle for the use of the rider, but excluding a tractor.

(18) "Motor-driven cycle" means every motorcycle, including every motor scooter with a motor which produces not to exceed five horsepower.

(34) "Trailer" means every vehicle with or without motive power, other than a pole trailer, designed for carrying persons or property and for being drawn by a motor vehicle and constructed so that no part of its weight rests upon the towing vehicle.

(38) "Vehicle" means every device in, upon, or by which a person or property is or may be transported or drawn upon a highway, excepting devices moved by human power or used exclusively upon stationary rails or tracks.

(43) "Moped" means, notwithstanding item (2), every cycle with pedals to permit propulsion by human power or without pedals and with a motor of not more than fifty cubic centimeters which produces not to exceed two brake horsepower and which is not capable of propelling the vehicle at a speed in excess of thirty miles an hour on level ground. If an internal combustion engine is used, the moped must have a power drive system that functions directly or automatically without clutching or shifting by the operator after the drive system is engaged.

#### **SECTION 57-3-780. Determinations required as to feasibility of high occupancy vehicle lanes, sidewalks, and bicycle lanes.**

Before building new or expanding existing primary highways, roads, and streets, the department shall consider and make a written determination whether it is financially and physically feasible to include:

- (1) high occupancy vehicle lanes, when the construction or expansion is in a metropolitan area;
- (2) pedestrian walkways or sidewalks; and
- (3) bicycle lanes or paths.

A copy of this determination must be submitted to the State Energy Office.

#### **SECTION 58-15-710. Bicycles and baby carriages deemed baggage.**

Bicycles and baby carriages shall be deemed baggage for the purpose of transportation by steam railroads and steam ferries. Steam railroads and steam ferries shall carry bicycles and baby carriages under the same rules and subject to the same liabilities as govern trunks and other separate baggage of a passenger. No person shall be required to crate, cover, lock, box or otherwise protect bicycles or baby carriages as baggage under the provisions of this section. But such steam railroads and steam ferries shall not be required to carry more than one bicycle or baby carriage for any one person.

#### **SECTION 59-17-150. Promotion of walking or bicycling to school safety. [SC ST SEC 59-17-150]**

(A) Municipal and county governing bodies shall work with school districts located in their jurisdictions to identify barriers and hazards to children walking or bicycling to and from school. The municipalities, counties, and districts may develop a plan for the funding of improvements designed to reduce the barriers and hazards identified. The sources of these funds may include federal funding or grants, state funding, or funding from private sources. Nothing in this section shall obligate any agency of federal, state, or local government to provide funding for identified improvements.

(B) Each school district in this State may establish a Safe Routes to School District Coordinating Committee. The coordinating committee shall include parents, children, teachers, administrators, local law enforcement officials, public health officials, interested citizens, and other persons familiar with the transportation needs of the school district. Duties of the coordinating committee may include gathering information about the schools in the district through surveys and traffic counts; organizing incentive-based events and contests to encourage students to try new modes of transportation; and promoting the program through school newsletters, assemblies, web sites, and other means to reach parents and students.

Any school within the district may establish a Safe Routes to School Team. The team shall include parents, children, teachers, administrators, and neighbors of the school. The team may be expanded to include local law enforcement officials, public health officials, and other persons familiar with the transportation needs of the school. The team shall select a representative to serve on the District Coordinating Committee. Duties of the team may include gathering information about their school through surveys and traffic counts; organizing incentive-based events and contests to encourage students to try new modes of transportation; and promoting the program through school newsletters and other means to reach parents and students.

(C) The first Wednesday of October of each year is designated as "Walk or Bicycle with Your Child to School Day" in each school district of this State to promote walking

or riding bicycles to school by students, with escorts if necessary, and to identify needed improvements such as sidewalks or safer pedestrian routes not open to vehicular traffic.

**SECTION 61-4-510. Special retail beer and wine permits.**

{ Paraphrased, this allows the proceeds from special retail beer and wine permits, in counties where they are allowed, to be used by local governments, with certain restrictions, for purposes which include acquisition of land for bicycle paths. }

**SECTION 61-6-2010. Temporary permits upon referendum vote.**

{ Paraphrased, this allows the proceeds from special retail liquor permits, to be used by local governments, with certain restrictions, for purposes which include acquisition of land for recreational bicycle paths. }

**SECTION 61-6-4040. Rendering aid in unlawful transportation.**

A person who acts as an advance or rear guard or pilot to a person engaged in the transportation of alcoholic liquors in

violation of any law of this State is guilty of the offense of knowingly transporting alcoholic liquors for unlawful purposes and, upon conviction, must be punished for this misdemeanor as follows:

(a) for a first offense, by a fine of not less than six hundred dollars or imprisonment for six months;

(b) for a second offense, by a fine of one thousand five hundred dollars or imprisonment for one year; and

(c) for a third or subsequent offense, by a fine of three thousand dollars or imprisonment for two years.

The buggy, wagon, automobile, aircraft, railroad car, bicycle, motorcycle, or other vehicle or boat, launch, or other vessel used by the person in rendering the aid may be confiscated in the same method and manner as provided by this article for the confiscation of a vehicle actually used in the carrying of these alcoholic liquors.

Note: These laws are believed to be complete as of May 12, 2009. However no responsibility is taken for inadvertent omissions. The laws from the SC Code of Laws include all matches using a computerized word search for 'Bicycle.'

It is recommended that local city and county ordinances also be consulted for relevancy to bicycles and bicycling.

--SCDOT Pedestrian & Bicycle Program

**Copyright and Disclaimer**

The State of South Carolina owns the copyright to the Code of Laws of South Carolina, 1976, as contained herein. Any use of the text, section headings, or catchlines of the 1976 Code is subject to the terms of federal copyright and other applicable laws and such text, section headings, or catchlines may not be reproduced in whole or in part in any form or for inclusion in any material which is offered for sale or lease without the express written permission of the Chairman of the South Carolina Legislative Council or the Code Commissioner of South Carolina. This statutory database is current through the 2007 Regular Session of the South Carolina General Assembly. Changes to the statutes enacted by the 2008 General Assembly, which will convene in January 2008, will be incorporated as soon as possible. Some changes enacted by the 2008 General Assembly may take immediate effect. The State of South Carolina and the South Carolina Legislative Council make no warranty as to the accuracy of the data, and users rely on the data entirely at their own risk. The Legislative Council by law is charged with compiling and publishing the 1976 Code and it is maintained in a database which may be accessed for commercial purposes by contacting the Legislative Council or the office of Legislative Printing and Information Technology Resources.

## **A Legal Perspective: How the Bicycle Safety Act Helps Cyclists**

Legal reform is tricky business. Sometimes, folks want one thing, and get another. I'll admit that I was concerned that this would happen here. While the old bicycle laws were inadequate and confusing, over many cases I had learned how to use them in favor of cyclists. Would the new law be mere window dressing, or even worse, a step back? The answer is clear. The new Bicycle Safety Law is a quantum leap forward and will be an immensely useful tool to protect and to enforce the rights of cyclists.

### **The Beginning of the End of Buzzing**

One of the most frustrating (and scary) problems we face is buzzing, where vehicles drive as close as possible to cyclists to threaten and terrify us (whether the driver intends to or not). The experience has ruined many rides for me (and has injured and even killed other cyclists). The old law was silent about buzzing. The new law, however, requires a "safe operating distance between the motor vehicle and a bicycle."

I've heard that some would have preferred a defined distance, such as a certain number of feet. From my professional experience, however, I actually prefer an undefined distance. Sometimes a defined amount would be enough, other times not; the new law gives me a flexible tool when an accident results from someone driving too close.

### **Civil Fines**

Any violation of the new law, including the safe passage provision, is punishable by a civil fine. The fine structure is based on injury and ranges up to \$1000. I know this doesn't sound like a lot, but the civil fine is in addition to other remedies, including a law suit against the driver and criminal charges. Trust me, the imposition of a civil fine of any amount will greatly help in the determination of more significant liability.

We will see how this develops across the state. My advice is to report all cases of buzzing and to educate the police officer and the prosecutor how the new law works. Demand that a fine be levied!

### **Criminal Prosecution for Curses and Cans**

When I was 25-years younger and lived my life in accordance with "Breaking Away," I didn't mind being yelled at on the road. It was part of the lifestyle. I've matured since, and have experienced many cases where verbal and physical projectiles out of cars have resulted in injury.

This is the worst kind of buzzing, and it's a specifically defined crime under the Bicycle Safety Law. Now, get the tag number, call the police, and file a criminal complaint against those drivers who "harass, taunt, or maliciously throw an object" at you. The jerks can go to jail for 30 days, whether they hit you or not. An injury or crash is not a requirement for prosecution.

### **It's Your Choice Where to Ride**

One of the biggest problems with the old law was its "exclusive side path" provision. It required that where there was a usable path adjacent to a road, you had to use the path. But we sometimes ride too fast to safely ride on a side path. And the path might be clogged with strollers and dog-walkers, or it might be poorly maintained. Now, you can choose to ride where you prefer. The new law says that you mostly have to stick to a bicycle lane (which is defined as paved lane, usually on the roadway, for the "preferential or exclusive use of bicyclists), but that you never have to choose an "adjacent recreational bicycle path."

This change is a big deal. With my young boys, I can ride on a path and with my cycling pals, on the road. This is not only much safer for us, but it reduces tension among path users. From a legal prospective, I can do a better job helping cyclists who are involved in accidents anywhere they occur. But stay off sidewalks in municipalities where sidewalk riding is not permitted (See [scbikelaw.com](http://scbikelaw.com) for a list of municipal laws).

### **Advocacy Success**

The PCC and its supporters deserve tremendous credit and it's hard to overstate the importance of this accomplishment. The PCC not only beat back attempts to water down the law, it catapulted the laws of South Carolina into the modern age, particularly with the anti-harassment provision. With the PCC, I plan to travel around the state to hold open workshops on the practical effects of the new law. There's a lot more to talk about. Please get in touch if you have any questions, or want to schedule a workshop. You can write me at [pwilborn@scbikelaw.com](mailto:pwilborn@scbikelaw.com).

**PETER WILBORN | 1-843-723-9804 | DERFNER, ALTMAN & WILBORN | 40 CALHOUN STREET, SUITE 410 | CHARLESTON, SC 29401**

## Summary of H3006 Bicycle Law Revisions

H3006 - The Bicycle Safety Act - amends Article 27, Chapter 5, Title 56 of the 1976 Code as indicated below. The Act is designed to provide greater safety for bicyclists on South Carolina roads and to bring South Carolina statutes into greater conformity with the Uniform Vehicle Code.

### Article 27

#### Bicyclists and Users of Play Vehicles; Rights and Duties

Section 56-5-3410. The provisions of this article are applicable to bicycles whenever a bicycle is operated upon any highway or upon any path set aside for the exclusive use of bicycles, subject to those exceptions stated in this article.

Section 56-5-3420. A person riding a bicycle upon a roadway must be granted all of the rights and is subject to all of the duties applicable to the driver of a vehicle by this chapter, except as to special provisions in this article and except as to those provisions of this chapter which by their nature can have no application.

#### Safe Operating Distance (new statute):

Section 56-5-3435. A driver of a motor vehicle must at all times maintain a safe operating distance between the motor vehicle and a bicycle.

“This should have been passed years ago,” said 5th Circuit Solicitor Barney Giese. This will give a needed legal tool to prosecute motorists who hit bicyclists. Before this law change it was a gray area according to Giese.

#### Anti-Harassment of Cyclists (new statute)

Section 56-5-3445. It is unlawful to harass, taunt, or maliciously throw an object at or in the direction of any person riding a bicycle. A person who violates the provisions of this section is guilty of a misdemeanor and, upon conviction, must be fined not less than two hundred fifty dollars or imprisoned not more than thirty days, or both.

#### Clearer signaling for cyclists (revised statute)

Section 56-5-3480. (A)(1) A bicyclist shall indicate a right turn by extending the left arm upward, by raising the left arm to the square, or by extending the right arm horizontally to the right.

(2) A bicyclist shall indicate a left turn by extending the left arm horizontally.

(3) A bicyclist shall indicate stopping or decreasing speed by extending the left arm or the right arm downward.

(B) A bicyclist is not required to give signals provided for in subsection (A) continuously if the hand or arm is needed to control the bicycle.

#### Clarification of lane positioning (revised statute)

Section 56-5-3430. (A) Except as provided in subsection (B), every bicyclist operating a bicycle upon a roadway shall ride as near to the right side of the roadway as practicable. A bicyclist may, but is not required to, ride on the shoulder of the roadway in order to comply with the requirements of this subsection.

(B) A bicyclist may ride in a lane other than the right-hand lane if only one lane is available that permits the bicyclist to continue on his intended route.

(C) When operating a bicycle upon a roadway, a bicyclist must exercise due care when passing a standing vehicle or one proceeding in the same direction.

(D) Bicyclists riding bicycles upon a roadway shall not ride more than two abreast except on paths or parts of roadways set aside for the exclusive use of bicycles.

### **Elimination of the mandatory sidepath law and clarification of right-of-way in bike lanes**

Section 56-5-3425. (A) For purposes of this section, 'bicycle lane' means a portion of the roadway or a paved lane separated from the roadway that has been designated by striping, pavement markings, and signage for the preferential or exclusive use of bicyclists.

(B) Whenever a bicycle lane has been provided adjacent to a roadway, operators of:

(1) motor vehicles may not block the bicycle lane to oncoming bicycle traffic and shall yield to a bicyclist in the bicycle lane before entering or crossing the lane; and

(2) bicycles are required to ride in the bicycle lane except when necessary to pass another person riding a bicycle or to avoid an obstruction in the bicycle lane. However, bicyclists may ride on the roadway when there is only an adjacent recreational bicycle path available instead of a bicycle lane.

**The statute mandating all bicycles to be equipped with a bell was eliminated.**

**The statute making it a misdemeanor for a bicycle to not be equipped with proper brakes, reflectors or lights was replaced with a fine of \$25.**

**Imposition of more severe penalties for motor vehicles that violate provisions within Article 27 pertaining to bicycles (revised statute)**

Section 56-5-3500. (A) Except as otherwise provided, in the absence of another violation being cited, a violation of this article by the driver of a motor vehicle is subject to a civil fine of up to one hundred dollars unless a bicyclist is injured as a result of the violation.

(B) In the absence of another violation being cited, a person driving a motor vehicle who violates a provision of this article and the violation is the proximate cause of a:

(1) minor injury to a bicyclist, must be assessed a civil fine of up to five hundred dollars; or

(2) great bodily injury, as defined in Section 56-5-2945, to a bicyclist, must be assessed a civil fine of not more than one thousand dollars.

**Definition of a bicycle (revised statute)**

"Section 56-5-160. A bicycle is a device propelled solely by pedals, operated by one or more persons, and having two or more wheels, except childrens' tricycles."

This revision ensures that adult bicycles using more than two-wheels are covered by the statutes in Article 27, Section 56.



**Document I:**  
**SCDOT EDM 22**

## **South Carolina Department of Transportation** **Engineering Directive Memorandum**

Number: 22

Primary Departments: Preconstruction, Traffic Engineering, Construction, Maintenance

Referrals: AASHTO Guide for the Development of Bicycle Facilities and SCDOT Highway Design Manual

Subject: Considerations for Bicycle Facilities

This directive addresses shared roadways and bike lanes/paved shoulders and provides guidance on design requirements for new projects. In addition, typical sections for both the design of bicycle facilities on new projects and restriping of existing five-lane sections to accommodate bicycle facilities are attached. Other design considerations for bicycle accommodations are also discussed.

### **A. Shared Roadways**

#### **Description**

Shared roadways are the way most bicycle travel in the United States occurs. This type of facility can be used to accommodate bicyclists without signing and striping roadways for bicycle travel. These facilities work well to accommodate bicycles through urban areas that are not considered to be high bicycle-demand corridors or where other constraints do not allow the development of bike lanes/paved shoulders.

#### **Design Considerations**

On urban sections (curb and gutter), an outside travel lane width of 14 feet is the minimum recommended width for a shared-use lane. The gutter pan is not to be included in the width of the shared roadway. On stretches of roadways with grades greater than 5 percent, consideration should be given to providing a 15-foot travel lane width. Shared roadway widths greater than 14 feet that extend continuously along stretches of roadway may encourage undesirable motor vehicle operations, especially in urban areas. Therefore, they are not recommended as shared use roadways and consideration should be given to striping the additional width. The Department's pedestrian and bicycle coordinator and Traffic Engineering can provide assistance in determining the need for a shared roadway as opposed to bike lanes/paved shoulders.

On rural sections (shoulder), criteria should be used as described in the bike lanes/paved shoulders section of this document.

## **B. Bike Lanes/Paved Shoulders**

### Description

This type of facility incorporates bicyclists into a roadway by utilizing bike lanes/paved shoulders adjacent to motor vehicle traffic. Bike lanes should be specifically signed and marked as indicated in the Manual on Uniform Traffic Control Devices (Part 9). Paved shoulders may be used to accommodate bicycle travel without specific markings and signs present. Bike lanes provide for more predictable movements by motorists and bicyclists. Bike lanes should be one-way facilities and carry bike traffic in the same direction as adjacent motor vehicle traffic. This type of facility should be used where the Department desires to provide continuity to other bicycle facilities or designate preferred routes through high demand corridors, such as any of our designated South Carolina bicycle touring routes or a municipality's bikeway. The Department's pedestrian and bicycle coordinator and Traffic Engineering can provide assistance in determining the need for bike lanes as opposed to a shared roadway.

### Design Considerations

On rural sections (shoulder) with ADT greater than 500, bike lanes/paved shoulders should be a minimum of 4 feet wide in each direction to accommodate bicycle travel. Bike lanes/paved shoulders will have a cross slope of 24H:1V (4.17 percent). Where motor vehicle speeds exceed 50 mph or the percentage of trucks, buses, and recreational vehicles is greater than 5 percent of the ADT, consideration should be given to providing a minimum width of 6 feet to accommodate bicycle travel adjacent to the higher speeds (50 mph or greater) and to lessen the effect of windblast from larger vehicles. On rural sections (shoulder) with ADT less than 500, paving 2 feet of the earthen shoulder will be adequate to better accommodate bicyclists.

On urban sections (curb and gutter), bike lanes/paved shoulders should be a minimum of 4 feet wide to accommodate bicycle travel. Bike lanes/paved shoulders will have a cross slope of 24H:1V (4.17 percent). The gutter pan is not to be included in the width of the bike lane/paved shoulder. Where the percentage of trucks, buses, and recreational vehicles is greater than 5 percent of the ADT, consideration should be given to providing a minimum width of 6 feet. Where motor vehicle speeds are 50 mph or greater, Department guidelines for shoulder widths should be utilized as defined in the SCDOT Highway Design Manual, thus giving the bicyclist either 8 or 10 feet of paved shoulder width to utilize.

## **C. Other Design Considerations for Bicycle Facilities**

### Paving Existing Shoulders

In order for a shoulder to be usable to a bicyclist, it must be paved. Adding or improving paved shoulders often can be the best way to accommodate bicyclists in rural areas and benefit motor vehicle traffic. Paved shoulders have the added benefit of not only

accommodating bicyclists, but they can also extend the service life of the road surface since edge deterioration will be significantly reduced. It is currently Department policy to provide 2 feet of paved shoulder width on all new projects utilizing earthen shoulders. Where practical and attainable, a minimum width of 4 feet should be paved on the shoulder to provide for bicycle facilities where the ADT of the road is greater than 500.

Where constraints do not allow obtaining the indicated widths, any additional width can be beneficial to a bicyclist.

#### Resurfacing/Restriping Existing Roadways

When the Department desires to accommodate bicycle facilities by resurfacing/restriping existing roadways, lane or median widths may be narrowed to obtain the desired bicycle facility. Roadways designated as being on the National Truck Network or South Carolina Truck Network or roadways where the percentage of trucks, buses, and recreational vehicles is greater than 5 percent of the ADT should have lane widths of 12 feet. Where conditions allow utilizing lane widths narrower than 12 feet to accommodate bicycle facilities, impacts of narrower lane widths to motor vehicle traffic should be determined. Guidance on selecting the proper lane width for a roadway can be found in Chapters 19 through 22 of the SCDOT Highway Design Manual.

A flush /painted median width of 15 feet is indicated by the South Carolina Highway Design Manual, but the width can be reduced to 12 feet to accommodate bicycle facilities on an existing roadway or existing project. Median widths less than 12 feet are not recommended where posted speeds are greater than 35 mph and the percentage of trucks, buses, and recreational vehicles is greater than 5 percent of the ADT.

#### Drainage Inlet Grates

Where practical, drainage inlets should be placed outside of the bicycle facility. Where this is not practical, hydraulically efficient, bicycle-safe grates should be utilized and should be placed or adjusted to be flush with the adjacent pavement surface. On bridges, a minimum of 4 feet from the edge of the travel lane should be clear of drainage inlets.

#### Longitudinal Rumble Strips

Bicycle traffic should be considered when determining the placement of longitudinal rumble strips. For further guidance, refer to the AASHTO Guide for the Development of Bicycle Facilities.

#### Bridges

In general, bridge widths should match the approach roadway widths (travelway plus bike lanes/paved shoulders). However, in determining the width for major water crossings, consider the cost of the structure, traffic volume, and potential for future width requirements.

Valley Gutter Sections

Guidelines for shared roadways and bike lanes/paved shoulders will be utilized to accommodate bicycle facilities on roadways with valley gutter. Since valley gutter sections are typically used on low-volume, two-lane secondary roadways, the cross slope of the paved shoulder/bike lane should be 48H:1V (2.08 percent).

Submitted by: Mitchell D. Metts Submitted by: D. R. Shealy  
Director of Preconstruction Director of Construction

Recommended by: John V. Walsh Submitted by: Richard B. Werts  
Chief Engineer for Planning, Location, and Design Director of Traffic Engineering

Submitted by: James J. Fedas, Jr.  
Director of Maintenance

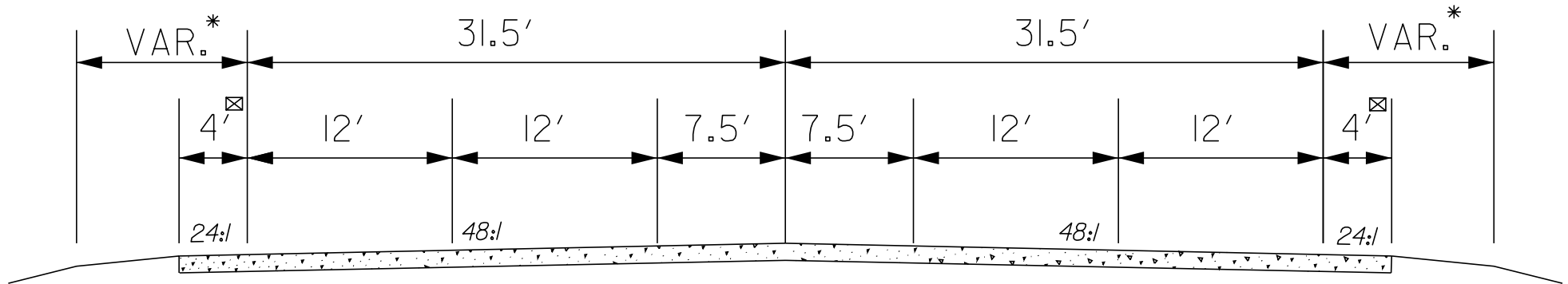
Recommended by: J. C. Watson  
Chief Engineer for Operations

Approved: Tony L. Chapman  
Deputy Secretary for Engineering

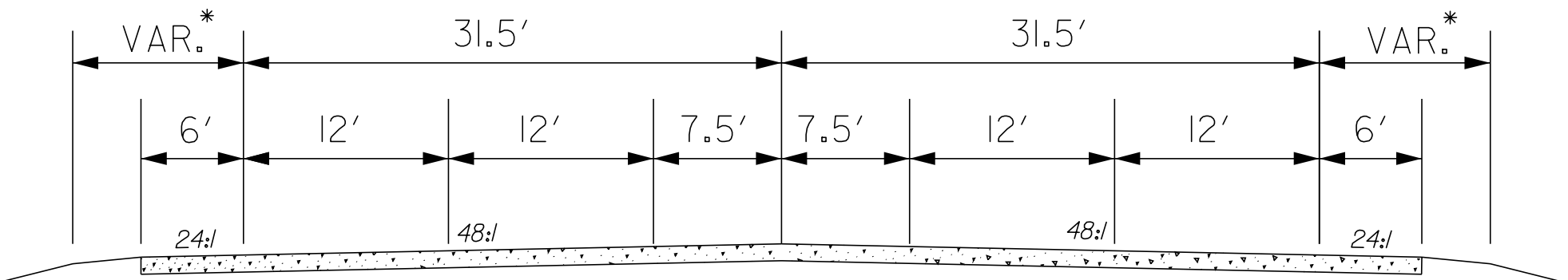
Effective Date: December 16, 2009

Original signed by Deputy Secretary for Engineering Tony L. Chapman, P.E. December 16, 2009. All original engineering directives maintained by the Office of the Deputy Secretary for Engineering.

# BICYCLE FACILITIES NEW CONSTRUCTION 5-LANE RURAL SECTION (SHOULDER)



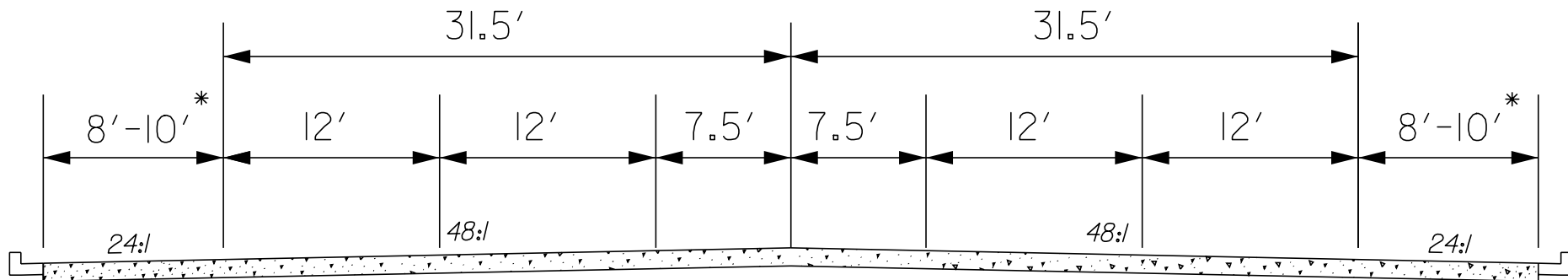
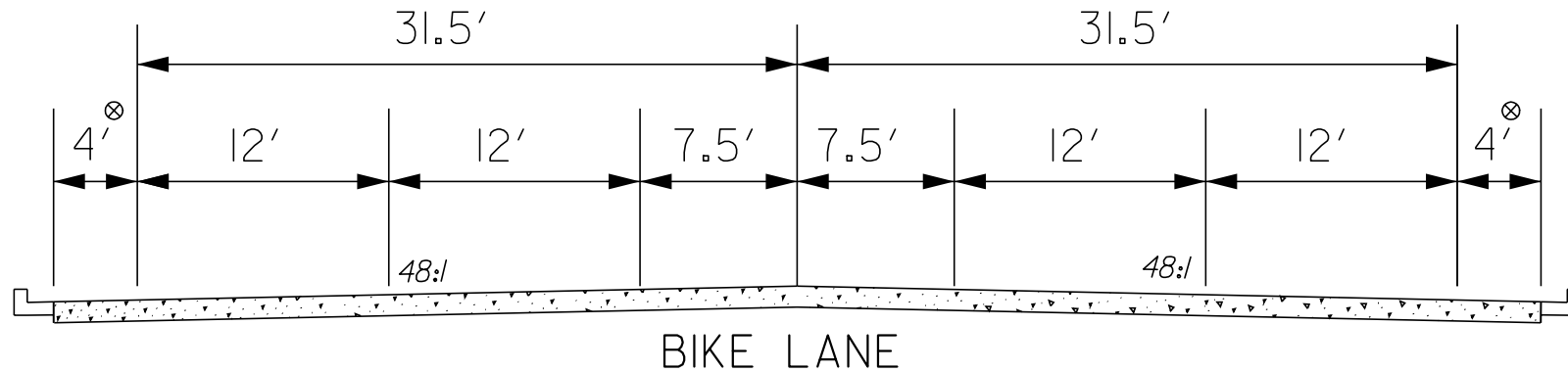
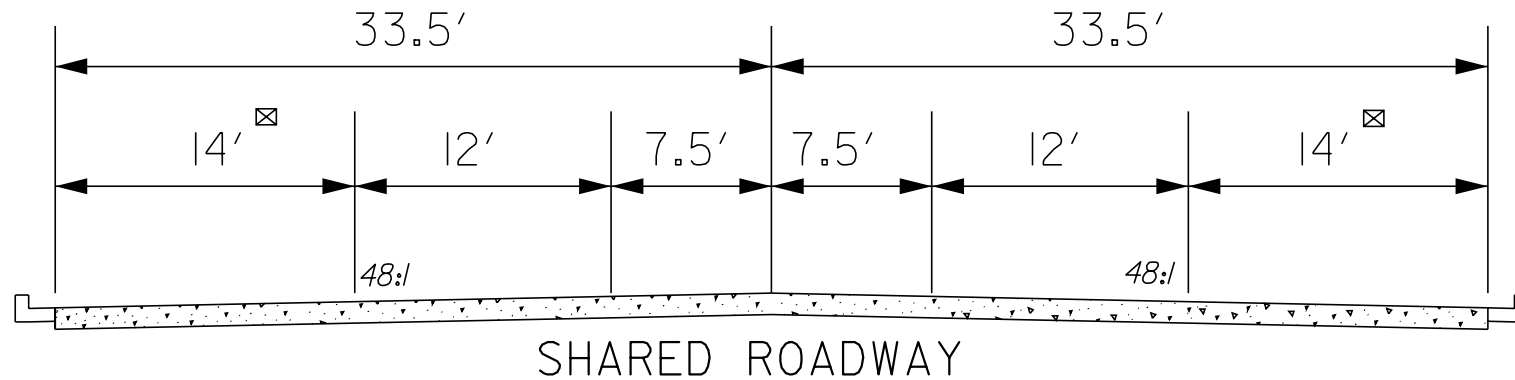
BIKE LANE - POSTED SPEED < 50 MPH OR  $\leq$  5% TRUCKS



BIKE LANE - POSTED SPEED  $\geq$  50 MPH OR > 5% TRUCKS



# BICYCLE FACILITIES NEW CONSTRUCTION 5-LANE URBAN SECTION (CURB AND GUTTER)



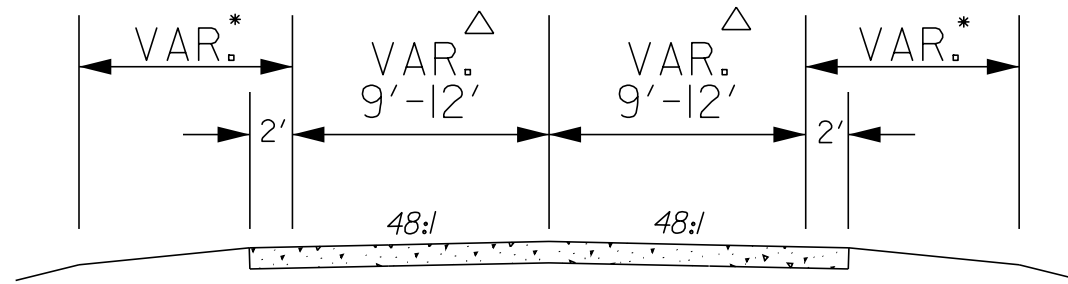
SHARED ROADWAY OR BIKE LANE  $\geq$  50 MPH

\* SHOULDER WIDTH PER SCDOT HIGHWAY DESIGN MANUAL

☒ CONSIDER USING 15' WHEN GRADES > 5%

⊗ CONSIDER USING 6' WHEN > 5% TRUCKS

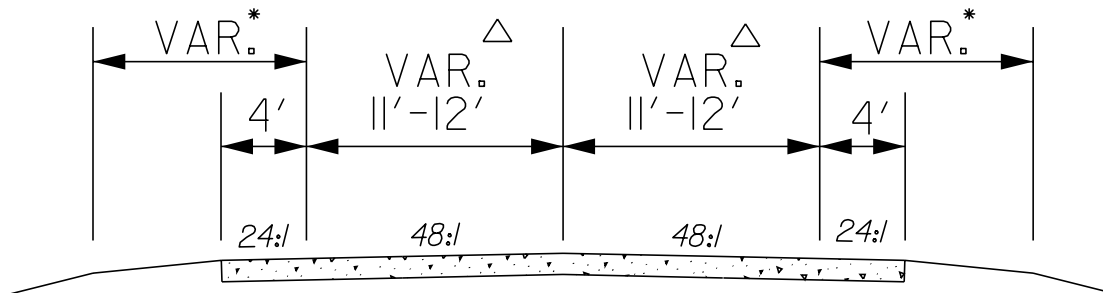
# BICYCLE FACILITIES NEW CONSTRUCTION 2-LANE RURAL SECTION (SHOULDER)



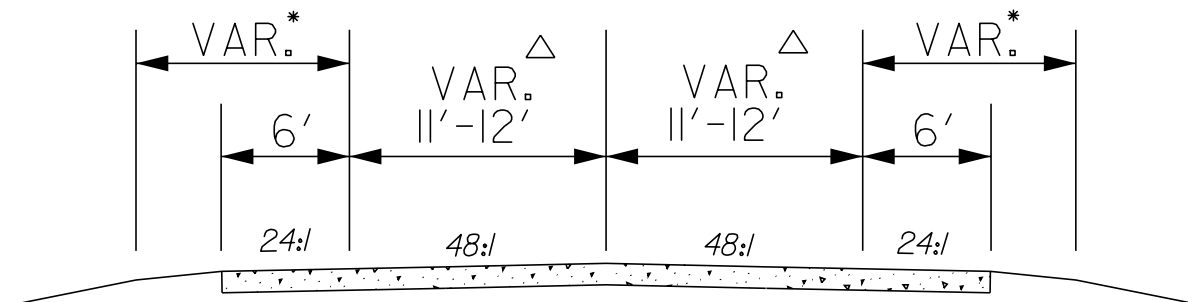
SHARED ROADWAY - LESS THAN 500 ADT

\* SHOULDER WIDTH PER  
SCDOT HIGHWAY DESIGN MANUAL

Δ LANE WIDTHS PER  
SCDOT HIGHWAY DESIGN MANUAL

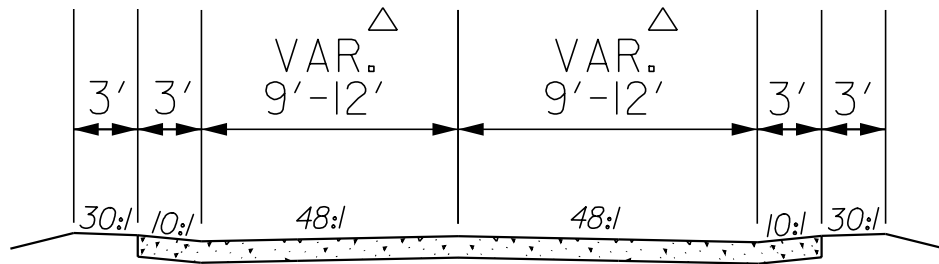


BIKE LANE - POSTED SPEED < 50 MPH OR  $\leq$  5% TRUCKS



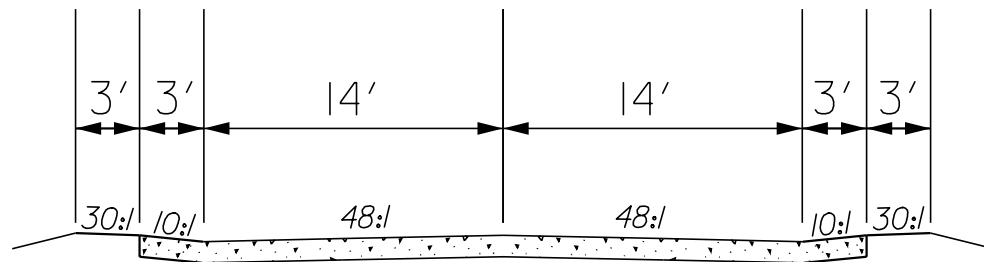
BIKE LANE - POSTED SPEED  $\geq$  50 MPH OR > 5% TRUCKS

# BICYCLE FACILITIES NEW CONSTRUCTION 2-LANE VALLEY GUTTER SECTIONS

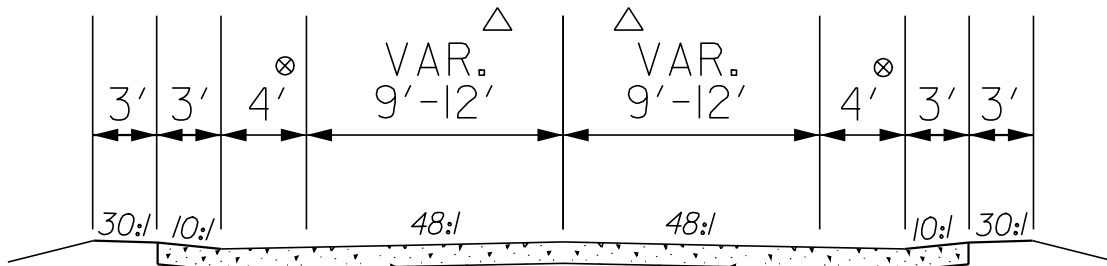


- △ LANE WIDTHS PER  
SCDOT HIGHWAY DESIGN MANUAL
- ⊗ CONSIDER USING 6' WHEN > 5% TRUCKS

SHARED ROADWAY - LESS THAN 500 ADT



SHARED ROADWAY

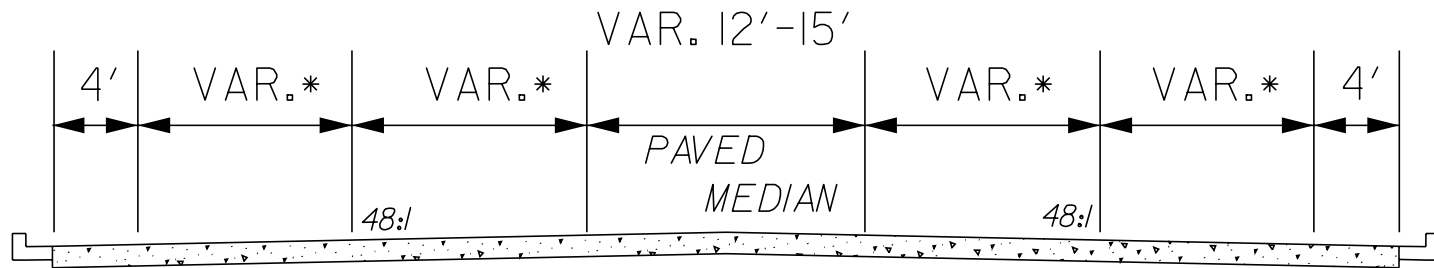


BIKE LANE

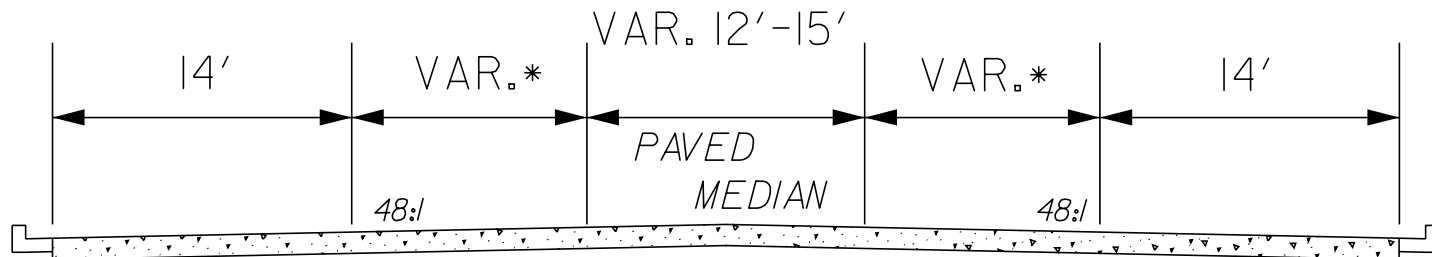
# BICYCLE FACILITIES

## RESTRIPING EXISTING 5-LANE

### URBAN SECTION (CURB AND GUTTER)



BIKE LANE



SHARED ROADWAY

\* 11'-12' LANE WIDTHS  
(ON NATIONAL OR SOUTH CAROLINA TRUCK NETWORK USE 12' MIN. LANE WIDTH)

**Document J:**  
**SCDOT Complete Streets Resolution**

## RESOLUTION

**WHEREAS**, increasing walking and bicycling offers the potential for cleaner air, greater health of the population, reduced traffic congestion, more livable communities, less reliance on fossil fuels and their foreign supply sources and more efficient use of road space and resources; and

**WHEREAS**, in 2001 crashes involving bicyclists and pedestrians represented 13 percent of the traffic fatalities in S.C. and in the U.S.; and

**WHEREAS**, the Federal Highway Administration (FHWA) in its February 24, 1999 Policy statement "Guidance on the Bicycle and Pedestrian Provisions of the Federal-Aid Program" urges states to include bicycle and pedestrian accommodations routinely in their programmed highway projects; and

**WHEREAS**, bicycle and pedestrian projects and programs are eligible for funding from almost all of the major Federal-aid funding programs; and

**WHEREAS**, the South Carolina Department of Transportation Commission is strongly committed to improving conditions for walking and bicycling; and

**WHEREAS**, the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) calls for the mainstreaming of bicycle and pedestrian projects into the planning, design and operation of our Nation's transportation system;

**NOW, THEREFORE, BE IT RESOLVED** that the South Carolina Department of Transportation Commission in meeting duly assembled this 14<sup>th</sup> day of January 2003, affirms that bicycling and walking accommodations should be a routine part of the department's planning, design, construction and operating activities, and will be included in the everyday operations of our transportation system; and

**THEREFORE, BE IT FURTHER RESOLVED**, that the South Carolina Department of Transportation Commission requires South Carolina counties and municipalities to make bicycling and pedestrian improvements an integral part of their transportation planning and programming where State or Federal Highway funding is utilized.

---

L. Morgan Martin, Chairman

---

Robert W. Harrell, First Congressional District

---

John N. Hardee, Second Congressional District

---

Eugene C. Stoddard, Third Congressional District

---

H. Howell Clyborne, Jr., Fourth Congressional District

---

B. Bayles Mack, Fifth Congressional District

---

John M. "Moot" Truluck, Sixth Congressional District



**Document K:**  
**SCDOT Design Exception Form**

Submitted By: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Recommended: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_  
Engineer of Record

To: \_\_\_\_\_  
Program / Project Manager

**BASIS OF DESIGN EXCEPTION**

- ☐ Request for Approval of Design Exceptions to AASHTO Guidelines  
☐ Request for Approval of Design Exceptions from Standard SCDOT Procedures

**PROJECT CHARACTERISTICS**

County: \_\_\_\_\_ Rd. / Route: \_\_\_\_\_ Const. Pin: \_\_\_\_\_

From: \_\_\_\_\_ To: \_\_\_\_\_

Length: \_\_\_\_\_ MPO / COG \_\_\_\_\_

Work Type: \_\_\_\_\_

Functional Classification: \_\_\_\_\_

Group Designation: ( 1 / 2 / 3 / 4 ) (if applicable)

Type of Terrain: (Level / Rolling / Mountainous )

Design Speed: \_\_\_\_\_ (mph)

\_\_\_\_\_ ADT \_\_\_\_\_

\_\_\_\_\_ ADT \_\_\_\_\_

TRUCKS \_\_\_\_\_ %

**CRASH ANALYSIS**

(Attach additional sheets with accident history data)

**TOTAL PROJECT ESTIMATE (\$)** \_\_\_\_\_

**CHECK APPROPRIATE BOX(ES) FOR DESIGN EXCEPTION(S)**

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Design Speed         | <input type="checkbox"/> Maximum Grade       | <input type="checkbox"/> Travel Lane Width       |
| <input type="checkbox"/> Horizontal Alignment | <input type="checkbox"/> Vertical Clearance  | <input type="checkbox"/> Shoulder Width          |
| <input type="checkbox"/> Minimum Radii        | <input type="checkbox"/> Bridge Width        | <input type="checkbox"/> Horizontal Clearances   |
| <input type="checkbox"/> Vertical Alignment   | <input type="checkbox"/> Structural Capacity | <input type="checkbox"/> Stopping Sight Distance |
| <input type="checkbox"/> Level SSD K-Values   | <input type="checkbox"/> Superelevation Rate |  |
|   | <input type="checkbox"/> Cross Slope         |  |
|   | <input type="checkbox"/> Travel Lanes        |  |
|   | <input type="checkbox"/> Shoulders           |  |

**DESCRIBE ELEMENT(S) FOR DESIGN EXCEPTION(S)**

(Attach additional Sheets as needed) \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**JUSTIFICATION FOR DESIGN EXCEPTION(S)**

(Attach additional Sheets as needed) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**DESCRIBE STEPS TO ELIMINATE DESIGN EXCEPTION(S), INCLUDE COST**

(Attach additional Sheets as needed) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**HOW WILL FUTURE CONSTRUCTION IMPACT DESIGN EXCEPTION(S)?**

(Attach additional Sheets as needed) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**RECORD OF DECISION**

☐ For  
☐ Against

☐ For  
☐ Against

☐ Approved  
☐ Denied

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
(Regional Design Manager/  
Program Manager / DEA)      Date

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
(Regional Production Engineer)      Date

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
(Director of Preconstruction)      Date

☐ Concur

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
FHWA (NHS Routes > \$50 million & All Interstate)

cc:  
Director of Preconstruction  
FHWA  
Preconstruction Support Engineer  
Regional Production Group Engineer  
District Engineering Administrator  
Director of Traffic Engineering

**Document L:**  
**USDOT Bicycle and Pedestrian Policies**

# **United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations**

**Signed on March 11, 2010 and announced March 15, 2010**

## **Purpose**

The United States Department of Transportation (DOT) is providing this Policy Statement to reflect the Department's support for the development of fully integrated active transportation networks. The establishment of well-connected walking and bicycling networks is an important component for livable communities, and their design should be a part of Federal-aid project developments. Walking and bicycling foster safer, more livable, family-friendly communities; promote physical activity and health; and reduce vehicle emissions and fuel use. Legislation and regulations exist that require inclusion of bicycle and pedestrian policies and projects into transportation plans and project development. Accordingly, transportation agencies should plan, fund, and implement improvements to their walking and bicycling networks, including linkages to transit. In addition, DOT encourages transportation agencies to go beyond the minimum requirements, and proactively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities, and utilize universal design characteristics when appropriate. Transportation programs and facilities should accommodate people of all ages and abilities, including people too young to drive, people who cannot drive, and people who choose not to drive.

## **Policy Statement**

The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.

## **Authority**

This policy is based on various sections in the United States Code (U.S.C.) and the Code of Federal Regulations (CFR) in Title 23—Highways, Title 49—Transportation, and Title 42—The Public Health and Welfare. These sections, provided in the Appendix, describe how bicyclists and pedestrians of all abilities should be involved throughout the planning process, should not be adversely affected by other transportation projects, and should be able to track annual obligations and expenditures on nonmotorized transportation facilities.

## **Recommended Actions**

The DOT encourages States, local governments, professional associations, community organizations, public transportation agencies, and other government agencies, to adopt similar policy statements on bicycle and pedestrian accommodation as an indication of their commitment to accommodating bicyclists and pedestrians as an integral element of the transportation system. In support of this commitment, transportation agencies and local communities should go beyond minimum design standards and requirements to create safe, attractive, sustainable, accessible, and convenient bicycling and walking networks. Such actions should include:

- Considering walking and bicycling as equals with other transportation modes: The primary goal of a transportation system is to safely and efficiently move people and goods. Walking

and bicycling are efficient transportation modes for most short trips and, where convenient intermodal systems exist, these nonmotorized trips can easily be linked with transit to significantly increase trip distance. Because of the benefits they provide, transportation agencies should give the same priority to walking and bicycling as is given to other transportation modes. Walking and bicycling should not be an afterthought in roadway design.

- Ensuring that there are transportation choices for people of all ages and abilities, especially children: Pedestrian and bicycle facilities should meet accessibility requirements and provide safe, convenient, and interconnected transportation networks. For example, children should have safe and convenient options for walking or bicycling to school and parks. People who cannot or prefer not to drive should have safe and efficient transportation choices.
- Going beyond minimum design standards: Transportation agencies are encouraged, when possible, to avoid designing walking and bicycling facilities to the minimum standards. For example, shared-use paths that have been designed to minimum width requirements will need retrofits as more people use them. It is more effective to plan for increased usage than to retrofit an older facility. Planning projects for the long-term should anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements.
- Integrating bicycle and pedestrian accommodation on new, rehabilitated, and limited-access bridges: DOT encourages bicycle and pedestrian accommodation on bridge projects including facilities on limited-access bridges with connections to streets or paths.
- Collecting data on walking and biking trips: The best way to improve transportation networks for any mode is to collect and analyze trip data to optimize investments. Walking and bicycling trip data for many communities are lacking. This data gap can be overcome by establishing routine collection of nonmotorized trip information. Communities that routinely collect walking and bicycling data are able to track trends and prioritize investments to ensure the success of new facilities. These data are also valuable in linking walking and bicycling with transit.
- Setting mode share targets for walking and bicycling and tracking them over time: A byproduct of improved data collection is that communities can establish targets for increasing the percentage of trips made by walking and bicycling.
- Removing snow from sidewalks and shared-use paths: Current maintenance provisions require pedestrian facilities built with Federal funds to be maintained in the same manner as other roadway assets. State Agencies have generally established levels of service on various routes especially as related to snow and ice events.
- Improving nonmotorized facilities during maintenance projects: Many transportation agencies spend most of their transportation funding on maintenance rather than on constructing new facilities. Transportation agencies should find ways to make facility improvements for pedestrians and bicyclists during resurfacing and other maintenance projects.

## **Conclusion**

Increased commitment to and investment in bicycle facilities and walking networks can help meet goals for cleaner, healthier air; less congested roadways; and more livable, safe, cost-efficient communities. Walking and bicycling provide low-cost mobility options that place fewer demands on local roads and highways. DOT recognizes that safe and convenient walking and bicycling facilities may look different depending on the context — appropriate facilities in a rural community may be different from a dense, urban area. However, regardless of regional, climate, and population density differences, it is important that pedestrian and bicycle facilities be integrated into transportation systems. While DOT leads the effort to provide safe and convenient accommodations for pedestrians and bicyclists, success will ultimately depend on transportation agencies across the country embracing and implementing this policy.

**Ray LaHood, United States Secretary of Transportation**

## **APPENDIX**

### **Key Statutes and Regulations Regarding Walking and Bicycling**

## Planning Requirements

The State and Metropolitan Planning Organization (MPO) planning regulations describe how walking and bicycling are to be accommodated throughout the planning process (e.g., see 23 CFR 450.200, 23 CFR 450.300, 23 U.S.C. 134(h), and 135(d)). Nonmotorists must be allowed to participate in the planning process and transportation agencies are required to integrate walking and bicycling facilities and programs in their transportation plans to ensure the operability of an intermodal transportation system. Key sections from the U.S.C. and CFR include, with italics added for emphasis:

- The scope of the metropolitan planning process "will address the following factors...(2) Increase the safety for motorized and *non-motorized users*; (3) Increase the security of the transportation system for motorized and *non-motorized users*; (4) Protect and enhance the environment, promote energy conservation, improve the quality of life..." 23 CFR 450.306(a). See 23 CFR 450.206 for similar State requirements.
- Metropolitan transportation plans "...shall, at a minimum, include...existing and proposed transportation facilities (including major roadways, transit, multimodal and intermodal facilities, *pedestrian walkways and bicycle facilities*, and intermodal connectors that should function as an integrated metropolitan transportation system..." 23 CFR 450.322(f). See 23 CFR 450.216(g) for similar State requirements.
- The plans and transportation improvement programs (TIPs) of all metropolitan areas "shall provide for the development and integrated management and operation of transportation systems and facilities (including *accessible pedestrian walkways and bicycle transportation facilities*)." 23 U.S.C. 134(c)(2) and 49 U.S.C. 5303(c)(2). 23 CFR 450.324(c) states that the TIP "shall include ...trails projects, pedestrian walkways; and bicycle facilities..."
- 23 CFR 450.316(a) states that "The MPOs shall develop and use a documented participation plan that defines a process for providing...representatives of users of *pedestrian walkways and bicycle transportation facilities*, and *representatives of the disabled*, and other interested parties with reasonable opportunities to be involved in the metropolitan planning process." 23 CFR 450.210(a) contains similar language for States. See also 23 U.S.C. 134(i)(5), 135(f)(3), 49 U.S.C. 5303(i)(5), and 5304(f)(3) for additional information about participation by interested parties.

## Prohibition of Route Severance

The Secretary has the authority to withhold approval for projects that would negatively impact pedestrians and bicyclists under certain circumstances. Key references in the CFR and U.S.C. include:

- "The Secretary shall not approve any project or take any regulatory action under this title that will result in the severance of an existing major route or have significant adverse impact on the safety for nonmotorized transportation traffic and light motorcycles, unless such project or regulatory action provides for a reasonable alternate route or such a route exists." 23 U.S.C. 109(m).
- "In any case where a highway bridge deck being replaced or rehabilitated with Federal financial participation is located on a highway on which bicycles are permitted to operate at each end of such bridge, and the Secretary determines that the safe accommodation of bicycles can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations." 23 U.S.C. 217(e). Although this statutory requirement only mentions bicycles, DOT encourages States and local governments to apply this same policy to pedestrian facilities as well.
- 23 CFR 652 provides "procedures relating to the provision of pedestrian and bicycle accommodations on Federal-aid projects, and Federal participation in the cost of these accommodations and projects."

## Project Documentation



- "In metropolitan planning areas, on an annual basis, no later than 90 calendar days following the end of the program year, the State, public transportation operator(s), and the MPO shall cooperatively develop a listing of projects (including investments in *pedestrian walkways and bicycle transportation facilities*) for which funds under 23 U.S.C. or 49 U.S.C. Chapter 53 were obligated in the preceding program year." 23 CFR 332(a).

#### *Accessibility for All Pedestrians*

- Public rights-of-way and facilities are required to be accessible to persons with disabilities through the following statutes: Section 504 of the Rehabilitation Act of 1973 (Section 504) (29 U.S.C. §794) and Title II of the Americans with Disabilities Act of 1990 (ADA) (42 U.S.C. §§ 12131-12164).
- The DOT Section 504 regulation requires the Federal Highway Administration (FHWA) to monitor the compliance of the self-evaluation and transition plans of Federal-aid recipients (49 CFR §27.11). The FHWA Division offices review pedestrian access compliance with the ADA and Section 504 as part of their routine oversight activities as defined in their stewardship plans.
- FHWA posted its [Clarification of FHWA's Oversight Role in Accessibility](#) to explain how to accommodate accessibility in policy, planning, and projects.

**Document M:**  
**MUTCD Chapter 9:**  
**Traffic Control for Bicycle Facilities**

# PART 9

## TRAFFIC CONTROL FOR BICYCLE FACILITIES

### CHAPTER 9A. GENERAL

#### **Section 9A.01 Requirements for Bicyclist Traffic Control Devices**

Support:

- 01 General information and definitions concerning traffic control devices are found in Part 1.

#### **Section 9A.02 Scope**

Support:

- 01 Part 9 covers signs, pavement markings, and highway traffic signals specifically related to bicycle operation on both roadways and shared-use paths.

*Guidance:*

- 02 *Parts 1, 2, 3, and 4 should be reviewed for general provisions, signs, pavement markings, and signals.*

**Standard:**

- 03 **The absence of a marked bicycle lane or any of the other traffic control devices discussed in this Chapter on a particular roadway shall not be construed to mean that bicyclists are not permitted to travel on that roadway.**

#### **Section 9A.03 Definitions Relating to Bicycles**

Support:

- 01 Definitions and acronyms pertaining to Part 9 are provided in Sections 1A.13 and 1A.14.

#### **Section 9A.04 Maintenance**

*Guidance:*

- 01 *All signs, signals, and markings, including those on bicycle facilities, should be properly maintained to command respect from both the motorist and the bicyclist. When installing signs and markings on bicycle facilities, an agency should be designated to maintain these devices.*

#### **Section 9A.05 Relation to Other Documents**

Support:

- 01 “The Uniform Vehicle Code and Model Traffic Ordinance” published by the National Committee on Uniform Traffic Laws and Ordinances (see Section 1A.11) has provisions for bicycles and is the basis for the traffic control devices included in this Manual.
- 02 Informational documents used during the development of the signing and marking recommendations in Part 9 include the following:
- A. “Guide for Development of Bicycle Facilities,” which is available from the American Association of State Highway and Transportation Officials (see Page i for the address); and
  - B. State and local government design guides.
- 03 Other publications that relate to the application of traffic control devices in general are listed in Section 1A.11.

#### **Section 9A.06 Placement Authority**

Support:

- 01 Section 1A.08 contains information regarding placement authority for traffic control devices.

#### **Section 9A.07 Meaning of Standard, Guidance, Option, and Support**

Support:

- 01 The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words “shall,” “should,” and “may.”

#### **Section 9A.08 Colors**

Support:

- 01 Section 1A.12 contains information regarding the color codes.

## CHAPTER 9B. SIGNS

### Section 9B.01 Application and Placement of Signs

#### Standard:

- 01 **Bicycle signs shall be standard in shape, legend, and color.**
- 02 **All signs shall be retroreflectorized for use on bikeways, including shared-use paths and bicycle lane facilities.**
- 03 **Where signs serve both bicyclists and other road users, vertical mounting height and lateral placement shall be as provided in Part 2.**
- 04 **Where used on a shared-use path, no portion of a sign or its support shall be placed less than 2 feet laterally from the near edge of the path, or less than 8 feet vertically over the entire width of the shared-use path (see Figure 9B-1).**
- 05 **Mounting height for post-mounted signs on shared-use paths shall be a minimum of 4 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the path surface (see Figure 9B-1).**

#### Guidance:

- 06 *Signs for the exclusive use of bicyclists should be located so that other road users are not confused by them.*
- 07 *The clearance for overhead signs on shared-use paths should be adjusted when appropriate to accommodate path users requiring more clearance, such as equestrians, or typical maintenance or emergency vehicles.*

### Section 9B.02 Design of Bicycle Signs

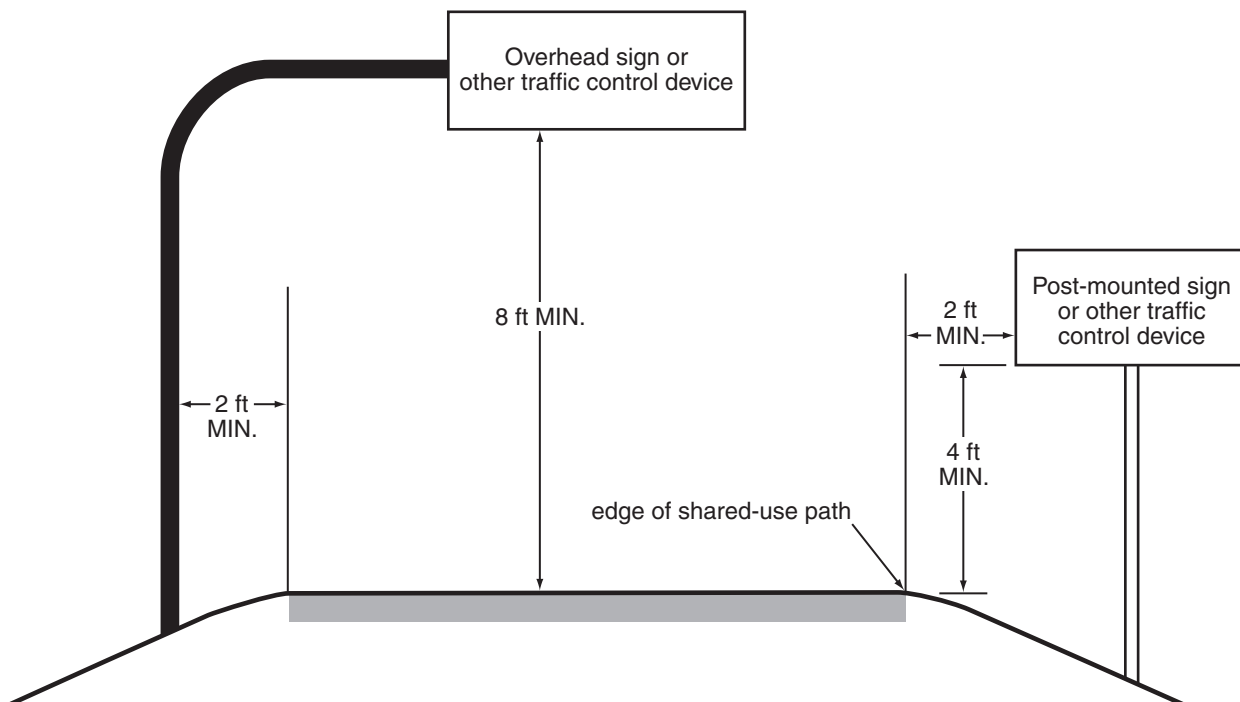
#### Standard:

- 01 **If the sign or plaque applies to motorists and bicyclists, then the size shall be as shown for conventional roads in Tables 2B-1, 2C-2, or 2D-1.**
- 02 **The minimum sign and plaque sizes for shared-use paths shall be those shown in Table 9B-1, and shall be used only for signs and plaques installed specifically for bicycle traffic applications. The minimum sign and plaque sizes for bicycle facilities shall not be used for signs or plaques that are placed in a location that would have any application to other vehicles.**

#### Option:

- 03 Larger size signs and plaques may be used on bicycle facilities when appropriate (see Section 2A.11).

**Figure 9B-1. Sign Placement on Shared-Use Paths**



**Table 9B-1. Bicycle Facility Sign and Plaque Minimum Sizes (Sheet 1 of 2)**

Sign or Plaque	Sign Designation	Section	Shared-Use Path	Roadway
Stop	R1-1	2B.05, 9B.03	18 x 18	30 x 30
Yield	R1-2	2B.08, 9B.03	18 x 18 x 18	30 x 30 x 30
Bike Lane	R3-17	9B.04	—	24 x 18
Bike Lane (plaques)	R3-17aP, R3-17bP	9B.04	—	24 x 8
Movement Restriction	R4-1,2,3,7,16	2B.28,29,30,32; 9B.14	12 x 18	18 x 24
Begin Right Turn Lane Yield to Bikes	R4-4	9B.05	—	36 x 30
Bicycles May Use Full Lane	R4-11	9B.06	—	30 x 30
Bicycle Wrong Way	R5-1b	9B.07	12 x 18	12 x 18
No Motor Vehicles	R5-3	9B.08	24 x 24	24 x 24
No Bicycles	R5-6	9B.09	18 x 18	24 x 24
No Parking Bike Lane	R7-9,9a	9B.10	—	12 x 18
No Pedestrians	R9-3	9B.09	18 x 18	18 x 18
Ride With Traffic (plaque)	R9-3cP	9B.07	12 x 12	12 x 12
Bicycle Regulatory	R9-5,6	9B.11	12 x 18	12 x 18
Shared-Use Path Restriction	R9-7	9B.12	12 x 18	—
No Skaters	R9-13	9B.09	18 x 18	18 x 18
No Equestrians	R9-14	9B.09	18 x 18	18 x 18
Push Button for Green Light	R10-4	9B.11	9 x 12	9 x 12
To Request Green Wait on Symbol	R10-22	9B.13	12 x 18	12 x 18
Bike Push Button for Green Light	R10-24	9B.11	9 x 15	9 x 15
Push Button to Turn On Warning Lights	R10-25	9B.11	9 x 12	9 x 12
Bike Push Button for Green Light (arrow)	R10-26	9B.11	9 x 15	9 x 15
Grade Crossing (Crossbuck)	R15-1	8B.03, 9B.14	24 x 4.5	48 x 9
Number of Tracks (plaque)	R15-2P	8B.03, 9B.14	13.5 x 9	27 x 18
Look	R15-8	8B.17, 9B.14	18 x 9	36 x 18
Turn and Curve Warning	W1-1,2,3,4,5	2C.04, 9B.15	18 x 18	24 x 24
Arrow Warning	W1-6,7	2C.12, 2C.47, 9B.15	24 x 12	36 x 18
Intersection Warning	W2-1,2,3,4,5	2C.46, 9B.16	18 x 18	24 x 24
Stop, Yield, Signal Ahead	W3-1,2,3	2C.36, 9B.19	18 x 18	30 x 30
Narrow Bridge	W5-2	2C.20, 9B.19	18 x 18	30 x 30
Path Narrows	W5-4a	9B.19	18 x 18	—
Hill	W7-5	9B.19	18 x 18	30 x 30
Bump or Dip	W8-1,2	2C.28, 9B.17	18 x 18	24 x 24
Pavement Ends	W8-3	2C.30, 9B.17	18 x 18	30 x 30
Bicycle Surface Condition	W8-10	9B.17	18 x 18	30 x 30
Slippery When Wet (plaque)	W8-10P	9B.17	12 x 9	12 x 9
Grade Crossing Advance Warning	W10-1	8B.06, 9B.19	24 Dia.	36 Dia.
No Train Horn (plaque)	W10-9P	8B.21, 9B.19	18 x 12	30 x 24
Skewed Crossing	W10-12	8B.25, 9B.19	18 x 18	36 x 36
Bicycle Warning	W11-1	9B.18	18 x 18	24 x 24
Pedestrian Crossing	W11-2	2C.50, 9B.19	18 x 18	24 x 24
Combination Bike and Ped Crossing	W11-15	9B.18	18 x 18	30 x 30
Trail Crossing (plaque)	W11-15P	9B.18	18 x 12	24 x 18
Low Clearance	W12-2	2C.27, 9B.19	18 x 18	30 x 30
Playground	W15-1	2C.51, 9B.19	18 x 18	24 x 24
Share the Road (plaque)	W16-1P	2C.60, 9B.19	—	18 x 24

**Table 9B-1. Bicycle Facility Sign and Plaque Minimum Sizes (Sheet 2 of 2)**

Sign or Plaque	Sign Designation	Section	Shared-Use Path	Roadway
XX Feet (plaque)	W16-2P	2C.55, 9B.18	18 x 12	24 x 18
XX Ft (plaque)	W16-2aP	2C.55, 9B.18	18 x 9	24 x 12
Diagonal Arrow (plaque)	W16-7P	9B.18	—	24 x 12
Ahead (plaque)	W16-9P	9B.18	—	24 x 12
Destination (1 line)	D1-1, D1-1a	2D.37, 9B.20	varies x 6	varies x 18
Bicycle Destination (1 line)	D1-1b, D1-1c	9B.20	varies x 6	varies x 6
Destination (2 lines)	D1-2, D1-2a	2D.37, 9B.20	varies x 12	varies x 30
Bicycle Destination (2 lines)	D1-2b, D1-2c	9B.20	varies x 12	varies x 12
Destination (3 lines)	D1-3, D1-3a	2D.37, 9B.20	varies x 18	varies x 42
Bicycle Destination (3 lines)	D1-3b, D1-3c	9B.20	varies x 18	varies x 18
Street Name	D3-1	2D.43, 9B.20	varies x 6	varies x 8
Bicycle Parking Area	D4-3	9B.23	12 x 18	12 x 18
Reference Location (1-digit)	D10-1	2H.02, 9B.24	6 x 12	10 x 18
Intermediate Reference Location (1-digit)	D10-1a	2H.02, 9B.24	6 x 18	10 x 27
Reference Location (2-digit)	D10-2	2H.02, 9B.24	6 x 18	10 x 27
Intermediate Reference Location (2-digit)	D10-2a	2H.02, 9B.24	6 x 24	10 x 36
Reference Location (3-digit)	D10-3	2H.02, 9B.24	6 x 24	10 x 36
Intermediate Reference Location (3-digit)	D10-3a	2H.02, 9B.24	6 x 30	10 x 48
Bike Route	D11-1, D11-1c	9B.20	24 x 18	24 x 18
Bicycles Permitted	D11-1a	9B.25	18 x 18	—
Bike Route (plaque)	D11-1bP	9B.25	18 x 6	—
Pedestrians Permitted	D11-2	9B.25	18 x 18	—
Skaters Permitted	D11-3	9B.25	18 x 18	—
Equestrians Permitted	D11-4	9B.25	18 x 18	—
Bicycle Route	M1-8, M1-8a	9B.21	12 x 18	18 x 24
U.S. Bicycle Route	M1-9	9B.21	12 x 18	18 x 24
Bicycle Route Auxiliary Signs	M2-1; M3-1,2,3,4; M4-1,1a,2,3,5,6,7,7a,8,14	9B.22	12 x 6	12 x 6
Bicycle Route Arrow Signs	M5-1,2; M6-1,2,3,4,5,6,7	9B.22	12 x 9	12 x 9
Type 3 Object Markers	OM3-L,C,R	2C.63, 9B.26	6 x 18	12 x 36

Notes: 1. Larger signs may be used when appropriate  
2. Dimensions are shown in inches and are shown as width x height

### Guidance:

- 04 *Except for size, the design of signs and plaques for bicycle facilities should be identical to that provided in this Manual for signs and plaques for streets and highways.*

### Support:

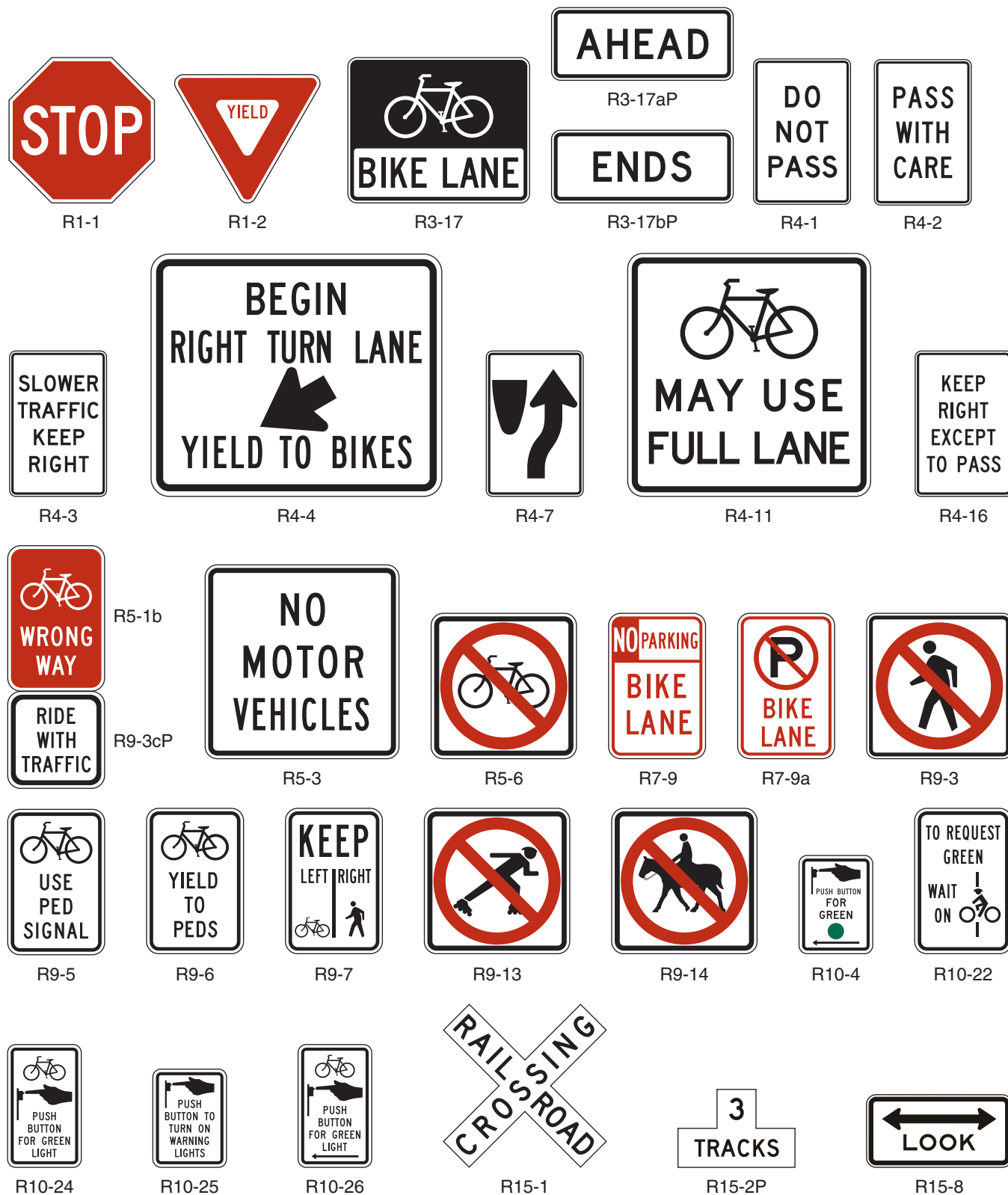
- 05 Uniformity in design of bicycle signs and plaques includes shape, color, symbols, arrows, wording, lettering, and illumination or retroreflectorization.

## Section 9B.03 STOP and YIELD Signs (R1-1, R1-2)

### Standard:

- 01 **STOP (R1-1) signs** (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists are required to stop.
- 02 **YIELD (R1-2) signs** (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists have an adequate view of conflicting traffic as they approach the sign, and where bicyclists are required to yield the right-of-way to that conflicting traffic.

Figure 9B-2. Regulatory Signs and Plaques for Bicycle Facilities





**Option:**

- 03 A 30 x 30-inch STOP sign or a 36 x 36 x 36-inch YIELD sign may be used on shared-use paths for added emphasis.

**Guidance:**

- 04 *Where conditions require path users, but not roadway users, to stop or yield, the STOP or YIELD sign should be placed or shielded so that it is not readily visible to road users.*
- 05 *When placement of STOP or YIELD signs is considered, priority at a shared-use path/roadway intersection should be assigned with consideration of the following:*
- A. *Relative speeds of shared-use path and roadway users,*
  - B. *Relative volumes of shared-use path and roadway traffic, and*
  - C. *Relative importance of shared-use path and roadway.*
- 06 *Speed should not be the sole factor used to determine priority, as it is sometimes appropriate to give priority to a high-volume shared-use path crossing a low-volume street, or to a regional shared-use path crossing a minor collector street.*
- 07 *When priority is assigned, the least restrictive control that is appropriate should be placed on the lower priority approaches. STOP signs should not be used where YIELD signs would be acceptable.*

**Section 9B.04 Bike Lane Signs and Plaques (R3-17, R3-17aP, R3-17bP)****Standard:**

- 01 **The BIKE LANE (R3-17) sign and the R3-17aP and R3-17bP plaques (see Figure 9B-2) shall be used only in conjunction with marked bicycle lanes as described in Section 9C.04.**

**Guidance:**

- 02 *If used, Bike Lane signs and plaques should be used in advance of the upstream end of the bicycle lane, at the downstream end of the bicycle lane, and at periodic intervals along the bicycle lane as determined by engineering judgment based on prevailing speed of bicycle and other traffic, block length, distances from adjacent intersections, and other considerations.*

**Section 9B.05 BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4-4)****Option:**

- 01 Where motor vehicles entering an exclusive right-turn lane must weave across bicycle traffic in bicycle lanes, the BEGIN RIGHT TURN LANE YIELD TO BIKES (R4-4) sign (see Figure 9B-2) may be used to inform both the motorist and the bicyclist of this weaving maneuver (see Figures 9C-1, 9C-4, and 9C-5).

**Guidance:**

- 02 *The R4-4 sign should not be used when bicyclists need to move left because of a right-turn lane drop situation.*

**Section 9B.06 Bicycles May Use Full Lane Sign (R4-11)****Option:**

- 01 The Bicycles May Use Full Lane (R4-11) sign (see Figure 9B-2) may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.
- 02 The Bicycles May Use Full Lane sign may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.
- 03 Section 9C.07 describes a Shared Lane Marking that may be used in addition to or instead of the Bicycles May Use Full Lane sign to inform road users that bicyclists might occupy the travel lane.

**Support:**

- 04 The Uniform Vehicle Code (UVC) defines a “substandard width lane” as a “lane that is too narrow for a bicycle and a vehicle to travel safely side by side within the same lane.”

**Section 9B.07 Bicycle WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3cP)****Option:**

- 01 The Bicycle WRONG WAY (R5-1b) sign and RIDE WITH TRAFFIC (R9-3cP) plaque (see Figure 9B-2) may be placed facing wrong-way bicycle traffic, such as on the left side of a roadway.
- 02 This sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic.

*Guidance:*

- 03 *The RIDE WITH TRAFFIC plaque should be used only in conjunction with the Bicycle WRONG WAY sign, and should be mounted directly below the Bicycle WRONG WAY sign.*

**Section 9B.08 NO MOTOR VEHICLES Sign (R5-3)***Option:*

- 01 The NO MOTOR VEHICLES (R5-3) sign (see Figure 9B-2) may be installed at the entrance to a shared-use path.

**Section 9B.09 Selective Exclusion Signs***Option:*

- 01 Selective Exclusion signs (see Figure 9B-2) may be installed at the entrance to a roadway or facility to notify road or facility users that designated types of traffic are excluded from using the roadway or facility.

**Standard:**

- 02 **If used, Selective Exclusion signs shall clearly indicate the type of traffic that is excluded.**

*Support:*

- 03 Typical exclusion messages include:

- A. No Bicycles (R5-6),
- B. No Pedestrians (R9-3),
- C. No Skaters (R9-13), and
- D. No Equestrians (R9-14).

*Option:*

- 04 Where bicyclists, pedestrians, and motor-driven cycles are all prohibited, it may be more desirable to use the R5-10a word message sign that is described in Section 2B.39.

**Section 9B.10 No Parking Bike Lane Signs (R7-9, R7-9a)****Standard:**

- 01 **If the installation of signs is necessary to restrict parking, standing, or stopping in a bicycle lane, appropriate signs as described in Sections 2B.46 through 2B.48, or the No Parking Bike Lane (R7-9 or R7-9a) signs (see Figure 9B-2) shall be installed.**

**Section 9B.11 Bicycle Regulatory Signs (R9-5, R9-6, R10-4, R10-24, R10-25, and R10-26)***Option:*

- 01 The R9-5 sign (see Figure 9B-2) may be used where the crossing of a street by bicyclists is controlled by pedestrian signal indications.
- 02 Where it is not intended for bicyclists to be controlled by pedestrian signal indications, the R10-4, R10-24, or R10-26 sign (see Figure 9B-2 and Section 2B.52) may be used.

*Guidance:*

- 03 *If used, the R9-5, R10-4, R10-24, or R10-26 signs should be installed near the edge of the sidewalk in the vicinity of where bicyclists will be crossing the street.*

*Option:*

- 04 If bicyclists are crossing a roadway where In-Roadway Warning Lights (see Section 4N.02) or other warning lights or beacons have been provided, the R10-25 sign (see Figure 9B-2) may be used.
- 05 The R9-6 sign (see Figure 9B-2) may be used where a bicyclist is required to cross or share a facility used by pedestrians and is required to yield to the pedestrians.

**Section 9B.12 Shared-Use Path Restriction Sign (R9-7)***Option:*

- 01 The Shared-Use Path Restriction (R9-7) sign (see Figure 9B-2) may be installed to supplement a solid white pavement marking line (see Section 9C.03) on facilities that are to be shared by pedestrians and bicyclists in order to provide a separate designated pavement area for each mode of travel. The symbols may be switched as appropriate.

*Guidance:*

- 02 *If two-way operation is permitted on the facility for pedestrians and/or bicyclists, the designated pavement area that is provided for each two-way mode of travel should be wide enough to accommodate both directions of travel for that mode.*

### **Section 9B.13 Bicycle Signal Actuation Sign (R10-22)**

#### **Option:**

- 01 The Bicycle Signal Actuation (R10-22) sign (see Figure 9B-2) may be installed at signalized intersections where markings are used to indicate the location where a bicyclist is to be positioned to actuate the signal (see Section 9C.05).

#### **Guidance:**

- 02 *If the Bicycle Signal Actuation sign is installed, it should be placed at the roadside adjacent to the marking to emphasize the connection between the marking and the sign.*

### **Section 9B.14 Other Regulatory Signs**

#### **Option:**

- 01 Other regulatory signs described in Chapter 2B may be installed on bicycle facilities as appropriate.

### **Section 9B.15 Turn or Curve Warning Signs (W1 Series)**

#### **Guidance:**

- 01 *To warn bicyclists of unexpected changes in shared-use path direction, appropriate turn or curve (W1-1 through W1-7) signs (see Figure 9B-3) should be used.*
- 02 *The W1-1 through W1-5 signs should be installed at least 50 feet in advance of the beginning of the change of alignment.*

### **Section 9B.16 Intersection Warning Signs (W2 Series)**

#### **Option:**

- 01 Intersection Warning (W2-1 through W2-5) signs (see Figure 9B-3) may be used on a roadway, street, or shared-use path in advance of an intersection to indicate the presence of an intersection and the possibility of turning or entering traffic.

#### **Guidance:**

- 02 *When engineering judgment determines that the visibility of the intersection is limited on the shared-use path approach, Intersection Warning signs should be used.*
- 03 *Intersection Warning signs should not be used where the shared-use path approach to the intersection is controlled by a STOP sign, a YIELD sign, or a traffic control signal.*

### **Section 9B.17 Bicycle Surface Condition Warning Sign (W8-10)**

#### **Option:**

- 01 The Bicycle Surface Condition Warning (W8-10) sign (see Figure 9B-3) may be installed where roadway or shared-use path conditions could cause a bicyclist to lose control of the bicycle.
- 02 Signs warning of other conditions that might be of concern to bicyclists, including BUMP (W8-1), DIP (W8-2), PAVEMENT ENDS (W8-3), and any other word message that describes conditions that are of concern to bicyclists, may also be used.
- 03 A supplemental plaque may be used to clarify the specific type of surface condition.

### **Section 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)**

#### **Support:**

- 01 The Bicycle Warning (W11-1) sign (see Figure 9B-3) alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflicts. These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

#### **Option:**

- 02 The combined Bicycle/Pedestrian (W11-15) sign (see Figure 9B-3) may be used where both bicyclists and pedestrians might be crossing the roadway, such as at an intersection with a shared-use path. A TRAIL X-ING (W11-15P) supplemental plaque (see Figure 9B-3) may be mounted below the W11-15 sign.
- 03 A supplemental plaque with the legend AHEAD or XX FEET may be used with the Bicycle Warning or combined Bicycle/Pedestrian sign.

#### **Guidance:**

- 04 *If used in advance of a specific crossing point, the Bicycle Warning or combined Bicycle/Pedestrian sign should be placed at a distance in advance of the crossing location that conforms with the guidance given in Table 2C-4.*

**Figure 9B-3. Warning Signs and Plaques and Object Markers for Bicycle Facilities**



\* A fluorescent yellow-green background color may be used for this sign or plaque. The background color of the plaque should match the color of the warning sign that it supplements.

**Standard:**

- 05 **Bicycle Warning and combined Bicycle/Pedestrian signs, when used at the location of the crossing, shall be supplemented with a diagonal downward pointing arrow (W16-7P) plaque (see Figure 9B-3) to show the location of the crossing.**

**Option:**

- 06 A fluorescent yellow-green background color with a black legend and border may be used for Bicycle Warning and combined Bicycle/Pedestrian signs and supplemental plaques.

**Guidance:**

- 07 *When the fluorescent yellow-green background color is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area should be avoided.*

**Section 9B.19 Other Bicycle Warning Signs****Option:**

- 01 Other bicycle warning signs (see Figure 9B-3) such as PATH NARROWS (W5-4a) and Hill (W7-5) may be installed on shared-use paths to warn bicyclists of conditions not readily apparent.

- 02 In situations where there is a need to warn motorists to watch for bicyclists traveling along the highway, the SHARE THE ROAD (W16-1P) plaque (see Figure 9B-3) may be used in conjunction with the W11-1 sign.

**Guidance:**

- 03 *If used, other advance bicycle warning signs should be installed at least 50 feet in advance of the beginning of the condition.*

- 04 *Where temporary traffic control zones are present on bikeways, appropriate signs from Part 6 should be used.*

**Option:**

- 05 Other warning signs described in Chapter 2C may be installed on bicycle facilities as appropriate.

**Section 9B.20 Bicycle Guide Signs (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c, D11-1, D11-1c)****Option:**

- 01 Bike Route Guide (D11-1) signs (see Figure 9B-4) may be provided along designated bicycle routes to inform bicyclists of bicycle route direction changes and to confirm route direction, distance, and destination.

- 02 If used, Bike Route Guide signs may be repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a bicycle route. Similar guide signing may be used for shared roadways with intermediate signs placed for bicyclist guidance.

- 03 Alternative Bike Route Guide (D11-1c) signs may be used to provide information on route direction, destination, and/or route name in place of the "BIKE ROUTE" wording on the D11-1 sign (see Figures 9B-4 and 9B-6).

- 04 Destination (D1-1, D1-1a) signs, Street Name (D3) signs, or Bicycle Destination (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c) signs (see Figure 9B-4) may be installed to provide direction, destination, and distance information as needed for bicycle travel. If several destinations are to be shown at a single location, they may be placed on a single sign with an arrow (and the distance, if desired) for each name. If more than one destination lies in the same direction, a single arrow may be used for the destinations.

**Guidance:**

- 05 *Adequate separation should be made between any destination or group of destinations in one direction and those in other directions by suitable design of the arrow, spacing of lines of legend, heavy lines entirely across the sign, or separate signs.*

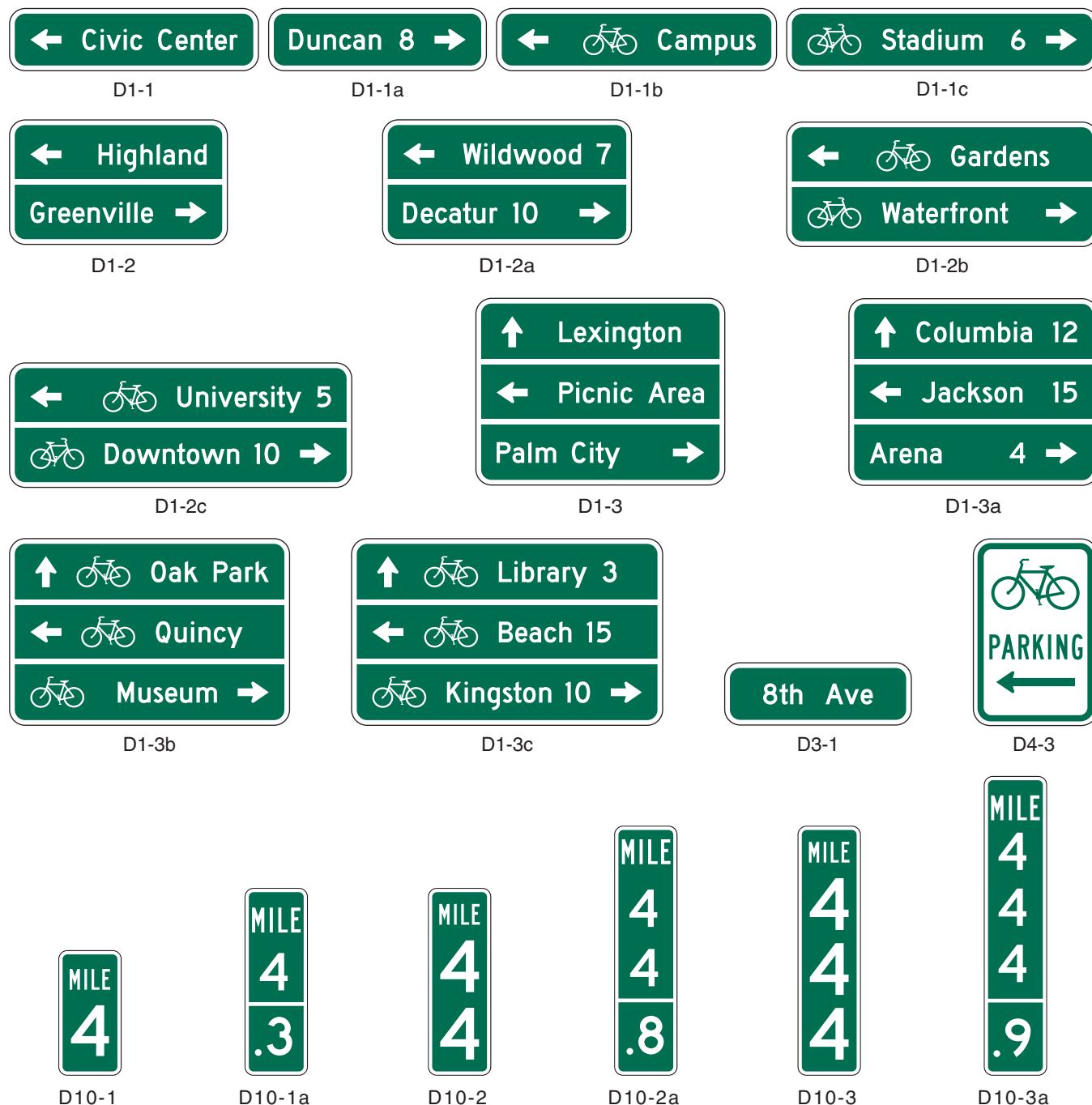
**Standard:**

- 06 **An arrow pointing to the right, if used, shall be at the extreme right-hand side of the sign. An arrow pointing left or up, if used, shall be at the extreme left-hand side of the sign. The distance numerals, if used, shall be placed to the right of the destination names.**

- 07 **On Bicycle Destination signs, a bicycle symbol shall be placed next to each destination or group of destinations. If an arrow is at the extreme left, the bicycle symbol shall be placed to the right of the respective arrow.**

**Guidance:**

- 08 *Unless a sloping arrow will convey a clearer indication of the direction to be followed, the directional arrows should be horizontal or vertical.*

**Figure 9B-4. Guide Signs and Plaques for Bicycle Facilities (Sheet 1 of 2)**

09 The bicycle symbol should be to the left of the destination legend.

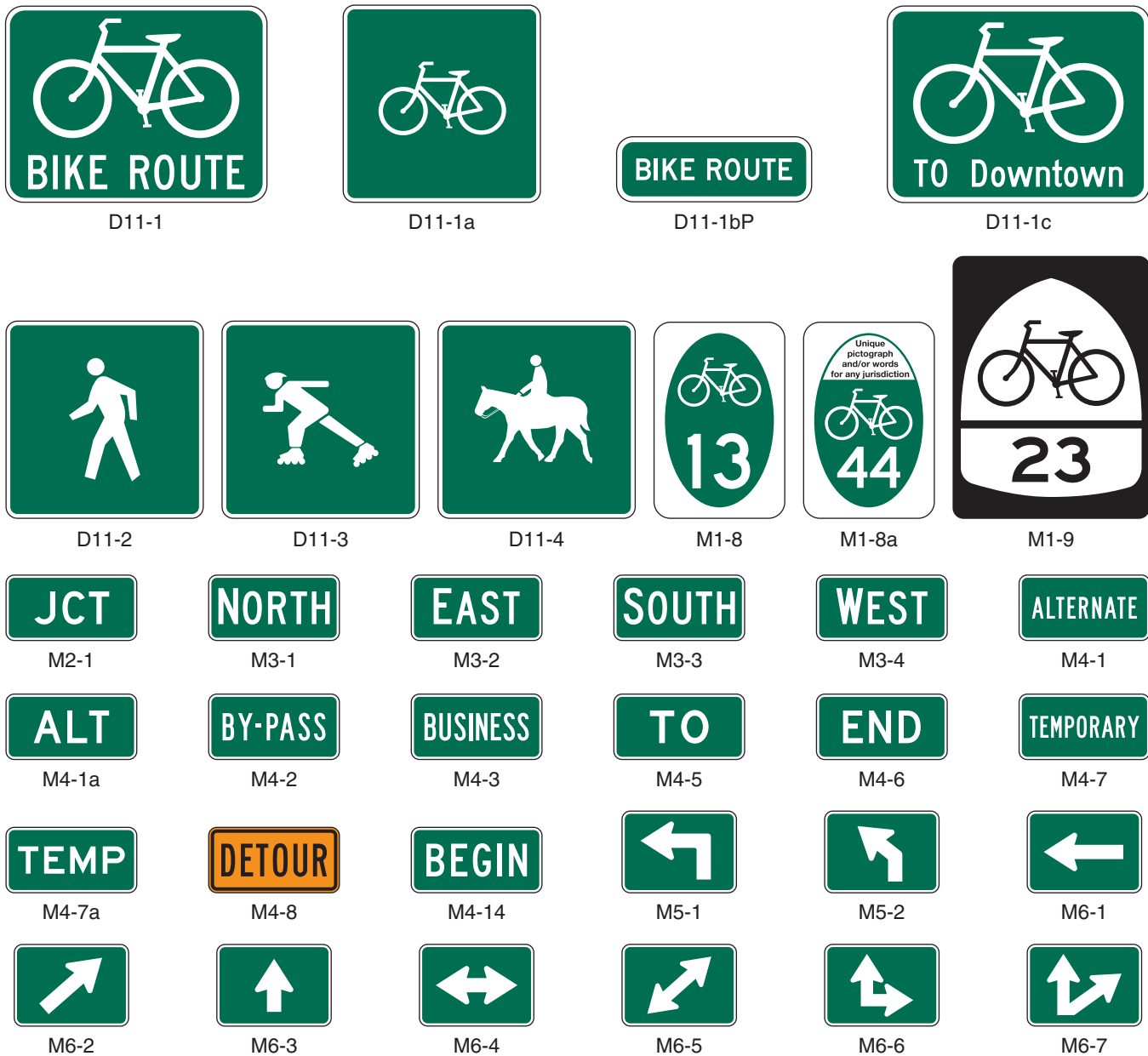
10 If several individual name signs are assembled into a group, all signs in the assembly should have the same horizontal width.

11 Because of their smaller size, Bicycle Destination signs should not be used as a substitute for vehicular destination signs when the message is also intended to be seen by motorists.

Support:

12 Figure 9B-5 shows an example of the signing for the beginning and end of a designated bicycle route on a shared-use path. Figure 9B-6 shows an example of signing for an on-roadway bicycle route. Figure 9B-7 shows examples of signing and markings for a shared-use path crossing.



**Figure 9B-4. Guide Signs and Plaques for Bicycle Facilities (Sheet 2 of 2)****Section 9B.21 Bicycle Route Signs (M1-8, M1-8a, M1-9)**

Option:

- 01 To establish a unique identification (route designation) for a State or local bicycle route, the Bicycle Route (M1-8, M1-8a) sign (see Figure 9B-4) may be used.

**Standard:**

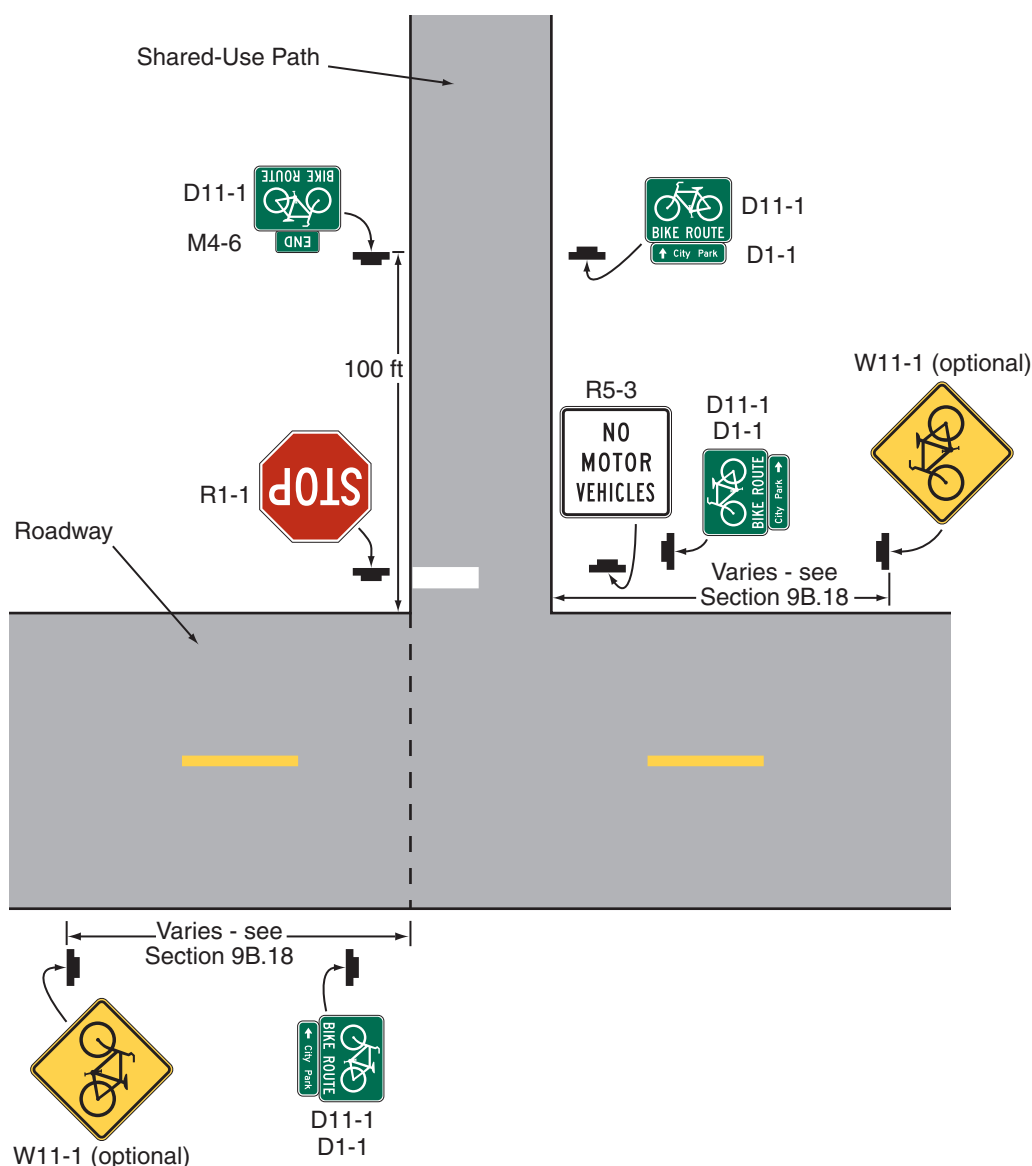
- 02 The Bicycle Route (M1-8) sign shall contain a route designation and shall have a green background with a retroreflectorized white legend and border. The Bicycle Route (M1-8a) sign shall contain the same information as the M1-8 sign and in addition shall include a pictograph or words that are associated with the route or with the agency that has jurisdiction over the route.

*Guidance:*

- 03 Bicycle routes, which might be a combination of various types of bikeways, should establish a continuous routing.



**Figure 9B-5. Example of Signing for the Beginning and End of a Designated Bicycle Route on a Shared-Use Path**



<sup>04</sup> *Where a designated bicycle route extends through two or more States, a coordinated submittal by the affected States for an assignment of a U.S. Bicycle Route number designation should be sent to the American Association of State Highway and Transportation Officials (see Page i for the address).*

**Standard:**

05     **The U.S. Bicycle Route (M1-9) sign (see Figure 9B-4) shall contain the route designation as assigned by AASHTO and shall have a black legend and border with a retroreflectorized white background.**

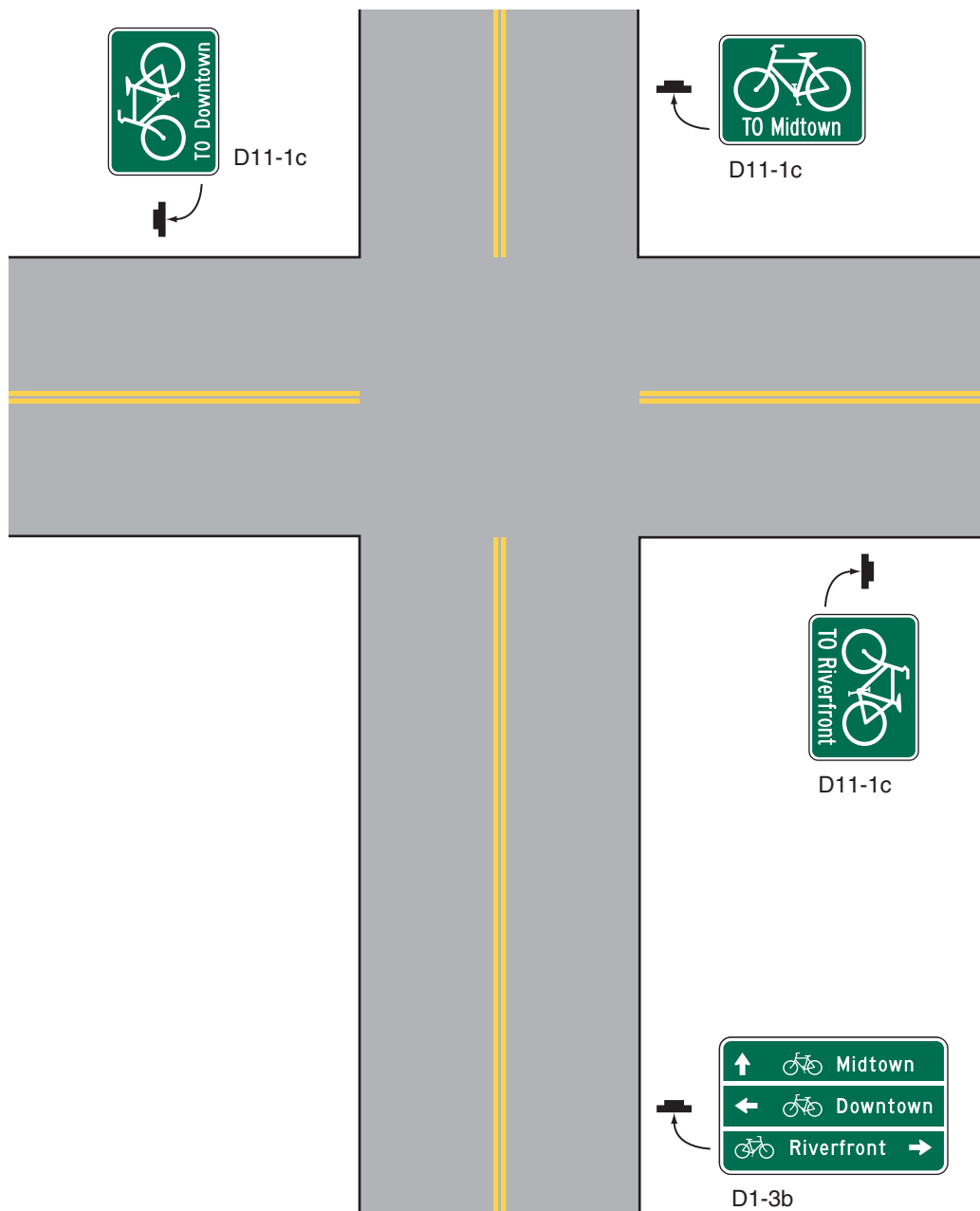
*Guidance:*

06 *If used, the Bicycle Route or U.S. Bicycle Route signs should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.*

Option:

07 Bicycle Route or U.S. Bicycle Route signs may be installed on shared roadways or on shared-use paths to provide guidance for bicyclists.

08 The Bicycle Route Guide (D11-1) sign (see Figure 9B-4) may be installed where no unique designation of routes is desired.

**Figure 9B-6. Example of Bicycle Guide Signing**

## Section 9B.22 Bicycle Route Sign Auxiliary Plaques

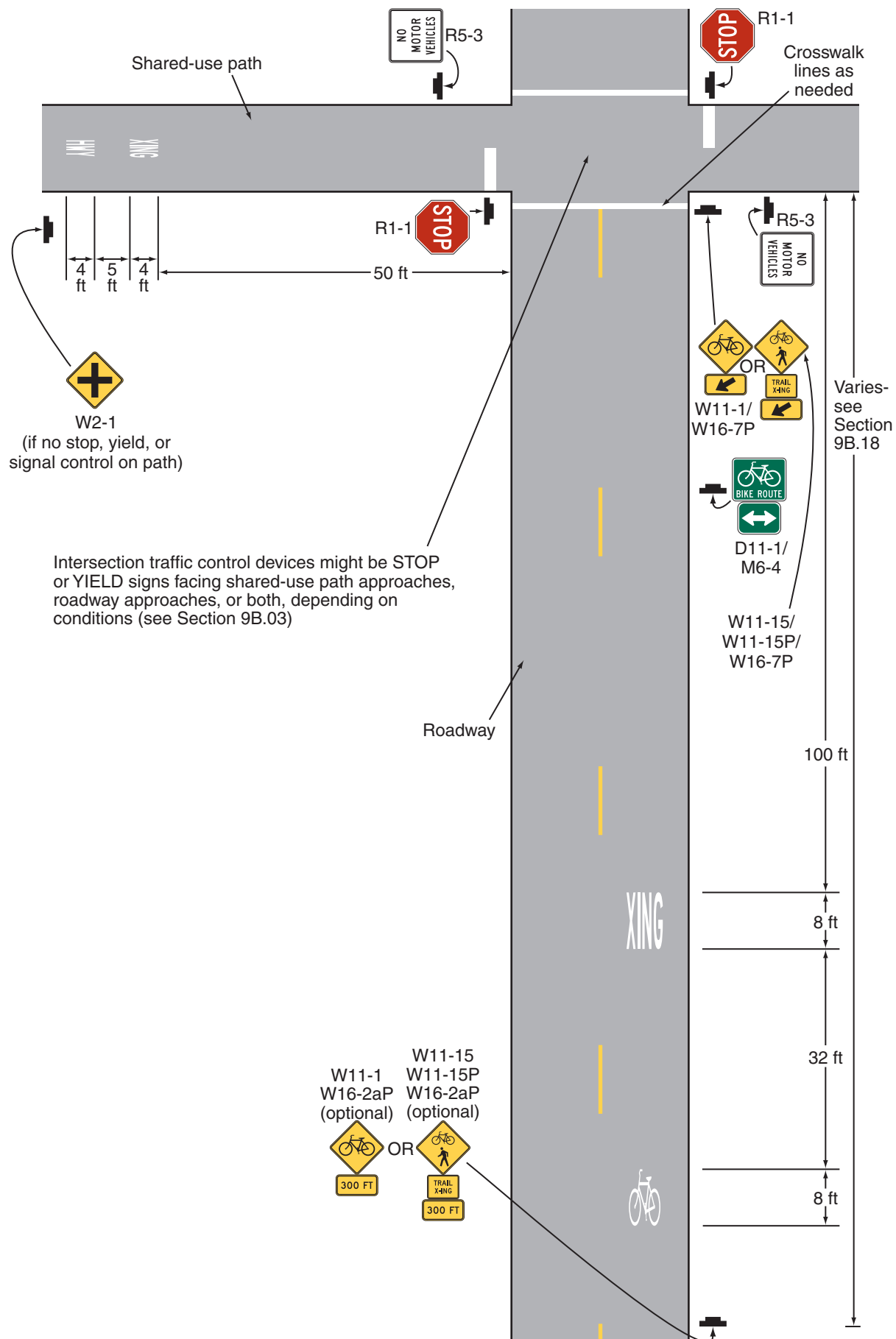
### Option:

- 01 Auxiliary plaques may be used in conjunction with Bike Route Guide signs, Bicycle Route signs, or U.S. Bicycle Route signs as needed.

### Guidance:

- 02 If used, *Junction (M2-1)*, *Cardinal Direction (M3 series)*, and *Alternative Route (M4 series)* auxiliary plaques (see Figure 9B-4) should be mounted above the appropriate *Bike Route Guide signs*, *Bicycle Route signs*, or *U.S. Bicycle Route signs*.
- 03 If used, *Advance Turn Arrow (M5 series)* and *Directional Arrow (M6 series)* auxiliary plaques (see Figure 9B-4) should be mounted below the appropriate *Bike Route Guide sign*, *Bicycle Route sign*, or *U.S. Bicycle Route sign*.
- 04 Except for the *M4-8 plaque*, all route sign auxiliary plaques should match the color combination of the route sign that they supplement.

### Figure 9B-7. Examples of Signing and Markings for a Shared-Use Path Crossing



- 05 *Route sign auxiliary plaques carrying word legends that are used on bicycle routes should have a minimum size of 12 x 6 inches. Route sign auxiliary plaques carrying arrow symbols that are used on bicycle routes should have a minimum size of 12 x 9 inches.*

Option:

- 06 With route signs of larger sizes, auxiliary plaques may be suitably enlarged, but not such that they exceed the width of the route sign.
- 07 A route sign and any auxiliary plaques used with it may be combined on a single sign.
- 08 Destination (D1-1b and D1-1c) signs (see Figure 9B-4) may be mounted below Bike Route Guide signs, Bicycle Route signs, or U.S. Bicycle Route signs to furnish additional information, such as directional changes in the route, or intermittent distance and destination information.

### **Section 9B.23 Bicycle Parking Area Sign (D4-3)**

Option:

- 01 *The Bicycle Parking Area (D4-3) sign (see Figure 9B-4) may be installed where it is desirable to show the direction to a designated bicycle parking area. The arrow may be reversed as appropriate.*

**Standard:**

- 02 **The legend and border of the Bicycle Parking Area sign shall be green on a retroreflectorized white background.**

### **Section 9B.24 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)**

Support:

- 01 There are two types of reference location signs:
- A. Reference Location (D10-1, 2, and 3) signs show an integer distance point along a shared-use path; and
  - B. Intermediate Reference Location (D10-1a, 2a, and 3a) signs also show a decimal between integer distance points along a shared-use path.

Option:

- 02 Reference Location (D10-1 to D10-3) signs (see Figure 9B-4) may be installed along any section of a shared-use path to assist users in estimating their progress, to provide a means for identifying the location of emergency incidents and crashes, and to aid in maintenance and servicing.
- 03 To augment the reference location sign system, Intermediate Reference Location (D10-1a to D10-3a) signs (see Figure 9B-4), which show the tenth of a mile with a decimal point, may be installed at one tenth of a mile intervals, or at some other regular spacing.

**Standard:**

- 04 **If Intermediate Reference Location (D10-1a to D10-3a) signs are used to augment the reference location sign system, the reference location sign at the integer mile point shall display a decimal point and a zero numeral.**
- 05 **If placed on shared-use paths, reference location signs shall contain 4.5-inch white numerals on a green background that is at least 6 inches wide with a white border. The signs shall contain the word MILE in 2.25-inch white letters.**
- 06 **Reference location signs shall have a minimum mounting height of 2 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the shared-use path, and shall not be governed by the mounting height requirements prescribed in Section 9B.01.**

Option:

- 07 Reference location signs may be installed on one side of the shared-use path only and may be installed back-to-back.
- 08 If a reference location sign cannot be installed in the correct location, it may be moved in either direction as much as 50 feet.

*Guidance:*

- 09 *If a reference location sign cannot be placed within 50 feet of the correct location, it should be omitted.*
- 10 *Zero distance should begin at the south and west terminus points of shared-use paths.*

Support:

- 11 Section 2H.05 contains additional information regarding reference location signs.

## Section 9B.25 Mode-Specific Guide Signs for Shared-Use Paths (D11-1a, D11-2, D11-3, D11-4)

### Option:

- 01 Where separate pathways are provided for different types of users, Mode-Specific Guide (D11-1a, D11-2, D11-3, D11-4) signs (see Figure 9B-4) may be used to guide different types of users to the traveled way that is intended for their respective modes.
- 02 Mode-Specific Guide signs may be installed at the entrance to shared-use paths where the signed mode(s) are permitted or encouraged, and periodically along these facilities as needed.
- 03 The Bicycles Permitted (D11-1a) sign, when combined with the BIKE ROUTE supplemental plaque (D11-1bP), may be substituted for the D11-1 Bicycle Route Guide sign on paths and shared roadways.
- 04 When some, but not all, non-motorized user types are encouraged or permitted on a shared-use path, Mode-Specific Guide signs may be placed in combination with each other, and in combination with signs (see Section 9B.09) that prohibit travel by particular modes.

### Support:

- 05 Figure 9B-8 shows an example of signing where separate pathways are provided for different non-motorized user types.

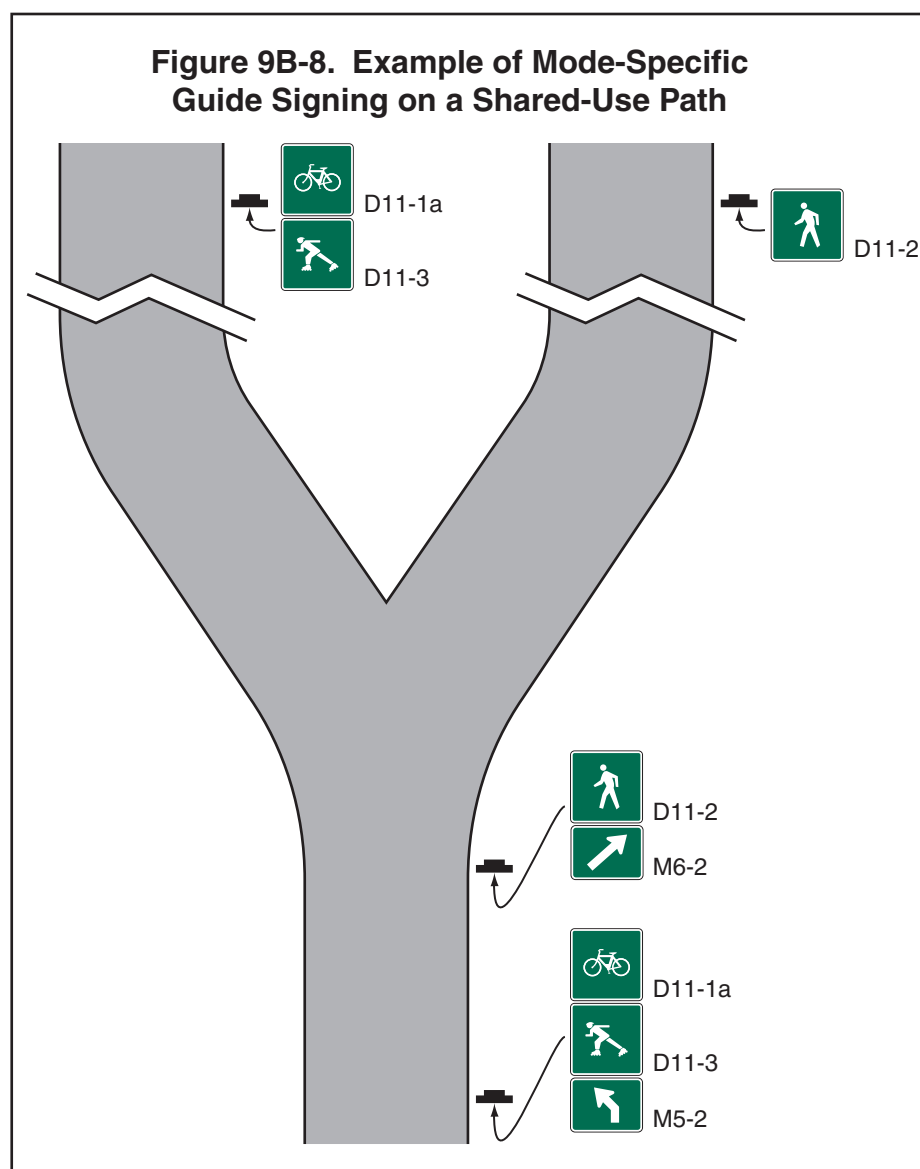
## Section 9B.26 Object Markers

### Option:

- 01 Fixed objects adjacent to shared-use paths may be marked with Type 1, Type 2, or Type 3 object markers (see Figure 9B-3) such as those described in Section 2C.63. If the object marker is not intended to also be seen by motorists, a smaller version of the Type 3 object marker may be used (see Table 9B-1).

### Standard:

- 02 **Obstructions in the traveled way of a shared-use path shall be marked with retroreflectorized material or appropriate object markers.**
- 03 **All object markers shall be retroreflective.**
- 04 **On Type 3 object markers, the alternating black and retroreflective yellow stripes shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the obstruction.**



## CHAPTER 9C. MARKINGS

### Section 9C.01 Functions of Markings

Support:

- 01 Markings indicate the separation of the lanes for road users, assist the bicyclist by indicating assigned travel paths, indicate correct position for traffic control signal actuation, and provide advance information for turning and crossing maneuvers.

### Section 9C.02 General Principles

Guidance:

- 01 *Bikeway design guides (see Section 9A.05) should be used when designing markings for bicycle facilities.*

**Standard:**

- 02 **Markings used on bikeways shall be retroreflectorized.**

Guidance:

- 03 *Pavement marking word messages, symbols, and/or arrows should be used in bikeways where appropriate. Consideration should be given to selecting pavement marking materials that will minimize loss of traction for bicycles under wet conditions.*

**Standard:**

- 04 **The colors, width of lines, patterns of lines, symbols, and arrows used for marking bicycle facilities shall be as defined in Sections 3A.05, 3A.06, and 3B.20.**

Support:

- 05 Figures 9B-7 and 9C-1 through 9C-9 show examples of the application of lines, word messages, symbols, and arrows on designated bikeways.

Option:

- 06 A dotted line may be used to define a specific path for a bicyclist crossing an intersection (see Figure 9C-1) as described in Sections 3A.06 and 3B.08.

### Section 9C.03 Marking Patterns and Colors on Shared-Use Paths

Option:

- 01 Where shared-use paths are of sufficient width to designate two minimum width lanes, a solid yellow line may be used to separate the two directions of travel where passing is not permitted, and a broken yellow line may be used where passing is permitted (see Figure 9C-2).

Guidance:

- 02 *Broken lines used on shared-use paths should have the usual 1-to-3 segment-to-gap ratio. A nominal 3-foot segment with a 9-foot gap should be used.*
- 03 *If conditions make it desirable to separate two directions of travel on shared-use paths at particular locations, a solid yellow line should be used to indicate no passing and no traveling to the left of the line.*
- 04 *Markings as shown in Figure 9C-2 should be used at the location of obstructions in the center of the path, including vertical elements intended to physically prevent unauthorized motor vehicles from entering the path.*

Option:

- 05 A solid white line may be used on shared-use paths to separate different types of users. The R9-7 sign (see Section 9B.12) may be used to supplement the solid white line.
- 06 Smaller size letters and symbols may be used on shared-use paths. Where arrows are needed on shared-use paths, half-size layouts of the arrows may be used (see Section 3B.20).

### Section 9C.04 Markings For Bicycle Lanes

Support:

- 01 Pavement markings designate that portion of the roadway for preferential use by bicyclists. Markings inform all road users of the restricted nature of the bicycle lane.

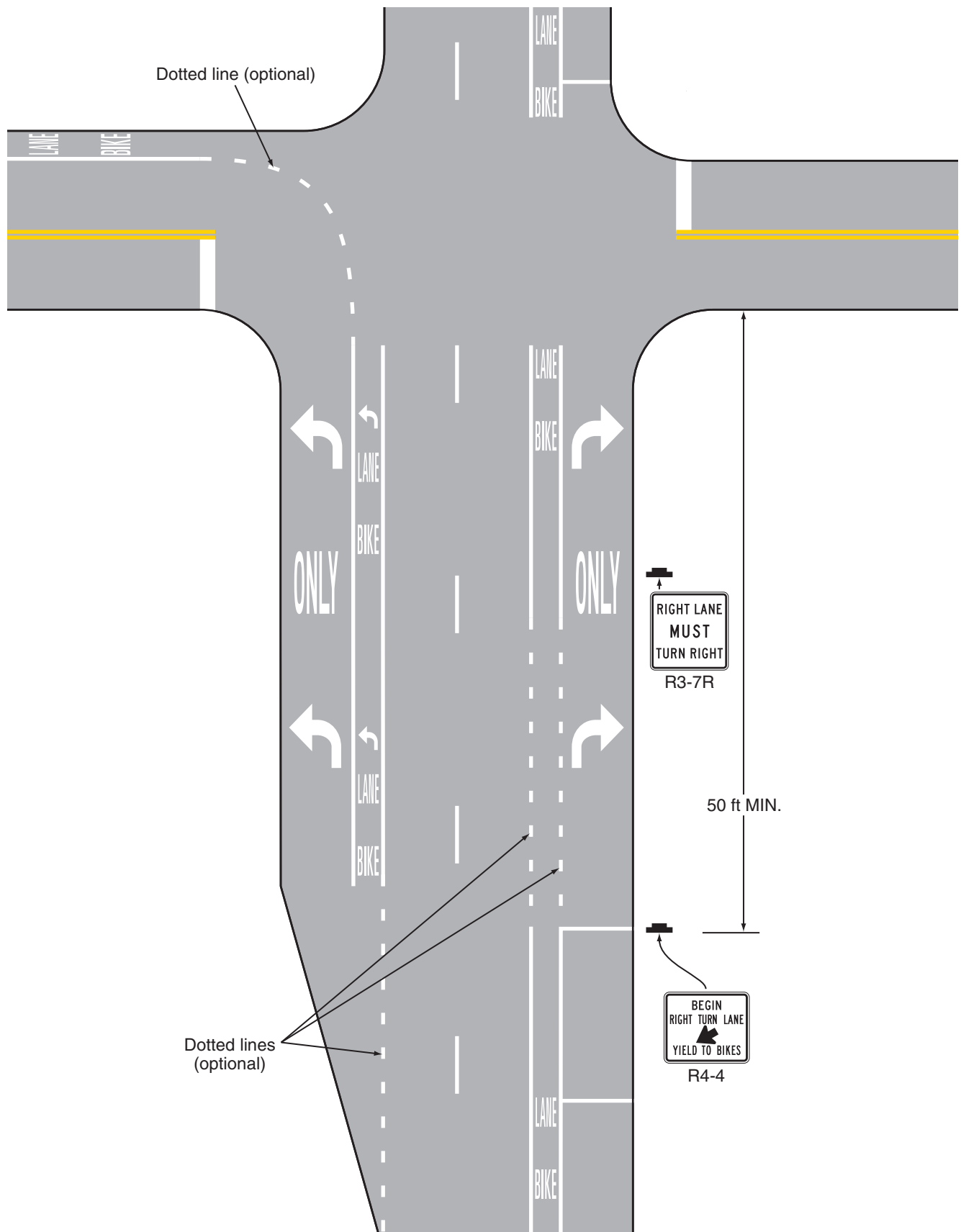
**Standard:**

- 02 **Longitudinal pavement markings shall be used to define bicycle lanes.**

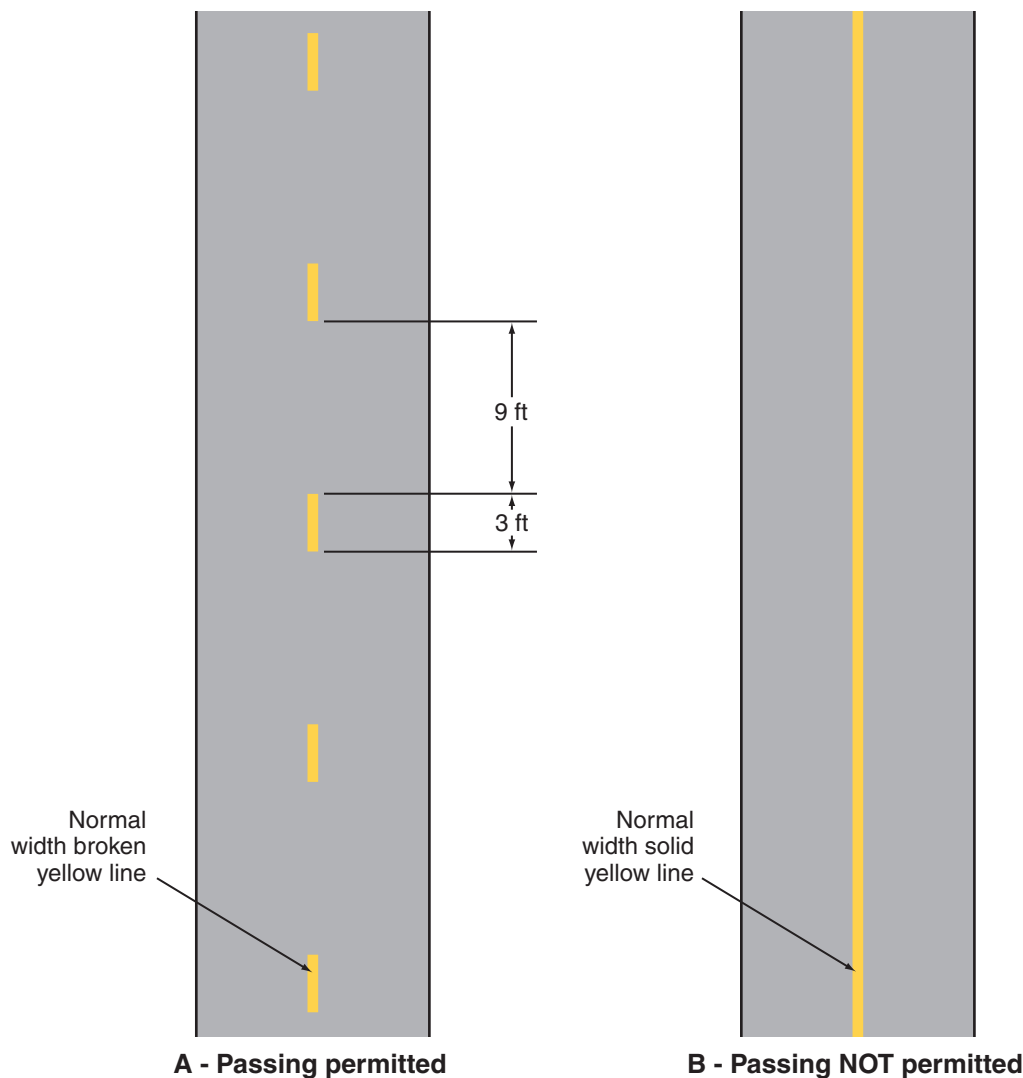
Guidance:

- 03 *If used, bicycle lane word, symbol, and/or arrow markings (see Figure 9C-3) should be placed at the beginning of a bicycle lane and at periodic intervals along the bicycle lane based on engineering judgment.*

**Figure 9C-1. Example of Intersection Pavement Markings—Designated Bicycle Lane with Left-Turn Area, Heavy Turn Volumes, Parking, One-Way Traffic, or Divided Highway**





**Figure 9C-2. Examples of Center Line Markings for Shared-Use Paths****Standard:**

04 **If the bicycle lane symbol marking is used in conjunction with word or arrow messages, it shall precede them.**

**Option:**

05 If the word, symbol, and/or arrow pavement markings shown in Figure 9C-3 are used, Bike Lane signs (see Section 9B.04) may also be used, but to avoid overuse of the signs not necessarily adjacent to every set of pavement markings.

**Standard:**

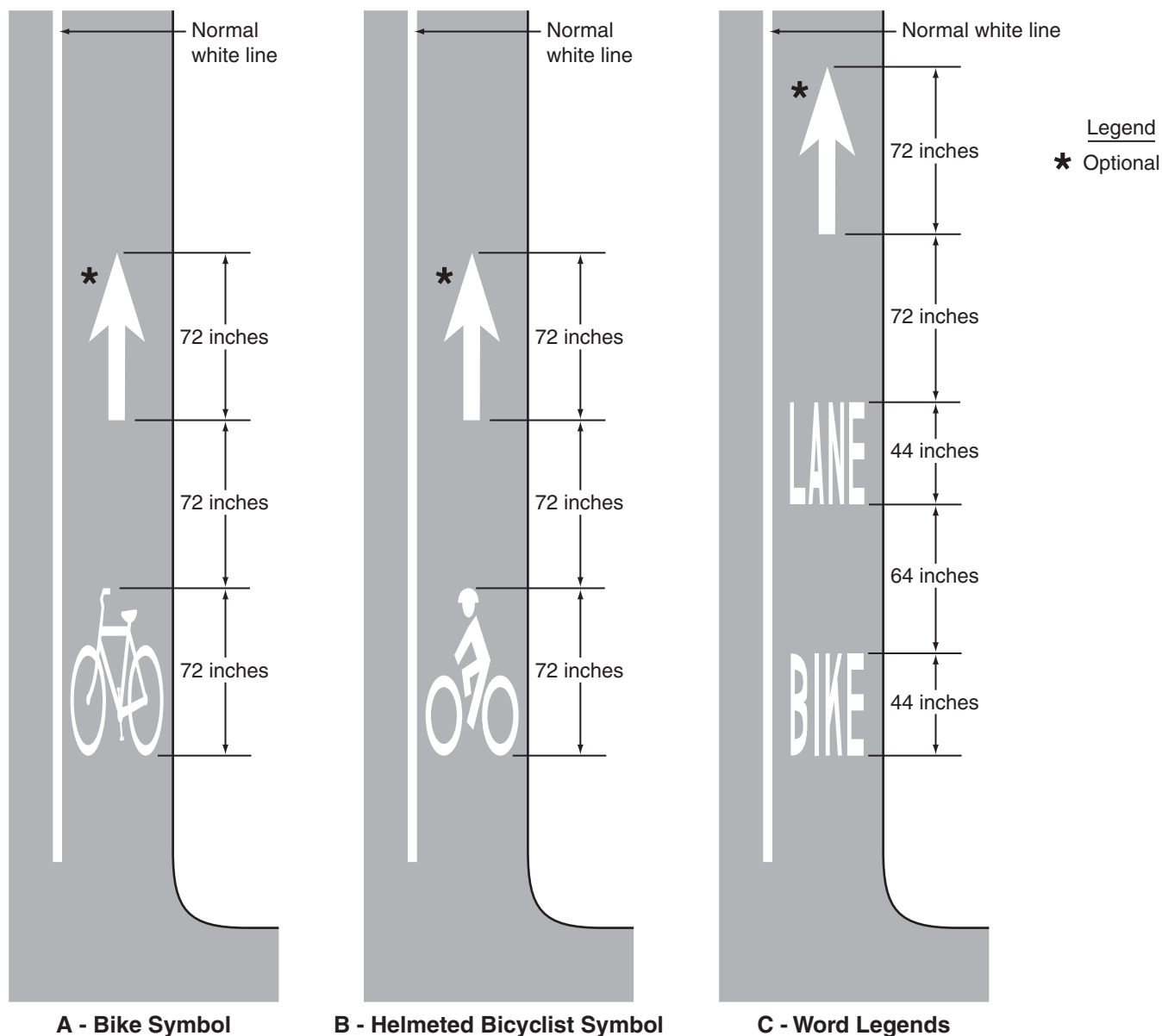
06 **A through bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.**

**Support:**

07 A bicyclist continuing straight through an intersection from the right of a right-turn lane or from the left of a left-turn lane would be inconsistent with normal traffic behavior and would violate the expectations of right- or left-turning motorists.

**Guidance:**

08 *When the right through lane is dropped to become a right turn only lane, the bicycle lane markings should stop at least 100 feet before the beginning of the right-turn lane. Through bicycle lane markings should resume to the left of the right turn only lane.*

**Figure 9C-3. Word, Symbol, and Arrow Pavement Markings for Bicycle Lanes**

09 *An optional through-right turn lane next to a right turn only lane should not be used where there is a through bicycle lane. If a capacity analysis indicates the need for an optional through-right turn lane, the bicycle lane should be discontinued at the intersection approach.*

10 *Posts or raised pavement markers should not be used to separate bicycle lanes from adjacent travel lanes.*  
Support:

11 *Using raised devices creates a collision potential for bicyclists by placing fixed objects immediately adjacent to the travel path of the bicyclist. In addition, raised devices can prevent vehicles turning right from merging with the bicycle lane, which is the preferred method for making the right turn. Raised devices used to define a bicycle lane can also cause problems in cleaning and maintaining the bicycle lane.*

**Standard:**

12 **Bicycle lanes shall not be provided on the circular roadway of a roundabout.**

*Guidance:*

13 *Bicycle lane markings should stop at least 100 feet before the crosswalk, or if no crosswalk is provided, at least 100 feet before the yield line, or if no yield line is provided, then at least 100 feet before the edge of the circulatory roadway.*

**Support:**

- 14 Examples of bicycle lane markings at right-turn lanes are shown in Figures 9C-1, 9C-4, and 9C-5. Examples of pavement markings for bicycle lanes on a two-way street are shown in Figure 9C-6. Pavement word message, symbol, and arrow markings for bicycle lanes are shown in Figure 9C-3.

**Section 9C.05 Bicycle Detector Symbol****Option:**

- 01 A symbol (see Figure 9C-7) may be placed on the pavement indicating the optimum position for a bicyclist to actuate the signal.
- 02 An R10-22 sign (see Section 9B.13 and Figure 9B-2) may be installed to supplement the pavement marking.

**Section 9C.06 Pavement Markings for Obstructions****Guidance:**

- 01 *In roadway situations where it is not practical to eliminate a drain grate or other roadway obstruction that is inappropriate for bicycle travel, white markings applied as shown in Figure 9C-8 should be used to guide bicyclists around the condition.*

**Section 9C.07 Shared Lane Marking****Option:**

- 01 The Shared Lane Marking shown in Figure 9C-9 may be used to:
- A. Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle,
  - B. Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,
  - C. Alert road users of the lateral location bicyclists are likely to occupy within the traveled way,
  - D. Encourage safe passing of bicyclists by motorists, and
  - E. Reduce the incidence of wrong-way bicycling.

**Guidance:**

- 02 *The Shared Lane Marking should not be placed on roadways that have a speed limit above 35 mph.*

**Standard:**

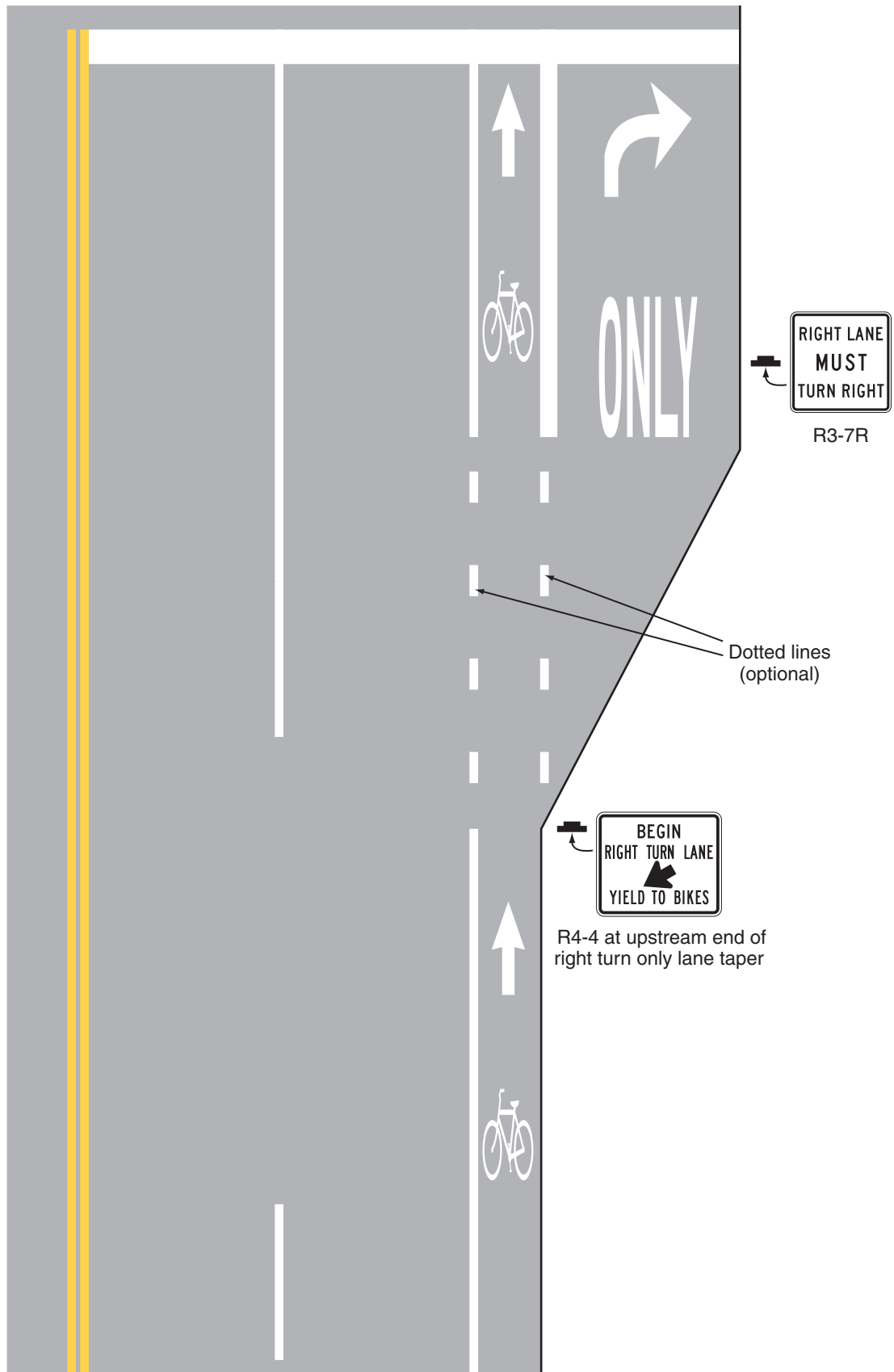
- 03 **Shared Lane Markings shall not be used on shoulders or in designated bicycle lanes.**

**Guidance:**

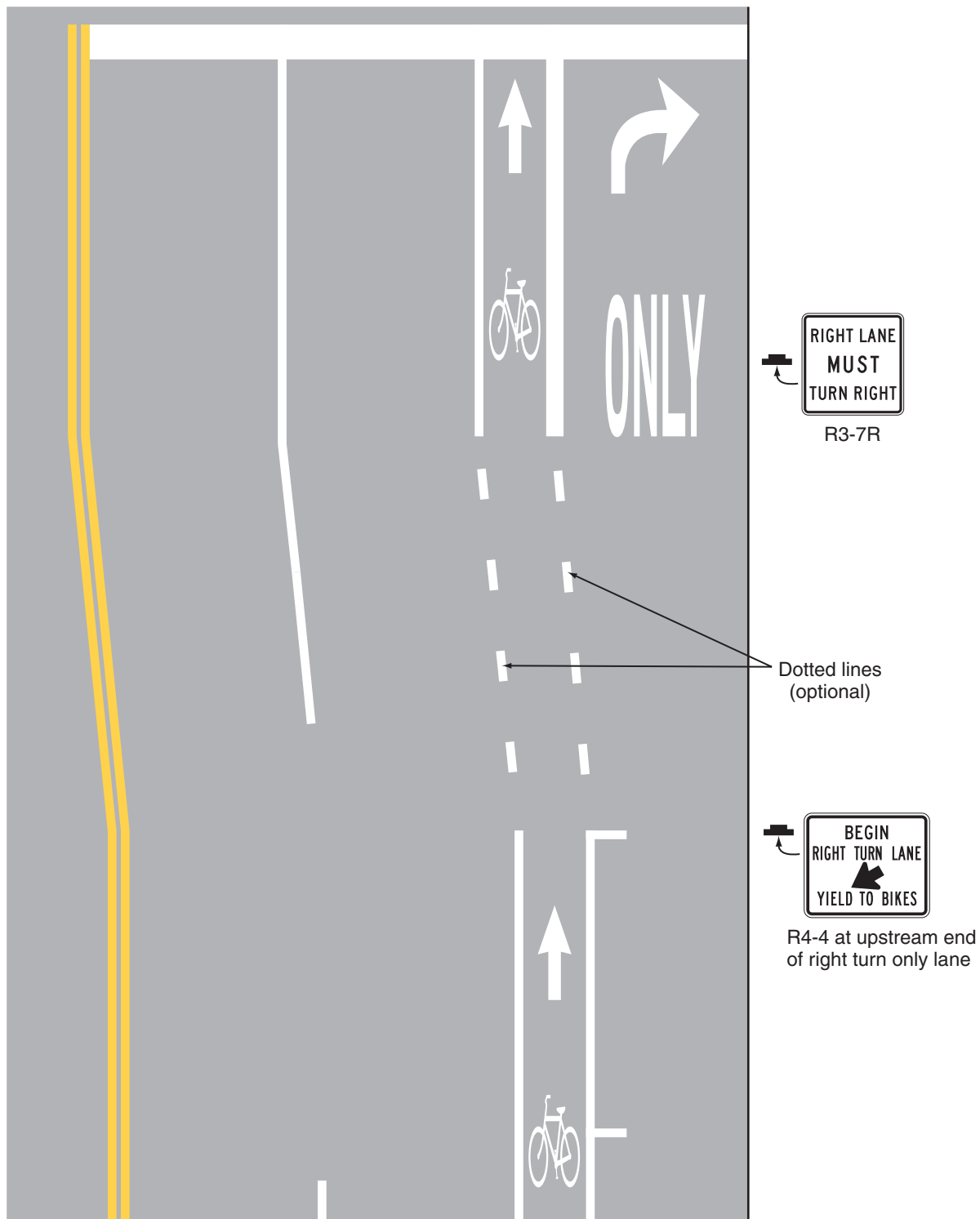
- 04 *If used in a shared lane with on-street parallel parking, Shared Lane Markings should be placed so that the centers of the markings are at least 11 feet from the face of the curb, or from the edge of the pavement where there is no curb.*
- 05 *If used on a street without on-street parking that has an outside travel lane that is less than 14 feet wide, the centers of the Shared Lane Markings should be at least 4 feet from the face of the curb, or from the edge of the pavement where there is no curb.*
- 06 *If used, the Shared Lane Marking should be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter.*

**Option:**

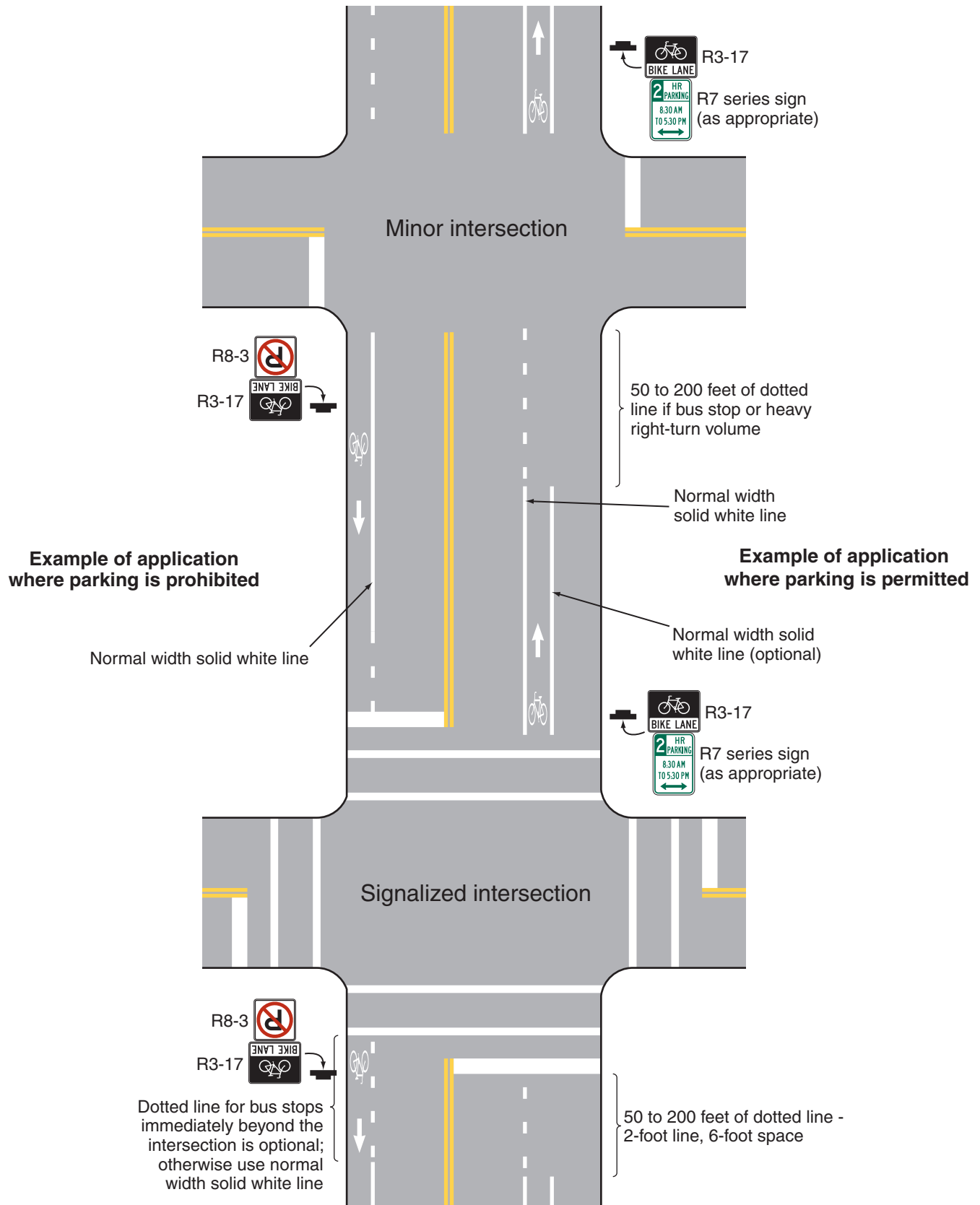
- 07 Section 9B.06 describes a Bicycles May Use Full Lane sign that may be used in addition to or instead of the Shared Lane Marking to inform road users that bicyclists might occupy the travel lane.

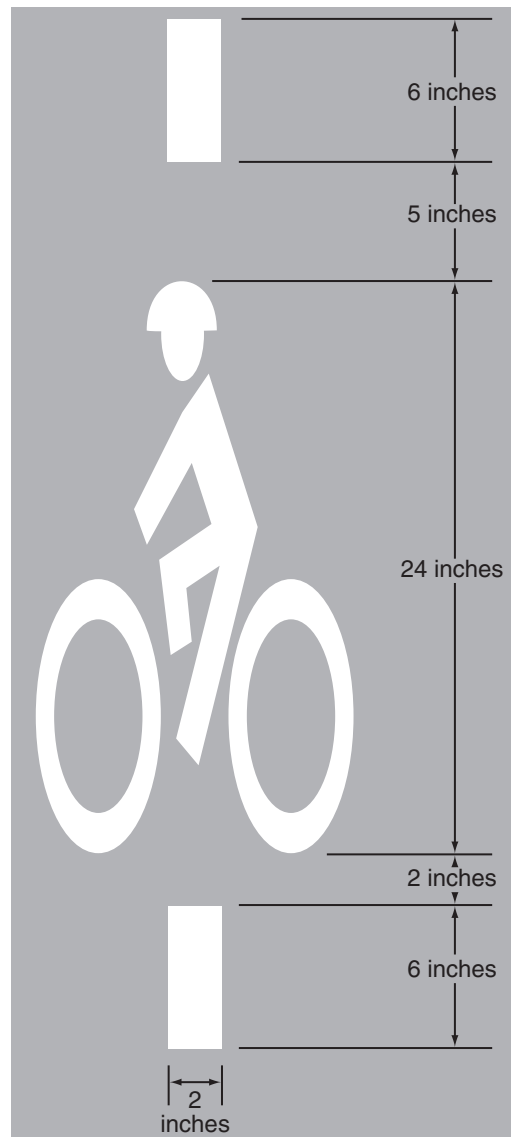
**Figure 9C-4. Example of Bicycle Lane Treatment at a Right Turn Only Lane**

**Figure 9C-5. Example of Bicycle Lane Treatment at Parking Lane into a Right Turn Only Lane**

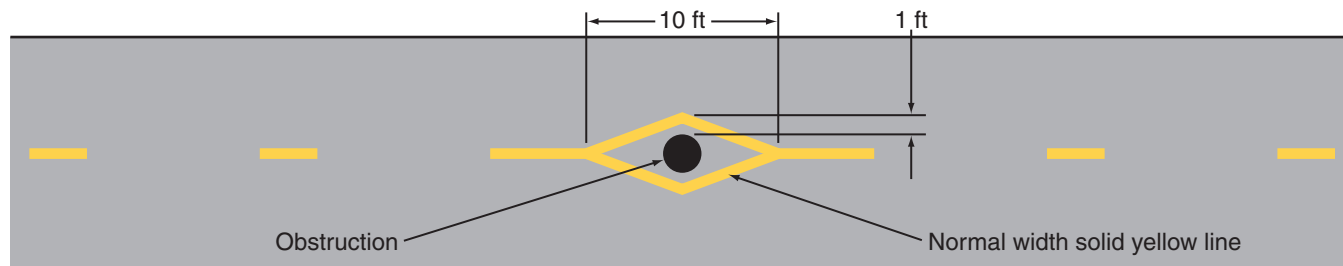
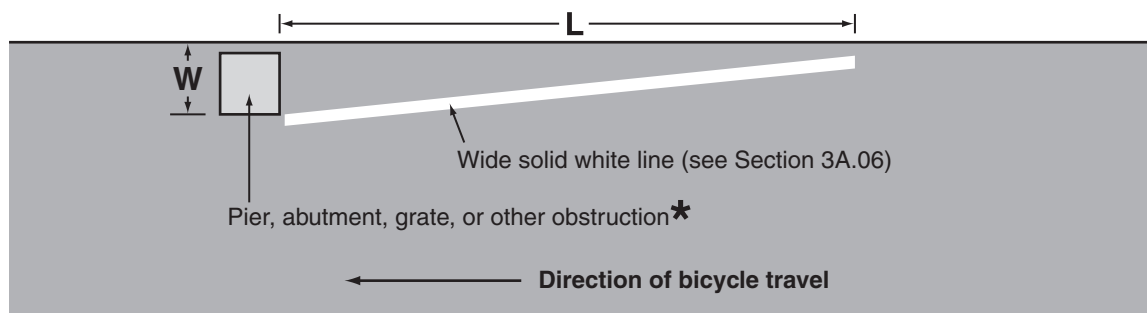


**Figure 9C-6. Example of Pavement Markings for Bicycle Lanes on a Two-Way Street**



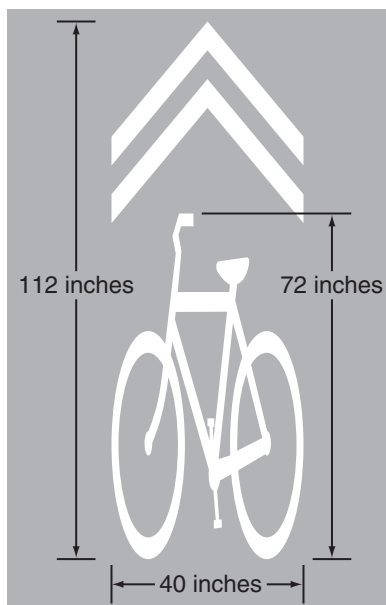
**Figure 9C-7. Bicycle Detector Pavement Marking**



**Figure 9C-8. Examples of Obstruction Pavement Markings****A - Obstruction within the path****B - Obstruction at edge of path or roadway**

$L = WS$ , where  $W$  is the offset in feet and  $S$  is bicycle approach speed in mph

★ Provide an additional foot of offset for a raised obstruction and use the formula  
 $L = (W+1) S$  for the taper length

**Figure 9C-9. Shared Lane Marking**

## CHAPTER 9D. SIGNALS

### Section 9D.01 Application

Support:

- 01 Part 4 contains information regarding signal warrants and other requirements relating to signal installations.

Option:

- 02 For purposes of signal warrant evaluation, bicyclists may be counted as either vehicles or pedestrians.

### Section 9D.02 Signal Operations for Bicycles

Standard:

- 01 At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.
- 02 On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists.

**Document N:**  
**FHWA Context Sensitive Solutions for**  
**Bicycles**

### 2.1.2: Bicycle Transportation

Bicycles are legally classified as vehicles, and are allowed on most public roads in Georgia with exceptions such as freeways. A **bikeway** is created when a street has the appropriate design treatment to accommodate bicyclists, based on motor vehicle traffic volumes and speed. The basic design treatments used to accommodate bicycle travel on the street are:

- shared roadway (B1-B3)
- shoulder bikeway (B4)
- bike lane (B5)
- multi-use path (B6)

#### Measures to Enhance BICYCLE Accessibility and Mobility:

##### **B1. SHARE ROADWAY - TYPE 1**

- Most suitable for residential streets with low travel speeds and traffic volumes.
- Bicyclists and motorists share the same travel lanes.
- A motorist will usually have to cross over onto the adjacent travel lane to pass a bicyclist. travel lanes for motorized vehicles and is open to bicycles, pedestrians, rollerbladers and skateboarders.



Orengo Community Station, OR

##### **B2. SHARE ROADWAY - TYPE 2**

- Allows an average size motor vehicle to pass a bicyclist without crossing over into the adjacent lane.
- Could be appropriate where shoulder bikeways or bike lanes are warranted but cannot be provided due to physical constraints, or on streets where traffic speed is around 20 mph.



Berkeley, CA

## 2. Alternative Strategies and Measures

### Measures to Enhance BICYCLE Accessibility and Mobility:

#### **B3. SHARE ROADWAY - TYPE 3**

- Created by modifying local street operation to function as a through street for bicycles, while maintaining local access for automobiles.
- Traffic calming devices control traffic speeds and discourage through trips by automobiles.
- Traffic controls are needed to limit conflicts between automobiles and bicycles and give priority to through bicycle movement.



Reverse flow bike lane; Boulder, CO

#### **B4. SHOULDER BIKE PATH**

- Paved shoulders on rural, state highways could accommodate bicycle travel.
- Minimizes conflicts with faster moving motor vehicle traffic.



Source: [www.fhwa.gov](http://www.fhwa.gov)

#### **B5. BIKE LANE**

- A portion of the roadway is designated for bicyclists.
- Appropriate on urban arterial and collector streets.
- Bike lanes must be at least four feet wide and clearly marked and identified to direct motorist attention to their preferred use by bicyclists.
- May be appropriate on county and rural roads where there is existing or potential demand for bicycle travel.



Portland, OR

#### **B6. MULTI-USE PATH**

- Typically a two-way, paved facility, used by pedestrians, joggers, skaters and bicyclists.
- Separated from motor vehicle traffic by an open space or barrier.
- Either within the roadway right-of-way or within an independent right-of-way.
- Most suited in recreation corridors / linear greenways, as elements of a community open space and trail plan.
- May be appropriate in transportation corridors not well served by the street system.



Vancouver, WA

**Appendix: F**  
**Streetplan Results**  
**Greenville, SC Bicycle Master Plan**  
**December 2011**

Street Name	Start of Segment - Nearest Cross Street & Offset Distance or Description (Ex. 50 E MAIN = 50 feet east of Main)	End of Segment - Nearest Cross Street & Offset Distance or Description (Ex. 50 E MAIN = 50 feet east of Main)	Street Width (curb to curb)	Shoulder 1 (Width of SB or WB striped shoulder, if present)	Width Right Turn Lane (Width of SB or WB right turn lane)	Width of left SB or WB Outside Lane (including on-street parking)	Width Inside Travel Lane 1 (SB or WB inside travel lane)	Width Inside Travel Lane 2 (SB or WB inside travel lane)	Width of Median	Is there a raised Median?	Width Inside Travel Lane 3 (NB or EB inside travel lane)	Width Inside Travel Lane 4 (NB or EB inside travel lane)	Width of right NB or EB Outside Lane (including on-street parking)	Width of Right Turn Lane (Width of SB or WB right turn lane)	Shoulder2 (Width of NB or EB striped shoulder, if present)	Number of travel directions	# of Travel Lanes (curb-to-curb)	# of Right Turn Lanes	# of Center or Left Turn Lanes	# of Parking Lanes	Parking not necessary	Shoulder Space Available	Need bike lanes based on volume? (Projected ADT >= BL_MIN_ADT)	Restripe existing outside lanes	Reconfigure lane or parking widths	Remove parking where not necessary	4 to 3 Road Diet Candidate (4 Lanes, No Center-Left Turn Lane)	Remove parking lanes	Add additional roadway width and stripe bikelanes	Final Outcome for GIS (controls GIS line color)	
TEXT	TEXT	TEXT	FTD	FTD	FTD	FTD	FTD	FTD	FTD	BOOL	FTD	FTD	FTD	FTD	FTD	1 or 2	INT	INT	INT	INT	BOOL	Bool	BOOL	BOOL	BOOL	BOOL	4 to 3 Road Diet Candidate (4 Lanes, No Center-Left Turn Lane)	BOOL	Bool	Bool	INT 0.5
Name	From (N or W)	To (S or E)	SW	SH1	RTL1	OS1	ITL1	ITL2	M	RaisedM	ITL3	ITL4	OS2	RTL2	SH2	D	T	RL	CL	P		Num5	Num1	Num2	Num3	Num4	Num6	Num7	GIS Outcome		
ANDERSON ST	S MAIN ST	LINCOLN ST	31.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	15.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
ASHLEY AV	RUTHERFORD RD	WILTON ST	19.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0	9.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
ASHLEY AV	WILTON ST	TOWNES ST EXT	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
ASHLEY AV	TOWNES ST EXT	N MAIN ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
AUGUSTA RD	POTOMAC AV	CITY LIMITS	74.0	0.0	0.0	14.0	16.5	0.0	20.5	1.0	11.0	0.0	14.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
AUGUSTA ST	AUGUSTA DR	CRYSTAL AV	40.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	10.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	
AUGUSTA ST	S MAIN ST	FIELD ST	46.0	0.0	0.0	9.0	14.0	0.0	0.0	0.0	14.5	0.0	9.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6	
AUGUSTA ST	FIELD ST	VARDRY ST	44.0	0.0	0.0	11.5	11.5	0.0	10.5	0.0	0.0	0.0	11.0	0.0	0.0	2.0	3.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
AUGUSTA ST	VARDRY ST	DUNBAR ST	42.0	0.0	0.0	10.5	10.5	0.0	0.0	0.0	10.5	0.0	10.5	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	
AUGUSTA ST	DUNBAR ST	WOODFIN AV	40.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	10.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	
AUGUSTA ST	WOODFIN AV	W PRENTISS AV	62.0	0.0	0.0	11.0	11.0	0.0	15.5	1.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
AUGUSTA ST	W PRENTISS AV	150 SE GROVE RD	56.0	0.0	0.0	12.0	12.0	0.0	4.0	1.0	17.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	1	0	0	2	
AUGUSTA ST	150 SE GROVE RD	CATEECHEE AV	50.0	0.0	0.0	11.5	13.0	0.0	0.0	0.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	
AUGUSTA ST	CATEECHEE AV	MELVILLE AV	42.0	0.0	0.0	10.5	10.5	0.0	0.0	0.0	10.5	0.0	10.5	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	
AUGUSTA ST	CATEECHEE AV	CURETON ST	64.0	0.0	0.0	11.0	12.0	0.0	15.0	1.0	12.0	0.0	13.0	0.0	0.0	2.0	5.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
AUGUSTA ST	CURETON ST	AUGUSTA DR	62.0	0.0	0.0	12.0	11.5	0.0	13.0	0.0	13.0	0.0	11.5	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	1	0	0	2	
AUGUSTA ST	CRYSTAL AV	POTOMAC AV	76.0	0.0	0.0	12.5	11.5	0.0	27.5	1.0	11.5	0.0	14.5	0.0	0.0	2.0	4.0	0.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
BATESVIEW DR	WADE HAMPTON BLVD	E NORTH ST	32.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	1	1	0	0	0	1	1	
BEATTIE PL	N CHURCH ST	E NORTH ST	58.0	0.0	0.0	12.0	11.5	11.0	0.0	0.0	10.5	0.0	12.0	0.0	0.0	1.0	5.0	0.0	0.0	0.0	0.0	0.0	1	1	0	0	0	0	0	1	
BEATTIE PL	N MAIN ST	INSIGNIA PL	46.0	0.0	0.0	11.0	11.0	12.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	1	1	0	0	1	0	0	1	
BEATTIE PL	INSIGNIA PL	N CHURCH ST	40.0	0.0	0.0	10.0	11.0	10.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	1	1	0	0	1	0	0	1	
BIRNIE ST	HANOVER ST	S HUDSON ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	1	1	0	0	0	1	1	
BUNCOMBE RD	725 N SHAW ST		36.0	0.0	0.0	12.8	0.0	0.0	10.0	0.0	0.0	0.0	13.5	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
BUNCOMBE RD	SHAW ST	PETE HOLLIS BLVD	36.0	0.0	0.0	13.0	0.0	0.0	10.0	0.0	0.0	0.0	13.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
BUNCOMBE ST	RUTHERFORD ST	HERITAGE GREEN PL	74.0	0.0	0.0	11.0	11.0	11.0	9.5	0.0	10.0	11.0	10.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
BUNCOMBE ST	RUTHERFORD ST	N ACADEMY ST	38.0	0.0	14.0	10.5	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	1.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
BUNCOMBE ST	N ACADEMY ST	RICHARDSON ST	40.0	9.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	1.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
BUTLER AV	BUNCOMBE ST	W WASHINGTON ST	36.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6	
CHICK SPRINGS RD	RUTHERFORD RD	MOHAWK DR	22.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
CLEVELAND PARK DR	E WASHINGTON ST	RIDGELAND DR	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
CLEVELAND ST	E CAMPERD OWN WY	SOUTHLAND AV	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
CLEVELAND ST	SOUTHLAND AV	CRESCENT AV	56.0	0.0	0.0	10.5	10.5	0.0	11.5	0.0	10.5	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
CLEVELAND ST	CRESCENT AV	325 E E FARIS RD	46.0	0.0	0.0	12.5	0.0	0.0	11.5	0.0	10.5	0.0	11.5	0.0	0.0	2.0	3.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
CLEVELAND ST	325 E E FARIS RD	UNNAMED STREET	26.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
CLEVELAND ST	UNNAMED STREET	500 NW CLEVELAND CT	34.0	6.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	1	0	0	0	1	2	
CLEVELAND ST	500 NW CLEVELAND CT	700 S CLEVELAND CT	44.0	0.0	0.0	12.5	0.0	0.0	15.0	0.0	0.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	1.0	1	0	1	0	0	0	1	2	
CLEVELAND ST	700 S CLEVELAND CT	450 W WINTERBERRY CT	26.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
CLEVELAND ST EXT	HENDERSON RD	E PARKINS MILL RD	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
CLEVELAND ST EXT	S PLEASANTBURG DR	PARKINS MILL RD	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
CLEVELAND ST EXT	PARKINS MILL RD	HENDERSON RD	25.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
COLLEGE ST	HERITAGE GREEN PL	N MAIN ST	53.0	0.0	0.0	12.0	12.5	12.5	0.0	0.0	0.0	0.0	16.5	0.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	1	0	0	1	
COLLEGE ST	HERITAGE GREEN PL	N ACADEMY ST	47.0	0.0	0.0	13.5	12.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
CONGAREE RD	WOODS CROSSING RD	GRIFFITH RD	36.0	0.0	0.0	11.0	0.0	0.0	12.5	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
CONGAREE RD	1000 E ROAD END	WOODS CROSSING RD	39.0	0.0	0.0	14.0	0.0	0.0	13.0	0.0	0.0	0.0	13.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
CONGAREE RD	GRIFFITH RD	ROPER MOUNTAIN RD	42.0	0.0	0.0	12.0	0.0	0.0	16.0	0.0	0.0	0.0	13.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
CONGAREE RD	ROAD END	1000 E ROAD END	23.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
DUNBAR ST	S LEACH ST	AUGUSTA ST	64.0	0.0	0.0	12.5	12.0	0.0	13.5	0.0	12.0	0.0	12.5	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0									



E NORTH ST	MANLY ST	I-385	82.0	0.0	0.0	11.5	11.0	0.0	13.5	1.0	11.0	12.0	11.5	0.0	0.0	2.0	6.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
E NORTH ST	WHITE OAK DR	N PLEASANTSBURG DR	40.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	10.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
E PARKINS MILL RD	ISELL LA	PARKINS MILL RD	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	
E PARKINS MILL RD	LAURENS RD	RIDGE RD	36.0	0.0	0.0	12.0	0.0	0.0	11.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
E PARKINS MILL RD	RIDGE RD	ISELL LA	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
E STONE AV	N MAIN ST	FERN AV	44.0	0.0	0.0	12.0	10.0	0.0	0.0	0.0	11.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
E STONE AV	FERN AV	E PARK AV	62.0	0.0	0.0	13.0	12.0	0.0	14.0	1.0	12.0	0.0	11.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
E STONE AV	E PARK AV	ACCESS RAMP	80.0	0.0	0.0	11.5	12.0	13.5	13.5	1.0	11.0	0.0	13.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
E STONE AV	ACCESS RAMP		82.0	0.0	0.0	13.0	13.5	0.0	4.0	1.0	13.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	2.0	0.0	0	0	1	0	1	0	0	0	0	2
EASLEY BRIDGE RD	PENDLETON ST	CITY LIMITS	65.0	0.0	0.0	11.5	12.0	0.0	13.0	1.0	11.5	0.0	16.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
FAIRFOREST WY	RIDGE ST	MAULDIN RD	58.0	0.0	0.0	11.5	13.5	0.0	10.0	1.0	12.0	0.0	11.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
FAIRFOREST WY	LAURENS RD	JACQUILINE LA	57.0	0.0	0.0	14.0	0.0	0.0	17.0	0.0	11.0	0.0	15.0	0.0	0.0	2.0	3.0	0.0	1.0	0.0	0.0	1.0	1	0	1	0	0	0	1	2
FAIRFOREST WY	JACQUILINE LA	RIDGE ST	41.0	0.0	0.0	13.0	0.0	0.0	13.0	0.0	0.0	0.0	14.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	1.0	1	0	1	0	0	0	1	2
FRONTAGE RD	INTERNATIONAL DR	MARCUS BLVD	24.0	1.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	1.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
FRONTAGE RD	PATEWOOD DR	INTERNATIONAL DR	26.5	1.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	0.0	1.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
FRONTAGE RD	MARCUS BLVD	ROPER MOUNTAIN RD	22.0	1.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	1.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
GALLIVAN ST	N MAIN ST	BENNETT ST	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
GALLIVAN ST	BENNETT ST	MOHAWK DR	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
GREEN AV	DUNBAR ST	350 SW GUESS ST	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
GREEN AV	S MARKLEY ST	DUNBAR ST	22.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
GREEN AV	350 SW GUESS ST	CITY LIMITS	28.0	3.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	4.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
GROVE RD	AUGUSTA ST	BROOKWAY DR	39.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	10.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
GROVE RD	BROOKWAY DR	HENRYDALE ST	46.0	0.0	0.0	13.0	10.0	0.0	0.0	0.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
GROVE RD	HENRYDALE ST	W FARIS RD	46.0	0.0	0.0	13.0	10.0	0.0	0.0	0.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	1	0	1	4
HAMPTON AV	MAY AV	FRANK ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	1	1	0	0	0	1	1
HAMPTON AV	FRANK ST		34.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	1	0	0	0	1
HAMPTON AV	FRANK ST	MULBERRY ST	34.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	1	0	0	0	1
HAMPTON AV	MULBERRY ST	BUTLER AV	40.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	1.0	1	0	0	0	0	1	1	6
HAMPTON AV	BUTLER AV	N ACADEMY ST	36.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
HAYWOOD RD	CRYSTAL SPRINGS RD	PELHAM RD	64.0	0.0	0.0	13.0	11.5	0.0	15.5	0.0	11.5	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	PELHAM RD	ORCHARD PARK DR	88.0	0.0	0.0	13.5	12.5	0.0	25.0	0.0	13.0	0.0	12.0	12.5	0.0	2.0	4.0	1.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	WOODS CROSSING RD	LAURENS RD	62.0	0.0	0.0	12.0	12.0	0.0	14.0	0.0	12.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
HAYWOOD RD	ACCESS RAMP	800 N WOODS LAKE RD	93.0	0.0	0.0	13.5	12.5	0.0	30.0	1.0	10.5	0.0	12.5	12.5	0.0	2.0	4.0	1.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	ORCHARD PARK DR	ACCESS RAMP	120.0	0.0	13.0	12.0	12.0	13.5	23.5	1.0	15.0	11.5	13.0	0.0	0.0	2.0	6.0	1.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	ACCESS RAMP	ACCESS RAMP	95.0	0.0	0.0	13.5	0.0	0.0	53.0	0.0	12.0	0.0	16.0	0.0	0.0	2.0	3.0	0.0	4.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	800 N WOODS LAKE RD	500 N WOODS LAKE RD	66.0	0.0	0.0	14.0	11.0	0.0	14.0	1.0	10.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HAYWOOD RD	500 N WOODS LAKE RD	WOODS CROSSING RD	62.0	0.0	0.0	12.5	13.0	0.0	13.5	0.0	11.5	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
HAYWOOD-HOWELL RD	CITY LIMITS	CRYSTAL SPRINGS RD	64.0	0.0	0.0	13.0	11.5	0.0	15.5	0.0	11.5	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
HOWE ST	BRADSHAW ST	UNIVERSITY RIDGE	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1
HOWE ST	UNIVERSITY ST	BRADSHAW ST	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
JONES AV	CARROLL LA	AUGUSTA ST	25.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
JONES AV	PEARL AV	CARROLL LA	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1
LAURENS RD	E NORTH ST	LANCE ST	80.0	0.0	0.0	13.0	13.0	0.0	16.0	1.0	12.0	12.0	12.0	0.0	0.0	2.0	5.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	LANCE ST	EASTLAN DR	63.0	0.0	0.0	13.0	12.0	0.0	14.0	0.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	EASTLAN DR	AIRPORT RD	63.0	0.0	0.0	13.0	12.0	0.0	14.0	1.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	EASTLAN DR	E ANTRIM DR	90.0	0.0	12.0	12.0	14.0	0.0	22.0	1.0	17.0	0.0	13.0	0.0	0.0	2.0	4.0	1.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	E ANTRIM DR	LINDSAY AV	86.0	0.0	0.0	12.0	16.5	0.0	34.0	1.0	12.0	0.0	12.5	0.0	0.0	2.0	4.0	0.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	LINDSAY AV	600 N HAYWOOD RD	64.0	0.0	0.0	12.0	12.0	0.0	15.0	0.0	13.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	600 N HAYWOOD RD	LAUREL CREEK LA	88.0	0.0	0.0	11.0	12.0	0.0	28.0	1.0	11.0	12.5	12.0	0.0	0.0	2.0	4.0	0.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	LAUREL CREEK LA	WOODRUFF RD	86.0	0.0	0.0	12.0	11.5	0.0	26.5	1.0	11.0	12.0	12.0	0.0	0.0	2.0	5.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
LAURENS RD	LAUREL CREEK LA	650 N VERDAE BLVD	88.0	0.0	0.0	11.5	11.5	12.0	15.5	1.0	12.0	12.0	12.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0								

N CHURCH ST	E NORTH ST	E COFFEE ST	70.0	0.0	0.0	10.0	10.0	10.0	8.0	1.0	11.0	0.0	10.5	10.0	0.0	2.0	4.0	1.0	0.0	0.0	0.0	0.0	1	0	1	0	1	0	0	2
N CHURCH ST	E COFFEE ST	E WASHINGTON ST	72.0	0.0	12.0	12.0	11.0	0.0	12.5	0.0	12.5	0.0	12.0	10.0	0.0	2.0	4.0	1.0	0.0	0.0	0.0	0.0	1	0	1	0	1	0	0	2
N HUDSON ST	HAMPTON AV	W WASHINGTON ST	35.0	0.0	0.0	12.5	0.0	0.0	10.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N LAURENS ST	COLLEGE ST	W NORTH ST	23.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N MAIN ST	BEATTIE PL	E WASHINGTON ST	54.0	0.0	0.0	14.0	15.0	0.0	0.0	0.0	15.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	0	2
N MAIN ST	RUTHERFORD RD	E AVONDALE DR	51.5	0.0	0.0	10.0	10.0	0.0	11.5	1.0	9.5	0.0	10.5	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0	0	1	0	0	0	1	0	0	4
N MAIN ST	E AVONDALE DR	SWANSON CT	49.0	0.0	0.0	12.5	12.5	0.0	1.0	1.0	10.5	0.0	10.5	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0	0	1	0	0	0	1	0	0	4
N MAIN ST	E AVONDALE DR	ASHLEY AV	52.0	0.0	0.0	10.0	10.0	0.0	12.0	1.0	10.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0	0	1	0	1	0	1	0	0	2
N MAIN ST	ASHLEY AV	GALLIVAN ST	46.0	0.0	0.0	15.5	0.0	0.0	10.5	0.0	0.0	0.0	19.5	0.0	0.0	2.0	2.0	0.0	1.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
N MAIN ST	GALLIVAN ST	E EARLE ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1
N MAIN ST	E EARLE ST	E STONE AV	36.0	0.0	0.0	18.5	0.0	0.0	0.0	0.0	0.0	0.0	17.5	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
N MAIN ST	E STONE AV	E PARK AV	63.5	0.0	0.0	12.0	11.5	0.0	14.5	0.0	12.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
N MAIN ST	N ACADEMY ST	E ELFORD ST	53.0	0.0	0.0	11.0	13.0	0.0	0.0	0.0	13.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	0	2
N MAIN ST	E ELFORD ST	BEATTIE PL	40.0	0.0	0.0	15.0	0.0	0.0	12.5	0.0	0.0	0.0	11.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N MAIN ST	E PARK AV	N ACADEMY ST	64.0	0.0	0.0	12.0	11.5	0.0	4.5	0.0	10.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
N MARKLEY ST	S HUDSON ST	RHETT ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1
N MARKLEY ST	RHETT ST	S MAIN ST	38.0	0.0	0.0	9.0	14.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	2.0	2.0	0.0	0.0	1.0	0.0	0.0	1	0	0	0	0	1	0	6
N PLEASANTBURG DR	ACCESS RAMP	725 S KEITH DR	84.0	0.0	0.0	13.0	12.0	12.0	13.0	0.0	11.0	12.0	12.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	CITY LIMITS	RUTHERFORD RD	88.5	0.0	0.0	12.0	11.0	12.0	15.0	0.0	12.5	11.5	11.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0	0	1	0	1	0	0	0	0	2
N PLEASANTBURG DR	RUTHERFORD RD	350 N AUBURN ST	84.0	0.0	0.0	12.5	12.0	9.5	17.0	1.0	11.0	11.5	12.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	350 N AUBURN ST	WADE HAMPTON BLVD	86.5	0.0	0.0	11.5	11.5	12.0	13.5	0.0	12.0	11.5	11.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0	0	1	0	1	0	0	0	0	2
N PLEASANTBURG DR	WADE HAMPTON BLVD	PINE KNOLL DR	82.0	0.0	0.0	13.0	11.0	11.0	15.0	1.0	10.5	10.5	12.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	PINE KNOLL DR	400 N SPRINGDALE DR	82.0	0.0	0.0	13.0	11.0	11.0	13.0	0.0	11.0	11.0	11.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	400 N SPRINGDALE DR	E NORTH ST	92.0	0.0	0.0	12.0	11.0	11.0	25.0	1.0	11.0	11.0	13.0	0.0	0.0	2.0	6.0	0.0	2.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	CRESCENT RIDGE DR	CENTURY DR	110.0	0.0	13.5	12.0	12.0	12.0	22.0	1.0	12.5	12.5	12.0	0.0	0.0	2.0	6.0	1.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
N PLEASANTBURG DR	E NORTH ST	CRESCENT RIDGE DR	92.0	0.0	0.0	11.0	10.5	11.0	13.5	0.0	11.0	11.0	11.0	13.0	0.0	2.0	6.0	1.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	CRESCENT RIDGE DR	ACCESS RAMP	80.0	0.0	0.0	11.0	11.0	11.0	14.0	0.0	11.0	11.0	11.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
N PLEASANTBURG DR	ACCESS RAMP	ACCESS RAMP	127.5	2.0	11.0	12.0	12.5	11.5	4.0	1.0	11.5	0.0	12.0	12.0	0.0	2.0	5.0	1.0	3.0	0.0	0	0	1	0	1	0	0	0	0	2
N PLEASANTBURG DR	ACCESS RAMP	LOWNDES HILL RD	100.0	0.0	14.0	12.0	12.0	11.5	16.0	1.0	11.5	11.0	12.0	0.0	0.0	2.0	6.0	1.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
N PLEASANTBURG DR	725 S KEITH DR	LAURENS DR	50.0	7.0	0.0	11.0	13.5	0.0	0.0	0.0	13.5	0.0	11.5	0.0	0.0	2.0	4.0	1.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
N TEXTILE AV	PERRY AV	PENDLETON ST	36.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
NELSON ST	ANDERSON ST	GREEN AV	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
OSCAR ST	TRESCOTT ST	S HUDSON ST	20.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
OSCAR ST	W WASHINGTON ST	TRESCOTT ST	20.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
OVERBROOK RD	LOWNDES HILL RD	WALNUT ST	24.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
OVERBROOK RD	WALNUT ST	E NORTH ST	38.0	0.0	0.0	14.0	0.0	0.0	8.5	1.0	0.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	1	1	0	0	0	1	1
PARKINS LAKE RD	E PARKINS MILL RD	PARKINS LAKE RD	21.0	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
PARKINS MILL RD	WINDMONT RD	MAULDIN RD	23.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
PARKINS MILL RD	LAURENS DR	RICHWOOD DR	33.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1
PARKINS MILL RD	RICHWOOD DR	PARKINS GLEN CT	23.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7
PARKINS MILL RD	PARKINS GLEN CT	WINDMONT RD	36.0	0.0	0.0	12.0	0.0	0.0	13.0	0.0	0.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
PATEWOOD DR	PELHAM RD	CONGAREE RD	62.0	0.0	0.0	11.5	12.0	0.0	17.0	0.0	12.0	0.0	11.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
PELHAM RD	PELHAM COMMONS	HAYWOOD RD	63.5	0.0	0.0	12.0	12.0	0.0	13.5	0.0	12.5	0.0	11.5	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
PELHAM RD	E NORTH ST	PELHAM COMMONS	63.0	0.0	0.0	12.5	12.5	0.0	13.5	0.0	11.5	0.0	12.5	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
PELHAM RD	HAYWOOD RD	CITY LIMITS	63.5	0.0	0.0	12.0	12.0	0.0	13.5	0.0	12.5	0.0	11.5	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2
PENDLETON ST	SUMNER ST	VARDRY ST	46.0	0.0	0.0	12.0	10.5	0.0	0.0	0.0	11.5	0.0	13.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4
PENDLETON ST	SACO ST	SMITH ST	37.0	7.0	0.0	11.5	0.0	0.0	10.0	0.0	0.0	0.0	10.0	0.0	0.0	2.0	2.0	0.0	1.0	1.0	0.0	0.0	1	0	0	0	0	1	0	6
PENDLETON ST	SMITH ST	IRVINE ST	42.0	7.5	0.0	13.5	0.0	0.0	10.0	0.0	0.0	0.0	12.5	0.0	7.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
PENDLETON ST	IRVINE ST	475 NW S ACADEMY ST	36.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6
PENDLETON ST	475 NW S ACADEMY ST	S ACADEMY ST	60.0	0.0	0.0	11.5	11.5	0.0	21.0	1.0	11.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5
PENDLETON ST	S ACADEMY ST	SUMNER ST	74.0	0.0	0.0	13.0	12.0	0.0	24.5	1.0	11.5	0.0	12.5	0.0	0.0															

S ACADEMY ST	N MARKLEY ST	MCCALL ST	75.0	0.0	10.0	12.5	12.5	10.5	4.5	1.0	12.5	0.0	12.5	0.0	0.0	2.0	5.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S ACADEMY ST	MCCALL ST	N CALHOUN ST	65.0	0.0	0.0	12.0	12.0	0.0	15.5	1.0	12.5	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S ACADEMY ST	N CALHOUN ST	N LEACH ST	75.0	0.0	0.0	10.0	12.5	12.5	16.5	1.0	10.0	0.0	13.5	0.0	0.0	2.0	4.0	1.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S ACADEMY ST	PERRY AV	PENDLETON ST	85.0	0.0	11.5	12.0	10.5	0.0	16.0	1.0	12.5	0.0	11.5	12.0	0.0	2.0	4.0	1.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S CHURCH ST	E WASHINGTON ST	UNIVERSITY RIDGE	52.0	0.0	0.0	12.0	12.0	0.0	3.0	1.0	12.0	12.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	1	0	0	2	
S CHURCH ST	UNIVERSITY RIDGE	S CHURCH ST	75.0	0.0	0.0	12.5	11.0	11.5	4.0	1.0	13.0	12.0	12.5	0.0	0.0	2.0	6.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S CHURCH ST	S CHURCH ST	AUGUSTA ST	88.0	0.0	0.0	14.0	11.5	11.0	17.0	1.0	12.0	11.0	13.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	
S HUDSON ST	W WASHINGTON ST	N MARKET ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
S LAURENS ST	W WASHINGTON ST	W MCBEE AV	36.0	0.0	0.0	7.0	11.0	0.0	0.0	0.0	11.0	0.0	7.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6	
S LEACH ST	PENDLETON ST	ARLINGTON AV	40.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	0	6	
S LEACH ST	ARLINGTON AV	ETHEL ST	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	
S LEACH ST	ETHEL ST	DUNBAR ST	28.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	0	0	0	0	0	1	7	
S MAIN ST	RIVER ST	MARKLEY ST	60.0	0.0	0.0	20.0	11.5	0.0	0.0	0.0	12.0	0.0	19.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	0	2	
S MAIN ST	E WASHINGTON ST	COURT ST	53.0	0.0	0.0	12.5	15.0	0.0	0.0	0.0	14.0	0.0	12.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	1	0	2
S MAIN ST	COURT ST	JAPANESE DOGWOOD LA	55.0	0.0	0.0	9.0	12.0	0.0	14.0	0.0	12.0	0.0	8.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	1	0	2
S MAIN ST	JAPANESE DOGWOOD LA	W CAMPERDOWN WY	50.0	0.0	0.0	7.5	11.5	0.0	11.5	0.0	11.5	0.0	7.5	0.0	0.0	2.0	2.0	0.0	1.0	2.0	0.0	0.0	1	0	0	0	0	1	1	0	6
S MAIN ST	W CAMPERDOWN WY	RIVER ST	46.0	0.0	0.0	7.5	15.0	0.0	5.0	0.0	12.0	0.0	7.5	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	0	0	0	1	1	0	6
S MAIN ST	MARKLEY ST	VARDRY ST	48.0	0.0	0.0	7.0	11.5	0.0	10.5	1.0	11.5	0.0	7.0	0.0	0.0	2.0	2.0	0.0	1.0	2.0	0.0	0.0	1	0	0	0	0	1	1	0	6
S PLEASANTBURG DR	CLEVELAND ST	MAULDIN RD	84.0	0.0	0.0	12.0	12.0	12.0	12.0	0.0	12.0	12.0	12.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
S PLEASANTBURG DR	LIBERTY LA	E ANTRIM DR	78.0	0.0	0.0	10.5	12.5	12.0	16.0	1.0	13.0	0.0	13.0	0.0	0.0	2.0	5.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
S PLEASANTBURG DR	E ANTRIM DR	LEGRAND BLVD	93.0	0.0	0.0	11.0	12.0	11.5	10.5	1.0	12.0	11.5	11.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0	0	1	0	1	0	0	0	0	2	2
S PLEASANTBURG DR	LEGRAND BLVD	CLEVELAND ST	85.5	0.0	0.0	11.0	12.0	11.5	13.0	0.0	11.5	11.5	11.5	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0	0	1	0	1	0	0	0	0	2	2
S PLEASANTBURG DR	MAULDIN RD	CHALMERS RD	86.0	0.0	0.0	12.0	12.0	12.0	15.0	0.0	12.0	12.0	12.0	0.0	0.0	2.0	6.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
S PLEASANTBURG DR	LAURENS RD	LIBERTY LA	64.0	0.0	0.0	11.0	12.0	11.5	4.0	1.0	14.0	0.0	12.0	0.0	0.0	2.0	5.0	0.0	0.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
SHAW ST	POINSETT HWY	BUNCOMBE RD	43.0	0.0	0.0	11.0	11.0	0.0	0.0	0.0	11.0	0.0	10.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	1	0	4	4
TWIN LAKE RD	CHICK SPRINGS RD	STONE LAKE DR	34.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	1
TWIN LAKE RD	STONE LAKE DR	LAKE FOREST RD	40.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	1.0	1	1	1	0	0	0	1	1	1
TWIN LAKE RD	LAKE FOREST DR	CAPEWOOD CT	36.0	0.0	0.0	7.5	11.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	1.0	0.0	0.0	1	0	0	0	0	1	1	0	6
TWIN LAKE RD	CAPEWOOD CT	WHITE OAK RD	30.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	1
UNIVERSITY RIDGE	HOWE ST	S CHURCH ST	62.0	0.0	0.0	13.0	11.0	0.0	13.5	0.0	11.5	0.0	12.5	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
UNIVERSITY RIDGE	S CHURCH ST	CLEVELAND ST	25.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
UNIVERSITY ST	AUGUSTA ST	HOWE ST	36.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	1
VERDAE BLVD	1000 S WOODRUFF RD	BONAVENTURE CIR	64.0	0.0	0.0	13.0	12.0	0.0	14.0	0.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
VERDAE BLVD	WOODRUFF RD	1000 S WOODRUFF RD	63.0	0.0	0.0	13.0	12.0	0.0	15.5	1.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
VERDAE BLVD	BONAVENTURE CIR	BONAVENTURE CIR	64.0	0.0	0.0	13.0	12.0	0.0	14.0	1.0	12.0	0.0	13.0	0.0	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
VERDAE BLVD	BONAVENTURE CIR	LAURENS RD	83.0	0.0	16.5	12.0	0.0	0.0	28.5	0.0	11.5	12.0	11.5	0.0	0.0	2.0	4.0	1.0	2.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
W BROAD ST	W MCBEE AV	RIVER ST	35.0	0.0	0.0	12.5	0.0	0.0	11.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
W BROAD ST	W WASHINGTON ST	W MCBEE AV	41.5	0.0	0.0	12.0	0.0	0.0	17.0	0.0	0.0	0.0	12.5	0.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
W BROAD ST	RIVER ST	S MAIN ST	48.0	0.0	0.0	8.0	12.5	0.0	6.5	0.0	12.5	0.0	8.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	1	0	1	0	0	1	1	0	2
W CAMPERDOWN WY	HAMMOND ST	S MAIN ST	46.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	14.0	0.0	16.0	0.0	0.0	2.0	2.0	0.0	0.0	1.0	0.0	0.0	1	0	1	0	0	1	1	0	2
W CAMPERDOWN WY	S ACADEMY WY	RIVER ST	70.0	0.0	13.0	0.0	0.0	0.0	23.0	1.0	0.0	0.0	11.0	23.0	0.0	2.0	1.0	2.0	2.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
W CAMPERDOWN WY	RIVER ST	HAMMOND ST	57.0	0.0	0.0	7.0	14.0	0.0	14.0	1.0	15.0	0.0	7.0	0.0	0.0	2.0	2.0	0.0	1.0	2.0	0.0	0.0	1	0	0	0	0	1	1	0	6
W FARIS RD	375 W DOCTORS DR	350 E GROVE RD	46.0	0.0	12.0	12.0	0.0	0.0	0.0	0.0	11.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	4
W FARIS RD	AUGUSTA ST	HIGHLANDER DR	33.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	1	1	0	0	0	0	1	1
W FARIS RD	HIGHLANDER DR	350 E MICHAUX DR	22.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
W FARIS RD	350 E MICHAUX DR	700 E DOCTORS DR	47.0	0.0	0.0	12.5	12.0	0.0	0.0	0.0	10.5	0.0	12.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	4
W FARIS RD	700 E DOCTORS DR	375 W DOCTORS DR	75.0	0.0	12.0	12.0	12.0	0.0	15.0	0.0	12.0	0.0	12.0	0.0	0.0	2.0	4.0	1.0	1.0	0.0	0.0	0.0	1	0	1	0	0	0	0	2	2
W FARIS RD	375 W DOCTORS DR		46.0	0.0	12.0	12.0	0.0	0.0	0.0	0.0	11.0	0.0	12.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	1	0	0	0	1	0	0	4	4
W FARIS RD	375 W DOCTORS DR	GROVE RD	64.0	0.0	10.0	11.0	10.0	0.0	10.0	0.0	11.0	0.0	12.0	0.0	0.0	2.0	4.0	1.0	1.0	0.0	0.0	0.0	1	0	0	0	0	0	0	5	5
W MCBEE AV	W MCBEE AV	S LAURENS ST	48.0	0.0	0.0	16.5	0.0	0.0	11.0	0.0	0.0	0.0	11.0	11.0	0.0	2.0	2.0														

## G. Appendix G: Prioritization + Implementation with Cost Estimates

### G.1. Infrastructure Improvement Cost Opinions

This section presents planning-level cost opinions for the comprehensive network of on-street bikeways and multi-use paths recommended in the Greenville Bicycle Master Plan. Cost estimates for bikeway facilities are based on cost opinions provided by the City of Greenville. The cost of bikeway facilities significantly varies by facility type, as shown in **Error! Reference source not found.** For example, the addition of shared lane marking (sharrows) to an existing roadway requires few changes to the existing roadway, but provides no exclusive space for bicycle use. By contrast, a separated multi-use path provides a far greater level of separation from the roadway, but at a greater fiscal burden. The following is a detailed summary of the fully burdened costs of different bikeway facility types and their associated costs. All costs are total installed costs that include: planning and engineering, environmental, and contingency.

#### Bike Lanes

Table G.1-1 shows the proposed bike lane projects as well as the fully-burdened cost of providing bike lanes in both directions. Bike lanes can be implemented either by striping existing roadways, re-striping an existing segment of roadway during resurfacing, adding a paved shoulder (in most cases, adding a paved shoulder will require stormwater piping and backfill, costs that are not shown in table 8.2-3) or through widening the existing roadway corridor. The StreetPlan analysis informs the implementation of recommended bike lane locations. In addition, bike lane projects on streets that are maintained by SCDOT will require only the additional cost of stenciling, while projects on streets under the City's jurisdiction will require the full costs of the improvements.

Segments that were identified as able to accommodate bike lanes through restriping, parking or lane reduction require only paint and signage. Segments that would require widening or additional engineering treatments were attributed the additional cost of widening the roadway. For streets that would require widening, curb and gutter significantly affects project costs. Presence of curb and gutter was determined through aerial photographs and using Google StreetView.

Table G.1-1. Bike Lane Project Costs

Location	From	To	Length (miles)	Implementation	State Maint.	Curb & Gutter	Cost Estimate
Airport Rd	Laurens Rd	Keith Dr	0.41	widen	Yes	No	\$15,000
		Easley Bridge					
Andrew St	Dunbar St	Rd	0.36	restripe	Yes	Yes	\$7,000
Antrim Dr	Ellison St	Laurens Rd	0.57	restripe	Yes	Yes	\$11,000
Augusta St	Field St	University St	0.13	restripe	Yes	Yes	\$3,000
Augusta St	Vardry St	Field St	0.11	restripe	Yes	Yes	\$2,000
Augusta St	Woodfin Ave	Vardry St	0.42	restripe	Yes	Yes	\$8,000
Augusta St	Otis St	S Church St	0.2	restripe	Yes	Yes	\$4,000

Location	From	To	Length (miles)	Imple- mentation	State Maint.	Curb & Gutter	Cost Estimate
Batesview Dr	Wade Hampton Blvd	North St	0.60	restripe	No	Yes	\$12,000
Carolina Point Pkwy	Woodruff Rd	Fibers Dr	0.30	restripe	Yes	Yes	\$6,000
Chick Springs Rd	Twin Lake Rd	Rutherford Rd	0.32	widen	No	No	\$12,000
Church St	S of E Stone Ave	N of E Stone Ave	0.18	restripe	Yes	Yes	\$2,000
Church St	N Academy St	S of E Stone Ave	0.31	restripe	Yes	Yes	\$3,000
Cleveland St	McIver St	E. Faris Rd	0.54	restripe	Yes	Yes	\$11,000
Column St	Wade Hampton Blvd	Church St	0.23	restripe	Yes	Yes	\$4,000
Dunbar St	Leach St	Augusta St	0.75	restripe	Yes	Yes	\$15,000
Dunbar St	Andrew St	Leach St	0.23	restripe	Yes	Yes	\$4,000
Duvall Rd	Ridge Rd	Parkins Mill Rd	1.44	widen	Yes	No	\$52,000
Faris Rd	E of Grove Rd	Grove Rd	0.27	widen	Yes	No	\$10,000
Faris Rd	Michaux Dr	E of Grove Rd	0.37	restripe	Yes	No	\$4,000
Faris Rd	E of Swamp Rabbit Trail	Cleveland St	0.22	widen	Yes	Yes	\$72,000
Faris Rd	W of McAlister Rd	E of Swamp Rabbit Trail	0.26	restripe	Yes	Yes	\$5,000
Faris Rd	Pleasantburg Dr	W of McAlister Rd	0.20	widen	Yes	Yes	\$65,000
Grove Rd	Augusta St	W Faris Rd	1.28	restripe	Yes	Yes	\$25,000
Guess St	Green Ave	Mills Ave	0.58	widen	Yes	Yes	\$21,000
Halton Rd	Haywood Rd	Congaree Rd	1.55	restripe	Yes	Yes	\$30,000
Halton Rd	Congaree Rd	Pelham Rd	0.77	restripe	Yes	Yes	\$15,000
I-385 Frontage Rd	Roper Patewood Dr	Roper Mountain Rd	1.18	widen	Yes	No	\$43,000
Independence Blvd	Roper Mountain Rd (N)	Roper Mountain Rd (S)	1.66	widen	Yes	No	\$60,000
Industrial Dr	N of Fore Ave	Commercial Dr	0.62	widen	Yes	No	\$23,000
Laurens Rd	I-385	Park Ave	0.10	restripe	Yes	Yes	\$2,000
Laurens Rd	Verdae Blvd	I-385	5.27	restripe	Yes	Yes	\$103,000
Laurens Rd	S of Verdae Blvd	Verdae Blvd	0.09	widen	Yes	Yes	\$29,000
Laurens Rd	Duvall Dr	Verdae Blvd	0.20	restripe	Yes	Yes	\$4,000

Location	From	To	Length (miles)	Imple- mentation	State Maint.	Curb & Gutter	Cost Estimate
Legrand Blvd - John McCarroll							
Way Rte	Don Dr	McAlister Rd	0.38	restripe	Yes	Yes	\$7,000
Lowndes Hill Rd	Walnut St	E North St	0.07	restripe	No	Yes	\$1,000
Lowndes Hill Rd	Walnut St	Oakland Dr	1.07	widen	No	No	\$39,000
Lowndes Hill Rd	Oakland Dr	Keith St	0.08	restripe	No	Yes	\$2,000
Main St	Rutherford Rd	Ashley Ave	0.97	restripe	Yes	Yes	\$19,000
Main St	Ashley Ave	Academy St	0.70	restripe	Yes	Yes	\$14,000
Woods							
Mall Connector Rd	Crossing Rd	Woodruff Rd	0.76	restripe	No	Yes	\$15,000
Mauldin Rd	Crystal Ave	N Kings Rd	0.75	restripe	Yes	Yes	\$15,000
Mauldin Rd	N Kings Rd	Parkins Mill Rd	0.47	restripe	Yes	Yes	\$9,000
McBee Ave	Academy St	Broad St	0.16	widen	No	Yes	\$3,000
McDaniel Ave	Augusta St	Camille Ave	0.21	restripe	Yes	Yes	\$4,000
McDaniel Ave	Ridgeland Dr	McBee Ave	0.07	restripe	Yes	Yes	\$1,000
McDaniel Ave	Broad St	Ridgeland Dr	0.18	restripe	Yes	No	\$7,000
McDaniel Ave	Woodland Way	Cleveland St	0.30	widen	Yes	Yes	\$98,000
Mills Ave	Lynn St	Augusta St	0.45	widen	Yes	Yes	\$9,000
Old Woodruff Dr	Woodruff Rd	Haywood Rd	0.20	restripe	Yes	No	\$7,000
Parkins Mill Rd	Mauldin Rd	Richwood Dr	2.23	widen	Yes	No	\$81,000
Parkins Mill Rd	Laurens Rd	Richwood Dr	0.74	widen	Yes	Yes	\$14,000
Pelham Rd - Roper							
Mountain Rd Lane	North St	Pelham Rd	2.32	restripe	Yes	Yes	\$45,000
Pelham Rd - Roper		Keys Dr/Roper					
Mountain Rd Lane	Pelham Rd	Mountain Rd	0.97	restripe	Yes	No	\$35,000
Pendleton St	Main St	Academy St	0.43	widen	Yes	Yes	\$8,000
Pete Hollis Blvd -							
Buncombe Rd	Margaret Ct	City Limit	0.80	restripe	Yes	Yes	\$259,000
Pleasantburg Dr	Rutherford Rd	City Limit	0.31	widen	Yes	Yes	\$6,000
Pleasantburg Dr	N of Auburn St	Rutherford Rd	0.21	restripe	Yes	Yes	\$68,000
Wade							
Pleasantburg Dr	Hampton Blvd	N of Auburn St	0.71	widen	Yes	Yes	\$14,000
Pleasantburg Dr		Crescent Ridge					
Pleasantburg Dr	Dr	Hampton Blvd	0.94	restripe	Yes	Yes	\$306,000
Pleasantburg Dr		Crescent Ridge					
Pleasantburg Dr	Century Dr	Dr	0.35	widen	Yes	Yes	\$7,000
Pleasantburg Dr	S of Century Dr	Century Dr	0.16	restripe	Yes	Yes	\$52,000
Pleasantburg Dr		Lowndes Hill					
Pleasantburg Dr	Rd	S of Century	0.32	widen	Yes	Yes	\$6,000

Location	From	To	Length (miles)	Imple- mentation	State Maint.	Curb & Gutter	Cost Estimate
Pleasantburg Dr	BRT Trail	Lowndes Hill Rd	0.66	restripe	Yes	Yes	\$215,000
Pleasantburg Dr	Cleveland St	BRT Trail	1.86	widen	Yes	Yes	\$36,000
Pleasantburg Dr	Cleveland St	Mauldin Rd	1.32	restripe	Yes	Yes	\$428,000
Prosperity Ave	Old Augusta Rd	Shemwood Ln	0.53	widen	Yes	No	\$5,000
Reid St - Twin Lake Rd	Chick Springs Rd	Holmes Dr	0.50	restripe	No	No	\$10,000
Ridge Rd	Parkins Mill Rd	Fairforest Wy	1.14	restripe	Yes	No	\$41,000
Rocky Slope Rd	Woodruff Rd	Halton Rd	0.27	widen	Yes	Yes	\$3,000
Roper Mountain Rd	Independence Blvd	Garlington Rd	0.69	widen	Yes	No	\$25,000
Rutherford Rd	Rayford La	Pleasantburg Dr	0.10	restripe	Yes	Yes	\$1,000
Rutherford Rd	Stone Lake Ct	Rayford La	0.09	widen	Yes	Yes	\$29,000
Rutherford Rd	Chick Springs Rd	Stone Lake Ct	0.14	restripe	Yes	Yes	\$1,000
Rutherford Rd	Arcadia Dr	Chick Springs Rd	0.90	widen	Yes	Yes	\$293,000
Rutherford Rd	Paris View Dr	Arcadia Dr	0.40	restripe	Yes	Yes	\$4,000
Rutherford Rd	Poinsett Hwy	Paris View Dr	0.76	widen	Yes	Yes	\$247,000
Rutherford St	Croft St	Shaw St	0.18	restripe	Yes	Yes	\$2,000
Rutherford St	W Stone Ave	Croft St	0.21	widen	Yes	Yes	\$68,000
Rutherford St	Buncombe St	W Stone Ave	0.21	Restripe	Yes	Yes	\$2,000
Salters Rd - Old Sulphur Springs Rd - Forrester Dr Lane	Woodruff Rd	Millenium Blvd	1.43	widen	No	No	\$52,000
Townes St	Mountainview Ave	Randall St	0.26	restripe	No	No	\$5,000
University Ridge	Howe St	Church St	0.28	widen	Yes	Yes	\$3,000
Verdae Blvd - E Parksins Mills Rd Lane	Woodruff Rd	E of Laurens	1.83	restripe	Yes	No	\$19,000
Verdae Blvd - E Parksins Mills Rd Lane	E of Laurens	Isbella Ln	0.63	restripe	Yes	No	\$23,000
Villa Rd	Pleasantburg Dr	bend in Villa Rd	0.93	restripe	Yes	No	\$34,000
Wade Hampton Blvd	N of E Stone Ave	Pleasantburg Dr	1.88	widen	Yes	Yes	\$20,000



Location	From	To	Length (miles)	Imple- mentation	State Maint.	Curb & Gutter	Cost Estimate
White Oak Dr	Midland St	North St	0.19	widen	No	No	\$4,000
White Oak Dr	Wade Hampton Blvd	Midland St	0.43	restripe	No	Yes	\$141,000
Woodruff Rd	Laurens Rd	Old Country Rd	2.78	restripe	Yes	Yes	\$29,000
Woodruff Rd	Old Country Rd	Carolina Point Pkwy	0.21	widen	Yes	Yes	\$2,000
Woodruff Rd	Carolina Point Pkwy	Garlington Rd	0.36	restripe	Yes	Yes	\$117,000
Woods Crossing Rd - Lowndes Hill Rd –	W of Hayward Rd	(Old) Lowndes Hill Road	0.65	restripe	Yes	Yes	\$211,000
Woods Crossing Rd - Lowndes Hill Rd –	(Old) Lowndes Hill Road	Keith Rd	1.00	widen	Yes	No	\$36,000
Woods Crossing Rd - Lowndes Hill Rd –		W of Haywood Rd	0.10	widen	Yes	Yes	\$1,000
Woods Crossing Rd - Lowndes Hill Rd –	Old Airport Rd	Haywood Rd	0.20	widen	Yes	Yes	\$65,000
Woods Crossing Rd - Lowndes Hill Rd –	Mall Connector Rd	Old Airport Rd	0.18	restripe	Yes	Yes	\$2,000
<b>Proposed Bike Lanes:</b>			<b>62.34</b>				<b>\$4,007,000</b>

## Sharrows

Streets where shared lane markings are recommended should also include signing. Table G.1-2 provides cost estimates for recommended sharrow projects.

Table G.1-2. Sharrow Project Costs

Location	From	To	Length (miles)	Cost Estimate
Broad St - Butler Ave Lane	Main St	Buncombe St	0.81	\$6,000
Brookwood Dr - Aberdeen Dr	Lewis Dr	Elsie Ave	0.24	\$2,000
Chick Springs Rd	Twin Lake Rd	Gallivan St	0.75	\$6,000
Chick Springs Rd	Northwood Ave	Twin Lake Rd	0.23	\$2,000
Cleveland Park Dr - Lakehurst St Rte	Washington St	Cleveland St	1.07	\$8,000
Cleveland St	Southland Ave	Jones Ave	0.54	\$4,000
Cleveland St Ext	Pleasantburg Dr	Parkins Mill Rd	0.24	\$2,000
E Parkins Mill Rd	Parkins Mill Rd	Isbella Ln	0.92	\$7,000
Faris Rd	Highland Dr	Club Forest Lane	0.46	\$3,000
Garlington Rd	Woodruff Rd	Roper Mountain Rd	1.32	\$10,000
Hampton Ave	Academy St	Mulberry St	0.67	\$5,000
Harris St	Augusta St	Howe St	0.12	\$1,000
Haynie St - Pearl Ave Rte	Augusta St	Cleveland St	0.54	\$4,000
Haywood Rd	Laurens Rd	City Limit	2.60	\$19,000
Hudson St	Hampton Ave	Dunbar St	1.35	\$10,000
Jones Ave	University Ridge	August St	0.74	\$6,000
Lois Ave - Woodside Rd Lane	Pendelton St	City Limit	0.25	\$2,000
Lynn St	Mills Ave	Grove Rd	0.28	\$2,000
Main St	Park Dr	Park Ave	0.38	\$3,000
Main St	Anderson St	River St	0.41	\$3,000
Mayberry St	Willard St	Hudson St	0.57	\$4,000
McBee Ave	Washington St	Academy St	0.67	\$5,000
McBee Ave	McDaniel Ave	Washington St	0.11	\$1,000
McDaniel Ave	Camille Ave	Cleveland St	0.52	\$2,000
McDaniel Ave	Woodland Way	E Broad St	0.20	\$1,000
Melville Ave	Brookwood Drive	Faris Road	0.45	\$3,000
Mulberry St	Pete Hollis Blvd	Hampton Ave	0.23	\$2,000
Mulberry St / Willard St.	Hampton Ave	Swamp Rabbit Tr	0.51	\$4,000
Nelson St	Guess St	Anderson St	0.10	\$1,000
North St	White Oak Dr	City Limit	0.53	\$4,000
Pointe Cir - Orchard Park	Villa Rd	Haywood Rd	0.57	\$4,000
Potomac Ave	Long Hill St	Augusta Rd	0.42	\$3,000

Location	From	To	Length (miles)	Cost Estimate
Richland Way	Washington St	Laurens Rd	0.23	\$2,000
Ridge Rd	Mauldin Rd	City Limit	2.01	\$15,000
Roper Mountain Rd	Waterway Ct	Woodruff Rd	0.72	\$5,000
Sevier St	Brookwood Dr	Augusta St	0.19	\$1,000
Simmons Ave – Sycamore Dr – Boland St Rte	Laurens Rd	Airport Rd	0.44	\$3,000
Wardlaw St - Westfield St Rte	Main St	Broad St	0.56	\$4,000
Woodlark St	Hillside Dr	Keith Dt	1.02	\$8,000
Worley Rd	Rutherford Rd	City Limit	0.48	\$4,000
<b>Proposed Sharrows:</b>			<b>24.48</b>	<b>\$173,000</b>

## Bike Route

Table G.1-3 provides planning-level cost estimate of establishing bike routes on existing roadways.

Table G.1-3. Bike Route Project Costs

Location	From	To	Length (miles)	Cost Estimate
Ackley Rd - Fernwood Lane - Woodland Way Rte	Beechwood Ave	Cleiveirvine Ave	0.30	\$1,000
Afton Ave - McIver St Rte	Crescent Ave	Cleveland St	0.42	\$1,000
Alameda St - Hilton St Rte	Clark St	Faris Rd	0.57	\$1,000
Amber Dr	Carolina Ave	Wembley Rd	0.20	\$1,000
Arthur Ave - Prentiss Ave Rte	Keowee Ave	Lynn St	0.53	\$1,000
Ashley Ave - Shaw St Lane	Main St	City Limit	0.69	\$2,000
Augusta St	Augusta Pl	Tallulah Dr	0.12	\$0
Augusta St	University St	Main St	0.09	\$0
Avondale Dr - Arcadia Dr Rte	Rutherford Rd	end of Arcadia Dr	0.56	\$1,000
Azalea Ct - Dera St - Greenland Dr Rte	Crescent Ridge Dr	Villa Rd	1.07	\$3,000
Blythe Dr	Augusta St	Long Hill St	0.32	\$1,000
Bradley Blvd - Brookside Cir Rte	White Oak Rd	Wade Hampton Blvd	0.80	\$2,000
Bradshaw St	Augusta St	Howe St	0.09	\$0
Burns St - Elms St Rte	Dunbar St	Grove Rd	0.66	\$2,000
Byrd Blvd - Gatlin Park Rte	Augusta Ct	Augusta St	1.48	\$4,000
Byrdland Dr	Woods Lake Rd	Old Airport Rd	0.77	\$2,000
Byrdland Dr - Old Airport Rd Rte	Woods Crossing Rd	Proposed Greenway	0.84	\$2,000
Carolina Ave	Laurel Creek Ln	Wembley Rd	0.29	\$1,000
Century Dr	Keith Dr	Pleasantburg Dr	0.65	\$2,000
Chick Springs Rd - Mohawk Dr Rte	Wade Hampton Blvd	Summit Dr	0.40	\$1,000
Church St	Academy St	Beattie Place	0.32	\$1,000
Circle Ave	North St	Keith Dr	0.45	\$1,000
Circle Ave - Fisher Dr Rte	North St	Pleasantburg Dr	0.63	\$2,000
Cleiveirvine Ave - Haviland Ave - Nicholtown Rd - Alameda St - Rebecca St Rte	Beechwood Ave	Clark St	0.81	\$2,000
Club Forest Lane - Michaux Dr Lane	Chapman Rd	Grove Rd	1.42	\$4,000
Crescent Ave	Church Ave	Cleveland St	1.19	\$3,000
Crescent Ridge Dr - Winthorp Ave Rte	Pleasantburg Dr	600' South of Fisher Dr	0.37	\$1,000
Crystal Ave	Old Augusta Rd	Augusta Rd	0.17	\$0
Dairy Dr	Ridge Rd	End of Dairy Dr	1.11	\$3,000
Decatur St	Parkins Mill Rd	Antrim Dr	0.39	\$1,000
Dellwood Dr	Stephens Lane	Chick Springs Rd	0.76	\$2,000

Location	From	To	Length (miles)	Cost Estimate
Don Dr	Wembley Rd	Legrand Blvd	0.51	\$1,000
Ebaugh Ave	Traxier St	Richard Way	0.14	\$0
Ellford St	Academy St	Church St	0.39	\$1,000
Elsie Ave - Lewis Dr - Brookwood Dr Rte	Cateechee Ave	Faris Rd	0.69	\$2,000
Field St	Augusta St	Market St	0.13	\$0
Fore Ave - Waite St Rte	Laurel Creek Lane	Carolina Ave	0.17	\$0
Frontage Rd	Laurens Dr	Proposed Greenway Near Millenium Blvd	0.41	\$1,000
Gallivan St	Main St	Mohawk Dr	0.39	\$1,000
Gatlin Park Rte	Sylvan Dr	Granada Dr	0.32	\$1,000
Gilfilling Rd - Essex Ct - Ridgecrest Dr Rte	Brookside Cir	Chick Springs Rd	0.77	\$2,000
Hanover - Bleckley Ave Rte	Sunset Ln	Decator St	0.34	\$1,000
Henderson Rd	Cleveland St	Laurens Rd	1.18	\$3,000
Hillcrest Dr - Orange St Rte	Townes Sr	Mohawk Dr	0.79	\$2,000
Hillside Dr - Prescott St - Harrington Ave Rte	Lowndes Hill Rd	Wade Hampton Blvd	1.08	\$3,000
Howe St - Fruman College Way Rte	University Ridge	End of Fruman College Way	0.53	\$1,000
James St - Earle St Rte	Buncombe St	Wade Thomas Blvd	1.25	\$3,000
Keith Dr - Airport Rd - Transit Dr Rte	North St	Halton Rd	2.95	\$8,000
Keowee Ave	Cateechee Ave	Elsie Ave	0.19	\$1,000
Lanneau Dr	McDaniel Ave	Faris Rd	0.46	\$1,000
Laurel Creek Ln	Laurens Dr	Carolina Ave	0.21	\$1,000
Market Point Connector	Carolina Point Pkwy	Woodruff Rd	0.28	\$1,000
Market St	Vardy St	Hudson St	0.49	\$1,000
McCuen St - Augusta Pl Rte	Faris Rd	Tallulah Dr	0.70	\$2,000
Mohawk Dr	Gallivan St	Wade Hampton Blvd	0.19	\$1,000
Mulberry St - Willard St - Cain St Rte	Swamp Rabbit Trail	2nd St	1.05	\$3,000
Nottingham Rd - Legrand Blvd Rte	Parkins Mill Rd	Pleasantburg Dr	0.54	\$1,000
Old Augusta Rd	Augusta St	Prosperity Ave	0.09	\$0
Old Sulphur Springs Rd	Woodruff Rd	Salters Rd	1.10	\$3,000
Otis St	Guess St	Augusta St	0.40	\$1,000
Parkins Lake Rd - Cleveland St Rte	Parkins Mill Rd	Duvall Dr	1.59	\$4,000
Penn St - Mt Vista Ave Rte	Byrd Blvd	Tallulah Dr	0.34	\$1,000
Phillips Lane - Augusta Ct Rte	Meyers Dr	End of Augusta Ct	0.29	\$1,000
Pinehurst Dr - Northwood Ave Rte	Avalon Dr	Chick Springs Rd	0.41	\$1,000
Pleasant Ridge Ave - Penrose Ave - Chapman Rd Rte	Old Augusta Rd	End of Chapman Rd	0.82	\$2,000

Location	From	To	Length (miles)	Cost Estimate
Ponderosa Rd	Cleveland St	Parkins Mill Rd	0.28	\$1,000
Primrose Ln - Midland St - Buena Vista Ave Rte	White Oak Dr	Batesview Dr	0.41	\$1,000
Rice St - Long Hill St Rte	Meyers Dr	Prosperity Ave	0.81	\$2,000
Riverside Dr	Byrd Blvd	Augusta St	0.25	\$1,000
Shelburne Rd	Parkins Mill Rd	Wembley Rd	0.40	\$1,000
Skyland Park Rte	175' S of Ackley Rd	230' N of Webster Rd	0.13	\$0
St Josephs Dr	Ridge Rd	Laurens Rd	0.51	\$1,000
Stephens Lane - Delwood Dr - Holmes Dr Rte	Wade Hampton Blvd	Pleasantburg Dr	0.96	\$3,000
Tallulah Dr	Augusta Pl	End of Tallulah Dr	0.73	\$2,000
Townes St	Hillcrest Ave	Randall St	0.50	\$1,000
Townes St	Mountainview Ave	Hillcrest Ave	0.08	\$0
Villa Rd	bend in Villa Rd	Pelham Rd	0.30	\$1,000
Waccamaw Ave - Meyers Dr Rte	Faris Rd	Augusta Dr	1.20	\$3,000
Webster Rd - Clark St - Greenacre Rd Rte	McAlister Rd	Baxter St	0.76	\$2,000
Webster Rd - Clark St - Greenacre Rd Rte	Skyland Dr	Clark St	0.52	\$1,000
Wembley Rd	Laurens Rd	Henderson Rd	1.10	\$3,000
Westminster Dr	Faris Rd	Augusta Pl	0.31	\$1,000
White Oak Rd - Twin Lake Rd	Wade Hampton Blvd	Holmes Dr	0.58	\$2,000
White Oak Rd Connector Rte	White Oak Rd cul-de-sac	White Oak Rd	0.08	\$0
Williams St	Washington St	North St	0.26	\$1,000
Willow Springs Dr	Parkins Mills Dr	Existing Greenway	0.27	\$1,000
Willow Springs Dr - Sunset Ln - Brookdale Ave Rte	Wembley Rd	Decator St	0.58	\$2,000
Winterberry Ct	Cleveland St	Pleasantburg Dr	0.49	\$1,000
<b>Proposed Bike Routes:</b>			<b>51.17</b>	<b>\$134,000</b>

### Multi-use Path

Table G.1-4Error! Reference source not found. shows the fully-burdened average costs for a typical asphalt 12' wide multi-use path. The estimate does not include land acquisition costs.

Table G.1-4. Multi-Use Path Project Costs

Location	From	To	Length (miles)	Cost Estimate
Beattie Pl	Heritage Green Pl	North St	0.68	\$545,000
BRT Trail	Traxler St	Millenium Blvd	4.38	\$3,505,000
Chick Springs Greenway	Twin Lake Rd	Poinsettia Pl	0.54	\$432,000
Dairy Dr Greenway	End of Dairy Dr	Parkins Mill Rd	0.33	\$264,000
Mauldin Rd Sidepath	Fairforest Way	Ridge Rd	0.43	\$346,000
Millenium Blvd Greenway	Millenium Blvd	Dallas Rd	0.84	\$673,000
Richland Way	Washington St	Laurens Rd	0.24	\$196,000
Tallulah Dr - Cleveland St Connector	Tallulah Dr	Cleveland St	0.15	\$122,000
<b>Proposed Multi-Use Paths:</b>			<b>7.61</b>	<b>\$6,083,000</b>



**To:** Andrew Meeker, City of Greenville  
**From:** John Cock and Tony Salomone, *Alta Planning + Design*  
**Date:** January 12, 2011  
**Re:** Greenville Bicycle Master Plan – Cycle Zones Analysis

---

This report summarizes technical information related to the Cycle Zone Analysis (CZA) used to evaluate existing bikeway conditions for the Greenville Bicycle Master Plan. This analysis aids the planning effort by:

- Highlighting factors that affect cycling conditions in different areas of the city
- Identifying zones with the highest potential for good cycling conditions to maximize the efficacy of investments
- Guiding the development of new bikeway design tools that enhance user experience and maximize cycling potential

The city was divided into 14 zones of roughly similar cycling characteristics with boundaries determined by combining census tracts and streets with high average daily traffic volumes. Such factors have a tendency to create their own bikability boundaries.

The goal of the CZA is to evaluate the bicycling experience throughout the city. This analysis projects which areas have the greatest potential for cycling through an evaluation of connectivity, trip attractors, and trip barriers. Each metric incorporated the following data:

- Density - roadway network density, bicycle network density
- Connectivity – roadway network connectivity, bicycle network connectivity
- Attractors – public facilities, commercial land use designations
- Barriers – highways, railroads, roadway slopes over five percent

The Bicycle Master Plan will use this information to target investment recommendations to locations that are likely to result in the highest increase in cycling.

### ***Data Gathering and Synthesis***

The analysis was based on existing data from the City of Greenville.

The reasoning for each measure's inclusion in the CZA is discussed in more detail below. In many cases, the selected measures were translated into density units – square acre or linear feet - to account for size variations between zones.

Each of the factors was multiplied by a weight and then normalized on a scale of 1 – 3. The resulting normalized scores were summed to create a composite score of overall bikability per zone. This methodology can easily be modified by the City in future to include additional factors and calibrated and weighted based on the purpose of that specific model run.

The following section discusses each of these factors, outlining the rationale for their inclusion in the model and a basic methodology for how they were calculated.

## Roadway and Bikeway Density

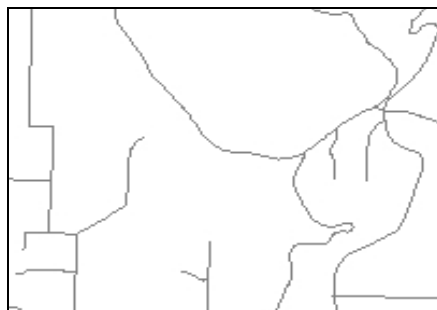
Table 1. Roadway and Bikeway Density Cycle Zone Factors

Cycle Zone	Area (Acres)	Roadway Length	Roadway Density	Bikeway Length	Bikeway Density
1	1,136	194,707	171	34,532	0.18
2	1,804	271,634	151	29,195	0.11
3	515	100,552	195	4,250	0.04
4	798	136,163	171	5,972	0.04
5	1,738	257,413	148	0	0
6	1,275	168,978	133	8,633	0.05
7	970	90,638	93	2,923	0.03
8	1,968	145,355	74	0	0
9	1,962	95,255	49	4,228	0.04
10	965	39,868	41	16,427	0.41
11	1,582	58,835	37	0	0.00
12	2,108	233,281	111	0	0.00
13	1,067	113,729	107	2,413	0.02
14	1,302	174,044	134	0	0

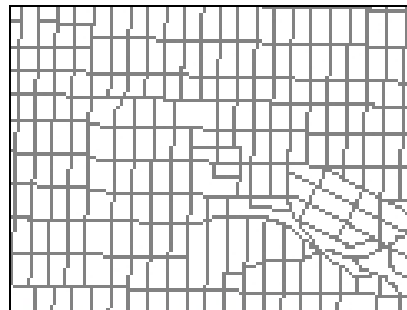
### Total Roadway Network Density:

**Definition:** The density in linear feet per square acre of all roads in the cycling zone. This includes roads of all types except for interstate highways, where bikes are not allowed.

### **Example:**



Sparse network limits rider choice

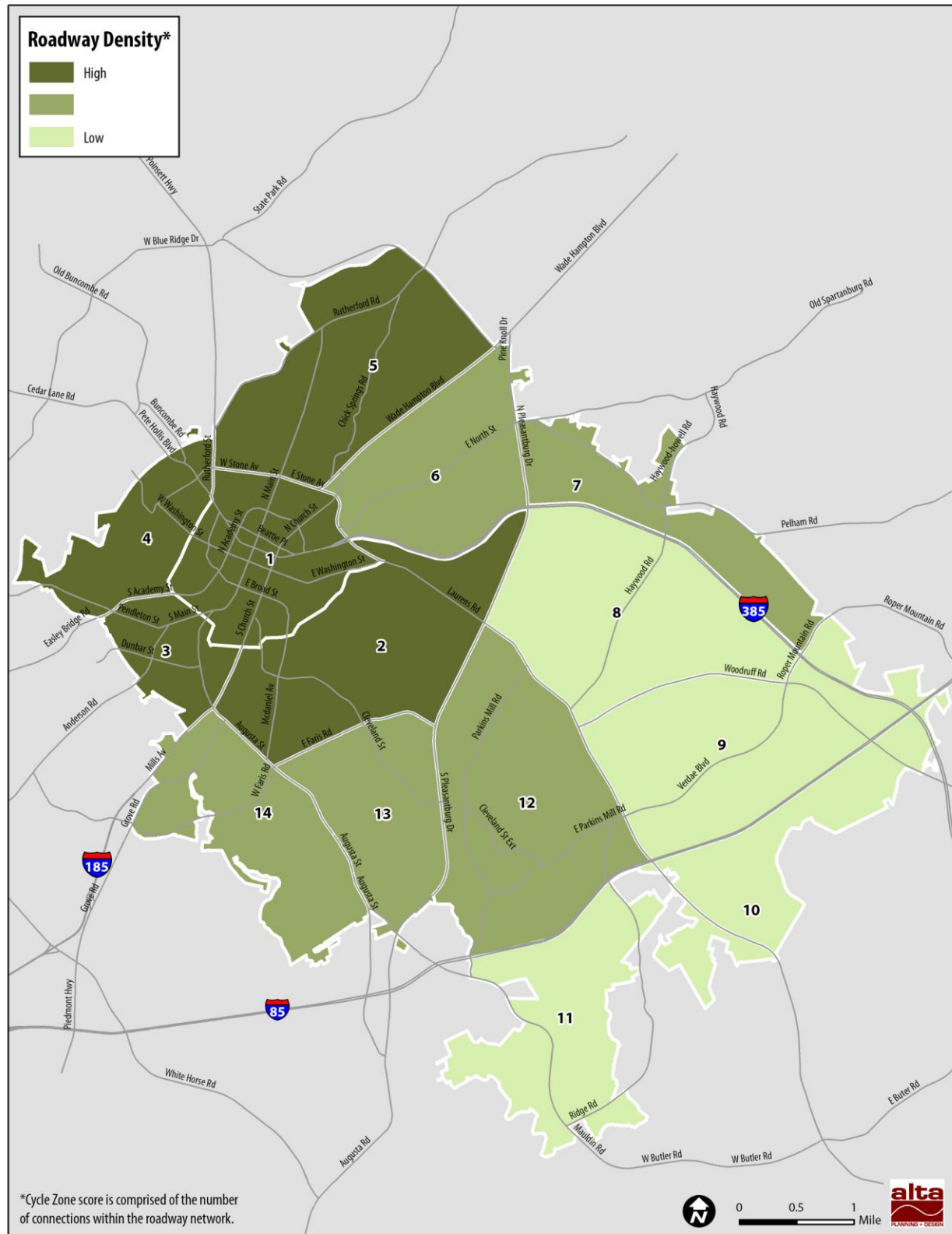


Dense network facilitates rider choice

**Reasoning:** A zone with a greater density of roads will facilitate a better cycling experience. Riders will be able to go more places and have greater route choice.

**Basic Methodology:** GIS tools were used to determine the overall length of roads falling within each cycle zone. This was divided by the zone's acreage to obtain an average road network density.

**Figure 1. Roadway Density CZA Scores**



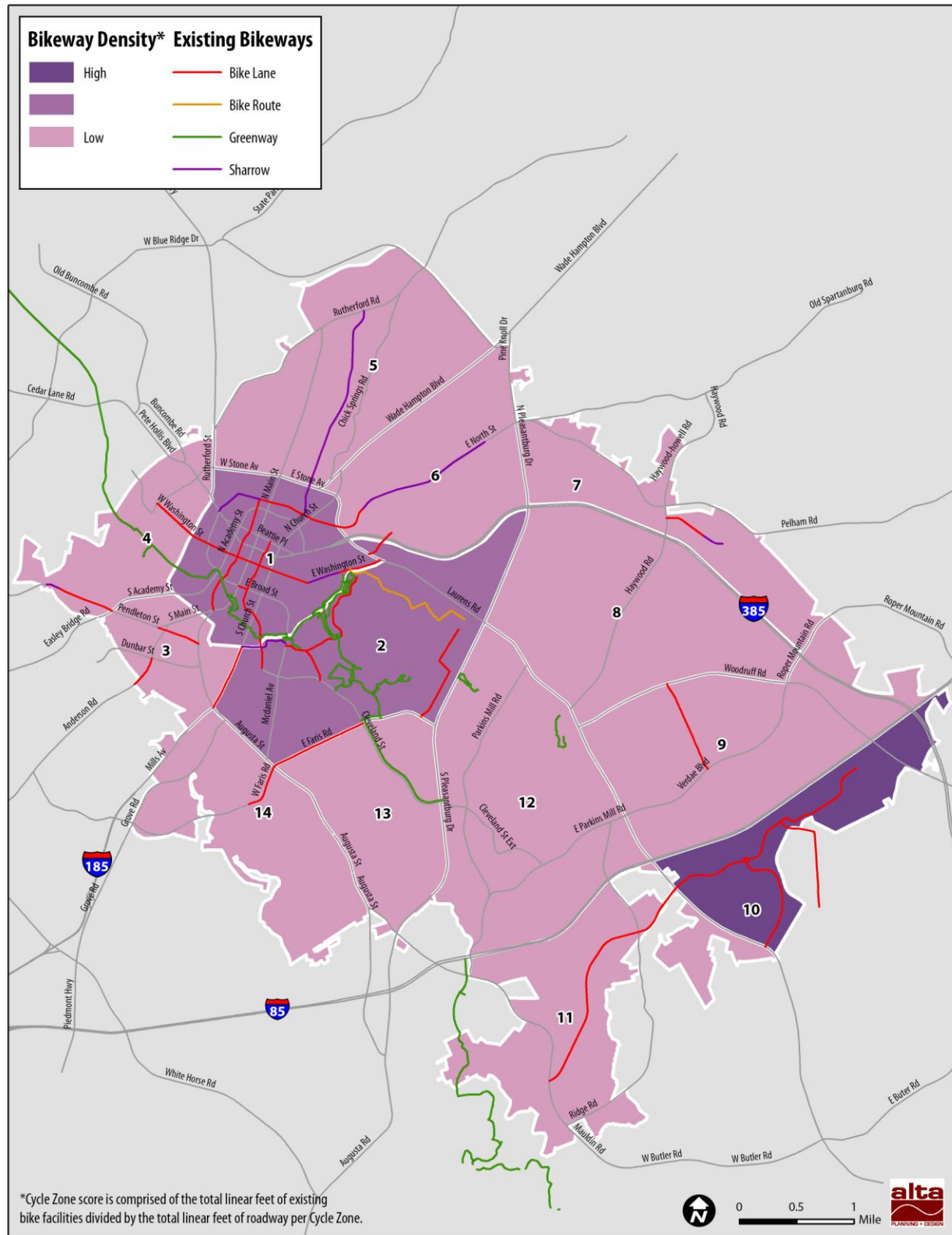
**Bike Network Density:**

**Definition:** The proportion of all roadways in the zone that provide bicycle accommodation.

**Reasoning:** The presence of facilities designed for cyclists increases their comfort and safety. A greater presence of cycle facilities will improve the cycling experience.

**Basic Methodology:** The bicycle network layer was intersected with the cycle zone boundary, and then the lengths of each segment or partial segment that fell within a specific zone were summed. The resulting number was divided by the total length of all roadways in the zone to obtain the density of bikeways.

Figure 2. Bikeway Density CZA Scores



## Roadway and Bikeway Connectivity

Table 2. Attractor Cycle Zone Factors

Cycle Zone	Roadway Connectivity	Bikeway Connectivity
1	0.88	0.58
2	0.85	0.25
3	0.90	0.00
4	0.90	0.00
5	0.88	0.00
6	0.89	0.00
7	0.75	0.00
8	0.77	0.00
9	0.74	0.00
10	0.63	0.00
11	0.75	0.00
12	0.79	0.00
13	0.87	0.00
14	0.90	0.00

### Roadway Connectivity:

**Definition:** A measure of roadway connectivity, this number, ranging from 0 – 1, represents the ratio of cul-de-sacs and three-way intersections to four- or more way intersections. The closer to one, the more grid-like the street pattern. An overall average score was calculated for each zone.

**Reasoning:** A zone with greater roadway connectivity will facilitate a better cycling experience. Riders will be able to easily go more places and have a greater route choice.

**Basic Methodology:** GIS was used to determine points in Greenville where one road was intersected by at least one other road. The location and number of roads at each intersection points were recorded. For each cycle zone, the overall number of intersections was summed as well as the number of intersections that were at least four-way. These numbers were used to determine the percentage of intersections that are four-ways or more.







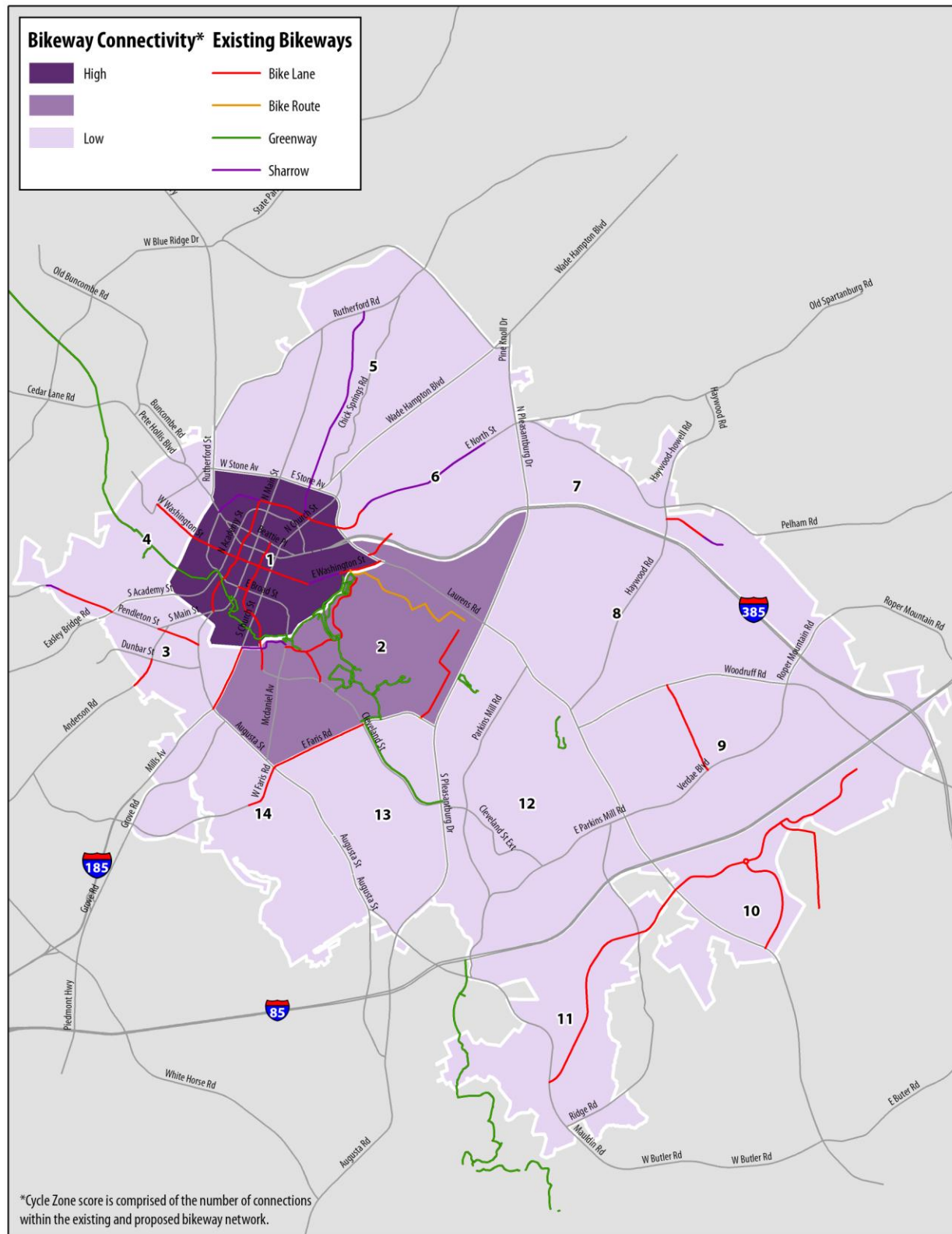
**Bikeway Connectivity:**

**Definition:** A measure of bikeway connectivity, this number, ranging from 0 – 1, represents the ratio of cul-de-sacs and three-way intersections that include bikeway facilities to four- or more way intersections that include bikeway facilities. The closer to one, the more grid-like the bikeway pattern. An overall average score was calculated for each zone.

**Reasoning:** A zone with greater bikeway connectivity will facilitate a better cycling experience. Riders will be able to easily go more places and have a greater route choice.

**Basic Methodology:** GIS was used to determine the points where segments of the existing bikeway network connect. The number of connected (four-way and T intersections) and disconnected (cul-de-sacs and bikeways that do not connect to other bikeways) points were recorded. For each cycle zone , a ratio of these intersections was calculated.

Figure 4. Bikeway Connectivity CZA Scores



## Attractors

Table 3. Attractor Cycle Zone Factors

Cycle Zone	Area (Acres)	Commercial Land Use Acreage	% of Commercial Land Use per Zone	Public Facilities Acreage	% Public Facilities per Zone	Total % of Attractors per Zone
1	1,136	306	27	200	18	45
2	1,804	226	13	101	6	18
3	515	122	24	34	7	30
4	798	15	2	33	4	6
5	1,738	102	6	53	3	9
6	1,275	118	9	239	19	28
7	970	159	16	2	0	17
8	1,968	383	19	48	2	22
9	1,962	33	2	18	1	3
10	965	129	13	0	0	13
11	1,582	32	2	234	15	17
12	2,108	233	11	40	2	13
13	1,067	63	6	93	9	15
14	1,302	67	5	43	3	8

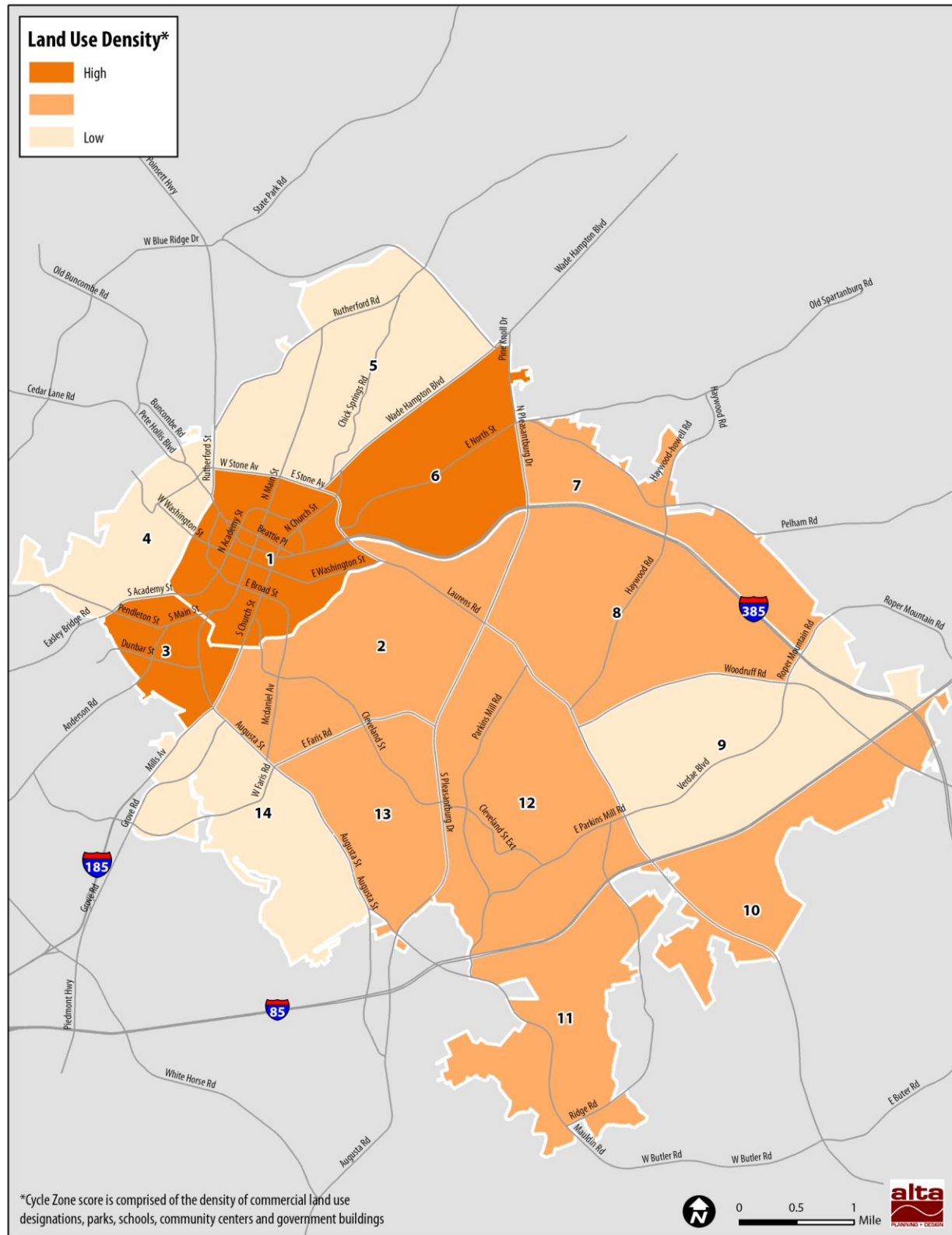
### Commercial Land Uses and Public Facilities Acreage:

**Definition:** The density of commercial/retail land use designations and public facilities in each zone. Public facilities are defined as parks, schools and government buildings.

**Reasoning:** Commercial land uses and public facilities are important destinations for bicyclists.

**Basic Methodology:** In this analysis, commercial land uses were derived from Greenville's current zoning layer. The public facilities used in this analysis (defined above) were extracted from another layer received from the City of Greenville. These layers were intersected with the cycle zone boundaries, and then the total area of these land uses within each zone was summed.

Figure 4. Attractors CZA Scores



## Barriers

Table 4. Barrier Cycle Zone Factors

Cycle Zone	Area (Acres)	Highway Length	Highway Density	Rail Length	Rail Density	% of Roadways With Slope Over 5%	Total Barrier Density
1	1,136	7,772	6.84	0	0	2	8.57
2	1,804	882	0.49	0	0	3	3.30
3	515	0	0	6,407	12.44	0	12.88
4	798	0	0	71,520	89.62	1	90.20
5	1,738	0	0	19,965	11.49	3	14.13
6	1,275	23,243	18.23	0	0	2	20.10
7	970	3,982	4.11	0	0	1	4.91
8	1,968	36,081	18.33	16,718	8.49	1	27.45
9	1,962	59,492	30.32	7,600	3.87	1	34.89
10	965	33,797	35.01	15,594	16.15	0	51.37
11	1,582	11,391	7.20	0	0	0	7.57
12	2,108	17,423	8.26	0	0	2	10.11
13	1,067	0	0	0	0	1	1.48
14	1,302	0	0	0	0	2	1.66

### Highways and Railroad Density:

**Definition:** Barriers that impede bicycling travel include interstates, railroads, and slope.

**Reasoning:** Limited crossing opportunities along highways and railroads force bicyclists to share major roadways with cars and/or force them to ride significantly out of direction to access a destination.

**Basic Methodology:** GIS was used to measure the length of interstates and railroads in each zone. This measure was divided by the total acreage of the zone to determine density.

### Slope:

**Definition:** The length of roadways with an average slope over five percent for each cycling zone.

**Example:**



Steep hills can be significant barriers for some cyclists.



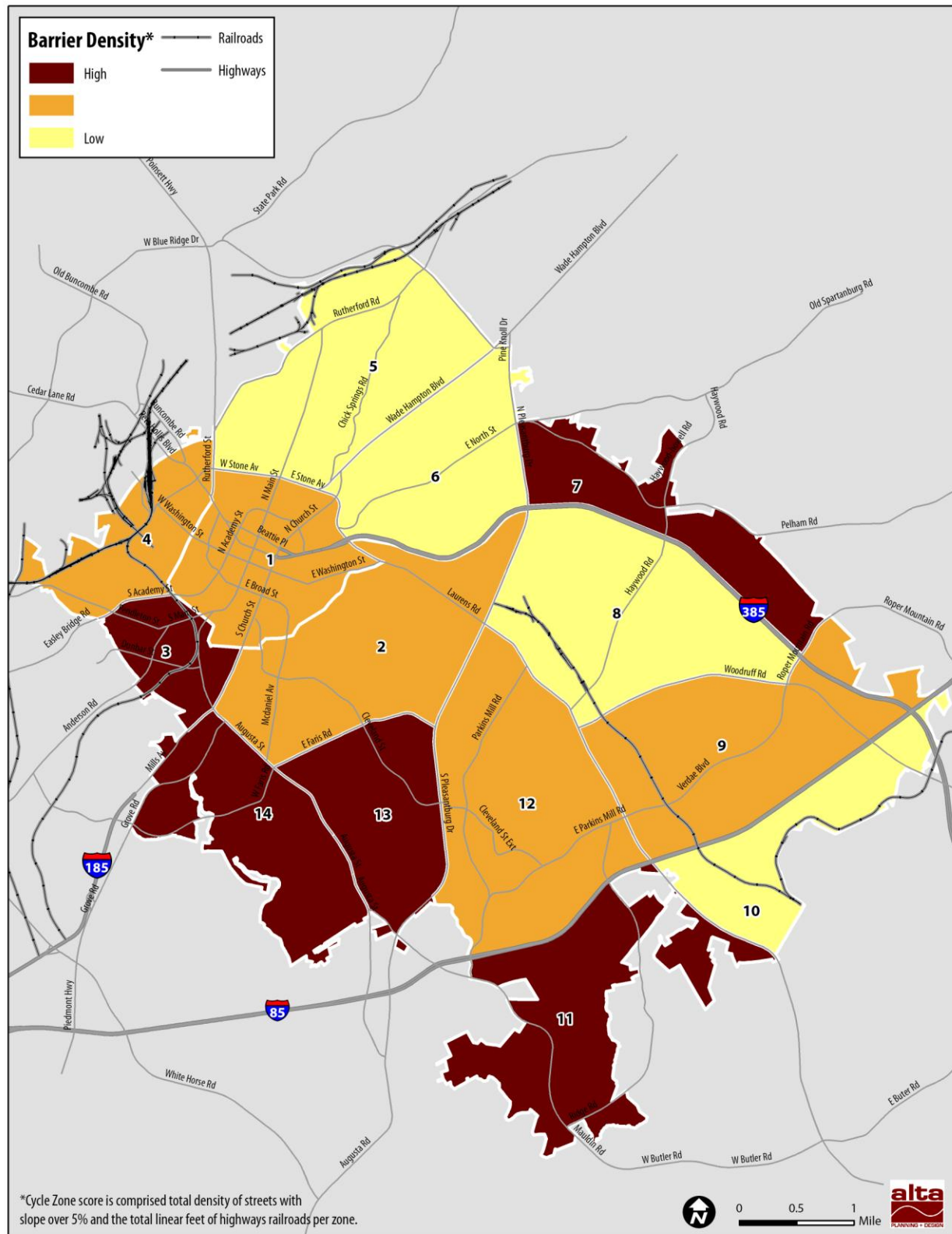
Flat terrain reduces barriers to cycling.

**Reasoning:** Topography can decrease the ease of cycling. A great cycle zone will be relatively flat. Topography is an issue that is difficult or impossible to change and is very important to consider when evaluating the bikability of a zone.

**Basic Methodology:** Elevation data from the USGS was used to determine the slope at 2 foot intervals throughout the city. Roadways were divided in 100 foot segments and average slope was recorded using GIS. Roadways with average slope over five percent were added together to estimate the footage of roadway with slope over five percent in each zone.



Figure 5. Combined Barriers CZA Scores





## CZA Evaluation

The resulting scores for each factor for each zone were weighted and incorporated into the model. Each factor has a potential score of three, with the eight factors adding to a maximum of 24 points. A score of 24 therefore represents a zone with the most ideal bicycling conditions. The influence of each variable can be weighted by changing the percentage that a variable contributes to the final score.

For example, slope can account for five percent or 50 percent of a zone score depending on the need to emphasize or de-emphasize a factor. Table 5 represents the weights given to the factors in Greenville's CZA:

**Table 5. CZA Factors and Weights**

<b>Bikeway Density</b>	11%
<b>Bikeway Connectivity</b>	11%
<b>Roadway Density</b>	16%
<b>Roadway Connectivity</b>	16%
<b>Land Use</b>	19%
<b>Topography</b>	19%
<b>Highway Density</b>	4%
<b>Railroad Density</b>	4%

Greenville's designated bicycle network is clustered within the vicinity of Downtown. The network outside of this area is limited which causes travel to be facilitated primarily on the roadway network. Therefore, roadway density and connectivity were given higher weights than bikeway density and connectivity. The density and connectivity of bicycle facilities in Greenville is currently relatively low. Introducing new designated bicycle facilities have proven to increase cycling activity in cities across the country. As this analysis is used to evaluate existing bikability, it can also be used to target future bicycle facility installation and analyze the impact of installing bike facilities in various zones.

While Greenville has a relatively level topography there are street segments with significant slopes and this is a major concern for citizens. Greenville also has an abundance of bikable destinations within and outside of Downtown Greenville. These include schools, parks, retail locations and other public places. Slope and land uses were therefore given the highest weights.

Highways and railroads are significant features that do not facilitate cycling activity but still have an influence on a network's connectivity. Greenville has two major highways that run through the southern and eastern sections of the City. Its railroads are generally isolated from the existing network with the exception of the westernmost part of West Washington Street which is adjacent to a cluster of rail. These features were therefore given a lower weight than the rest of the features.

## Using CZA to Identify Cycling Potential

This tool can be used to highlight zones with issues such as topography and lack of road network connectivity that are difficult to easily solve through planning. Road network density, roadway connectivity, slope and destinations are all baseline factors that define the cycling potential in a given area. The development of the bicycle network will improve a zone from the baseline. Table 6 illustrates the relationship between the factors, scores and zones. This table can be used to understand the existing conditions in each zone, understand the factors that can be changed, and develop a strategy to develop each zone to its maximum cycling potential.

Table 6. Summary of CZA Scores

Cycle Zone	Bikeway Connectivity	Bikeway Density	Roadway Connectivity	Roadway Density	Land Use	Topography	Highway Density	Railroad Density	Composite CZA
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

Value Key
High
Medium
Low

## Goal Setting with CZA

This tool can also be used for goal setting by setting a target that all zones must rate a score of five or higher by 2020, for example. The CZA can be calibrated to highlight areas where additional cycling facilities will increase the rating from good to great, or poor to good. This could be accomplished by heavily weighting the scores associated with bike infrastructure density while holding the other factors equal.

Figure 6. Composite CZA Scores

