



The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.



WALK BIKE COLUMBIA

COLUMBIA, SOUTH CAROLINA | PEDESTRIAN & BICYCLE MASTER PLAN



INTRODUCTION FROM MAYOR STEPHEN K BENJAMIN

JANUARY 21, 2015

My fellow Columbians,

From creating our Bicycle Pedestrian Advisory Committee (BPAC) and completing Phase I of the Vista Greenway to installing new bicycle corrals and the first HAWK pedestrian signal in South Carolina, we've made great strides towards making Columbia a truly bicycle and pedestrian friendly city because we recognize that bicycling is not only a safe, fun and convenient way to travel, but also holds a unique potential to connect our diverse communities and make our city more livable, economically vibrant and environmentally sustainable.

Because of those efforts including our groundbreaking City Employee Bike Share Program and spectacular events like the Main Street Crit, our Annual Famously Hot Mayor's Bike Ride, Bike and Walk to School Day and our first Youth and Teen Bike Ride and Bike-A-Thon, today we are a nationally designated Bicycle Friendly Community and the University of South Carolina is the first Bicycle Friendly University in the state and one of only a few dozen around the country.

Today we see students riding their bikes to campus and young professionals jogging on Main Street every day but rather than sitting back and celebrating, we're pushing harder moving forward with developing our combined Pedestrian and Bicycle Master Plan and Bike Share Plan – Walk Bike Columbia – because we're not satisfied with more bicycle lanes and wider sidewalks.

We want to be the most bicycle and pedestrian friendly city in the Southeast and, with your help, we can make it happen.

Sincerely,

A handwritten signature in white ink that reads "Steve Benjamin". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

Stephen K. Benjamin

Mayor

City of Columbia, SC



TABLE OF CONTENTS

Walk Bike Columbia Introduction	4	Recommendations	54	Appendices	130
Project Partners	6	Program and Policy Recommendations	54	Demand and Benefits Analysis	131
Why Plan for Pedestrians, Transit, and Bicyclists?	7	Program Recommendations	56	WFC/BFC Analysis, Application, and Action Plans	142
Demand and Benefits Overview	10	Policy Recommendations	60	Planning, Policy and Code Review	150
Project Vision, Goals and Objectives	12	Pedestrian and Bicycle Network	64	Public Input and Bicycle Counts	174
Existing Conditions Analysis	16	Pedestrian and Bicycle Infrastructure Types	67	Existing Conditions Detailed Analyses	200
Plans Policies and Design Analysis	16	Pedestrian and Bicycle Network Recommendations	72	Intermodal Transit Analyses	232
Walk-Friendly Community and Bike-Friendly Community Assessment: Going for Gold!	18	Bicycle Parking Assessment and Recommendations	90	Bikespace Analysis	242
Planning & Policy Review	20	Implementation Plan	97	Potential Implementation Funding Sources	248
User Needs Analyses	26	Capital Improvements Plan	98	Complete Streets Design Guidelines	262
Public Involvement	26	Catalyst Projects to Build Momentum	114	Recommended Project Master Tables	325
Pedestrian and Bicycle Counts	30	Walk Friendly Bike Friendly Community Action Plans	120		
Multi-modal Network Analysis	32				
Existing Walking and Bicycling Conditions	32				
Safety Analysis	40				
Pedestrian and Bicycle Level of Service Analysis	46				
Intermodal Transit Analysis	52				

**PEOPLE OF ALL AGES
AND ABILITIES ENJOY
WALKING AND BIKING
AND BENEFIT FROM
ENHANCED QUALITY
OF LIFE, PUBLIC HEALTH,
AND ECONOMIC
OPPORTUNITY.**





WALK BIKE COLUMBIA: INTRODUCTION

Columbia, SC is a thriving community and hub of South Carolina. It is the hub geographically, with great access to the mountains and sea, as well as other major cities and centers of commerce and trade such as Charlotte, Atlanta, Charleston and Greenville. As the State capital, it is the hub of government and a center of culture and history. Finally it is the hub of education; being home to the most colleges and universities in the State, as well as other centers of learning.

The City's position as the face of the State, its relatively mild year-round climate and relatively flat terrain, its compact downtown core, and high concentration of young people all make it an ideal setting for a future where walking, bicycling, and transit are a safe, enjoyable and normal part of daily life. As such, this Plan is a collaborative effort to to capitalize on these positive characteristics and establish a path towards making Columbia the State hub for healthy and sustainable transportation.





Project Partners

The Walk Bike Columbia Pedestrian and Bicycle Master Plan and Bike Share Plan was commissioned by The Central Midlands Council of Governments (CMCOG) in partnership with the City of Columbia in 2014 with major funding granted by the Federal Transit Administration, and additional support provided by Palmetto Health and Abacus Planning.

Key partners that have been integral to this planning effort include the Central Midlands Regional Transit Authority (The

COMET), the City of Columbia Bicycle and Pedestrian Advisory Committee, South Carolina Department of Transportation, and The University of South Carolina. Collaboration with numerous other communities, agencies and local partners has also been integral to the development of this plan. Other key partners have included surrounding municipalities within the Columbia region; other State agencies such as the South Carolina Department of Health and Environmental Control; Allen University and other institutions of higher education; business

district associations; and , bicycle and transit advocacy groups such as Palmetto Conservation Foundation and Palmetto Cycling Coalition.

Finally, substantial and valuable input and feedback was gathered throughout the planning process from engaged and concerned citizens, and the Walk Bike Columbia Project Advicory Committee.

Advisory Committee Members

- Jim Love, AARP
- Erin Letts, Abacus Planning
- Kimberly Tissot, Able SC
- Dana Higgins, City of Columbia
- John Fellows, City of Columbia
- Lucinda Statler, City of Columbia
- Jeff Caton, City of Columbia
- Robert Anderson, City of Columbia
- Gregory Sprouse, CMCOG
- Reginald Simmons, CMCOG
- Paige Tyler, Coldwell Banker United
- Samuel Scheib, COMET
- Natalie Britt, Palmetto Conservation Foundation, Chairperson Bike and Pedestrian Advisory Committee
- Mary Roe, Palmetto Conservation Foundation, Vice Chairperson Bike and Pedestrian Advisory Committee
- Amy Johnson, Palmetto Cycling Coalition
- Candace Knox, Palmetto Health
- Hope Hasty, Richland County
- Tom Dodds, SCDOT
- Ed Sawyer, SCDOT
- Mike Sullivan, SCDOT
- Mark Pleasant, SCDOT
- Rob Bedenbaugh, SCDOT
- Catherine Graham, SC Interagency Office of Disability & Health
- Lauren Angelo, United Way of the Midlands
- Jenny Rooney, University of South Carolina
- Gene Bell, Watson Tate Savory, Bike and Pedestrian Advisory Committee Representative

Partnering Organizations





Why Plan for Pedestrians, Bicyclists, and Transit?

Imagine Columbia in 20 years as a place where people choose to walk, bike and/or take transit for some trips – not out of necessity, but because it is a convenient and enjoyable transportation choice. Development is dense and well-designed so that people have many of their everyday needs available by a short walk, bike ride or transit trip. Programs such as walking school busses and bike safety rodeos are commonplace in schools, and walk, bike and transit-friendly streets are prevalent so that parents feel perfectly safe letting their children walk or bike to and from school (freeing up valuable time in their daily lives as well). Transit is as reliable and convenient as driving a car and is easily accessible by anyone. As a result, it is utilized by people of all ages, backgrounds and abilities; providing better access for families without cars to get to jobs, retail and school; creating additional viable transportation options for elderly citizens; and allowing more college students and families to live car-free.

An increasing number of communities and their leadership are seeing the potential of a future like this one; a future where better walking, bicycling and transit are critical parts of transforming and revitalizing our communities, making them more desirable places to live and visit. This movement is a direct result of the nationwide demand for more livable communities and transportation options. In 2010, Transportation for America conducted a nationwide survey that showed 59% of Americans in rural and urban areas preferred a transportation future that “[improves] public transportation and making it easier to walk and bike over building more roads and expanding existing roads.” In addition, “66% [of respondents said] that they ‘would like more transportation options so they have the freedom to choose how to get where they need to go.’ And 73% [of respondents felt] they ‘have no choice but to drive as much as they do’, with 57% desiring to spend less time in the car.”

If Americans themselves were crafting the transportation bill, we would see a doubling of the share for public transportation; an ironclad system of accountability for restoring existing roads and bridges before simply building more of them, and a strong commitment to making all our streets safe enough for kids to bicycle to school or so seniors can walk to nearby restaurants or the drug store.”

- Geoff Anderson, T4 America

Preference to Reduce Traffic Congestion

Transportation for America - Future of Transportation National Survey

*Source: Transportation For America: <http://t4america.org/maps-tools/polling/2010survey/>



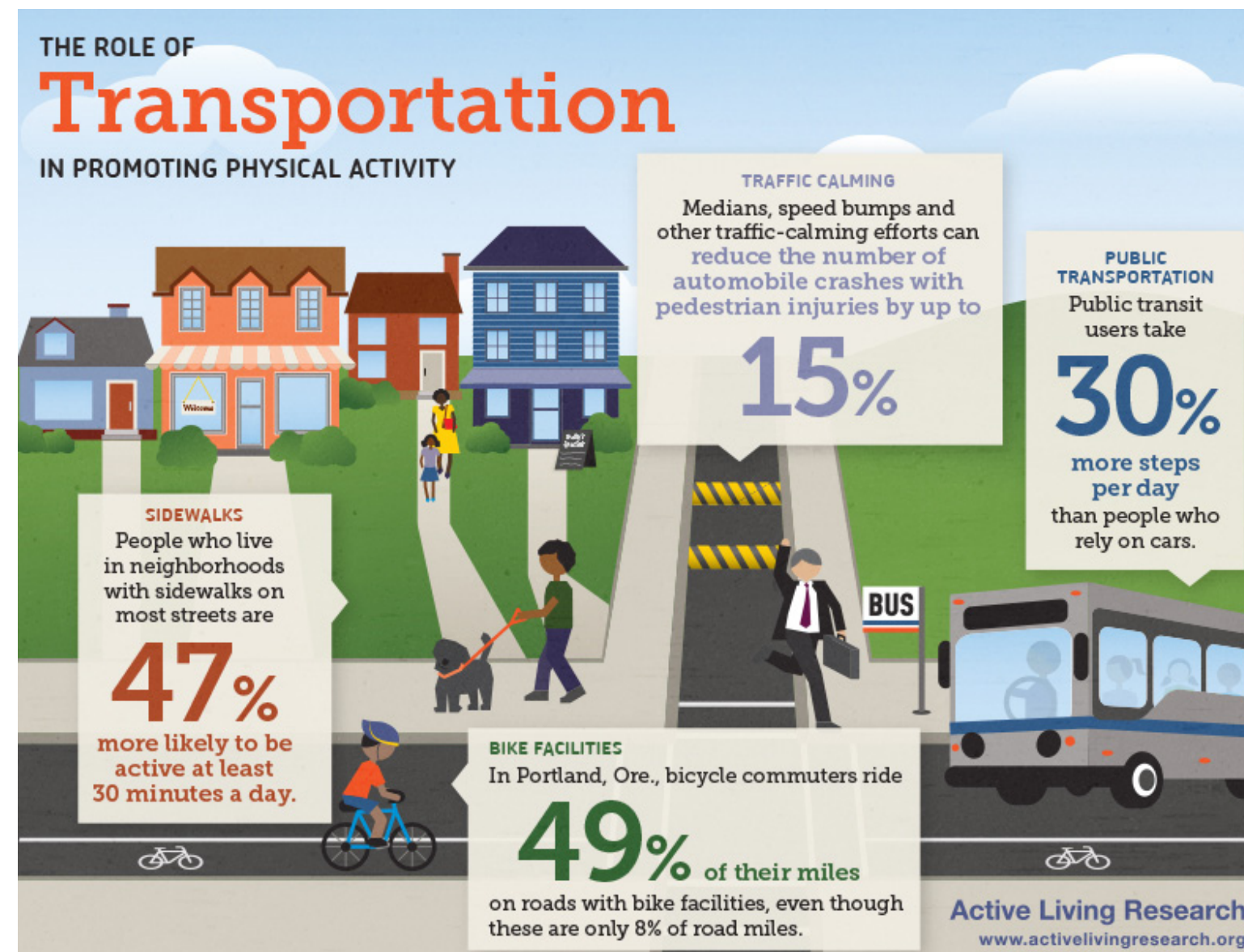


Benefits of Walking and Bicycling Summary

The “Facts on Active Transportation” shared on the following page present some of the acute health, safety and economic issues many cities today face and the ways in which improved active transportation and recreation can have a positive impact on these. In the following section, a summary of the estimated, quantified benefits that would result from increasing walking and bicycling rates and safety in Columbia is presented. These benefits offer a powerful statement regarding Columbia’s return on investment for implementing the recommendations in this Plan.

Active transportation can play a major role in building healthier and wealthier communities. The infographic to the right depicts some of the data collected showing just how much of a positive impact it can have.

(infographic source: Active Living Research)





The Facts on Active Transportation

ECONOMY

Issues

- **Traffic congestion in 2011 caused Americans in cities to travel an additional 5.5 billion hours, purchase an additional 2.9 billion gallons of fuel, and spend an additional \$121 billion in gas.** This means, on average, each car commuter spends roughly 40 hours and over \$800 per year waiting in traffic.

Opportunities

- Reducing the number of vehicular lane-miles through road-diets and other methods decreases wear and tear from motor vehicles. Replacing these with pedestrian facilities, bicycling facilities or transit capacity increases transportation capacity with less investment.
- Reducing the dependence on personal motor vehicles decreases personal and family expenditures on autos, potentially saving thousands of dollars per family annually.
- Reports have shown that pedestrians and bicyclists spend more, on average, than motorists.
- Bikeways and trails across many regions and cities have been shown to have a major economic impact. For example, following the opening of the Greenville, SC Swamp Rabbit Trail in 2011, **most businesses along the trail saw a 30%-50% increase in sales after the trail opened, and businesses that relocated to the trail observed a 30% to 90% increase in sales.**
- **Pedestrian and bicycle infrastructure projects create 8–12 jobs per \$1 million of spending.** Road infrastructure projects create 7 jobs per \$1 million of expenditures (Garrett-Peltier, 2011)
- Focusing investment in Pedestrian and Bicycle Infrastructure Improvements has proven to be more cost effective than vehicular infrastructure across the board.

SAFETY

Issues

- Higher traffic speeds result in reduced driver response times and increased accident severity. **A chance a pedestrian would survive if hit by a car travelling at 20 mph is 95%. This percentage is reduced to 60% at 30mph and 20% at 40mph.**
- Nationally, there were over 33,500 traffic fatalities reported in 2012. **The Alliance for Bicycling and Walking reports that 14.9% of traffic fatalities are pedestrians or bicyclists, while only 11.4% of all trips are made either walking or bicycling.**

Opportunities

- Increasing the number of pedestrians and bicyclists along a corridor, and network-wide, by itself creates a safer environment for these users. Motorists expect the presence of these users and drive more cautiously as a result.
- Complete Streets Improvements that reduce crossing distances for pedestrians and bicyclists, highlight conflict zones, create dedicated roadway space for non-motorized users, reinforce safe roadway behavior, increase visual stimulation or a sense of enclosure, and/or actively reduce speeds through geometric roadway changes foster safer speeds and behavior among all roadway users.

HEALTH

Issues

- **“Obesity costs American companies \$225.8 billion per year in health-related productivity losses.”**
- **“The estimated annual health care costs of obesity-related illness are a staggering \$190.2 billion or nearly 21% of annual medical spending in the United States.** Childhood obesity alone is responsible for \$14 billion in direct medical costs.”

Opportunities

- A recent study shows that people who live within 0.6 miles of a pedestrian and bicycle path get 45 minutes more of exercise a week, on average.
- “A 5% increase in walkability [has been found] to be associated with a per capita 32.1% increase in time spent in physically active travel, a 0.23-point reduction in body mass index, 6.5% fewer vehicle miles traveled, 5.6% fewer grams of oxides of nitrogen (NOx) emitted, and 5.5% fewer grams of volatile organic compounds (VOC) emitted.”
- Studies have shown that increased amounts of physical exercise, including walking and bicycling, improves mental well-being.



Columbia Active Transportation Demand and Benefits

The project team conducted a demand and benefits analysis to estimate the potential benefits that Columbia could realize by becoming a more walk and bicycle-friendly City. The analysis calculated these benefits based on existing data gathered from sources such as the US Census combined with economic impact assumptions, health assumptions, and environmental/air quality impact assumptions gathered from nationally-accepted studies. A detailed breakdown of this analysis and the results can be found in **Appendix A**.

In summary, the demand analysis revealed that Columbia residents are already walking, biking, and accessing transit with a combined total of **40 million trips annually. This equates to a total of 30 million miles traveled by bike or on foot each year and about 9 million hours of moderate intensity physical activity.**

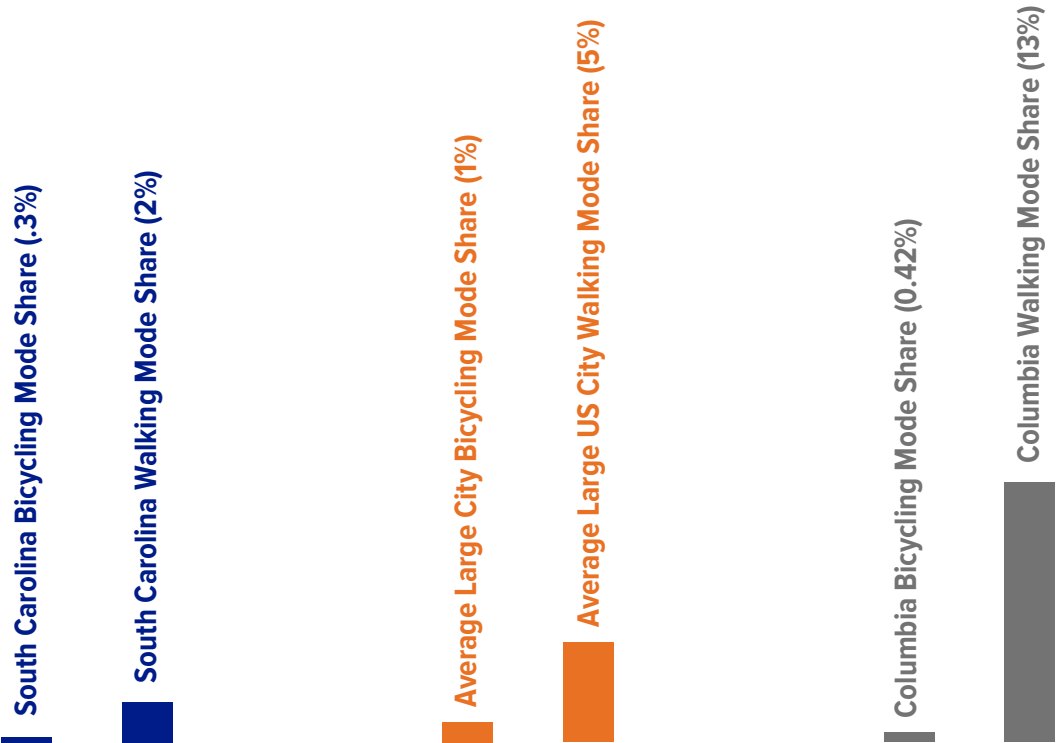
When translating existing demand into measurable benefits to the Columbia community, the analysis revealed that **Columbia**

is already realizing over \$14 million in community-wide benefits from existing walking activity, and over \$1 million in community-wide benefits from existing bicycling activity.

With incremental increases in mode share for walking and bicycling, those monetary benefits will grow exponentially, equating to a significant return on investment when it comes to walking and bicycling infrastructure, policies, and programs.

By increasing walking rates by two percentage points and doubling the current bicycle mode share, Columbia could increase those benefits to more than \$19 million in community-wide impact. By increasing walking mode share by a total of four percentage points and reaching the bicycling mode share of a peer Silver-level Bicycle Friendly Community (see text box for more info on the Bicycle Friendly America Program) [insert text box] , **Columbia could realize an estimated \$27.7 million in economic benefits resulting from walking and bicycling activity, nearly doubling the current estimated benefits.**

The following page presents a snapshot of the benefits of increasing walking and bicycling in Columbia. Increasing walking and bicycling rates not only have positive qualitative impacts on resident health, livability and the environment, but can have substantial economic benefits as well.

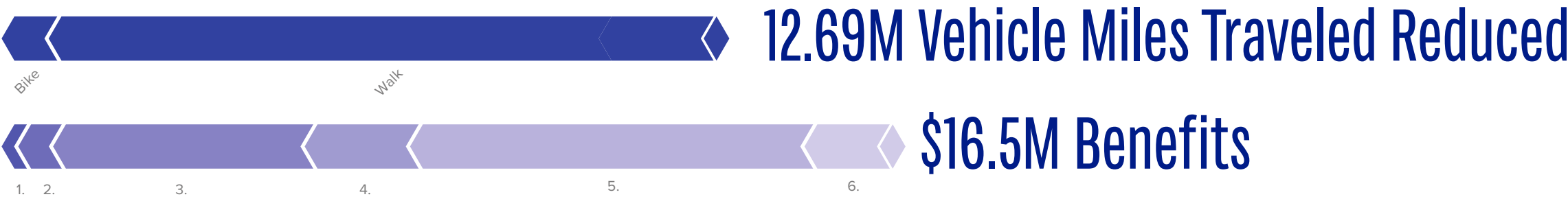


The graphics to the left show how Columbia compares with averages for walking and bicycling and national large city averages. While Columbia ranks high in the Country for existing walking rates, there is ample room to improve in terms of walking and bicycling rates and safety.

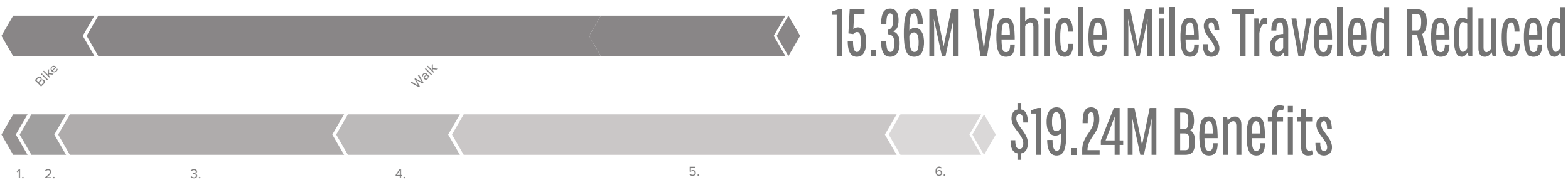


BENEFITS SNAPSHOT

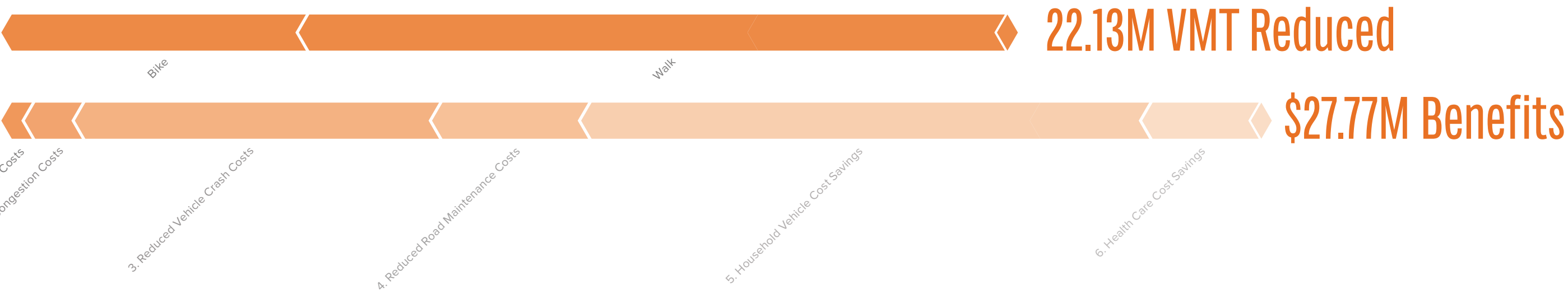
Columbia Current Walking Mode Share (13%) and Current Bicycling Mode Share (0.42%)



2% Walking Mode Share Increase (15%) and Double Bicycling Mode Share (0.84%)

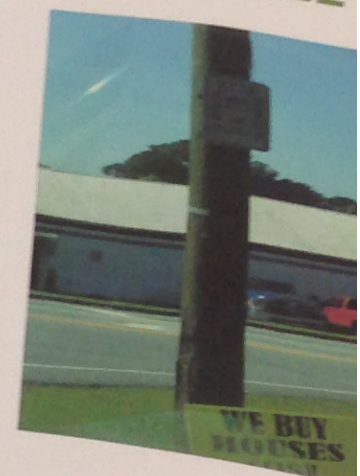


Example 4% Walking Mode Share Increase (17%) and Silver-Level Bicycle Friendly Community Bicycling Mode Share



WA
A Project of
WW

**A LACK OF SIDEWALKS, ADA-A
OR OTHER KEY ELEMENTS OF A
CONVENIENCE, AND OVERALL**



**WHAT WOULD MAKE TRANSIT IN
COLUMBIA MORE CONVENIENT
AND PRACTICAL FOR YOU?**

signs w/
timetables

yes!!

→

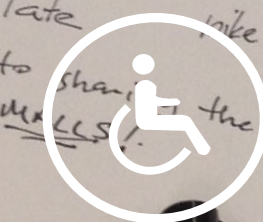
Charlotte Airport

shuttle every hour w/ wifi, movies

Columbia

Charleston

**BICYCLE RACKS ON BUSES, V
FEATURES ARE CRITICAL TO E
PRACTICAL, AND INVITING C**





WALK BIKE COLUMBIA: PROJECT VISION, GOALS AND OBJECTIVES

Introduction

The infrastructure improvements, policies, and programs recommended in Walk Bike Columbia are shaped by the Plan's vision, goals and objectives. The vision, goals, and objectives are developed by the Project Advisory Committee with input from agency staff and based, in part, on:

- stakeholder focus groups and broad public outreach
- existing vision and goal statements of prior city and regional planning efforts,
- nationally-recognized performance measures for pedestrian and bicycle planning, and
- the League of American Bicyclists' (LAB) feedback for Columbia's 2013 Bicycle Friendly Community application.

The following is a unique vision statement and related goals and objectives for Walk Bike Columbia. The objectives serve as performance measures, allowing Columbia and its partners to evaluate its progress towards and the impact of implementing the Plan's recommendations:

Transit is an important component of this planning effort . To increase the use of transit, and effectively increase the range of pedestrians, transit stops must be accessible by sidewalks. In addition, bicycles and bike share are both effective at extending the effective range of transit.

Vision Statement

Walk Bike Columbia envisions an expanded and ADA-accessible network of transit, sidewalks, greenways, trails, and on-street bicycle connections linking people to jobs, schools, destinations, adjacent communities, and one another. The network serves residents, commuters, students, and visitors alike. Walking, biking and transit are an integral part of City projects, policies, and programs and are perceived as routine, efficient, safe, and comfortable options for both transportation and recreation. People of all ages and abilities enjoy walking and biking and benefit from enhanced quality of life, public health, and economic opportunity.





Goals and Objectives

GOAL 01

Choice - Provide a range of transportation options to advance Columbia’s multimodal linkages and transportation culture.

Objective 1-1: Expand the range of ways to move throughout the city.

Objective 1-2: Implement a phased bike share system that complements and expands the transit and pedestrian networks.

Objective 1-3: Connect walking and bicycling infrastructure improvements with transit stops for **last-mile linkages**.

Objective 1-4: Increase the number of bike-on-bus trips by 50% by 2018, and 100% by 2020.

GOAL 03

Connectivity and Convenience – Biking, walking, and using transit for transportation will be easy, efficient, and routine activities.

Objective 3-1: Connect residents and visitors with on- and off-street pedestrian and bicycle facilities to destinations and activity centers throughout the city.

Objective 3-2: Integrate transportation and land use policies to encourage sustainable growth that encourages walking, bicycling and transit.

Objective 3-3: Prioritize pedestrian and bicycle routes between the Three Rivers Greenway, the Statehouse, USC campus, and each of the major business districts in downtown.

Objective 3-4: Prioritize pedestrian and bicycle routes from neighborhoods to transit stops, and from neighborhood to neighborhood.

GOAL 02

Accessibility – Institutionalize universal design principals to meet the needs of all modes and all users, including children, families, the aging, and those with disabilities.

Objective 2-1: Update design guidelines to meet current best practices of ADA-accessibility, transit access, and safe and innovative pedestrian and bicycle facilities.

Objective 2-2: Upgrade streets of all typologies, including transit corridors, based on improved accessibility guidelines to meet the needs of all users.

Objective 2-3: Expand development standards to require bicycle parking at retail, commercial, civic, and employment uses and multi-family housing.

Objective 2-4: Establish short-term and long-term bicycle parking at all major transit stops.

Objective 2-5: Establish form-based codes or similar development standards to ensure setbacks, parking lots, and other street-level design elements prioritize pedestrian and bicycle access.

Objective 2-6: Reduce the demand for costly paratransit trips as result of infrastructure improvements aimed towards pedestrians with mobility or visual impairments.

GOAL 04

Safety and Comfort – Improve pedestrian and bicyclist safety while designing attractive, welcoming, and comfortable streets, trails, and greenways for all users.

Objective 4-1: Reduce the number of bicyclist injuries and fatalities by 20% by 2018 and by 40% by 2020.

Objective 4-2: Reduce the number of pedestrian injuries and fatalities by 20% by 2018, and by 40% by 2020.

Objective 4-3: As a long-term goal, strive to eliminate all traffic fatalities, across all transportation modes.

Objective 4-4: Continue Columbia’s tradition of tree-lined streets while incorporating low-stress facilities such as wider sidewalks and innovative bike treatments.

Objective 4-5: Incorporate intersection safety and accessibility improvements for pedestrians and bicyclists within corridor improvement projects.

Objective 4-6: Develop off-street facilities to meet national best practices in design, providing a safe and inviting environment for all ages and ability levels.



GOAL 05

Awareness - Education, encouragement, and enforcement related to biking and walking will ensure all residents and visitors feel confident biking and walking throughout Columbia.

Objective 5-1: Generate awareness among motorists, pedestrians, and bicyclists of their rights related to safe and courteous use of roadways.

Objective 5-2: Provide educational opportunities and encouragement programs specifically targeted to the “interested but concerned” group of existing and potential bicyclists, including families and children.

Objective 5-3: Ensure that education and encouragement programs for transit, walking, and biking reach all socioeconomic groups, geographic locations, genders, races, and walks of life.

Objective 5-4: Utilize targeted enforcement to discourage unsafe behaviors of motorists, Licensed Commercial Drivers, pedestrians, bicyclists, and transit users.

Objective 5-5: Develop and promote an easy-to-read User Map & Guide, supported by wayfinding signage, for the combined transit, pedestrian, and bicycle network.

GOAL 07

Implementation – Local leadership, coordination, and funding will allow the continued growth of the pedestrian and bicycle network as well as opportunities for bike sharing.

Objective 7-1: Work across jurisdictions, departments, and organizations to achieve coordination on short-, medium-, and long-term transportation-related goals and plans.

Objective 7-2: Establish dedicated funding amounts and fundraising goals for implementation of the Plan.

Objective 7-3: Implement at least six recommendations of the Plan within six months of adoption with a goal of implementing at least one recommendation in each of the 5 E categories within 1 year of adoption.

Objective 7-4: Establish an annual work plan of programmatic, policy, and infrastructure recommendations ready for implementation, for pedestrians, bicyclists, and transit users.

Objective 7-5: Closely follow the Implementation Plan included as a component of this planning effort to **build 50 miles of on-street bike facilities by 2017.**

Objective 7-6: 30 miles of greenway are currently programmed with penny sales tax funds within the Columbia urban services area. The city should **build 20 miles of off-street, paved shared-use paths or greenways by 2020.**

Objective 7-7: Identify non-profit and private sector partners to lead community-based education and encouragement programs.

Objective 7-8: Designate a staff member and/or **establish a new staff position dedicating at least 50% of time to implementation of the Plan.**

GOAL 06

Usage – The transit-, walking-, and biking-environment will inspire movement in everyday life.

Objective 6-1: Maintain a walking mode share at or above current levels, remaining one of the highest in the country.

Objective 6-2: Double transit mode share by 2020, establishing a level of usage comparable to the national average.

Objective 6-3: Double bicycle mode share by 2020, establishing a level of usage comparable to peer BFC-designated cities.

Objective 6-4: Establish and maintain an annual counts program, documenting trends in pedestrian and bicycle activity.

Objective 6-5: Document an annual increase in physical activity levels among Columbia residents, ultimately reducing rates of obesity and related chronic diseases.

GOAL 08

Evaluation – The City will measure progress towards advancing the vision and goals of Walk Bike Columbia.

Objective 8-1: Develop and publish a bi-annual report summarizing progress in implementing the transit, walking, and bicycling recommendations of the Plan.

Objective 8-2: Coordinate annual pedestrian and bicycle counts with planned infrastructure investments to measure impacts.

Objective 8-3: Conduct bi-annual analysis of pedestrian and bicycle collision data to measure progress towards safety goals and objectives.

Objective 8-4: Maintain up-to-date GIS inventory of pedestrian, bicycling, and transit facilities including ADA improvements.

Objective 8-5: Achieve Silver-level BFC by 2018 and Gold-level BFC by 2020.

Objective 8-6: Achieve WFC status by 2015, Gold-level by 2018, and Platinum-level by 2020.

TRANSPORTATION IS ABOUT MORE THAN ASPHALT, CONCRETE AND STEEL. ULTIMATELY IT IS ABOUT PEOPLE. IT IS ABOUT PROVIDING PEOPLE WITH THE OPPORTUNITY FOR A SAFER, HAPPIER AND MORE FULFILLING LIFE.



-- RODNEY SLATER,
FORMER US SECRETARY OF TRANSPORTATION



EXISTING CONDITIONS: PLANS, POLICIES, AND DESIGN

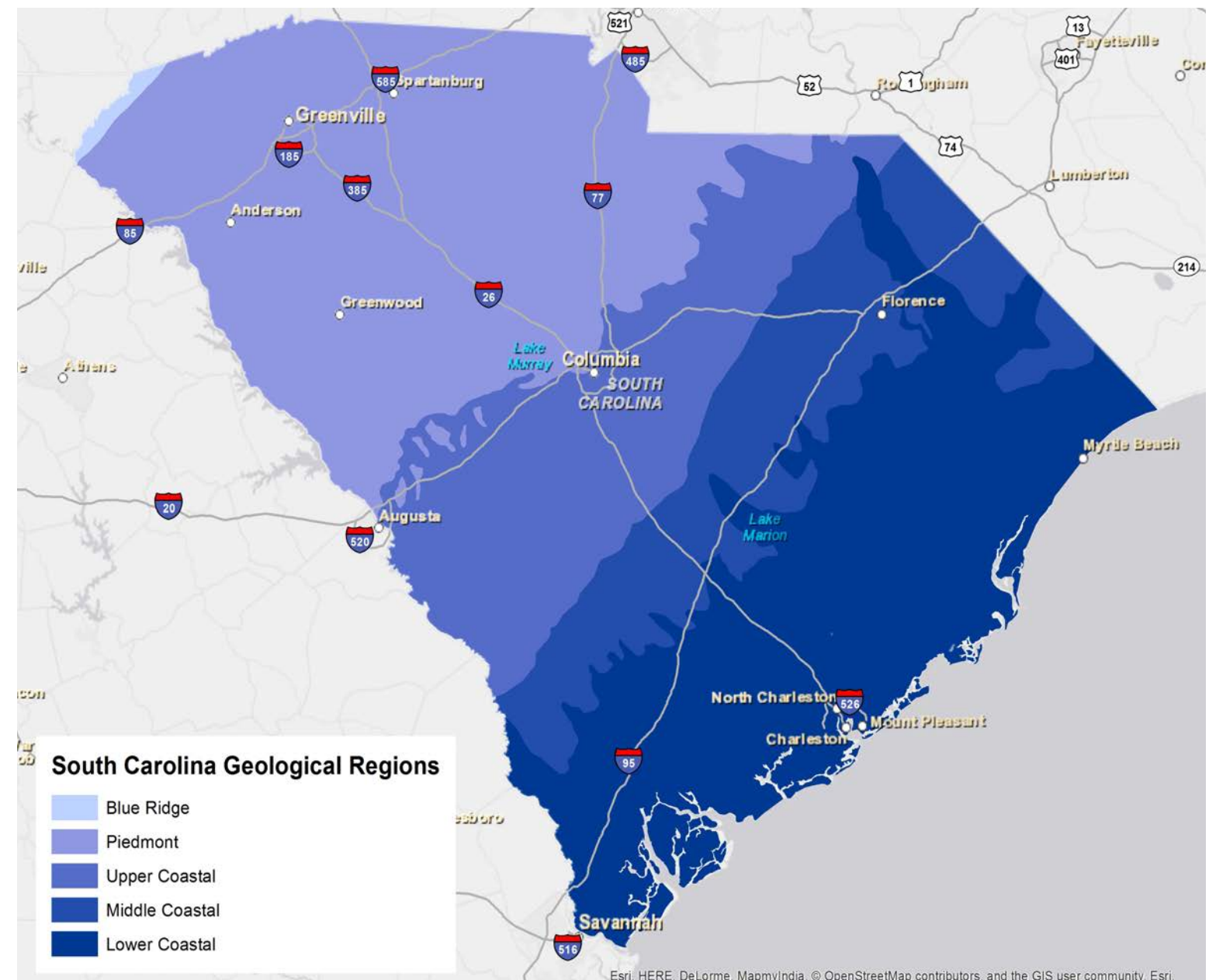
The scope of this planning effort encompasses pedestrian, bicycle and transit activity within the Columbia, SC city limits. However, this plan acknowledges that the City of Columbia's transportation patterns are affected by several surrounding jurisdictions such as Cayce, West Columbia, Irmo, Forest Acres, Arcadia Lakes, Lexington, and Springdale. It also considers several areas around the Columbia city limits that are priority areas for annexation into the city limits.

Columbia is a mid-sized city in the Midlands region of South Carolina. The City is within the Upper Coastal or Sandhills landform region, which is characterized by flat terrain and rolling hills. However, the rivers and creeks that transect the city - such as The Broad/Saluda/Congaree Rivers to the west and Gills Creek to the east - are the cause of a substantial amount of grade change in areas such as south of downtown Columbia. Columbia's climate is characterized by hot summers and mild falls, winters and springs, with an average of 217 sunny days a year. All of these conditions make Columbia an ideal city for active transportation most of the year.

Walk Bike Columbia is a master plan for the pedestrian and bicycle network, with a focus on walking and bicycling as "feeder modes" for Columbia's larger transit network. A safe and accessible pedestrian network is key to an effective transit network and vice versa. Without accessible pedestrian connectivity to stops, the effective transit network is greatly reduced; and a strong transit network can greatly expand the effective range of someone heading to a destination by foot.

Likewise, an accessible bike network can expand the range of transit significantly. If a transit station is a 20 minute walk from someone's origin, but only a 5 minute bike ride, this may be the difference in choosing to take a car or take transit. The key to encouraging people to bike to transit is to make it convenient,

comfortable and safe. For example, installing separated bike facilities to the transit stop, providing end-of-trip facilities such as secure bike parking at the stop, or planning bike share station placement around transit lines.





Going for Gold! Walk-Friendly and Bike-Friendly Community Assessment



Introduction

The Walk Friendly Community (WFC) and Bicycle Friendly Community (BFC) programs are two national initiatives designed to encourage cities and towns across the country to improve the walking and bicycling environments in their communities and to recognize communities that are successfully doing so. The programs provide communities with invaluable resources related to pedestrian and bicycle planning, help communities identify projects and programs to improve the walking and bicycling environment, and also generate positive media attention at the national and local level for communities that earn a designation.

The BFC program is administered by the League of American Bicyclists, a national bicycling advocacy organization based in Washington, D.C. Since the program began, the League has awarded over 300 communities with “bicycle-friendly” status. There are currently 6 BFCs in South Carolina. In 2011, the Pedestrian and Bicycle Information Center, based in Chapel Hill, North Carolina, announced the development of the WFC Program. There are currently 47 “walk-friendly” designated communities around the country, but none yet in South Carolina.

Both the WFC and BFC program use the five “E’s” of pedestrian and bicycle planning as the framework for identifying successful biking and walking communities. The five “E’s” are: Engineering, Encouragement, Education, Enforcement, and Evaluation. Each program has its own detailed questionnaire that a city or town must complete online in order to apply for recognition. Five levels of award

designation are possible in the BFC program: Bronze, Silver, Gold, Platinum, and Diamond. The WFC program offers four award levels: Bronze, Silver, Gold, and Platinum. Both programs offer an Honorable Mention category, as well.

In 2008, Columbia applied for BFC designation and received a Bronze level award in 2008 and 2013. **Columbia is one of five Bronze level communities in South Carolina**, alongside Charleston, Greenville, Spartanburg, and Rock Hill. Hilton Head is the only Silver level community in the state; no South Carolina communities have reached Gold, Platinum, or Diamond BFC designation. There are two opportunities each year to apply to both the BFC and WFC programs: BFC deadlines are in the spring and fall of each year, and WFC deadlines are in the summer and winter of each year.

Appendix B of Walk Bike Columbia provides a BFC Action Plan setting clear action steps for Columbia to reach Gold level BFC status. This project also includes a completed WFC application for Columbia to be submitted in the spring of 2015, along with a WFC Action Plan for Columbia to become the first Walk Friendly Community in the state.

The following sections show the team’s initial walk-friendly and bicycle-friendly community assessment of Columbia. This evaluation provides a baseline for the BFC and WFC Action Plans as well as the City’s WFC application.



WFC Assessment

The WFC application involves a detailed list of questions organized around the 5 “E’s”. For the purposes of Walk Bike Columbia, the project team developed a BFC scorecard, which uses the WFC application framework to evaluate the current walking environment in Columbia. This scorecard is not intended to be a complete picture of WFC-readiness, but rather a useful snapshot of Columbia’s strengths and weaknesses based on our understanding of the selection criteria.

Based on the WFC scorecard:

- Columbia has been **successful at implementing a variety of Education & Encouragement programs** related to walking.
- Some Engineering and Enforcement practices and policies are positively influencing the walking environment, while others currently limit pedestrian activity and safety.
- **Evaluation & Planning for pedestrians is the area most in need of improvement.** The City currently lacks a dedicated pedestrian coordinator position, a full range of planning initiatives and policies related to pedestrian safety and accessibility, and long-term tracking of valuable pedestrian-related data such as crashes, motor vehicle traffic volumes and speeds, and pedestrian counts to target improvements and track progress.

With a total score of 15 out of 32 possible points, the City of Columbia is identified as a candidate for Bronze level WFC status. A higher range of points are needed to evidence a likelihood of attaining Silver (19-25) or Gold (26-32) level status.

Table 1 gives an overview of how Columbia scored in the 5 “E” categories for walking, and the complete results of the review can be found in **Appendix B**.

BFC Assessment

The BFC application involves a detailed list of questions organized around the 5 “E’s”. For the purposes of Walk Bike Columbia, the project team developed a BFC scorecard, which uses the BFC application framework to evaluate the current bicycling environment in Columbia. This scorecard is not intended to be a complete picture of BFC-readiness, but rather a useful snapshot of Columbia’s strengths and weaknesses based on our understanding of the selection criteria.

The BFC scorecard shows that:

- Columbia has a **strong collection of Education and Encouragement efforts** to develop a safer and more welcoming bicycling environment.
- Some Engineering and Enforcement initiatives promote bicycle safety, convenience, and comfort, but several policies and programs are lacking in these categories that could further improve Columbia’s bicycling environment.
- **Columbia scores weakest on Evaluation & Planning;** this planning process, the Bicycle and Pedestrian Advisory Committee, and the Safe Streets Save Lives Campaign provide a good foundation, but there is room for improvement. In particular, the City currently lacks a dedicated bicycle coordinator position and long-term tracking of valuable bicycle-related data, such as crashes, motor vehicle traffic volumes and speeds, and bicycle counts to target improvements and track progress.

With a total score of 18.5 out of 29 possible points, the City of Columbia shows its commitment to maintaining its BFC status and potential for a Silver level designation within the near-term. A higher range of points are needed to evidence a likelihood of attaining Silver (20-24) or Gold (25-29) level status.

Tables 2 gives an overview of how Columbia scored in the 5 “E” categories for bicycling, and the complete results of the review can be found in **Appendix B**.

TABLE 1 – WALK-FRIENDLY COMMUNITY ASSESSMENT

Evaluation Category	Columbia Score	Total Points Possible
Engineering	4.5	8
Education and Encouragement	5.5	9
Enforcement	1.5	4
Evaluation and Planning	3.5	11
Total Score	15	32

TABLE 2 – BICYCLE FRIENDLY COMMUNITY ASSESSMENT

Evaluation Category	Columbia Score	Total Points Possible
Engineering	5.5	8
Education and Encouragement	8.5	11
Enforcement	2	4
Evaluation and Planning	2.5	6
Total Score	18.5	29





Planning and Policy Review

Introduction

This section provides a summary of pedestrian, bicycle, and transit planning-related efforts in Columbia. Twenty relevant plans were reviewed for information and recommendations relevant to walking and bicycling. The documents reviewed for this Plan are listed in **Table 3**, and detailed reviews of the documents listed here can be found in **Appendix C**.

Figures 1 and 2 on the following pages show existing conditions and planned pedestrian and bicycle projects within the City of Columbia.

Key Findings

These plans, studies, and reports help to identify the gaps that exist in the current pedestrian and bicycle network and underscore the demand for investment in improved facilities for walking and bicycling. **Several of the plans repeatedly stress the importance of developing complete streets that make the transportation network and local and regional destinations accessible not just by automobile, but also by foot, bike, and transit.** Key themes from previous planning efforts include:

- Improve pedestrian and bicycle connections to schools, parks, and employment centers; along major corridors; within commercial nodes; and within and between neighborhoods.
- Provide multi-use trails to link destinations throughout Columbia and the surrounding region.
- Improve pedestrian and bicycle access to transit with more sidewalks, bikeways, and amenities.
- Integrate complete streets design on new and existing roadways.

TABLE 3 – DOCUMENTS INCLUDED IN WALK BIKE COLUMBIA! BACKGROUND REVIEW

Plan	Agency	Year
<i>Columbia Owens Master Plan</i>	South Columbia Development Corporation and Columbia Empowerment Zone	2002
<i>A Plan for the Redevelopment of East Central City</i>	East Central City Consortium, City of Columbia	2004
<i>The Master Plan for The Villages of North Columbia</i>	City of Columbia	2005
<i>Five Points “FutureFive” Redevelopment and Master Plan</i>	The Five Points Association	2006
<i>Lower Waverly Catalyst Redevelopment Plan</i>	City of Columbia Planning Department	2006
<i>Bike and Pedestrian Pathways Plan</i>	CMCOG	2006
<i>Central Midlands Commuter Rail Feasibility Study</i>	CMCOG	2006
<i>Innovista Master Plan</i>	University of South Carolina, City of Columbia	2007
<i>Midlands Tomorrow Household Travel Survey Report</i>	CMCOG	2007
<i>Midlands Tomorrow – 2035 Long Range Transportation Plan</i>	CMCOG	2008
<i>South Carolina Statewide Multimodal Transportation Plan – At a Crossroads</i>	South Carolina Department of Transportation (SCDOT)	2008
<i>The Columbia Plan: The Comprehensive Plan for Columbia, South Carolina, 2008-2018</i>	City of Columbia Planning Department	2008
<i>Southeast Lower Richland Sub-Area Transportation Study</i>	Central Midlands Council of Governments (CMCOG)	2008
<i>Columbia Area Transportation Study Transportation Improvement Program</i>	CMCOG	2009
<i>Regional Pathways Plan</i>	CMCOG	2010
<i>University of South Carolina Vision for a Sustainable Future: 2010 Master Plan</i>	University of South Carolina	2010
<i>Broad River Road Corridor and Community Master Plan</i>	CMCOG and Richland County	2010
<i>Irmo/Dutch Fork Sub-Area Transportation Study</i>	CMCOG	2010
<i>Central Midlands Regional Transportation Authority Comprehensive Operational Analysis Report</i>	Central Midlands Regional Transit Authority (CMRTA)	2010
<i>Central Midlands Regional Transportation Authority Park-and-Ride Study</i>	CMRTA	2010
<i>Columbia Connectivity: Linking Main Street and the Vista</i>	Urban Land Institute - South Carolina	2011
<i>COMET Vision: 2020</i>	CMRTA	2012
<i>Rosewood Plan: A Corridor & Neighborhood Plan</i>	City of Columbia Planning & Development Department	2012
<i>Joint Land Use Study Implementation for Fort Jackson – McGrady Training Center – McEntire JNGB</i>	CMCOG	2013
<i>City of Columbia Parks and Recreation Master Plan</i>	City of Columbia	2013
<i>Newberry-Columbia Alternatives Analysis</i>	CMCOG	2014
<i>Devine Street/Fort Jackson Boulevard Commercial Node Plan</i>	CMCOG	2014



Municipal Code Review

Introduction

The consultant team reviewed existing development policy and regulatory documents for the City of Columbia. This task included a review of available policies and standards directly related to pedestrian and/or bicyclist safety within the City. The review focused on the City’s Code of Ordinances (CO), but also included a review of the City of Columbia 2010 Complete Streets Resolution.

The full policy and regulatory review is provided in the Policy Matrix found in **Appendix C**.

Planning and development regulations provide guidelines and requirements for most of what is developed in the City and as such are fundamental to the area’s walk- and bike-friendliness. **Since most new development in Columbia is provided through private investment or investment by non-City agencies, the provision of walk- and bike-friendly development policies and ordinances are one of the most cost-effective means that the City has to establish walkable and bikeable infrastructure for its neighborhoods and districts.**

Key Findings

The City of Columbia has a number of very positive policies and regulations that support walkable and bikeable environments. However, it is also evident that the City could significantly strengthen many areas of policy regarding complete streets (including transit access), bicycle parking, and pedestrian and bicycle facility requirements and enhancements within the context of development ordinances. Policies and standards geared toward retrofit of existing facilities are also recommended and discussed within the attached policy matrix. below describes key strengths identified within the existing ordinances and policies of the City, as well as priority areas for improvement.

Conclusion

What is evident is that a more holistic approach to facilitating walkable and bikeable new development is required. The City development standards are very much oriented towards automobile access first and foremost. Walkability begins with access to destinations and to the extent politically feasible, the City and its partners at County and State agencies should promote development that is proximate to existing infrastructure, residential development, and existing destinations for education, employment, commerce, and civic activities. This begins with allowing and promoting a mixture of land uses and density of land uses that support walking and bicycle access in the built up areas of the city. For current residents who do not drive or have access to a car and for future residents and visitors who are looking to visit or invest in a place where walking and biking are part of the transportation options, walkable land use patterns are critical to quality of life.

Second, promoting “complete” infrastructure and transportation linkages between land uses is what is required to make sure that places that are proximate in distance are indeed comfortable and safe to walk or bike to and from. This will require a thorough review and refinement of existing development standards to ensure that pedestrian and bicycle access and access to transit is considered in every requirement from the development of sidewalks to provision of bicycle parking and street trees and pedestrian-scaled lighting. Development standards should also consider whether or not buildings and lots are oriented for pedestrian and bicycle access. **The City of Columbia recently adopted a Complete Streets resolution and endorsed the NACTO Urban Bikeway Design Guide, which are great first steps in this direction.**

The comments in the **Appendix C** tables outline many opportunities for making local development standards more pedestrian and bicycle friendly. This plan suggests that City staff and appropriate appointed committees develop proposed text amendments for any “low hanging fruit” amendments noted.

For more holistic changes, staff, committees, and the Plan committee members should incorporate changes into the upcoming comprehensive audit and rewrite of development standards over the next 12-18 months. The outcome of such an effort will be development standards that are predictable and sustainable for investors and developers, but that also promote active living, aging in place, quality of life, and transportation and recreation choices; and respect the local character of the City.

TABLE 4 – KEY STRENGTHS AND AREAS FOR IMPROVEMENT IN COLUMBIA ORDINANCES.

City of Columbia Ordinances and Policies	
Strengths	Priority Areas for Improvement
Complete Streets Resolution	Development of comprehensive Complete Streets design guidance for new development and public investment
Adoption of NACTO Urban Bikeway Design Guide	Require pedestrian improvements with new development and redevelopment (sidewalks, lighting, street trees, etc.)
Good base of ordinances supporting pedestrian and bike safety (including prohibition on using mobile devices while driving, etc.)	Develop bicycle parking requirements
Good ordinance language requiring property owner participation in sidewalk maintenance	Update very suburban, auto-oriented development standards to be more context-based and pedestrian-friendly
Clear language prohibiting obstructions to sidewalks	Develop policy and ordinances for improved access to transit and improved safety requirements for heavy commercial vehicle operation within the City



FIGURE 1 - EXISTING AND PLANNED PEDESTRIAN INFRASTRUCTURE

Existing and Planned Pedestrian Infrastructure

Existing Infrastructure

- Existing Paved Trail
- Planned/Committed Trail
- Existing Unpaved Trail
- Existing Sidewalk

Penny Sales Tax Priority Projects

- Intersection Enhancement
- Sidewalk

Other Planned Infrastructure

- Planned Sidewalk

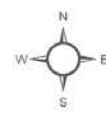
Palmetto Trail Master Plan Recommendations

- Existing Palmetto Trail
- Palmetto Trail Gap Options

Legend

- COMET Route
- USC Shuttle Route
- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body

0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

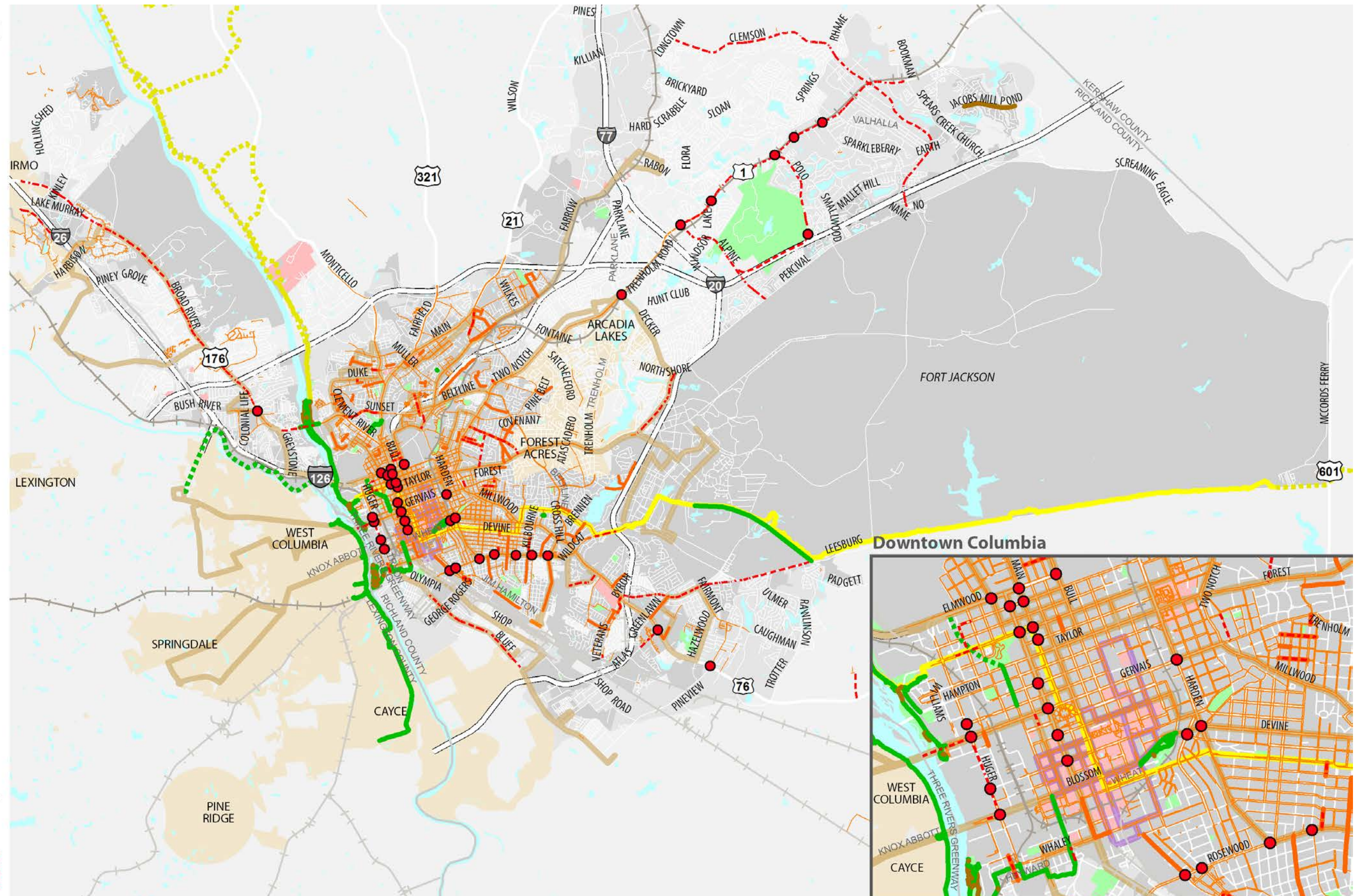




FIGURE 2 – EXISTING AND PLANNED BICYCLE INFRASTRUCTURE

Existing and Planned Bicycle Infrastructure

Existing Infrastructure

- Existing Bike Lane
- Existing Sharrows
- Existing Paved Trail
- Planned/Committed Trail
- Existing Unpaved Trail

Penny Sales Tax Priority Projects

- Intersection Enhancement
- Bikeway

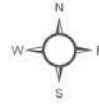
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0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

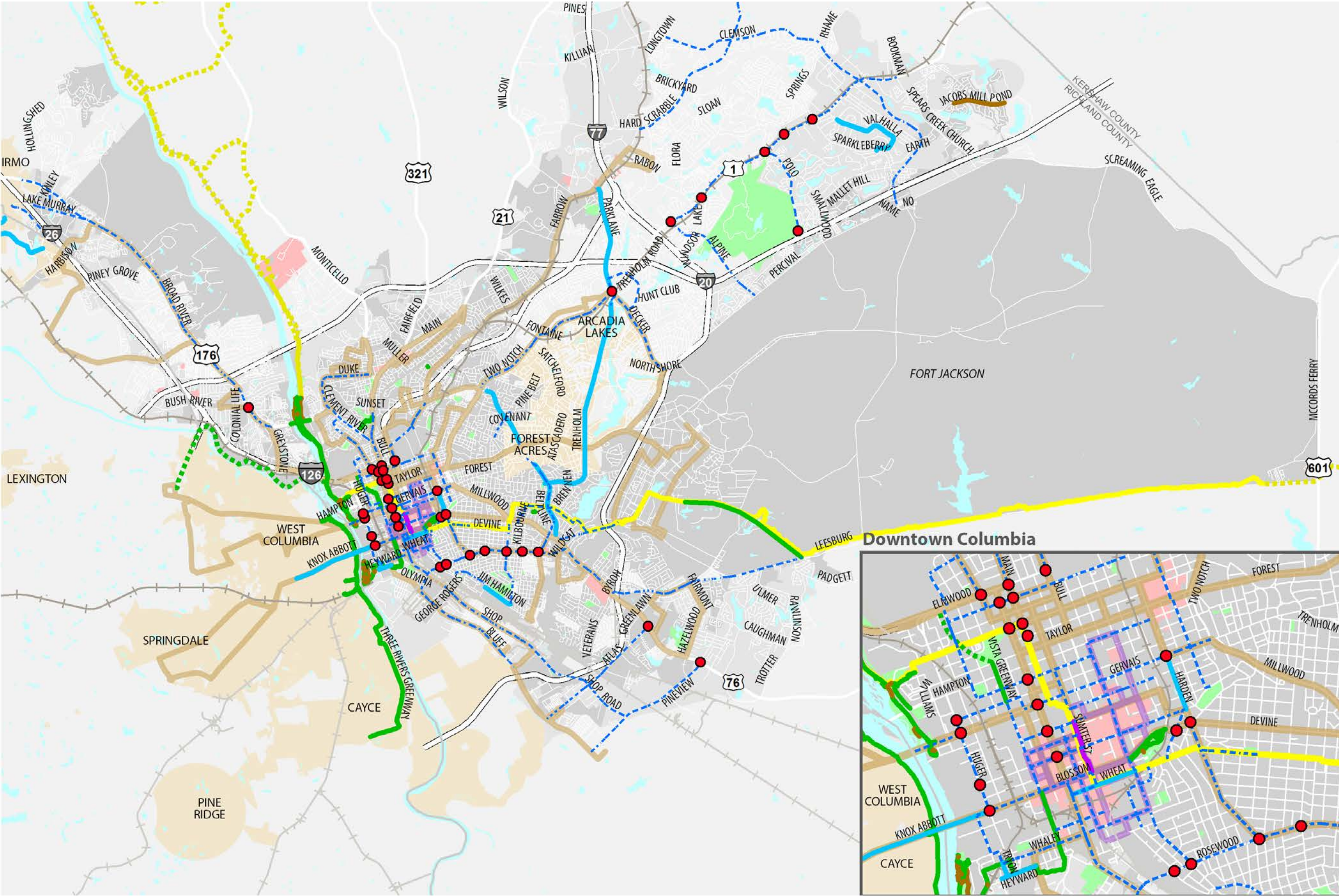




FIGURE 3 - COLUMBIA TRANSIT NETWORK

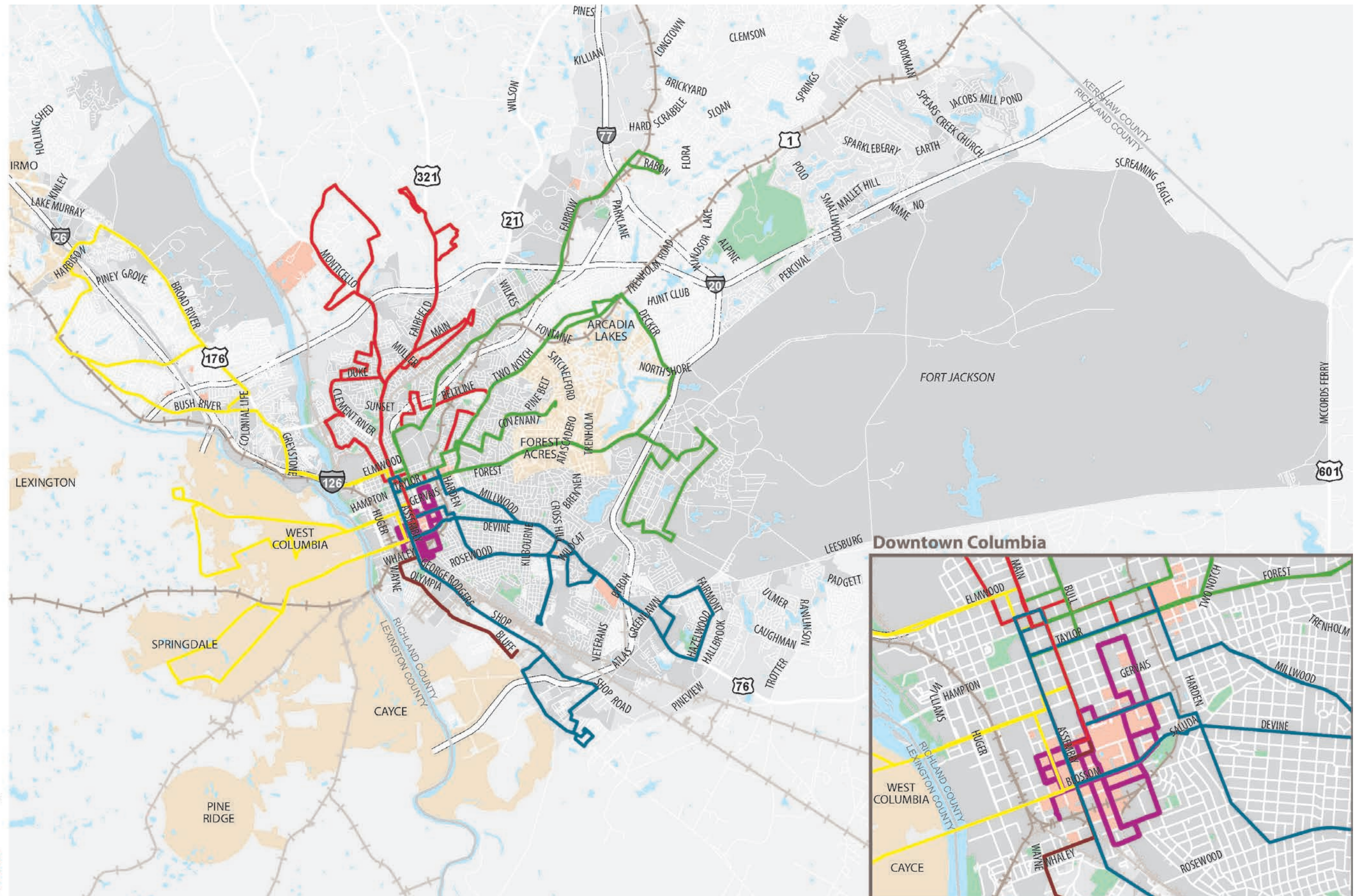
Columbia, SC Transit Routes

City of Columbia Transit Routes

- North Routes (6, 11/12, 30, 31, 101)
- South Routes (42, 201, 401, 601)
- Garnet Route
- East Routes (5, 15, 16, 17, 23)
- West Routes (26, 28, 34, 348)
- USC Shuttle Routes

Legend

- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.



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EXISTING CONDITIONS: USER NEEDS ANALYSIS

Public Involvement

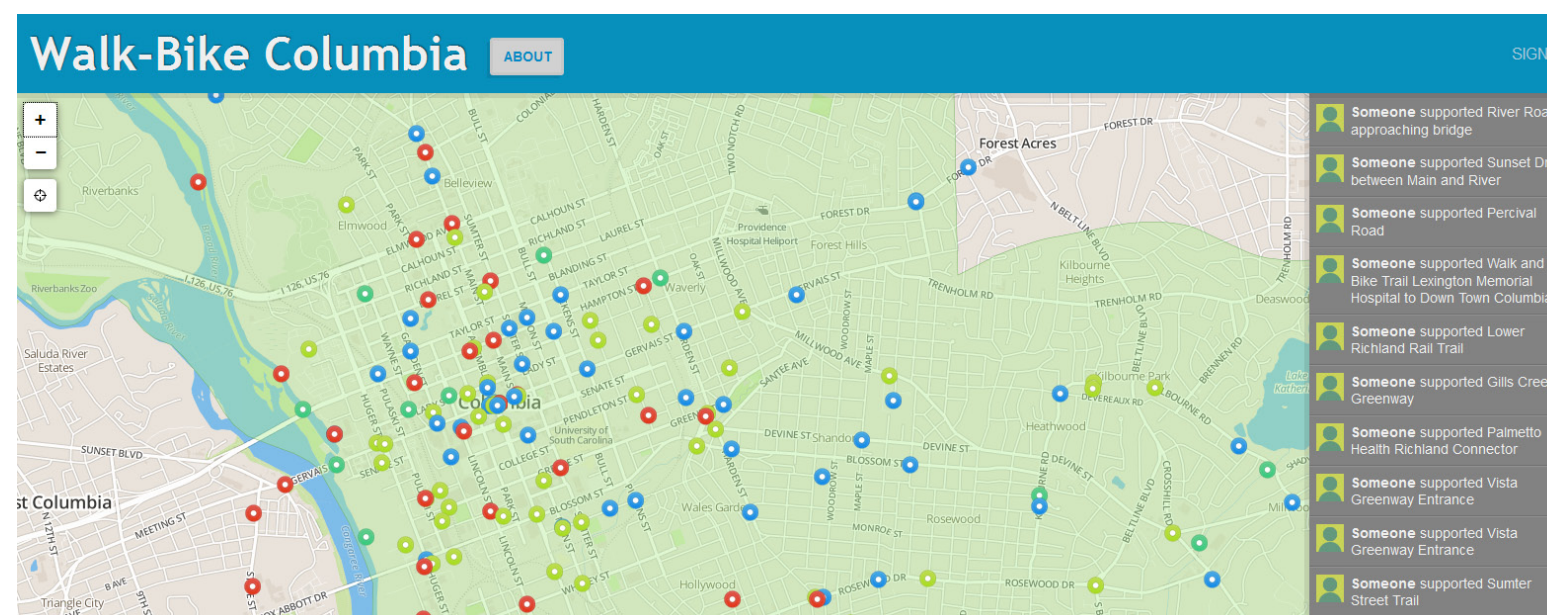
The consultant team conducted a multifaceted public outreach effort over a period of four months, from May 2014 to August 2014. The purpose of the effort was to gather local knowledge and community input to guide the plan's development. The project team's public engagement events and efforts included the following:

- 4 Steering Committee meetings: 25 committee members
- 4 public workshops with interactive project boards and maps: over 120 attendees
- 8 stakeholder focus groups: 90 invited stakeholders
- Citizen survey (available both online and in hard copy): 825 respondents
- Project website with project information, videos, and relevant links: 3,300 unique viewers
- Online interactive map and input tool: 282 points on the map and comments
- Staffed information booth on multiple days at the downtown transit center and Main Street Farmer's Market

The project team promoted these public involvement opportunities through broad distribution of flyers, posters, and postcards, social media, press releases, and TV ads on the City access channel. Spanish language interpreters attended public events and The COMET bus with bike rack was available for public meeting attendees to explore.

Public outreach efforts were offered across the city and through a variety of media in order to provide the representatives and residents of Columbia with many opportunities and different mechanisms for contributing to the Plan's development.

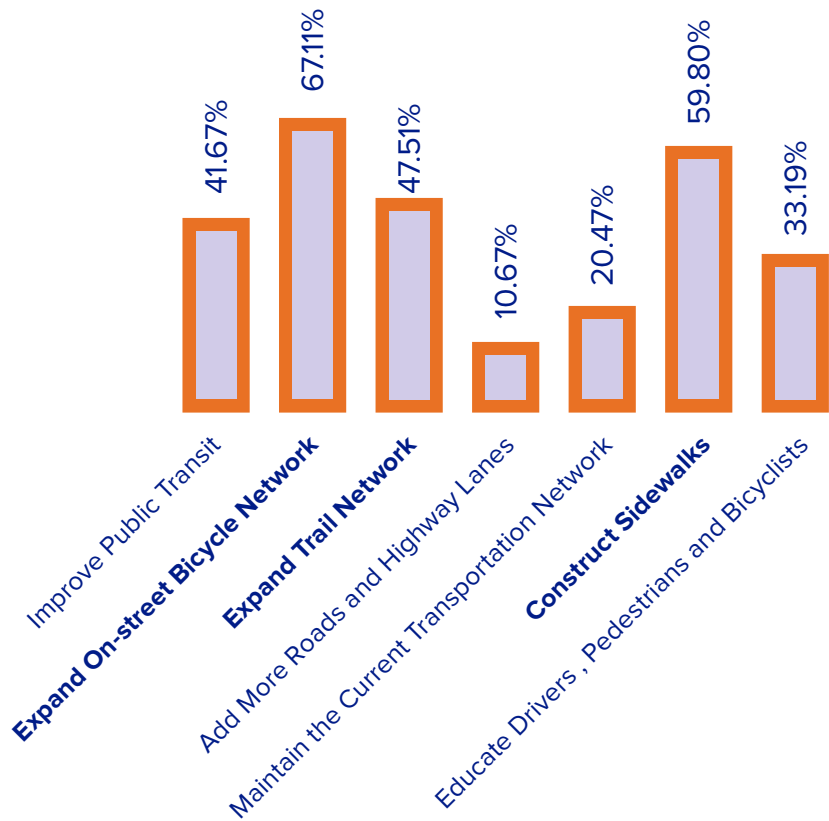
The Walk Bike Columbia public outreach process confirmed that Columbia citizens value access to active transportation and public transit. This is reflected in the low marks given to Columbia's existing pedestrian and bicycle network and its transit operations, as well as in the fact that 81 % of survey respondents said walking and bicycling improvements are "very important" and 61% of respondents said that transit improvements are "very important." Comments received through the public meetings and focus group meetings underscored this.



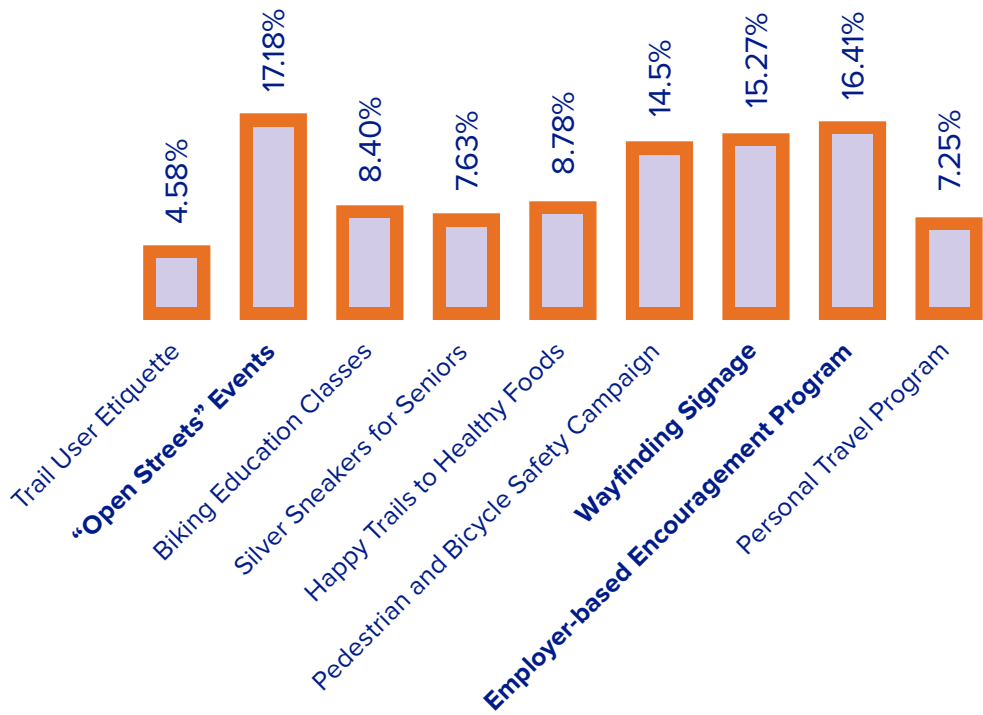
*The image to the right shows a screenshot from the public online interactive mapping tool that allowed Columbia residents to input specific challenges and opportunities for walking, bicycling and transit access. The full report summarizing the public input process and results can be found in **Appendix D**.*



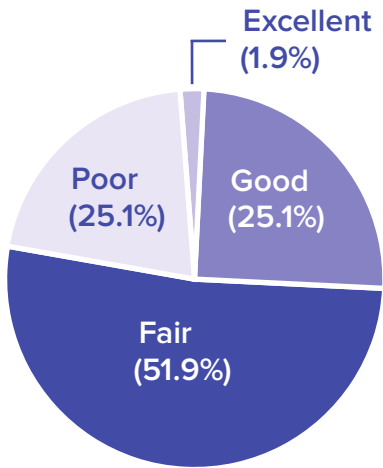
PLEASE SELECT YOUR TOP THREE TRANSPORTATION PRIORITIES FOR SPENDING OF TAXPAYER MONEY (WEB SURVEY QUESTION)



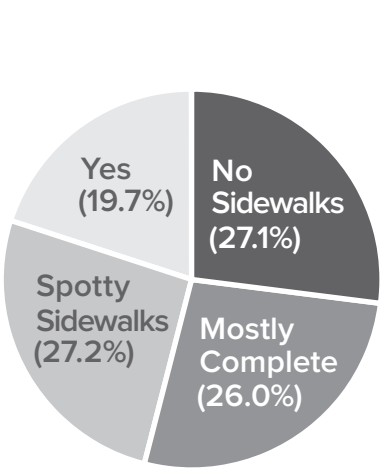
WHAT EDUCATION, ENCOURAGEMENT AND ENFORCEMENT PROGRAMS WOULD YOU LIKE TO SEE AROUND COLUMBIA? (PUBLIC WORKSHOP QUESTION - 262 VOTES)



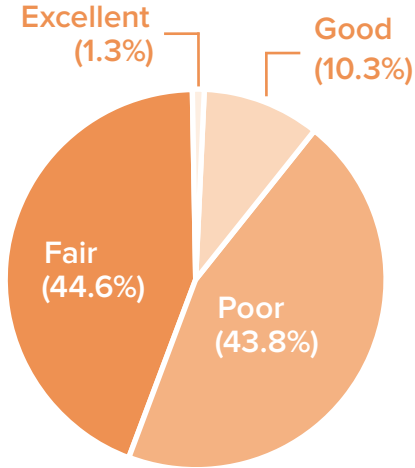
WALKING AND BICYCLING CONDITIONS QUESTIONS (WEB SURVEY QUESTIONS)



HOW DO YOU RATE OVERALL WALKING CONDITIONS IN COLUMBIA?

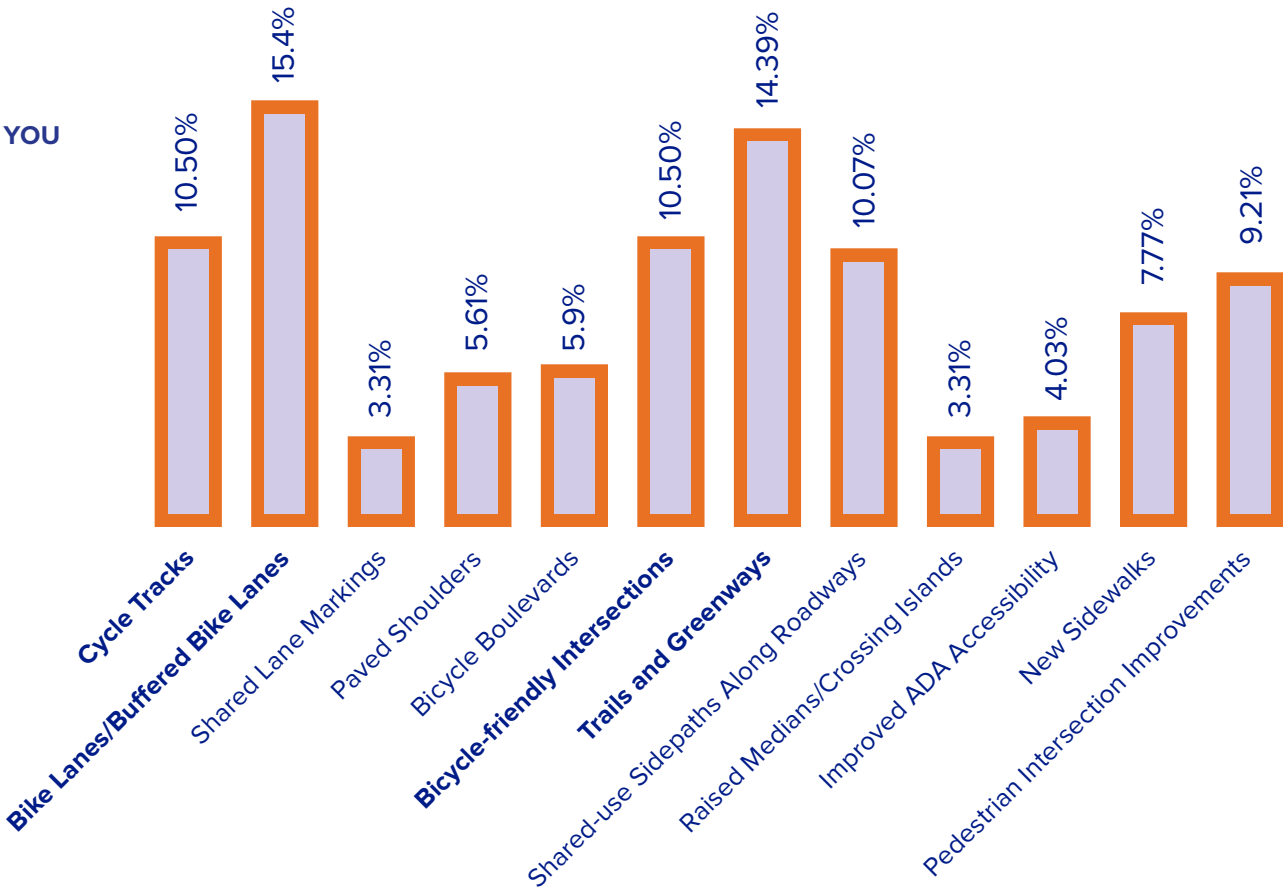


IS THE SIDEWALK NETWORK NEAR YOUR HOME COMPLETE?



HOW DO YOU RATE OVERALL BICYCLING CONDITIONS IN COLUMBIA?

WHAT PEDESTRIAN AND BICYCLE INFRASTRUCTURE IMPROVEMENTS WOULD YOU MOST LIKE TO SEE IN COLUMBIA? (PUBLIC WORKSHOP QUESTION - 695 VOTES)





Infrastructure and Transit Priorities

The primary concerns of residents when it comes to both walking and biking are the lack of safe roads and/or sidewalks, the need for improved design and/or maintenance of existing facilities, and the distance between destinations. The latter item points to a critical link between land use planning/land development and transportation planning/network development. The current efforts by the City and County to work collaboratively to update their land use plans and policies present a unique opportunity to address that important element. In addition to these priority concerns, citizens also noted lack of bicycle parking as a key deterrent to bicycling activity and transit users stressed the need to improve and enhance transit operations (route network, headways, and reliability) while improving walking and biking access to transit.

Regarding infrastructure improvements, Columbia citizens expressed a preference for sidewalks, trails, and shared-use paths and intersection improvements for both pedestrians and bicyclists. For on-street bicycle facilities, buffered bicycle lanes and cycle tracks are preferable to standard bicycle lanes or shared roadways. **Citizens also clearly stated neighborhood connectivity and access to parks and trails as city-wide priorities.**

Non-infrastructure Priorities

Based on the public input, the key non-infrastructure strategies for encouraging safe walking, bicycling, and transit usage that are likely to have an impact in Columbia fall into the following categories:

EDUCATION & ENFORCEMENT PRIORITIES:

- Safety education media campaigns
- Law enforcement stings targeted to motorists, pedestrians, and bicyclists
- Awareness campaign regarding the benefits and availability of walking, bicycling, and transit usage

ENCOURAGEMENT PRIORITIES:

- Employer-based incentives
- Wayfinding signage for the complete multi-modal network
- Informal, family-friendly events like 'Open Streets' (also known as Ciclovía)

EVALUATION PRIORITIES:

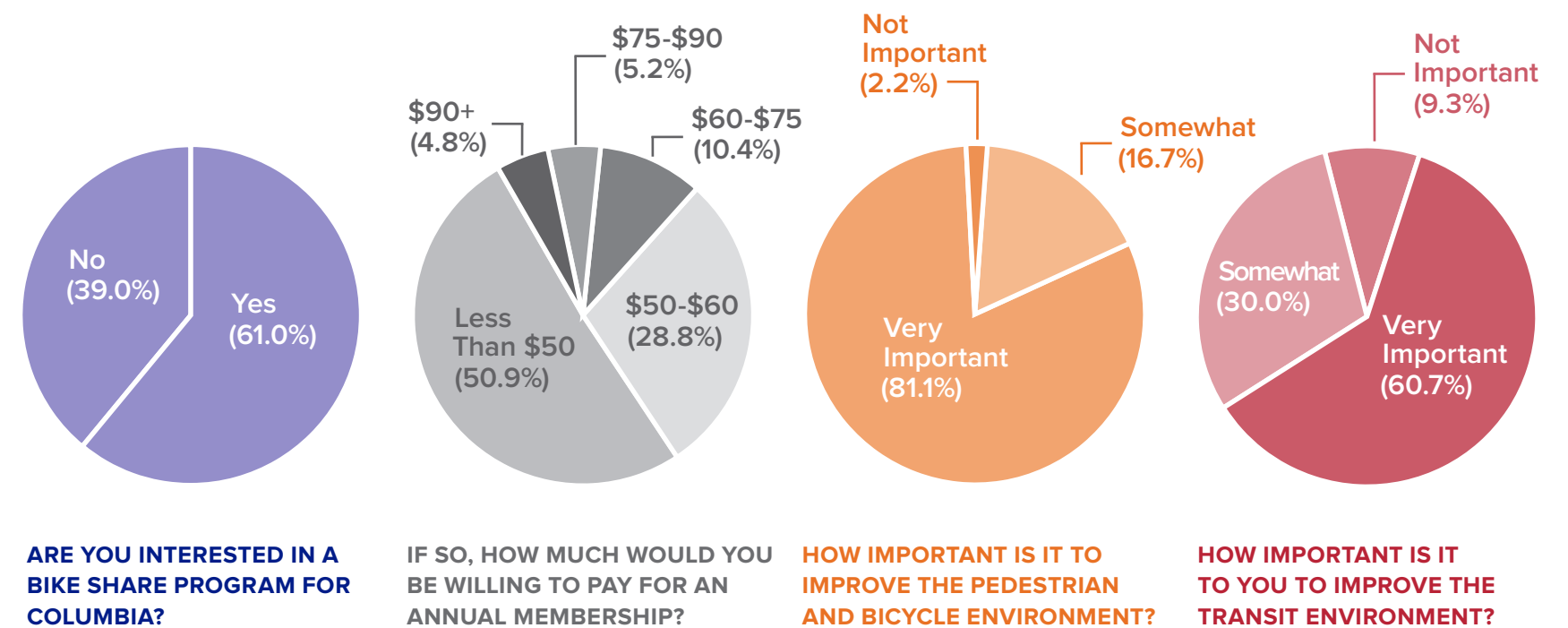
- Policies, plans, programs, and funding that prioritizes Safe Routes to Schools
- Policies, plans, programs, and funding that prioritizes Safe Routes to Transit
- Coordination of land use planning and transportation planning
- Updated and improved design standards and design guidance for pedestrian and bicycle infrastructure, transit stop infrastructure, bicycle parking, and ADA accessibility

Bike Share Priorities

A majority of public outreach responses support the concept of bike share in Columbia. Concerns regarding the distance between destinations in Columbia and the low levels of bicycling for transportation that currently exist were expressed in terms of potential bike share usage. For a local bike share program to be deemed successful, citizens and stakeholders identified the following as the primary outcomes:

- Improve transportation options and access to healthy living and active transportation.
- Reduce the number of cars on the road.
- Reduce the number of car trips and vehicle miles traveled in private vehicles.

BICYCLE SHARE AND TRANSIT PRIORITIES (WEB SURVEY QUESTIONS)





Pedestrian and Bicycle Counts

Overview

Annual counts conducted in a systematic manner provide strong benchmarking information on walking and bicycling activity and related benefits. Count data adds to Columbia’s understanding of existing pedestrian and bicycling patterns and needs, allows for more strategic planning of future bikeway and walkway investments, and provides a means of evaluating the impact of programs and facilities. **While count data will not provide comprehensive mode share data, it offers a snapshot of peak pedestrian and bicycle activity on a typical day.** It can also provide important baseline data for before-after studies where new investments are planned and provide insight into overall trends in Columbia’s walking and bicycling environment over time.

As a component of this Planning effort, the **consultant team developed a recommended yearly, manual counts program for the City of Columbia** based off of the National Bike and



Pedestrian Documentation Project. The project team also implemented the recommended program in September 2014. The program collected data at 28 sites around Columbia based on access to transit, proximity to main entrances for shopping or employment areas, and high density downtown or residential areas. Locations with recently completed or planned pedestrian or bicycle projects were also considered.

Counts Summary

As seen from both the weekday and the weekend counts, Columbia has a substantial amount of pedestrian and bicycle traffic occurring throughout the City. **Much of this traffic observed during the counts implementation is occurring around popular destinations for walking and bicycling such as recreation centers, civic buildings, college and university campuses and downtown.**

Pedestrian levels are indicative of the City’s census-reported high rates of walking commuting. Anecdotally, many surveyors noted unsafe jaywalking occurring at several of the count locations. Weekend events such as the Soda-City Market, South Carolina Pride Festival and Greek Festival also likely increased walking rates.

The count results suggest that many people in Columbia are bicycling for commuting purposes to work and/or school as higher numbers of these users are bicycling during typical weekday commute times. The counts also show a high instance of sidewalk bicycle riding, even occurring on streets with existing bike lanes. This is typically an indicator that users don’t feel comfortable riding in the roadway due to inadequate bicycle facilities for roadway conditions.

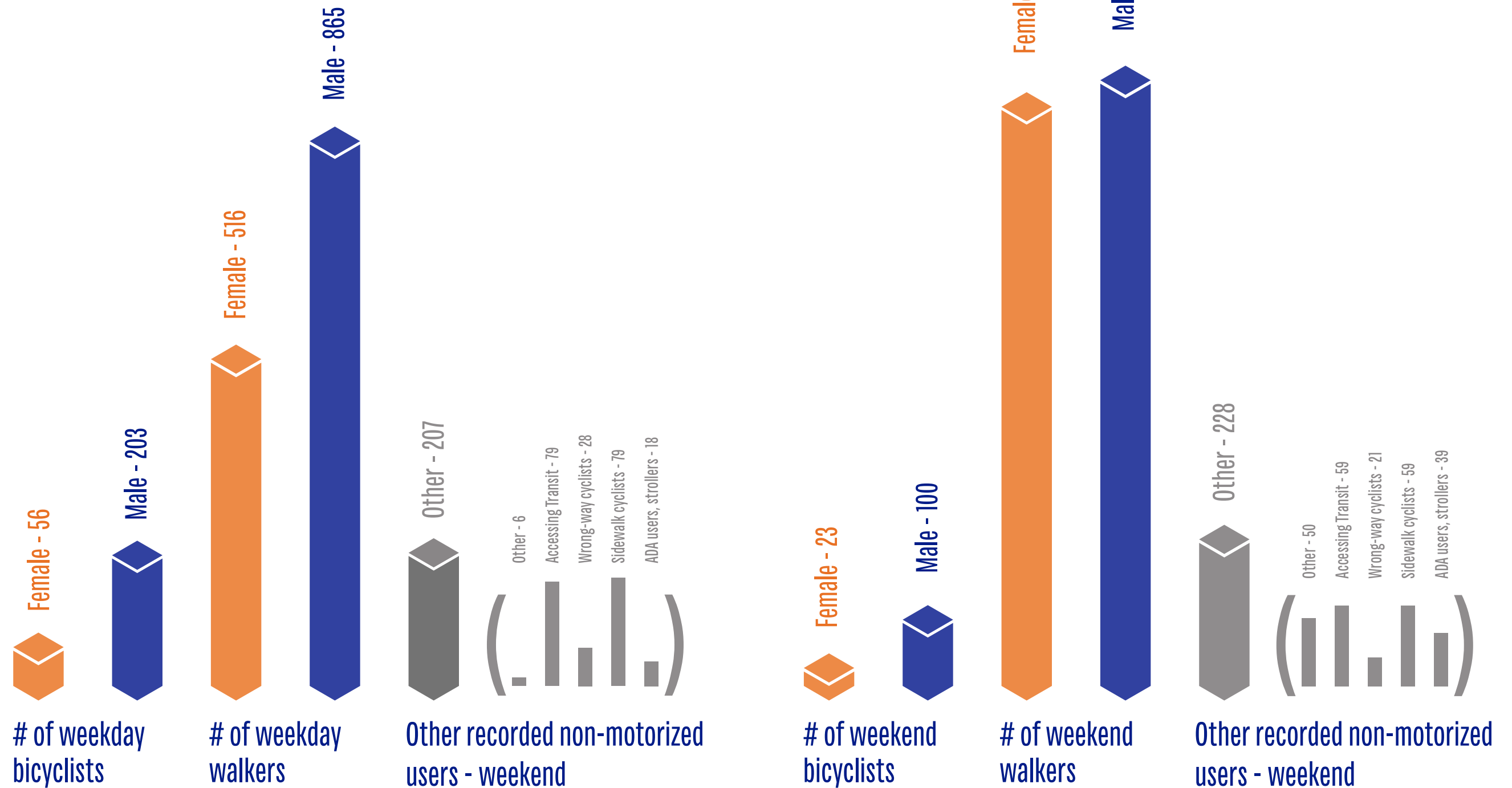
A comparison of the weekday and weekend count numbers are provided below as well as the top count locations. Full count methodology and the results can be found in **Appendix D.**

TABLE 5 – TOP PEDESTRIAN AND BICYCLE COUNT LOCATIONS

Top 3 Locations for Bicyclists from Weekday Counts:	
Wheat Street between Pickens Street and Sumter Street	47 bicyclists
Greene Street between Laurens Street and Saluda Ave	45 bicyclists
Harden Street between Greene Street and Devine Street	29 bicyclists
Top 3 Locations for Pedestrians from Weekday Counts	
Blossom St between Park St and Lincoln St	185 pedestrians
Harden St between Greene St and Devine St	121 pedestrians
Laurel St between Sumter St and Main St	128 pedestrians
Top 3 Locations for Bicyclists from Weekend Counts:	
Broad River Rd between St. Andrews Pkwy and Farrington Way	18 bicyclists
Sumter St between Greene St and Pendleton St – 11 bicyclists	11 bicyclists
Wheat St between William St and Huger St – 9 bicyclists	9 bicyclists
Top 3 Locations for Pedestrians from Weekend Counts	
Hampton St between Assembly and Park St	462 pedestrians
Sumter St between Greene St and Pendleton St	329 pedestrians
Gervais St between Lincoln St and Park St	279 pedestrians



PEDESTRIAN AND BICYCLE COUNTS DATA SUMMARY







EXISTING CONDITIONS: MULTI-MODAL NETWORK ANALYSIS

Introduction

*Columbia has the foundation to become a premiere walking and bicycling-friendly City. However, as indicated in the public outreach, bike and walk-friendly community audit, network analysis and safety analysis **there are many significant safety concerns, physical barriers and gaps in network connectivity that must be addressed in order to reach these goals.***

The overall multi-modal network analysis is based on the following quantitative and qualitative assessments:

- Equity and Natural Resource Mapping
- Summary of Field Conditions
- Safety Analysis
- Pedestrian and Bicycle Level of Service Analysis
- Intermodal Transit Analysis

The picture to the right shows the project stakeholder team in the field analyzing existing conditions. The presence of a bus stop and worn turf indicate heavy pedestrian use in this area. Considerations like these were incorporated into the prioritization of the network.

The following sections discuss the current strengths and barriers of the transportation network for walking and bicycling and present a map of existing and proposed network conditions.

Figures 9 and 10 present maps depicting an equity analysis and natural resources overview including street tree coverage in Columbia. Considerations for equity ensure that the proposed improvements of this Plan reach populations that

may need or use pedestrian and bicycle facilities the most. Since shade is a major determinant of comfortable walking and bicycling conditions in a city like Columbia throughout the warmer months, and the City would like to preserve and expand upon its street tree network wherever possible, the project team also considered connecting these and other natural resources when developing pedestrian and bicycle recommendations.





Pedestrian Network

The existing and proposed pedestrian network has many strengths and opportunities:

- **The street and sidewalk network is well connected** in the downtown core and surrounding older neighborhoods of Columbia. There are many existing streets in this area that are walk friendly and easy to cross.
- **Recent crossing improvements along Assembly Street** make this roadway easier for pedestrians of multiple abilities to cross.
- **The existing greenways, downtown business district, Five Points and Congaree Vista offer walk-friendly environments** that many residents and students currently utilize.
- **Planned pedestrian improvements at key intersections** along many of Columbia’s major corridors such as Huger Street, Rosewood Drive and Elmwood Avenue will improve pedestrian safety and encourage people to walk.
- **Many civic destinations such as schools, libraries and parks are accessible by walking**, especially in older areas of Columbia where street networks are well connected and sidewalk coverage is good.
- **Many bus stops in Columbia have amenities** such as benches and shelters for pedestrians.
- The City utilizes **high-visibility crosswalk markings in some highly-trafficked pedestrian areas** such as near schools and in business or retail centers.
- Several **ADA accessibility improvements at curb ramps have been made** throughout Columbia in recent years.

However, there are many physical barriers currently present for pedestrians as well:

- **Large vehicular corridors** such as (but not limited to) Garners Ferry Road, Fort Jackson Boulevard, Two Notch

Road, Broad River Road and North Main Street **are barriers for pedestrians trying to cross** or traverse these roads due to large distances between safe crossings, long distances across roadways and long wait times for traffic signals to change. Also, some of the major corridors in Columbia don’t currently have sidewalks.

- **Many of the City’s busiest retail, employment, recreation and learning centers are difficult to access by foot due to their location along high-traffic, high-speed and wide roadways.** Also, the low density of development, high-frequency of curb-cuts and large parking lots in front of businesses along these corridors decreases walking comfort and increases walking distances and potential safety issues.
- **Access to significant City parks and green spaces along the river is limited by foot** which discourages the use of these areas. The area adjacent to Columbia’s riverfront has the potential to be a rich pedestrian-oriented work/live/play destination – one key to realizing this potential will be improving connectivity to the riverfront from adjacent neighborhoods.
- **As one moves away from the City core, presence of sidewalks, sidewalk connectivity and street connectivity worsens**, rendering many areas of town virtually un-walkable.
- **Some existing sidewalks are narrow or constrained by obstructions** such as utility poles or maintenance issues. This forces pedestrians with assisted mobility devices to ride within the roadway in some areas.
- **Several bus stops lack sidewalk connectivity**, especially as one moves away from the City core.
- **Many crosswalks lack curb ramps or do not meet ADA requirements** for accessibility. In some areas, median islands at pedestrian crossings do not have cut-throughs necessary for pedestrians with mobility impairments.



The photo above shows a substantial barrier for pedestrians. Not only is the sidewalk narrow and uninviting, it may be inaccessible by some with physical impairments.



Bicycling Network

The existing and proposed bicycling network has many strengths and opportunities:

- **Much of the City, especially around the downtown core, offers good street connectivity** which provides alternate routes for bicyclists wanting to travel off of heavily trafficked streets.
- **Many roadways in Columbia have more capacity than their traffic volumes warrant.** This creates an opportunity to reutilize this space for other uses that are more human-scaled. For example, road diets can be implemented to add space for on-street parking, landscaping, pedestrian crossing improvements, and/or bike facilities.
- **Most Columbia primary schools are located in walkable or bikeable areas.** Relatively minor improvements can be made to make walking and bicycling to school a more attractive and safe activity.
- **The City's growing greenway network, and the presence of the Palmetto Trail provide many opportunities for recreational riding.** These facilities can help prospective bicycle commuters hone their skills as grow confidence towards a goal of bicycling for transportation needs. As these facilities become more connected with the on-street bicycling network, they can become the backbone of a strong citywide bicycling system.
- **The City and SCDOT have made on-street bicycling improvements** to many corridors in recent years, including Beltline Blvd, Wheat St and Hardin Street.
- **Recent intersection improvements that will make crossing conditions safer for pedestrians and bicyclists** have been made on Assembly Street.
- **The pathway across the Broad River Road Bridge** will provide an important and high-quality pedestrian and

bicycle connection across the Broad River and to the Three Rivers Greenway.

- **The future Gills Creek Trail** will provide an important connection both along and across Gills Creek.

However, there are many physical barriers currently present for bicyclists as well:

- **Large vehicular corridors** such as (but not limited to) Assembly Street, Elmwood Avenue, Bull Street, Gervais Street, Blossom Street, Huger, Two-Notch Road and Garners Ferry Road **pose a barrier** for many prospective cyclists, primarily due to their width, traffic speed and volumes, and lack of separated bicycle facilities.
- **Many of the City's busiest retail, employment, recreation and learning centers are difficult to access by bike** due to their location along high-traffic, high-speed and wide roadways. Also, the low density of development, high-frequency of curb-cuts and large parking lots in front of businesses along these corridors decreases bicycling comfort and increases bicycling distances and potential safety issues.
- **As one moves away from the City center, street network connectivity and development density decreases.** This makes bicycling more difficult as prospective riders are typically forced onto major roadways and must travel longer distances to reach their destinations. Strategic improvements in street network connectivity and policy affecting new development can help to improve this.
- **Bike connectivity across the Congaree River is limited** due to a lack of separated bicycle facilities across many of the bridges.
- **Separated bike facilities, such as bike lanes or off-street paths are limited.** These are important as they create a

more comfortable environment for bicyclists of multiple ages and abilities.

- **Design of some existing bikeways are uncomfortable and/or dangerous for bicyclists.** Harden Street is an example of this (see Existing Conditions photo inventory in following sections).
- **Surface condition and debris on some roadways make it difficult for bicyclists,** who are more susceptible to poor maintenance conditions.
- **Short and long-term bicycle parking is limited throughout town,** especially as one moves away from central business districts.



Many roadways exist in Columbia with under utilized space or parking. These are great opportunities for adding bicycle facilities, sometimes by simply re-striping the existing roadway.

Existing Conditions Photo Inventory



1. Columbia has a high existing demand for walking and bicycling due to the high and dense populations of college students and downtown businesses and amenities. The relatively mild climate and flat terrain also make the environment very amenable to walking and bicycling. An abundance of wide roadways with relatively low-volumes in Columbia can easily be retrofitted to include bicycle and walking. (Blossom Street and Sumter Street)



2. Sidewalks like this not only discourage walking by making it an uncomfortable activity, but they are an accessibility and safety issue to those with visual or mobility impairments. The lack of a curb ramp and narrow functional width of the sidewalk make this a difficult environment for users with mobility impairments, as well as pedestrians walking side by side or passing each other. (photo: Forest Drive)



5. Bicycle improvements on Pickens Street would provide a comfortable, low-volume connection to major destinations such as the USC campus, future development on the former State hospital property, and downtown. The gate shown above is an opportunity to provide a pedestrian and bicycle cut through to the future development on the State hospital property.



6. Additional bike parking is needed throughout Columbia, especially at key work and shopping destinations. Secured short and long-term bike parking shows the community that Columbia is supportive of bicycling for transportation. (photo: Five Points business district)



9. Some corridors throughout Columbia have existing on-road infrastructure for bicycling. While bike lanes such as the ones shown above on Beltline Boulevard offer designated space for bicyclists, only the most confident bicyclists would likely feel comfortable on such a facility due to the bike lane's narrow width, higher traffic volumes and speeds, and little separation from traffic. Bike lanes like this could be enhanced by adding buffers, bollards and/or green pavement to improve visibility and comfort for users.



10. Some corridors throughout Columbia are sub-standard facilities for bicycling such as the bike lanes on Harden Street. Bike lanes adjacent to parking should be at minimum 5', and preferably wider or with added buffers, to give bicyclists adequate space to ride safely outside of the "door zone" of parked vehicles.



3. There have been some traffic calming efforts made in the Cottontown neighborhood that can help to make the streets safer for pedestrians and bicyclists. Traffic calming tools such as diverters and restricted turns should have cut throughs or exceptions for bicyclists to encourage the use of these low-volume streets. (photo: Bull Street and Franklin Street)



4. Many corridors throughout Columbia have some existing well-placed marked mid-block crossings such as the one pictured above. These should be enhanced with high-visibility markings, mid-block refuges, and actuated pedestrian beacons where feasible. Additional mid-block crossings should be considered where warranted, and all arterial and collector roadways should have mid-block crossings at minimum every ¼ mile. (Rosewood Drive at the Rosewood School)



7. Several roadways throughout Columbia have more vehicular capacity than warranted by traffic volumes. These roadways are good opportunities for reducing the number of vehicular lanes to improve overall roadway safety and add bicycle facilities. (photo: Farrow Road)



8. Columbia has a substantial number of residents who bike for recreation. Fort Jackson is a popular destination for both on-road recreational bicyclists and users of the Palmetto Trail system. Improving bicycle connectivity to this area would improve safety and access for these users, as well as residents who reside in Fort Jackson. (photo credit: <http://www.army.mil/article/46896/wheel-power-wtu-soldiers-ride-on-road-to-recovery/>)



11. Sidewalks are needed on many corridors throughout Columbia, especially outside the downtown and core neighborhoods. Colonial Drive (pictured) is an example of a corridor that connects job centers but isn't currently served by pedestrian facilities.



12. Many bus stops have amenities such as benches and shelters, but many stops outside of the downtown core lack sidewalk connectivity. The bus stop and pedestrian crossing pictured above poses a serious obstacle for pedestrians with mobility impairments due to the improperly designed ramp. In addition, bicycle connectivity to transit could be further enhanced by providing secure bicycle parking at bus stops.



FIGURE 9 - COLUMBIA EQUITY ANALYSIS

Equity Analysis

The Composite Social Equity Tiers reflect the average of four social groups with higher concentrations of:

- 1) Families living below or near the poverty line
- 2) Households with no vehicle available
- 3) Non-White populations
- 3) Households with a limitation on English speaking ability

A higher tier represents a higher relative concentration of these groups.

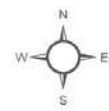
Equity Tier



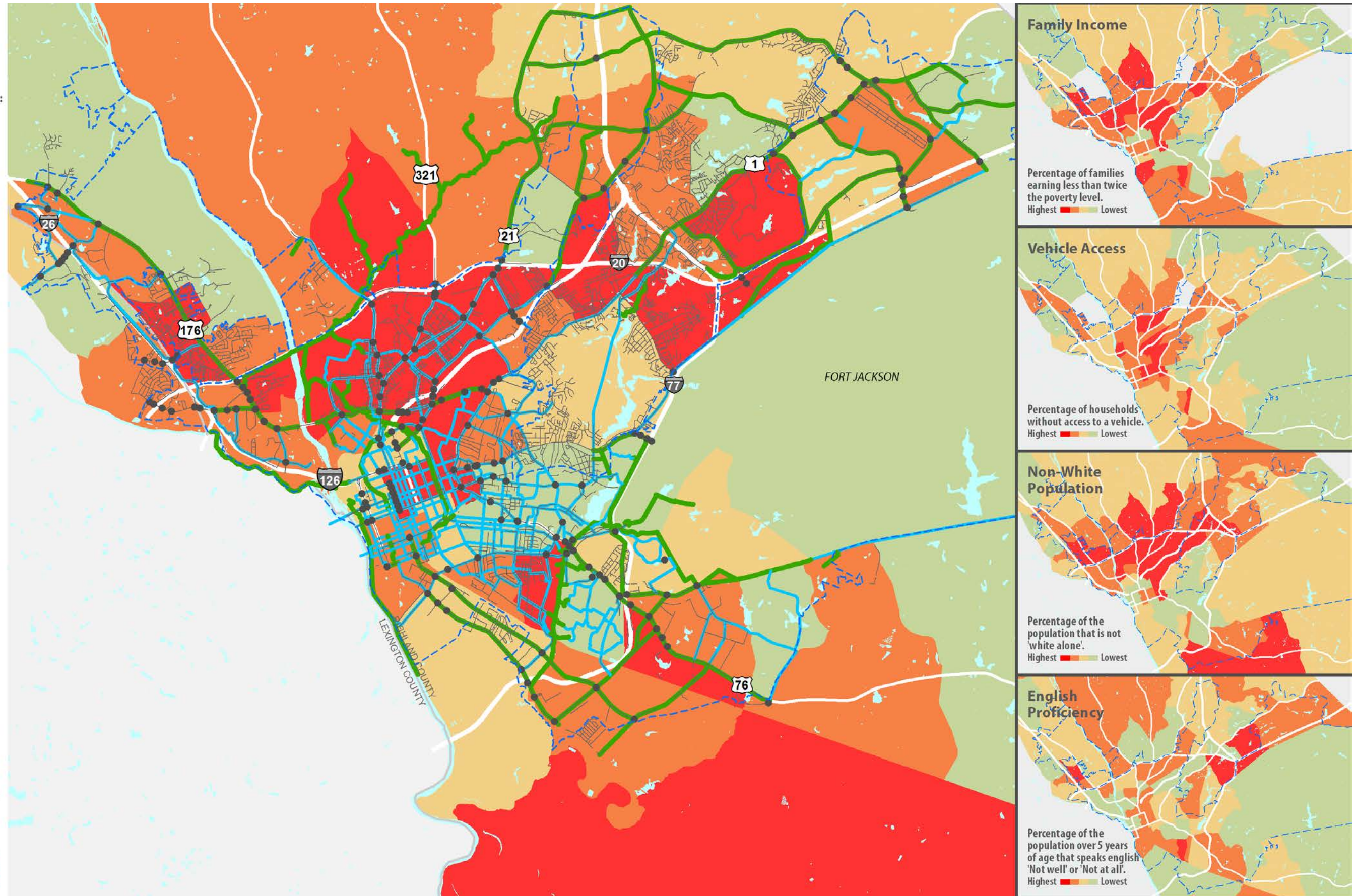
Legend

- Intersection Improvement
- Recommended Sidewalk
- Recommended Greenway
- Recommended Bikeway
- Water Body
- Study Area

0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.



Family Income

Percentage of families earning less than twice the poverty level.
Highest (red) Lowest (green)

Vehicle Access

Percentage of households without access to a vehicle.
Highest (red) Lowest (green)

Non-White Population

Percentage of the population that is not 'white alone'.
Highest (red) Lowest (green)

English Proficiency

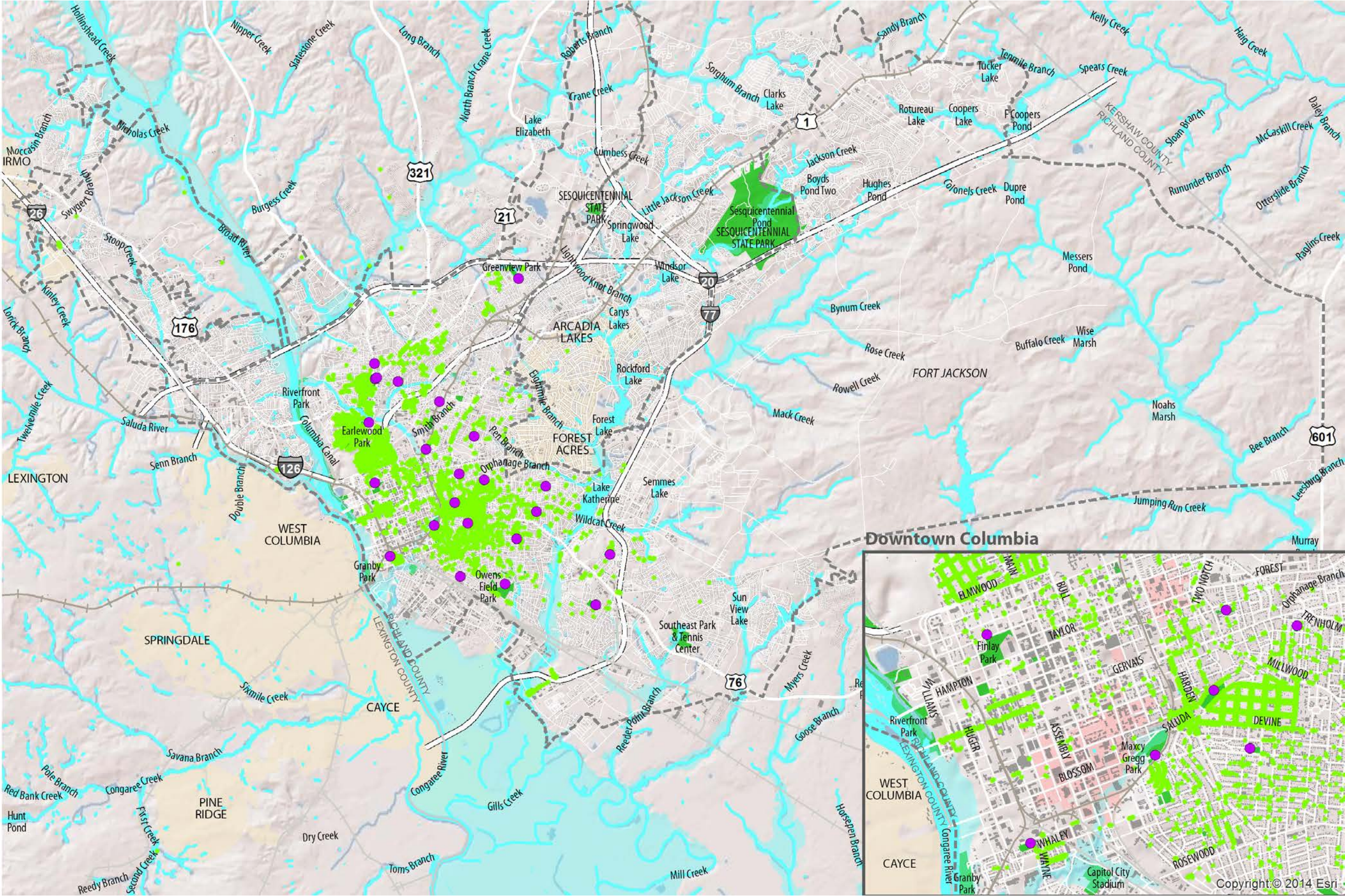
Percentage of the population over 5 years of age that speaks english 'Not well' or 'Not at all'.
Highest (red) Lowest (green)



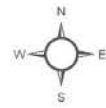
FIGURE 10 – EXISTING COLUMBIA NATURAL RESOURCES

Natural Resources

- Legend**
- Park Community Center
 - Public Works Tree Inventory
 - Park
 - Stream, Canal, or Artificial Path
 - Water Body
 - Floodplain
 - Commuter Rail Line (Proposed)
 - Other Rail Line
 - Building Footprint
 - Other Jurisdiction
 - Study Area



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.



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SAFETY ANALYSIS

Overview

Analysis of crash data can provide insight as to the major areas of concern for safety within the existing pedestrian and bicycle network. While this information is helpful in determining both infrastructure and non-infrastructure priorities, it should always be utilized in conjunction with other sources of information such as walking and bicycling counts and demographic information. For instance, an absence of crashes does not necessarily denote safe conditions for walking and bicycling – it could also imply that the corridor is lacking the key elements that make it an inviting and safe place to bike and walk, and therefore is not being utilized.

The safety analysis shows that while pedestrian and bicycle crashes are distributed fairly evenly throughout Columbia, the majority of pedestrian and bicycle crashes have occurred on major roadways. **Broad River Road, Two Notch Road and Bluff Road are among the corridors which have seen the greatest number of pedestrian and bicycle accidents in Columbia.** The highest concentration of pedestrian collisions occurred in the central part of town – west of Main/N. Main Street and east of US 1 and US 76.

The figures on the following pages provide an overview of where the majority of pedestrian and bicycle crashes occurred in Columbia.

FIGURE 3 – RICHLAND COUNTY TOTAL PEDESTRIAN AND BICYCLE COLLISIONS REPORTED (JANUARY 2010 – DECEMBER 2013)

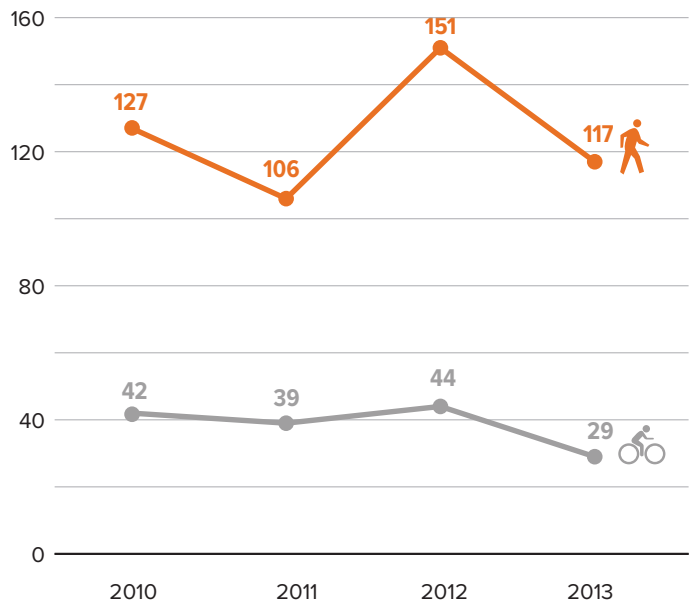


TABLE 6 – PEDESTRIAN AND BICYCLE COLLISION DATA FOR CITIES WITH CHARACTERISTICS SIMILAR TO COLUMBIA

City	Population	Average Annual Pedestrian Collisions	Average Annual Bicycle Collision	University/College Presence
Columbia, SC	133,000	132	41	USC
Cary	136,278	29	19	N/A
Fayetteville	208,615	96	28	N/A
Durham	229,014	114	39	Duke
Winston-Salem	229,986	55	16	Wake Forest University
Greensboro	269,696	150	48	UNC-G and others
Raleigh	406,056	195	86	NC State



Improvements such as high-visibility crosswalks and mid-block crossings make pedestrians more visible and encourage safe pedestrian behavior.



TABLE 7 – TOP PEDESTRIAN CRASH INTERSECTIONS AND CORRIDORS IN COLUMBIA

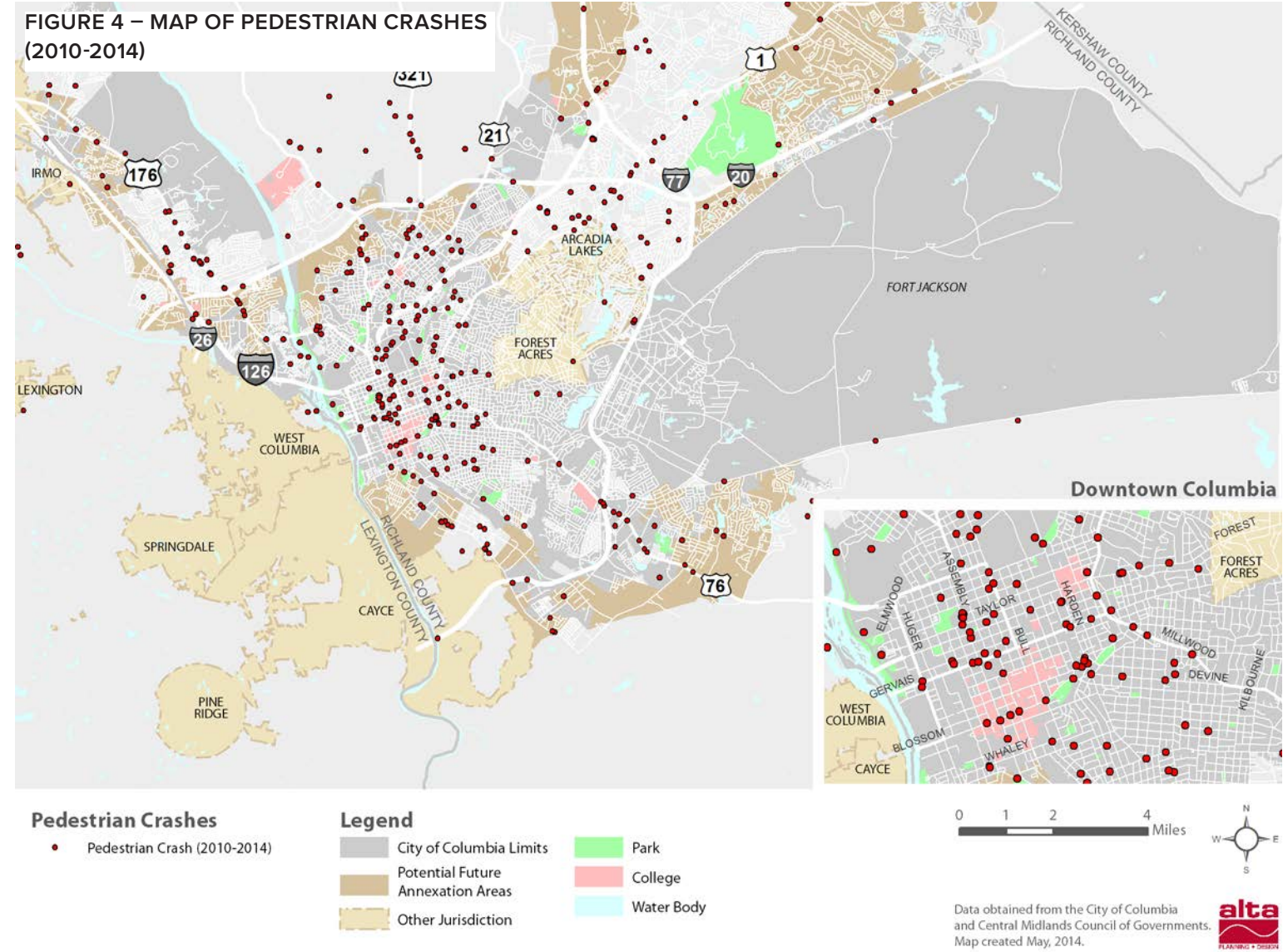
Top Intersections	Number of Collisions
Bull & Whaley	3
Forest & McDuffie	3
Devine & Santee	3
Devine & Harden	3
Greenlawn & Garners Ferry	3
Top Corridors	Number of Collisions
Broad River Rd	27
Two Notch Rd	17
Bluff Rd	12
Garners Ferry Rd	11
Farrow Rd	9
Harden St	9
Blossom St	8
Devine St	8

Distribution of Pedestrian Crashes

Pedestrian crashes are relatively evenly distributed in Columbia and the surrounding areas (see Figure 4). The highest concentration exists in the central Columbia area, immediately west of Main/N. Main Street and east of US 1 and US 76. Additionally, several arterials present long stretches of high levels of pedestrian collisions and pedestrian collisions are clustered at several key intersections. Table 7 shows the top intersections and corridors for pedestrian collisions in the study area.

Distribution of Bicycle Crashes

Bicycle crashes are evenly distributed in Columbia and the surrounding areas (see Figure 5). The majority of crashes are along streets with no dedicated bikeway facility, however three occurred on the Beltline Boulevard bike lane, one on the Wheat Street bike lane, and four along the Trenholm Road bike lane (outside of the project study area). Collisions occur on arterials, collector roads, and neighborhood streets alike. Collisions occurred on both the Hampton Street and Gervais Street bridges across the Broad River. Broad River Road and Bluff Road bear the highest numbers of bicycle collisions.





Crash Analysis Summary

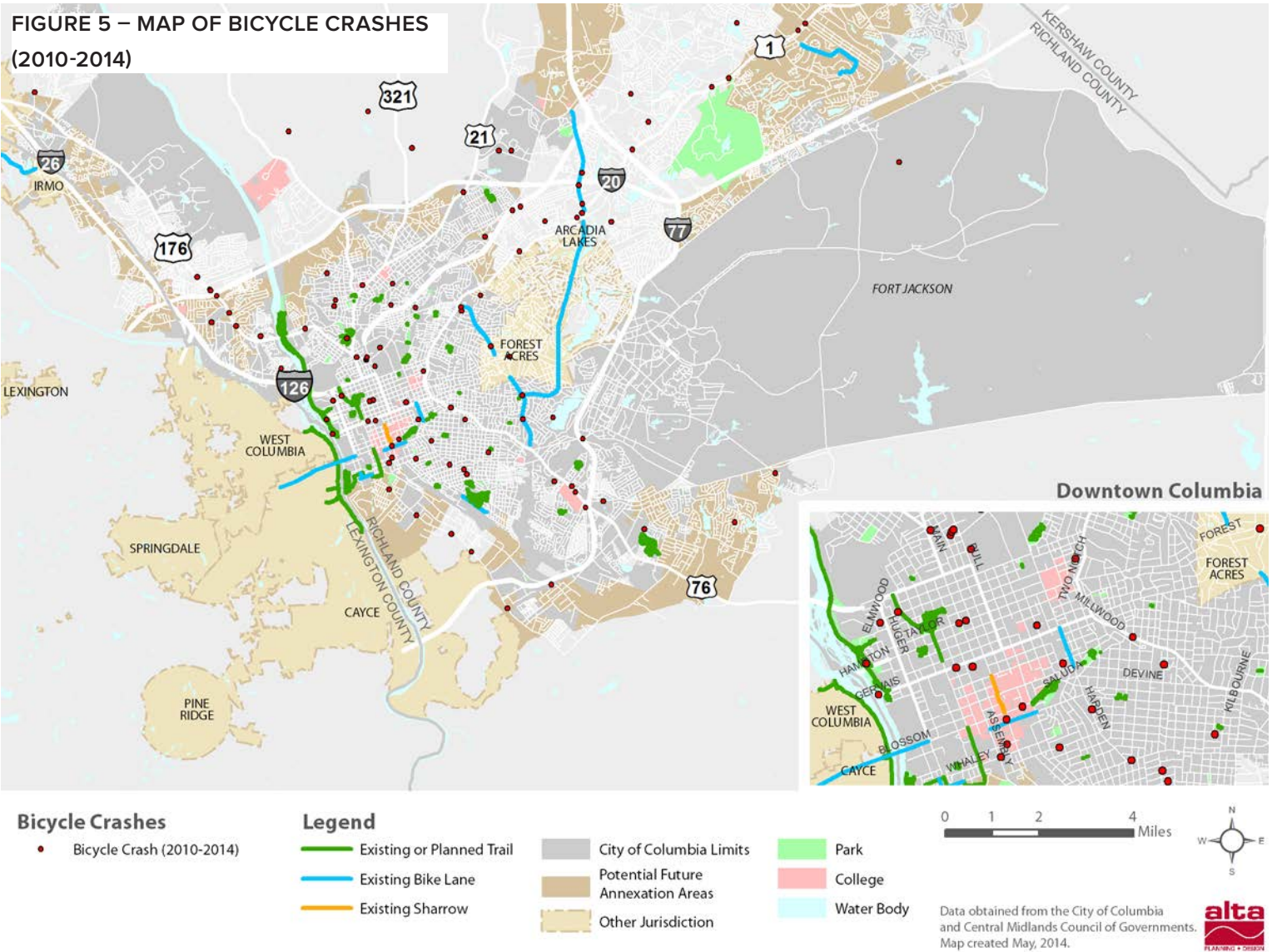
Analysis of reported contributing factors to pedestrian and bicycle accidents provides some insight as to what may be needed as priority infrastructure and non-infrastructure improvements. **For pedestrians:** motorists failing to yield the right of way, pedestrian improper crossing, and pedestrian lying and/or illegally in the roadway are all recorded as primary contributing factors of collisions involving pedestrians.

Potential solutions to address these issues include:

- **Motorists failing to yield the right of way could be improved through both educational and infrastructure improvements** such as signs that highlight the State law to yield to pedestrians, improvements to the visibility of pedestrian crossings through enhanced pavements markings or actuated signals, and general traffic calming improvements that slow down traffic and improve stopping sight distances for motorists.
- **Improper pedestrian crossing is primarily caused by an infrequency of designated crosswalks** along a roadway. Crosswalk infill along corridors could help improve this safety issue.
- **Pedestrians illegally in the roadway may be linked to a lack of adequate pedestrian facilities.** For example, many users, especially those who depend assisted mobility devices, often have no choice but to travel in the roadway in areas where sidewalks are absent or don't meet ADA requirements. This can be addressed through infrastructure improvements.

For bicyclists: bicyclists disregarding signals, bicyclists failing to yield the right of way, motorists failing to yield the right of way and bicycling wrong side/way riding were all listed as major contributing factors to bicycle collisions. **Potential solutions to address these issues include:**

- **Bicyclists disregarding signals could potentially be addressed through programs which encourage good bicycling behavior,** or bicycle-specific traffic signals or signs in key areas.
- **Motorists failing to yield the right of way may be addressed through better educational programs for motorists and clearer delineation of a bicyclist's path of travel** through pavement marking improvements along roadways and at intersections.
- **Bicycling wrong side/way riding can be improved through educational programs and bicycle infrastructure** that clearly delineates the expected direction of travel such as bike lanes and shared-lane markings.





Collisions, Injuries and Fatalities

Figure 6 shows the percent of total collision fatalities attributable to each transportation mode. As shown, between 11.8% (in 2013) and up to 18.8% (in 2014 to-date) of reported collision fatalities in Richland County are pedestrian fatalities, with an annual average (excluding 2014) of 13.0%. No bicyclist fatalities are shown in this time period, however, the Columbia community has suffered the loss of several bicyclists over the last few years. The tragic deaths of 19 year old Jesse Gamble in 2008 and 45 year old Mandy Kennedy, a mother of two, in March of 2014 rattled the community. Each was commuting to/ from work at the time of their motor vehicle collision. The March 2014 fatality is not included in this data because the incident is under investigation at the time of this study.



Bicycle Injuries and Fatalities

Figure 7 shows the ratio of bicyclist injuries and of fatalities to the total collisions reported in Richland County that involved a bicycle from 2010 through May 9, 2014. As shown, there have been no bicyclist fatalities as a result of reported collisions in Richland County over the time period. However, the majority of bicycle collisions (94.4%) result in an injury.

Pedestrian Injuries and Fatalities

Figure 8 shows the ratio of pedestrian injuries and of fatalities to the total collisions reported in Richland County that involved a pedestrian during the data time period. As shown, 86.6% of the pedestrian collisions resulted in one or more injuries, and 9.1% resulted in a fatality. Only 4.3% of pedestrian collisions during the data time period did not result in an injury or fatality

FIGURE 6: FATALITY RATES PER MODE CHOICE 2010-2014

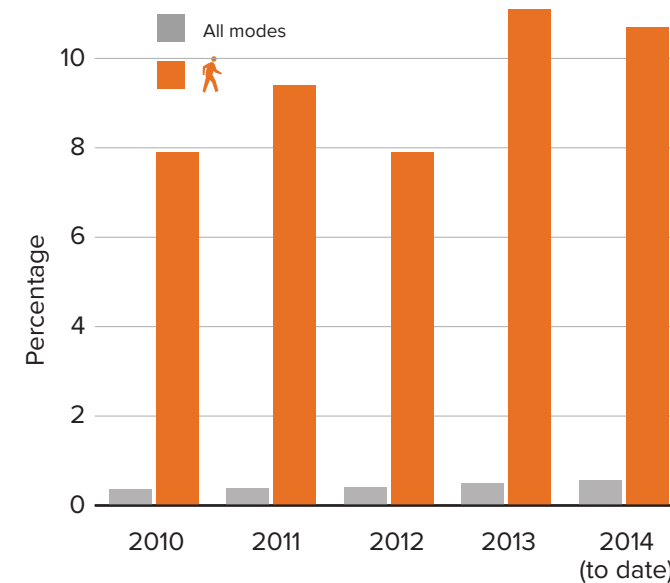


FIGURE 7: RATIO OF BICYCLIST INJURIES AND FATALTIES TO TOTAL COLLISIONS REPORTED (2010-2014)

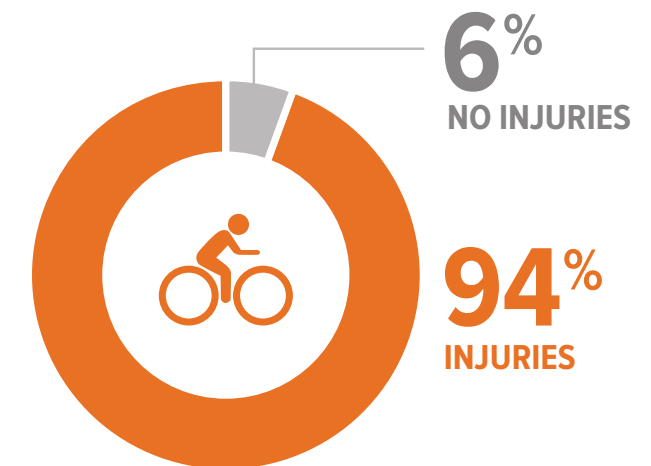
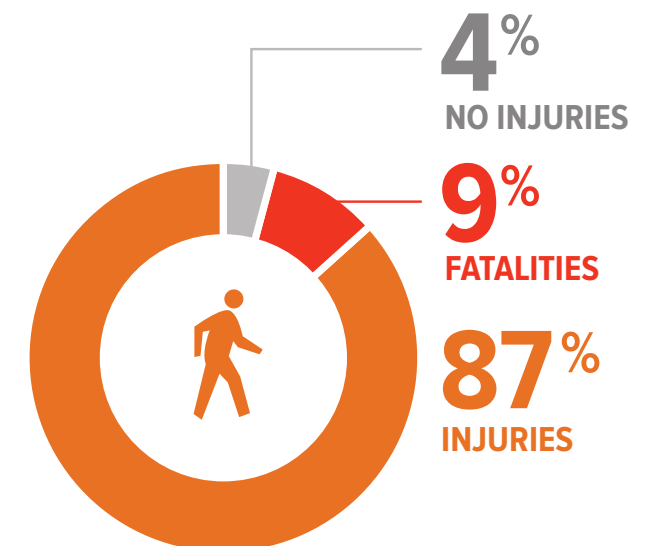


FIGURE 8: RATIO OF PEDESTRIAN INJURIES AND FATALTIES TO TOTAL COLLISIONS REPORTED (2010-2014)





In South Carolina, 11.5% of all traffic fatalities are pedestrians and 1.6% are bicyclists. While there have been no documented bicyclist fatalities in the last four years, Columbia’s pedestrian fatality rate is significantly higher than the State’s average (as high as 18%).

Currently in Columbia, nearly one in ten pedestrian collisions results in a fatality. One of the most effective means of increasing safety across all modes is through reducing vehicular speeds. The chances of a pedestrian fatality are reduced from 85% to 45% to 5% when the speed of the vehicle is reduced from 40 mph to 30 mph to 20 mph, respectively. System-wide vehicular speed reduction can be accomplished through a combination of education, enforcement and design.

Collision Conditions

A total of 529 pedestrian collisions and 162 bicycle collisions were reported in Richland County from January 1, 2010 through May 9, 2014. **Table 8** presents the characteristics of these collisions, such as the road surface conditions, lighting conditions, weather conditions, and where the collision occurred.

As shown in **Table 8**, most crashes for pedestrians and bicyclists occurred during dry road surface conditions (96% and 87%, respectively) and on clear days (89% and 83%, respectively). The majority of bicycle collisions occurred during daylight hours (70%), but only 43% of pedestrian collisions occurred during daylight. In addition, most collisions occurred on the roadway (89% for bicyclists and 87% for pedestrians).

TABLE 8 – RICHLAND COUNTY COLLISION CHARACTERISTICS

	Bicycle		Pedestrian	
	Total	% of Total	Total	% of Total
Total Collisions Reported	162	100%	529	100%
Road Surface Conditions				
Wet	6	4%	65	12%
Dry	155	96%	461	87%
Lighting Conditions				
Daylight	114	70%	230	43%
Dawn / Dusk	9	6%	29	5%
Dark (Street Lamp Lit)	20	12%	121	23%
Dark (Lighting Unspecified)	7	4%	53	10%
Dark (Unlit)	12	7%	96	18%
Weather Conditions				
Clear	144	89%	440	83%
Cloudy	10	6%	38	7%
Fog,Smog,Smoke	2	1%	3	1%
Rain	4	2%	45	9%
Snow	1	0.6%	2	0.4%
Unknown	1	0.6%	1	0.2%
First Harmful Event Location				
On Roadway	144	89%	458	87%
Median/Shoulder	3	2%	18	3%
Off Roadway	15	9%	45	9%
Unknown	0	0%	8	2%

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Pedestrian and Bicycle Level of Service Analyses

Analysis Summary

The consultant team conducted several different analyses for the Walk Bike Columbia Master Plan. This includes the following analyses which sequentially build upon each other to provide a comprehensive look at pedestrian and bicycle levels of comfort and safety overlaid with areas of pedestrian and bicycle supply and demand.

Pedestrian Level of Service and Bicycle Level of Traffic Stress Analyses (PLOS and BLTS)

The Pedestrian Level of Service Analysis (PLOS) and Bicycle Level of Traffic Stress (BLTS) analyses provide objective, data-driven scores of roadway comfort for pedestrian and bicycle travel. The results of these models are incorporated into Alta’s Pedestrian and Bicycle Suitability Analyses (PSA and BSA) to identify pedestrian and bicycle network gaps and potential projects and aid in system-wide prioritization.

Each analysis incorporates the recent research on factors that impact pedestrian and bicycle comfort and safety, and was tailored to the City of Columbia using the data available. Each model analyzed the full roadway network within Columbia’s Urban Service Area (and adjacent areas where they border the urban service area on both sides), excluding limited access highways, to provide a full picture of connectivity around the city.

A full explanation of the methodology and results can be found in **Appendix E**.

Pedestrian and Bicycle Suitability Analyses (PSA and BSA)

To build upon the Level of service analyses presented in the previous section, the consultant team conducted a Pedestrian Suitability Analysis (PSA) and Bicycle Suitability Analysis (BSA) for Walk Bike Columbia. The PSA and BSA build on the Pedestrian Level of Service and Bicycle Level of Traffic Stress models completed previously. These models identify areas of demand for pedestrian and bicycle travel, and then overlay supply (Pedestrian Level of Service and Bicycle Level of Traffic Stress) and demand. The results can be used to identify areas in need of improvement and to prioritize pedestrian and bicycle projects where infrastructure need meets trip demand.

The Pedestrian and Bicycle Suitability Analysis an objective, data-driven process to identify network gaps as potential projects in areas of high pedestrian and bicycle activity. In the first step, the quality of the user experience along and across the existing network of roadways and trails was measured and termed Supply. Next, the potential for walking trips was measured based on the proximity and density of trip generators (such as homes and workplaces) and trip attractors (such as shopping centers and parks) and termed Demand. Supply and demand were then overlaid to identify priority areas for infrastructure improvements.

A summary of the findings from this analysis are presented in the following section. A detailed report explaining the suitability analysis methodology and full results can be found in **Appendix E**.

Pedestrian Composite Results

Figure 11 displays demand and supply results in **downtown Columbia** and the adjacent areas. The majority of downtown and the University of South Carolina have high demand for walking, with a good supply of facilities. Several other locations indicate a need for improved crossings or facilities, including the following:

- The cluster of schools along US 321 north of downtown, including Lutheran Theological Southern Seminary and Columbia College, are in need of improved crossings, along with sidewalk improvements on local roads.
- The medical district around Palmetto Health Richland and Providence Hospital are in need of improved crossings, and may need midblock crossings along long stretches of Harden Street, Forest Drive, and Two Notch Road.
- Improvements are needed along Colonial Drive from Harden Street to English Avenue.
- Improved crossings are needed in the commercial cluster and area around Midlands Technical College southeast of downtown.

Figure 12 displays demand and supply results in **southeast Columbia**. In addition to the area between Garners Ferry Road, Rosewood Drive, and Beltline Boulevard, the following areas should be priorities for improvement:

- Garners Ferry Road is in need of linear improvements, intersection improvements, and may need midblock crossings. The segment near the University of South Carolina’s School of Medicine and the segment between Greenlawn Drive and Patterson Road have the highest need.
- The neighborhood roads north of Hampton Memorial Park are in need of linear improvements in the form of sidewalks or traffic calming.



Figure 13 displays demand and supply results in **northwest Columbia**. The following areas need improvement:

- Linear improvements are needed on Dutch Square Boulevard and crossing improvements are needed along Bush River Road to serve the Dutch Square shopping center.
- Crossing improvements are needed on Broad River Road and Greystone Boulevard near their intersection.
- Linear improvements are needed on Stoneridge Drive.
- Crossing improvements are needed on Bush River Road near the Outlet Pointe Shopping Center.
- Linear improvements are needed on Harbison Boulevard near Columbiana Drive.

Figure 14 displays demand and supply results in **northeast Columbia**. The following areas need improvement:

- Linear and crossing improvements are needed on Farrow Road near Providence Hospital Northeast.
- Linear and crossing improvements are needed along Two Notch Road south of Clemson Road to serve the Village at Sandhill shopping center. Midblock crossings may also be warranted to serve the neighborhoods east of Two Notch Road.
- Linear improvements are needed on Polo Road near Two Notch Road, and linear and crossing improvements are needed along Two Notch Road near this intersection.
- Linear and crossing improvements are needed along Sparkleberry Lane near Spring Valley High School and near the intersection with Clemson Road.

Bicycle Composite Results

Figure 15 displays demand and supply results in **greater downtown Columbia**. The following areas need improvement:

- A few key low-stress corridors in the north-south and east-west direction are needed in downtown to improve mobility and provide better access to the University of South Carolina from the northern half of downtown and adjacent northern neighborhoods.
- Crossing opportunities are needed across Beltline Boulevard near Palmetto Health Richard to link the high demand neighborhood north of Route 277. Linear improvements along US 321 would link this neighborhood to downtown, and additional crossing opportunities of Main Street and Monticello Road would improve mobility around this neighborhood.
- Crossing opportunities are needed along Beltline Boulevard between Two Notch Road and Craig Road.

Figure 16 displays demand and supply results in **southeast Columbia**. The following areas need improvement:

- Garners Ferry Road provides the only connection between downtown and the University of South Carolina School of Medicine, along with its adjacent neighborhoods. Connectivity could be greatly improved by low-stress greenway links across Gills Creek to these neighborhoods.
- Leesburg Road and Garners Ferry Road east of Interstate 77 need additional crossing opportunities to serve the neighborhood around Annie Burnside Elementary School.

Figure 17 displays demand and supply results in **northwest Columbia**. The following areas need improvement:

- Short greenway connections between low-stress neighborhood roadways could increase the low-stress

connected network in the area south of Interstate 20 and west of the river.

- Crossing opportunities are needed along Broad River Road.
- Improvements are needed along Bush River Road to connect neighborhoods to shopping destinations in Dutch Square.

Figure 18 displays demand and supply results in **northeast Columbia**. The following areas need improvement:

- Bicycle travel increasingly requires travel on collector and arterial roadways in the northeast area as roadway connectivity decreases. Improvements are needed along Parklane Road and Farrow Road to connect neighborhoods to schools, stores, and health services along Farrow Road.
- Short greenway connections are needed in the neighborhood east of Two Notch Road near Clemson Road.
- Crossing opportunities are needed along Sparkleberry Lane and additional connectivity is needed in the neighborhood to its south.

Conclusion

The Walk Bike Columbia Pedestrian and Bicycle Suitability Analyses provide a data-driven illustration of the quality of infrastructure serving pedestrians and bicyclists in the study area and the demand for infrastructure. **The results demonstrate the need to improve pedestrian facilities around schools, medical districts, and shopping centers, and focus on improving crossings of collector and arterial roadways for pedestrians and cyclists.** Together, the supply and demand models will guide prioritization of infrastructure investments where they will be most useful to residents and visitors and have the greatest impact on safety.



FIGURE 11: PEDESTRIAN SUPPLY AND DEMAND RESULTS FOR GREATER DOWNTOWN



FIGURE 12: PEDESTRIAN SUPPLY AND DEMAND RESULTS FOR NORTHEAST COLUMBIA

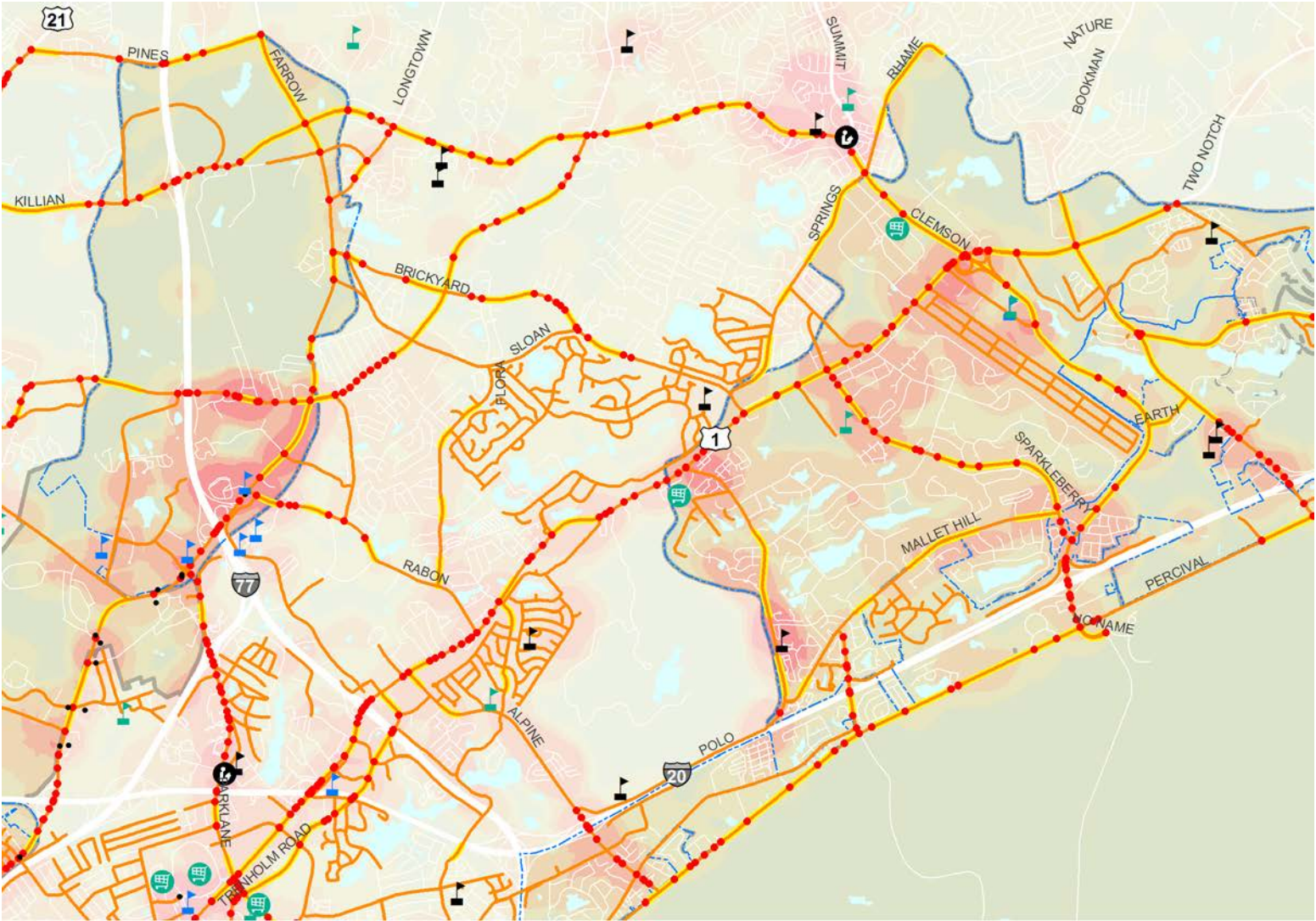




FIGURE 13: PEDESTRIAN SUPPLY AND DEMAND RESULTS FOR SOUTHEAST COLUMBIA



FIGURE 14: PEDESTRIAN SUPPLY AND DEMAND RESULTS FOR NORTHWEST COLUMBIA

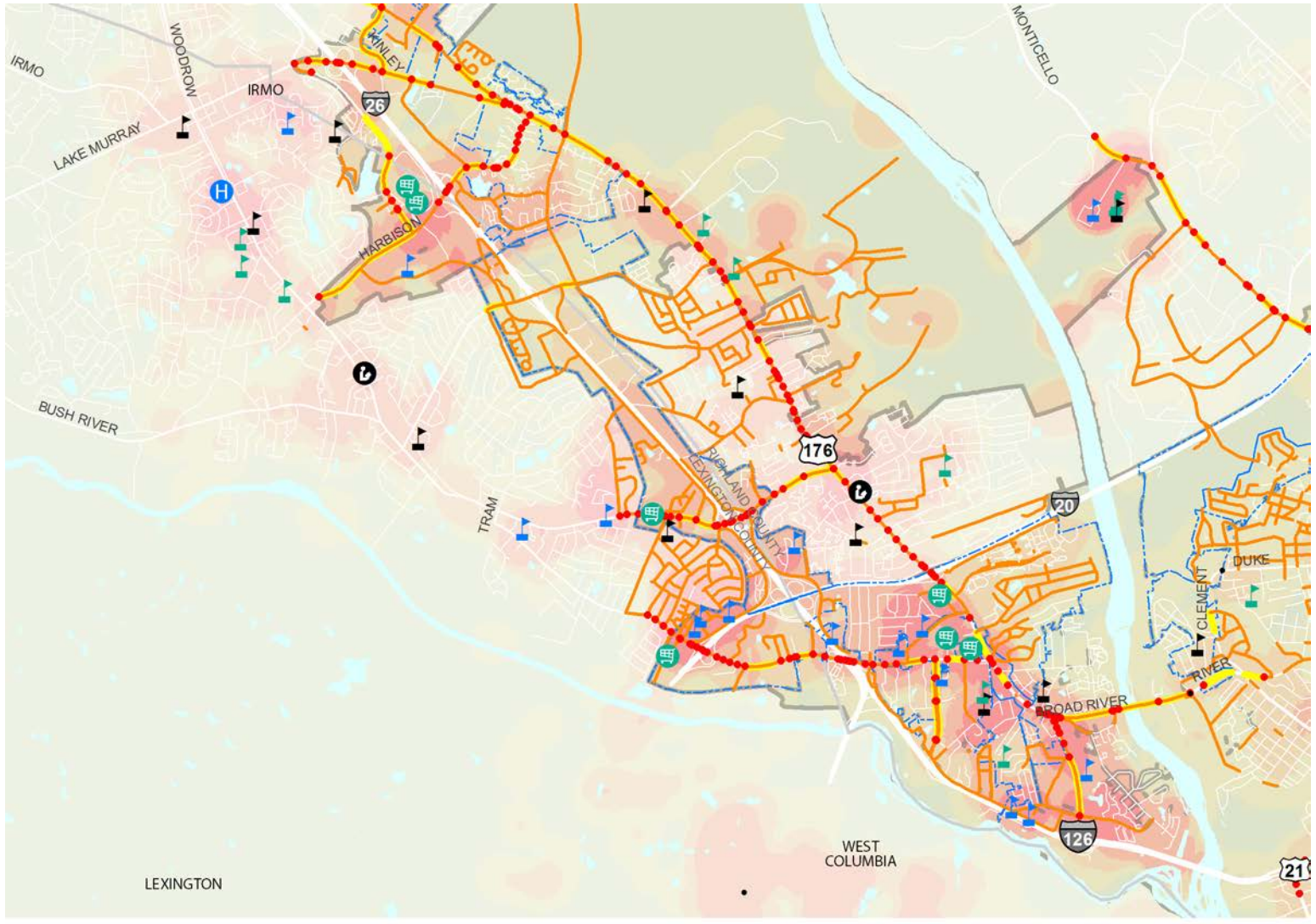
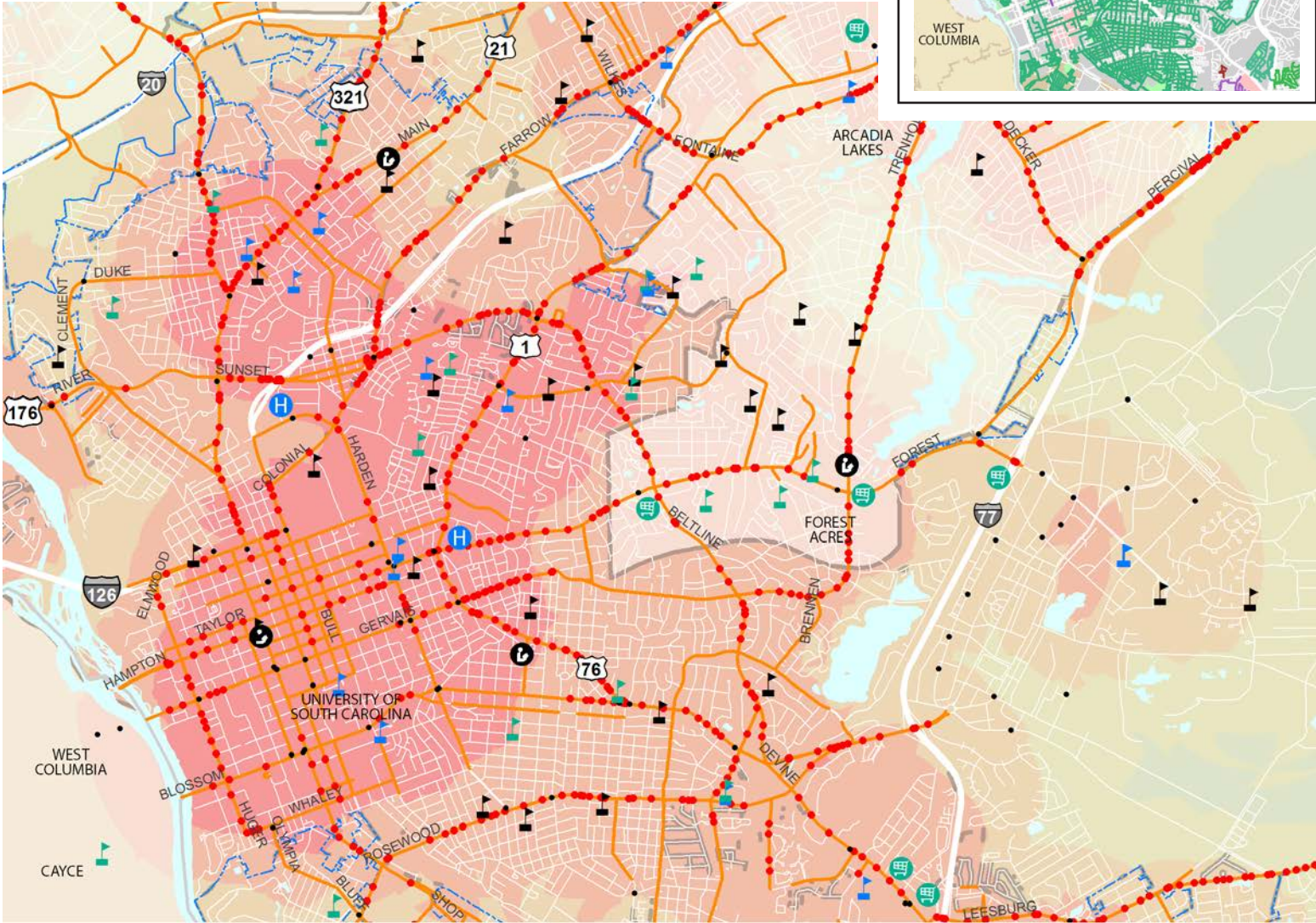




FIGURE 15: BICYCLE SUPPLY AND DEMAND RESULTS FOR GREATER DOWNTOWN COLUMBIA



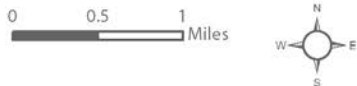
Greater Downtown Supply and Demand Results

- Supply**

 - High Stress Crossing (3-4)
 - High Stress Segment (3-4)
- Demand**

 - Highest
 - Medium
 - Low
 - Lowest
- Destinations**

 - Elementary School
 - High School/Middle School
 - College/Higher Education
 - Hospital
- Shopping Center
 - Library
 - Bus Stop - May 2013
 - City Limits
 - Potential Future Annexation Area



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created June, 2014.



FIGURE 16: BICYCLE SUPPLY AND DEMAND RESULTS FOR SOUTHEAST COLUMBIA



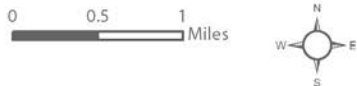
Southeast Supply and Demand Results

- Supply**

 - High Stress Crossing (3-4)
 - High Stress Segment (3-4)
- Demand**

 - Highest
 - Medium
 - Low
 - Lowest
- Destinations**

 - Elementary School
 - High School/Middle School
 - College/Higher Education
 - Hospital
- Shopping Center
 - Library
 - Bus Stop - May 2013
 - City Limits
 - Potential Future Annexation Area



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created June, 2014.





FIGURE 17: BICYCLE SUPPLY AND DEMAND RESULTS FOR NORTHWEST COLUMBIA

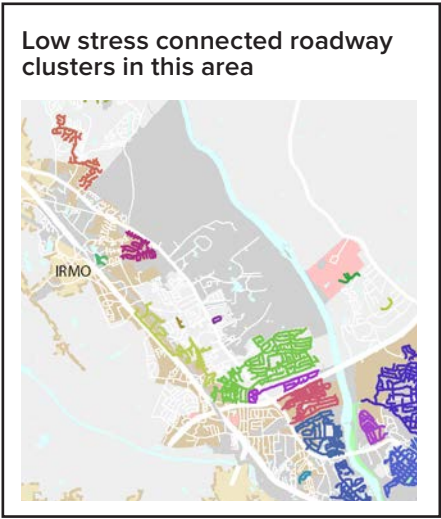
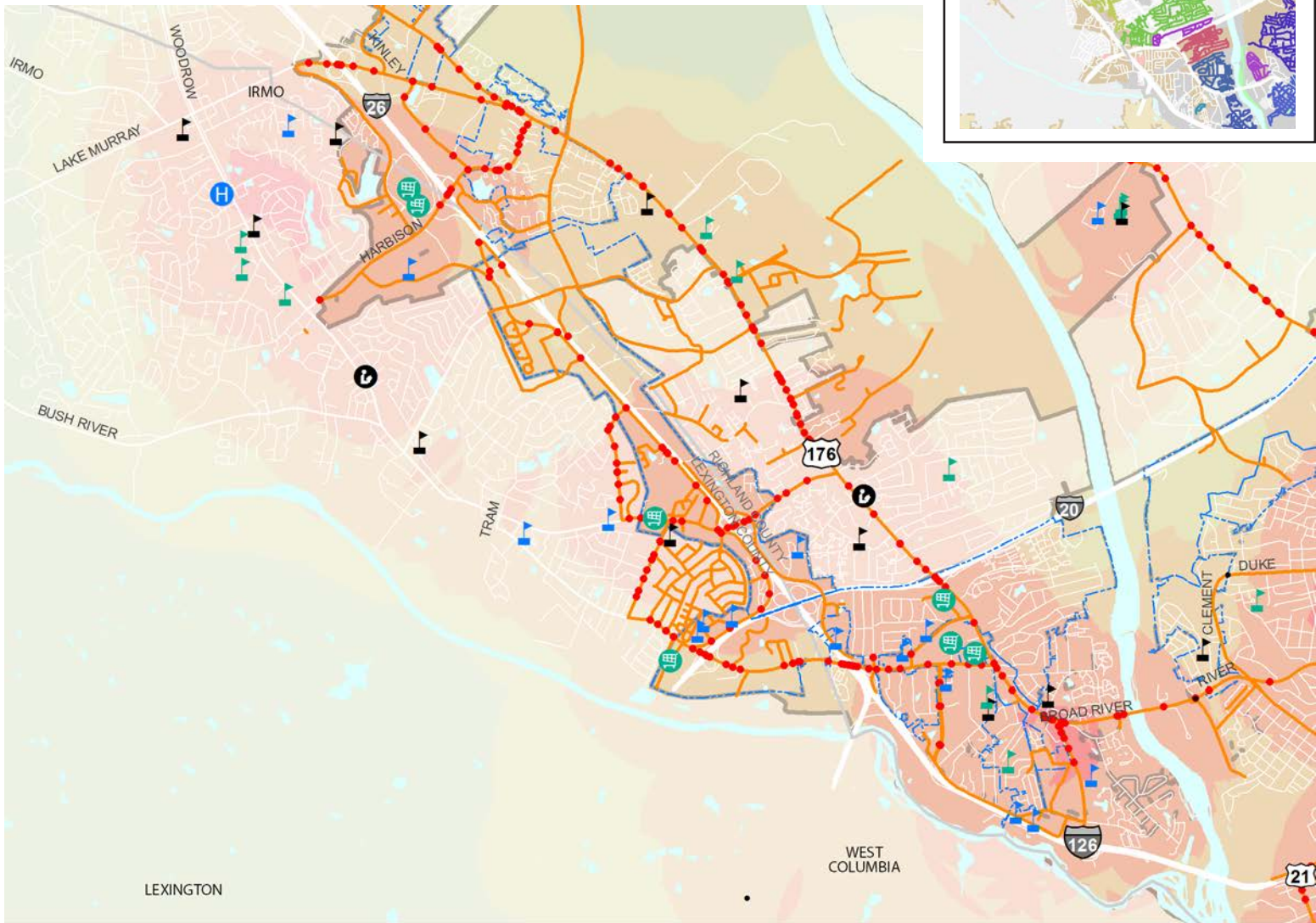
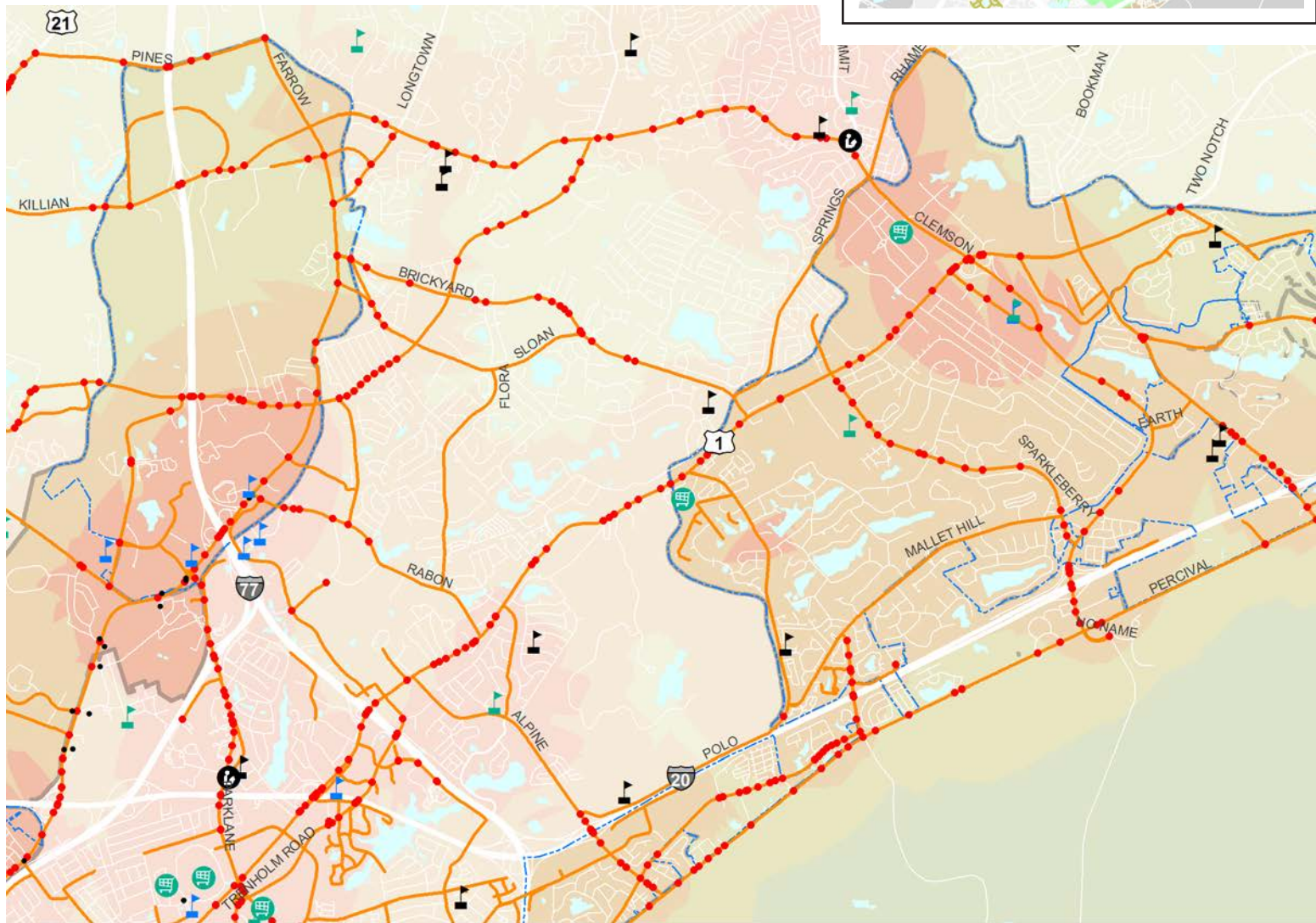


FIGURE 18: BICYCLE SUPPLY AND DEMAND RESULTS FOR NORTHEAST COLUMBIA



Northwest Supply and Demand Results



Northeast Supply and Demand Results





Intermodal Transit Analysis: Safe Routes to Transit

Existing Columbia Area Public Transportation Options:

- *The COMET, a public transit agency operated by the Central Midlands Regional Transit Authority (CMRTA)*
- *University of South Carolina Transportation Services, private student transportation*
- *The Santee Wateree Regional Transit Authority serving Elgin, Lugoff, Sumter, Hopkins, Camden, and Columbia*
- *Newberry Express from Newberry*
- *Intercity services, Greyhound Lines and Southeastern Stages, Megabus*
- *Private taxi, limousine, and shuttle providers*

Introduction

A major theme emerging from the Bike Walk Columbia Plan and the long-range vision for the Columbia area is that the region must develop a transportation system that creates and encourages the use of more travel choices, such as transit, biking, walking and ridesharing, and begin to reduce the degree of reliance on the single-occupant automobile for vehicle travel.

Well-designed, strategically located pedestrian and bicycle facilities can increase ridership on public transit by providing people with safe, pleasant access to these transit options. With geographically strategic investments in pedestrian and bicycle system improvements, together with the implementation of smart land use strategies and better education and incentive programs, many short auto trips could be shifted to walking, biking or transit trips to help reduce vehicles miles traveled (VMT) and emissions for a relatively low cost.

Summary of Regional Transit Strengths

Over the past 10 years, there has been a strong national emphasis for livable communities that provide a range of transportation choices available to all residents within the community, including transit, walking and bicycling. The transit services within Columbia and surrounding areas (shown at left) offer some transportation options to residents. Building upon these existing systems is a goal for many agencies in the area. The state of coordination among the transit providers is present, but limited within the community.

- The COMET has bicycle racks on all buses, which has been a priority for the agency for several years. New buses ordered by The COMET buses will have racks for three bikes.

- USC does not have bike racks on buses, but does have many bicycle racks located on campus to accommodate student and faculty bike riders. Future buses should include bicycle racks on the front of the vehicles to accommodate the high usage of bicycles on campus. USC should continue to provide bicycle racks around campus to accommodate the bicycle mode share.
- The COMET, in coordination with USC, began in August 2014 the Garnet route, which provides service every 20 minutes from the student complexes on Bluff Road to the USC campus. Currently the apartment complexes on Bluff Road provide small shuttle vans for USC students to/from campus. Over the next year, The COMET and USC will continue to work together for future funding of this route.
- The COMET began in August 2014 more frequent service in the core downtown from the Downtown Transit Center to the USC campus. The goal of the reconfiguration of routes is to provide convenient and frequent service to downtown employees, students, and staff.
- Local government agencies involved in the High Speed Rail initiatives continue to recognize the necessary link between bus and rail services for the future.
- The COMET has approximately 900 bus stops located across Columbia. One goal of the agency is to have accessibility at all bus stops. This goal will improve accessibility to pedestrian facilities within the community.



Best Practices

The following provide examples of effective policies supporting coordination of transit, pedestrian and bicycle modes.

- **Promote convenient intermodal connections between all elements of the Columbia transportation network**, including a transit system that incorporates easy pedestrian and bike access.
- **Promote transportation improvements that support the redevelopment of lower-density, auto-dominated arterials** to become more pedestrian and transit compatible urban transportation corridors.
- **Promote the development of local street patterns and pedestrian routes that provide access to transit services** within convenient walking distance of homes, jobs, schools, stores, and other activity areas.
- **Develop a coordinated network of facilities for pedestrians and bicycles which provides effective local mobility**, accessibility to transit services and connections to and between centers.
- **Support opportunities to redevelop the road system as multimodal public facilities** which accommodate the needs of pedestrians, bicycles, transit, automobiles, and trucks.
- **Provide opportunities for creation of town centers in urban areas** that: (1) serve as focal points for neighborhoods and major activity areas; (2) include a mix of land uses, such as pedestrian-oriented commercial, transit stops, recreation and housing; and (3) encourage transit use, biking and walking through design and land use density.
- **Support the transformation of low-density auto-oriented transportation corridors to higher-density mixed-use urban transportation corridors** when redevelopment

would not detract from centers or compact communities. Corridors that offer potential include those that are located near significant concentrations of residences or employment, and have the potential to support frequent transit service and increased pedestrian activity. Encourage the redevelopment of these arterials through:

- Addition of transit facilities, pedestrian-oriented retail, offices, housing, and public amenities,
- Building design and placement, street improvements, parking standards, and other measures that encourage pedestrian and transit travel, and
- Provision of pedestrian and bicycle connections between transportation corridors and nearby neighborhoods.

As the Midlands region continues to grow over the next decade, providing a viable transportation network for all modes becomes critical. The data included in this summary, and the full report in **Appendix F** provide guidance for policy and decision makers to improve transportation for all modes, including pedestrian, transit and bicycle connections.

The COMET (above, right) offers bus service throughout Columbia. USC also offers localized bus service (below, right) connecting the campus to local destinations.



RECOMMENDATIONS

**EVERY TIME I SEE AN
ADULT ON A BICYCLE,
I NO LONGER DESPAIR
FOR THE FUTURE OF THE
HUMAN RACE.**



-- H.G. WELLS



RECOMMENDATIONS: PROGRAMS AND POLICY

Introduction

While engineering improvements are important to improving walking and bicycling conditions in Columbia, non-infrastructure improvements are equally important for developing a culture where walking and bicycling for transportation are normal and celebrated activities, and support for these modes is institutionalized.

Based on a thorough review of existing municipal codes, City policies, enforcement practices, encouragement activities and walking and bicycle program evaluation, the team developed a number of non-infrastructure recommendations, presented in the following chapter, that should be implemented as the City continues working towards its walking and bicycling goals.

Many neighborhoods, like Earlewood, are already fairly friendly to pedestrians and bicyclists and could be enhanced through relatively minor improvements.

Along with engineering improvements, these recommendations follow the nationally successful six “E’s” strategy for better walking and bicycling accommodation. This approach considers engineering, encouragement, enforcement, education and evaluation/planning activities implemented in an equitable fashion as part of a holistic approach to walk and

bicycle-friendly community planning. The six “E’s” approach is consistent with the criteria of the Walk- and Bicycle-Friendly Community programs, as discussed in the WFC and BFC Assessment of this Plan.





Program Recommendations

Introduction

While improving pedestrian and bicycle infrastructure is critical to increasing walking and bicycling rates and safety, program efforts play an equally important role in developing a more bike- and walk-friendly culture. **Programs are generally categorized by five of the Six “E”’s of pedestrian and bicycle planning (Education, Encouragement, Enforcement, Evaluation, and Equity), with engineering recommendations playing a complementary role.** Program recommendations are categorized by the first four of these “E”’s, with the fifth “E,” Equity, considered an essential element throughout. These programs raise awareness of pedestrian and bicycle safety, help residents access opportunities to walk and bike, and provide guidance on why and how to integrate walking and bicycling into their everyday lives. **In essence, these efforts market active transportation to the general public and ensure the maximum “return on investment” in the form of more residents walking and bicycling and a higher degree of safety and awareness.**

The following sections contain information on existing programs and partners and new program concepts for Columbia to pursue. The recommended program concepts include a description of the basic approach and links to model programs and resources. Recommendations were informed by input from public outreach and local stakeholders, feedback from the League of American Bicyclists on the City of Columbia’s Bicycle Friendly Community application, the objectives of the City’s Bicycle and Pedestrian Advisory Committee, and the results of the Columbia BFC/WFC Assessment and Safety Analysis included in this plan, as well as best practices for successful programs gleaned from around the Southeast and the country. The Walk Bike Columbia Implementation Plan and BFC and WFC Action Plans provide further detail regarding next steps for program development, potential funding sources, and a timeline for phased implementation.

Existing Programs and Partners

Columbia has several existing walking and bicycling programs, particularly education and encouragement programs that are helping to make the city a more bike- and walk-friendly place. Below is a description of some of the major program efforts that are helping to improve the walking and bicycling culture and environment of Columbia. Beyond the major partners and programs, bike and walk related activities are continually being introduced or reinvented – often under the radar or on a small scale – and are an important complement to the broader, more formal programs for walking and biking culture. **Richland County Library system’s bicycle-powered mobile library and the University of South Carolina’s Outdoor Recreation Program are examples of supportive efforts.**

Existing and Potential Partners

Columbia’s existing programs are a reflection of the many partners that are already creating a more walk- and bicycle-friendly Columbia. While the vast majority of infrastructure and policy recommendations of Walk Bike Columbia fall within the exclusive authority of CMCOG, COATS, or the City, many program recommendations can, and should, fall under the banner of outside agencies, private sector partners, and nonprofit organizations. A collaborative approach to implementing and sustaining bicycling and walking programs contributes to the broader vision of fostering a strong community and culture for advocating transit, walking, and bicycling. 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.

Beyond the CMCOG, COATS, and City of Columbia, organizations that already act as partners in program

implementation or who may want a role in implementing community programs include:

Agencies, Institutions, and Commissions
City of Columbia Planning Commission
City of Columbia Bicycle and Pedestrian Advisory Committee
City of Columbia Police Department
City of Columbia Parks & Recreation Department
Richland County Recreation Commission
Richland County School District
Richland Library
Local colleges and universities
South Carolina Department of Transportation
South Carolina Department of Health and Environmental Control
Nonprofits and Community Coalitions
Palmetto Cycling Coalition
Eat Smart Move More SC (and the Richland County Chapter)
Carolina Cyclers
Midlands SORBA
Healthy Columbia
Palmetto Conservation Foundation
Friends of Harbison State Forest
American Diabetes Association
Sustainable Midlands
The River Alliance
Lexington Greenways Alliance (Community Open Land Trust)
CMRTA Advocacy Coalition
AARP
ABLE SC

Private sector and business support for program development and implementation is already evidenced through the contributions of Palmetto Health and Abacus Planning to the Walk Bike Columbia project and the participation of local bicycle shops. The broad participation of business-owners,



Education programs for practitioners such as the Columbia innovative bikeway design training workshop that was conducted in the fall of 2014 are also an important program consideration. The City should continue these training efforts for employees involved in project relevant to walking and biking modes.

property-owners, and major employers in the stakeholder focus group outreach phase of the Plan is further evidence. These groups and others will serve as important partners when implementing employer/employee incentive programs, seeking sponsorship funds, recruiting volunteers for activities, or advocating for the role of walking, bicycling, and transit within the City's and the region's larger economic development vision.

Safe Streets Save Lives Campaign

The Safe Streets Save Lives Campaign is a long-term strategic bicycle safety campaign that was launched statewide in 2010. This program is a joint effort of two South Carolina bicycle advocacy organizations: the Palmetto Cycling Coalition and Bike Law. The Safe Streets Save Lives Campaign provides a series of educational materials and events to improve bicycle safety in Columbia and South Carolina as a whole:

- Information on bicyclists' and motorists' rights and responsibilities on the road
- Educational videos on bicycle safety topics, such as how to ride in traffic, proper signaling, and how to drive around bicyclists as a motorist
- The Rolling Bike Summit: a bicycle education and networking event series for advocates, planners, engineers, elected officials, and others in Columbia and throughout the state who are interested in improving bicycling and walking in their communities
- Safe Streets Ambassadors Training Tour: Educational workshops held to train local staff, advocates, and citizens to promote bicycle safety and education within their communities
- Active Facebook page with safety education tips, videos, and bicycle laws and guidance

Bike Month Events

The City of Columbia has been actively involved in Bike Month each May. The Bicycle and Pedestrian Advisory Committee (www.columbiasec.net/bikefriendly) and other partners have

led a variety of activities to promote Bike Month, including the following:

- Bicycle Skills Clinic
- Tour de Cure Mayor's Bike Ride, Family Fun Ride, and Bike Rodeo
- Bike to Work Day with pit-stops for bicyclists throughout Columbia
- Bike to School Day
- Ride of Silence

Local Rides, Walks, and Bicycling and Walking Related Events

Several weekly, annual, and special events provide opportunities for Columbia residents to walk and bike, including recreational bike rides, family rides, fun runs and races, charity rides and walks, parades, and guided trail rides. Some highlights include the following:

- Carolina Cyclers weekly rides and events (<http://www.carolinacyclers.org/>)
- Handlebar Happy Hour
- Palmetto Half Marathon, 5K, and Fun Run
- Snowman Run 8K Road Race and Youth Fun Run
- National Walk @ Lunch Day
- Self-guided walking tours, historic tours, and guided neighborhood tours
- Tour de Cure and similar charity road bicycling events



Physical Activity and Healthy Lifestyle Programs

The goal of increased physical activity and healthier lifestyles in Columbia is being propelled locally by a number of agency and community initiatives, such as:

- Healthy Columbia’s Step Forward Columbia (walking program) and the Healthy Richland Initiative
- Eat Smart Move More Richland County
- Palmetto Health’s 29203 LiveWell Columbia Community Assessment and Healthy Palmetto program
- Carolina Cyclers promotion of biking and biking-related activities
- Girls on the Run of Columbia running programs that empower girls from 3rd to 8th grade for a lifetime of healthy living
- City of Columbia’s Bicycle and Pedestrian Advisory Committee, which encourages active transportation and leads numerous annual community events to promote walking and biking

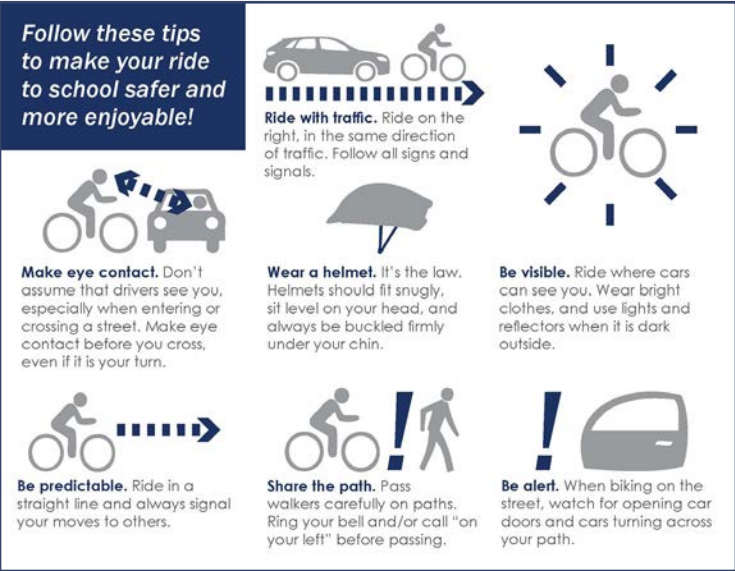
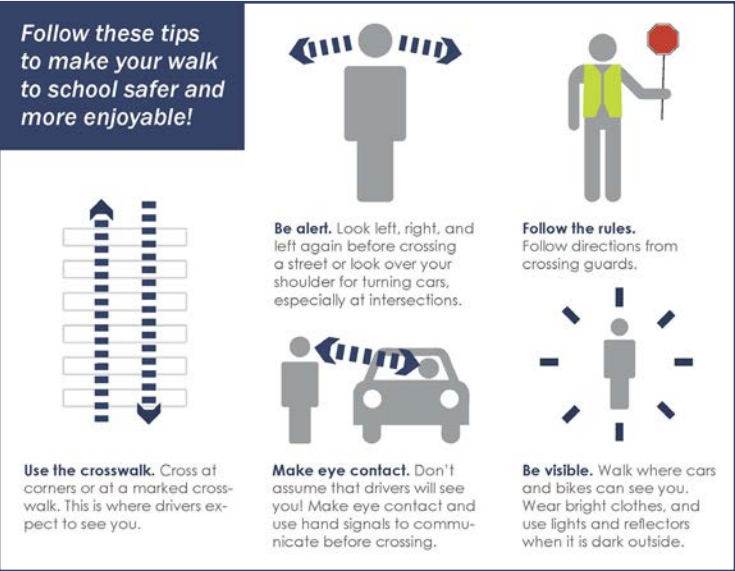
The Step Forward Columbia walking program is one example of many initiatives that are encouraging people to walk and bike more in their daily lives. Step Forward Columbia promotes the physical and mental health benefits of walking and encourages Columbia residents to walk more for exercise. The 6-week encouragement program helps participants create a walking team, set individual and team goals, schedule group walking activities, and awards participants with prizes. The program website (<http://www.healthycolumbia.org/exercising>) provides information on local walking events and fitness classes, and participants receive a free walking booklet and access to tools to track their progress.

Safe Routes to School Efforts

More than half of all elementary and middle schools in Columbia are participating in Safe Routes to School programs. School program efforts include developing and sending flyers with safety information to students’ homes, classroom pedestrian and bicycle safety education, a Walking Fridays encouragement program, and school public address announcements that educate students on walking and bicycling safety. Teachers conduct periodic in-class tallies to record how students are traveling to and from school, which

can help to track trends in student walking and bicycling rates over time. Columbia police officers have also increased their patrol presence around schools during morning arrival and afternoon dismissal times to enforce school zone speed limits.

The frames below show images from an Elmhurst, IL Safe Routes to School safety education campaign. The school district developed a set of tri-fold brochures to educate pedestrians, bicyclists and motorists on safe operation when traveling to and from school.





New Programs

In order to build upon the success of existing programs and improve the safety, comfort, and enjoyment of walking and bicycling in Columbia, this section provides a overview of programs that have shown success across the country and are recommended for the City of Columbia to pursue. A full, detailed list of these recommendations including links to additional resources and identified project partners can be found in **Appendix G**.

Education Programs

Education programs come in a variety of scopes and sizes and unique offerings should be developed and targeted towards users of all modes, ages and abilities. The most successful education programs target specifically identified safety or awareness deficiencies. For example, programs that educate motorists on safe bicycle passing buffers, educate bicyclists on the importance of utilizing bike lights, educate pedestrians on how to use pedestrian-oriented traffic signals and provide wayfinding information to potential transit users are among common programs. The City of Columbia should work with local partners to implement the programs recommended here. Recommendations are based on observations collected by the team through public input, data analysis and field work.

- **Expand Media Campaign to Educate Motorists, Pedestrians, and Bicyclists**
- **Walk Bike Ambassador Program and Classes**
- **Traffic Ticket Diversion Program**
- **Expand Safe Routes to School Efforts**

Encouragement Programs

Encouragement programs seek to target people who are “interested but concerned” to try walking, bicycling and transit for transportation by providing them with the resources to make them feel more comfortable doing so. They also can have a secondary function to normalize walking and bicycling, especially as a form of transportation, for all roadway users. The following programs reflect encouragement needs identified

in the existing conditions analysis. The City of Columbia should work with local partners to implement the following recommendations:

- **Commute Trip Reduction and Employer Incentives Program**
- **Walking and Bicycling Programs for Underrepresented Groups**
- **Bicycle Friendly Business Districts**
- **Open Streets Events**
- **Walking and Bicycling Map with Online Route Planning Tool**
- **Bicycle Co-op**
- **Walk, Bike, and Take Transit to Special Events**

Enforcement Programs

One of the specific gaps identified in the Columbia BFC/ WFC Assessment and the League of American Bicyclists’ BFC Application feedback is a lack of pedestrian- and bicycle-specific enforcement programs. **39% of Columbia Walk Bike Columbia survey respondents believe that law enforcement programs targeting drivers, pedestrians, and bicyclists would have the greatest impact on improving walking and biking in Columbia.** These programs can help to raise awareness of pedestrians and bicyclists, enforce road user rights and responsibilities, and reduce unsafe traffic behavior.

The Columbia Safety Analysis performed for this plan found that traffic enforcement for motorists should focus on speeding enforcement and ticketing drivers who fail to yield the right of way to pedestrians and bicyclists. Traffic enforcement for bicyclists should focus on enforcement for failing to follow traffic signs and signals, improper operations on the road, and wrong way riding on the road. These issues present the greatest crash risks to road users and could be reduced through targeted

enforcement programs, as well as improved education and roadway engineering.

- **Crosswalk Enforcement Action Program**
- **Targeted Enforcement & Speed Feedback Signs**

Evaluation and Planning Programs

In the Columbia BFC/WFC Assessment conducted for this plan, Evaluation and Planning program efforts were identified as the most in need of enhancement. Establishing this plan and tracking its implementation is an important first step in the evaluation and planning arena. Creating a dedicated pedestrian and bicycle coordinator position or selecting an outside consultant to perform the duties of coordinator at the City will be a critical implementation step in developing and maintaining long-term evaluation and planning initiatives within Columbia. A series of evaluation programs are described below that can help Columbia identify pedestrian and bicycle needs, track successes, and make the case for further bicycling and walking investments.

- **Citywide Pedestrian and Bicycle Counts Program**
- **“Measuring the Street” Pre- and Post-Project Evaluation Program**
- **Walking, Bicycling, and Greenways Report Card**



Policy Recommendations

Introduction

Planning and development regulations provide guidelines and requirements for most of what is developed in the City and as such are fundamental to the area’s walk- and bike-friendliness and access to transit. Since most new development in Columbia is provided through private investment or investment by non-City agencies, **the provision of walk- , bike-, and transit-friendly development policies and ordinances are one of the most cost-effective means that the City has to establish walkable and bikeable infrastructure for its neighborhoods and districts.**

Policy recommendations of Walk Bike Columbia are based on a review and assessment of development requirements related to pedestrian and bicycle facilities for the City and on policy best practices from around the Southeast and the country. The review focused on the City’s Code of Ordinances (CO), Engineering Regulations, but also included a review of the City of Columbia 2010 Complete Streets Resolution.

Appendix H includes matrices of the full policy review and item by item policy recommendations. The following provides recommended “next steps” for priority improvements to the bicycle- and walk-friendliness of local policies.

The provision of walk- , bike-, and transit-friendly development policies and ordinances are one of the most cost-effective means that the City has to establish walkable and bikeable infrastructure for its neighborhoods and districts.

Design Standards

Develop and Codify Complete Streets Design Standards

Key strengths of Columbia’s current policy environment is the adoption of a Complete Streets Resolution in 2010 , the inclusion of SCDOT’s EDM-22 (bicycle facility memo) in the City’s Engineering Regulations, and the endorsement of the NACTO Urban Bikeway Design Guide in 2013 . While these are critical first steps, the City must further codify these policy measures to ensure that the design principles within each are seamlessly integrated within the City’s Code of Ordinances and Engineering Regulations. This City must ensure that all land use regulations, development requirements, or engineering standards reflect the NACTO Urban Bikeway Design Guide and also further develop standards/guidelines for pedestrian facilities to complement those endorsed for bicyclists.

The Design Guidelines developed for this Plan (**Appendix XX**) provide the necessary standards for integrating best practices in pedestrian and bicycle facility design (including integration with transit and ADA accessibility) into the City’s Engineering Regulations. This Plan recommends formally adopting the Design Guidelines. Beyond adoption, these standards will be further institutionalized by developing Complete Streets Context-Sensitive Street Typology Guide as part of the Engineering Regulations and complementary Complete Streets Ordinance (complete streets development standards codified through the Code of Ordinances). This recommendation is already reflected in the City’s existing Complete Streets Policy, which states that the City will prepare draft regulations to implement the policy.

The Complete Streets Ordinance will provide a “package” of code improvements related to bicycling, walking, and access to transit as well as standards for context-appropriate street design for all modes of transport. This “package” will include policy recommendations included within the attached

matrix and will ensure that design guidance is integrated into development standards for new development. The Complete Streets Local Policy Workbook – by the National Complete Streets Coalition and Smart Growth America (<http://www.smartgrowthamerica.org/documents/cs-local-policy-workbook.pdf>) is an important resource for developing an effective complete streets ordinance.

The Complete Streets Context Sensitive Street Typology will serve as a complement to the design guidelines included in this Plan. As one example, the Cleveland (OH) Complete and Green Streets Typology Manual reclassifies the City’s streets into typologies based on transportation function, width, land-use, and other considerations. Developed in conjunction with the passage of a Complete and Green Streets Ordinance, the initiative requires implementation of sustainable policies and guidelines in all construction projects within the public right of way. The City adopted the manual for the explicit purpose of creating a walking, biking and public transportation-friendly city while reducing environmental impact by incorporating green infrastructure. Examples and resources for typology-based design manuals include:

- *Cleveland Complete and Green Streets Typology Manual:* <http://www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability/SustainableMobility>
- *Charlotte Urban Street Design Guidelines and related development standards:* <http://charmeck.org/city/charlotte/transportation/plansprojects/pages/urban%20street%20design%20guidelines.aspx>
- *Raleigh Street Design Manual:* <http://www.raleighnc.gov/content/extra/Books/PlanDev/StreetDesignManual/#1>
- *NACTO Urban Street Design Guidelines:* <http://nacto.org/usdg/>



Develop and Adopt an ADA Transition Plan

Through adoption of Title II of the federal Americans with Disabilities Act (ADA) in 1990, all city governments are required to complete a self-evaluation of their facilities, programs, policies, and practices. As described by the U.S. Department of Justice, Civil Rights Division, “the self-evaluation identifies and corrects those policies and practices that are inconsistent with Title II’s requirements. Self-evaluations should consider all of a city’s programs, activities, and services, as well as the policies and practices that a city has put in place to implement its various programs and services.” (Source: U.S. Department of Justice, Civil Rights Division, Disability Rights Section. (October 2008). The ADA and City Governments: Common Problems. Retrieved from: <http://www.ada.gov/comprob.htm>) This is a required step and an essential tool for advancing ADA accessibility locally that Columbia has not yet taken.

An ADA Transition Plan adopted by the City of Columbia is a policy document intended to meet the accessibility needs identified as part of the required self-evaluation. For all public facilities within the City of Columbia’s jurisdiction, the ADA Transition Plan will identify infrastructure or other physical obstacles that limit accessibility, establish a strategy for making the facility accessible, adopt a timeline for achieving ADA compliance, and assign an agency, department, or staff position responsible for implementing each of the Plan’s identified improvements. Other elements of an ADA Transition Plan, as identified in the Federal Highway Administration’s best management practices guide, that are essential to an effective Plan are as follows:

- Ensure that ADA requirements and standards are fully integrated into all of the agency’s policy, planning, and design handbooks or manuals.
- Ensure that all district planning and engineering staff (and not just an ADA coordinator) have the required training. Because of evolving ADA standards and employee turnover, periodic offerings of training will be necessary.

- Ensure that ADA improvements can be funded through a variety of funding programs/sources. For example, nearly all agencies surveyed made ADA improvements through standard construction/reconstruction projects. For relatively small improvement needs, most agencies used a maintenance budget.
- In other cases, if an improvement need could not be included in a maintenance budget and there was an active construction project, several agencies budgeted a separate and distinct funding category specifically for ADA improvements.

(Source: The National Academies, National Academy of Sciences, National Cooperative Highway Research Program. (May 2009). ADA Transition Plans: A Guide to Best Management Practices. NCHRP Project Number 20-7 (232). Retrieved from: http://www.fhwa.dot.gov/indiv/docs/ada_transition_plans_report.pdf)

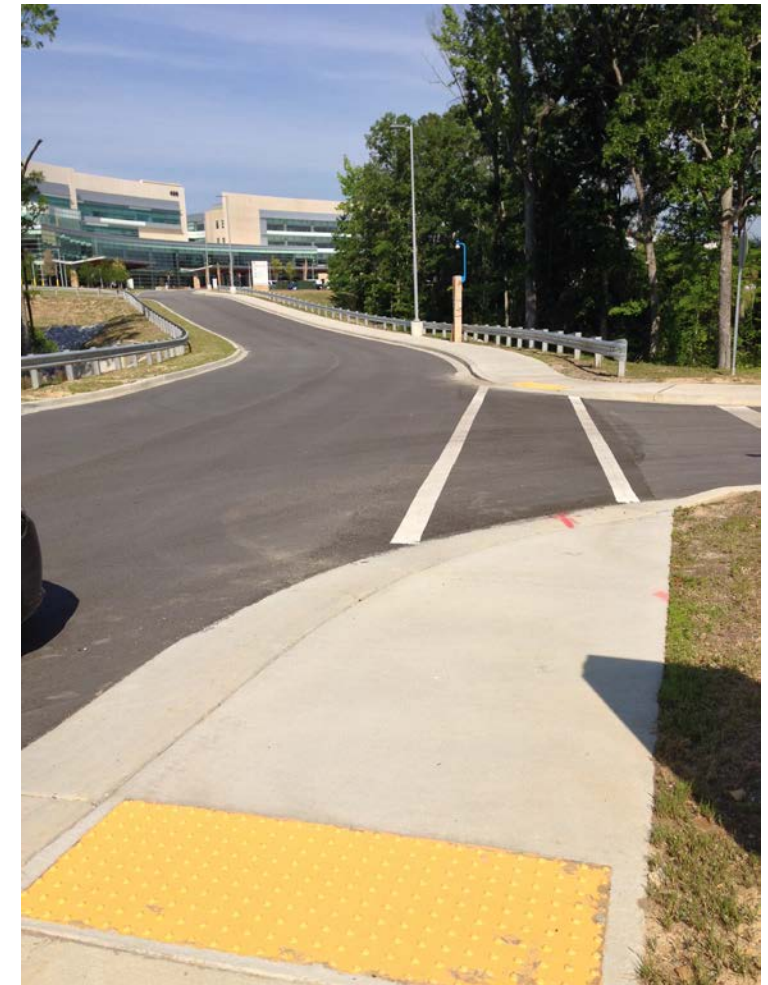
Development Ordinances

Bicycle Facilities within New and Redevelopment

Adopting the Design Guidelines developed for this Plan, as well as a Complete Streets Ordinance, and Context Sensitive Street Typology Guide will provide the basis for advancing the pedestrian and bicycle network in future roadway new construction and reconstruction. New policies must ensure that the network recommendations of Walk Bike Columbia are implemented as part of new development and roadway maintenance. Additionally, updates to the City’s code should include requirements for greenway corridor reservation, dedication, or construction in new developments where a greenway or trail is shown on an adopted plan or where a property connects to an existing or proposed greenway.

Sidewalks within New and Redevelopment

The existing conditions report identified not only a need for closing existing gaps within the sidewalk network, but also for establishing policies that require the provision of sidewalks



ADA transition plans, required by the Civil Rights Act of 1990, provide a systematic tool to ensure that existing facilities are accessible to all potential pedestrians and transit users, regardless of age and ability. The City of Columbia should look to develop an ADA transition plan in the near-term.



through the development process. This Plan recommends that Columbia include and refine regulatory standards in the Zoning Ordinance and/or Subdivision Regulations requiring new developments to include sidewalks.

Refinement of existing sidewalk requirements in the Engineering Regulations will ensure long-term, cost-effective improvements to local mobility options and to the overall walkability of Columbia. The City should adopt standards requiring sidewalks in specified contexts, based on street type, land use, or densities. This should be incorporated into the Complete Streets Ordinance and Engineering Regulations. Examples can be found in nearby Dekalb County, GA, and the City of Mount Pleasant, SC., as cited below:

Dekalb County Code of Ordinances sec. 14-383 (Streets)

(a) Sidewalks shall be required on all sides of street frontage on all new and improved local residential streets in all subdivisions and along the street frontage of all new and improved non-residential developments and as set forth in section 14-190 of this article, unless determined by the planning commission to be infeasible only due to severe cross-slopes, shallow rock, soil or topographic conditions. At a minimum, however, continuous

sidewalks shall be required on at least one (1) side of all new and improved local residential streets in all new and improved. No other variances or exceptions are allowed.

(b) The development director or planning commission may require that sidewalks required pursuant to 14-383(a) be continued to the nearest major or minor arterial or collector street.

Mt. Pleasant, South Carolina Code of Ordinances sec. 156-108 (Curb Cuts and Pedestrian Access)

(1) New developments, subdivisions, and remodeling. Appropriate pedestrian access shall be provided for all new developments, subdivisions, and renovation or remodeling equaling 50% of the existing building’s value, either through the construction of concrete sidewalks or pedestrian path/ bikeway systems, or a combination of both.

(2) Table of pedestrian access requirements. (see **Table 9** on the following page)

Bicycle Parking Ordinance

Bicycle parking options in downtown Columbia have increased dramatically in the last five years. As referenced in the Bicycle Parking Plan, Columbia has installed bicycle corrals, custom-designed bicycle racks, and standard racks in highly visible locations within downtown districts. While the current approach has been successful at increasing bicycle parking options, it has not met demand or provided the level of geographic coverage needed to serve necessity, as well as choice, cyclists. The most effective means of addressing this is through a combination of City-installed bicycle racks and codified bicycle parking requirements. This Plan recommends that the City adopt general bicycle parking requirements that extend to all land uses.

Just as car trips vary in purpose and duration, so too do bicycle trips. Because of the varied nature of bicycle trips, different types of bicycle parking should be provided to accommodate these needs. These needs can be met by providing both short-term and long-term parking. The Association of Pedestrian and Bicycle Professionals addresses the distinction between Short/Long-Term parking in the Bicycle Parking Guide, 2nd Edition, 2010) (**Table 10**).

Codified bicycle parking ordinances and guidelines ensure the systematic and uniform accommodation of short-term and long-term bicycle parking throughout a community. Bicycle parking can also be designed to reflect local aesthetics or cultures as the image to the right from Columbus, OH depicts.





TABLE 9 – MT. PLEASANT TABLE OF PEDESTRIAN ACCESS REQUIREMENTS

Land Use/Road Classification	Minimum Requirement
Commercial and industrial (new streets)	Sidewalk both sides
Commercial and industrial (new development on existing street)	Sidewalk one side if specified on Road Improvement/ Transportation Plan
Major arterial	Sidewalk both sides
Residential collector (including boulevards, parkways, and spine roads)	Sidewalk one side on streets having direct access to lots
Local residential streets	
Greater than 3.5 units per acre	Sidewalk both sides
Between 3.5 and 1.1 units per acre	Sidewalk one side
Less than or equal to 1.0 units per acre	Pedestrian path/bikeway
Between neighborhoods, commercial developments, schools, parks, community areas and the like	Whenever possible, a pedestrian access path, bike trail, or crosswalk shall be provided between existing and proposed new subdivisions and other pedestrian- oriented destinations

For short-term bicycle parking, as referenced in the policy recommendations matrix, the minimum number of parking spaces for bicycles will be based on land use, with at least two bicycle parking spaces provided for all sites. For long-term bicycle parking, the policy must incentivize or require either bike lockers or secure parking areas (SPAs), indoor or in a gated outdoor area, specifically designated for bicycle parking.

Bicycle parking design, installation, and location are critical elements of a bicycle parking policy, as well. The policy will need to reference to the bicycle parking guidelines included within the Design Guidelines of this Plan. Additional resources related to the design, installation and location of bicycle parking standards include:

Unit of Measurement for Bicycle Parking

The new APBP Bicycle Parking Guidelines recommend uncoupling bike parking supply from car parking supply. The reason for this is that a percentage of car parking supply is not necessarily a good measure of the number of cyclists who would be expected to travel to a particular destination, especially in densely urbanized areas or where multiple travel options exist. We recommend a land use-based approach with location-specific measures of supply such as parking spaces per square footage of retail or percentage of transit boardings. See the resources below for model ordinance examples:

- *Association of Bicycle and Pedestrian Professionals Bicycle Parking Guidelines (2nd Edition)*: <http://www.apbp.org/?page=publications>
- Bicycle Parking Model Ordinance, Change Lab Solutions: <http://changelabsolutions.org/publications/bike-parking>

TABLE 10 – APBP SHORT AND LONG-TERM PARKING BEST PRACTICES

Criteria	Short-term	Long-term
Parking Duration	Less than two hours (shoppers and other short term visitors)	More than two hours (e.g., students, employees, residents)
Fixture Type	Simple bicycle racks	Lockers, racks in secured area or room
Weather Protection	Unsheltered (but can also be sheltered for protection from sun and rain)	Sheltered or enclosed Secured, active surveillance
Security	Unsecured, passive surveillance	Unsupervised “Individual-secure” such as bicycle lockers “Shared-secure” such as bicycle room or cage Supervised Valet bicycle parking Paid area of transit station
Typical land uses	Commercial or retail, medical/healthcare, parks and recreation areas, community centers, and public buildings	Residential, workplace, schools, transit centers

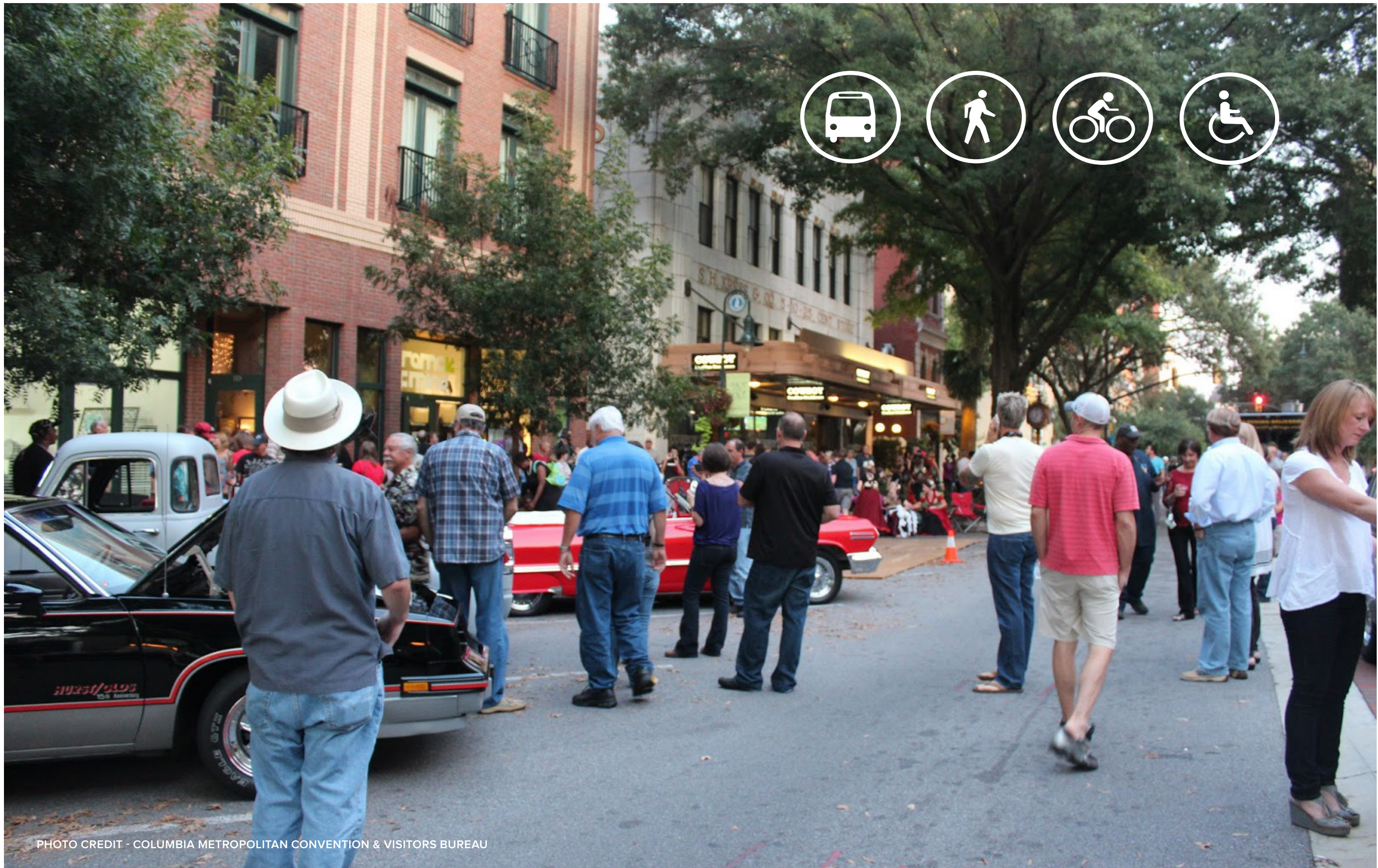


PHOTO CREDIT - COLUMBIA METROPOLITAN CONVENTION & VISITORS BUREAU

RECOMMENDATIONS: PEDESTRIAN AND BICYCLE NETWORK

Introduction

*A growing concept in the non-motorized transportation field is the idea of “8 to 80” cities – where the vast majority of the population has a safe option of either walking or biking safely and comfortably for their transportation needs. 8 to 80 cities are resilient, safer and more livable cities; where not only the most strong and resilient, or those who do it out of need walk and bike, but rather people of **all ages and abilities** do so by choice – because it’s a safe, convenient and pleasant transportation option.*

A Columbia resident, likely a college student, bicycles to the ATM in the Five Points area. An 8-80’s walking, bicycling and transit network would support users of all ages and abilities in easily accomplishing daily errands like going to the bank or ATM car-free.

Among other things, 8 to 80 cities give children the option of walking or biking to school, relieving traffic congestion at peak hours and giving parents extra time for other activities. They also provide seniors with options to live independently without the use of a car, saving them money and making roadways safer. A comprehensive 8 to 80’s approach to pedestrian and bicycle planning includes strong development policy, infrastructure and non-infrastructure support programs that work in tandem to create an urban environment where

walking and bicycling are appealing to a wide variety of users. This section looks specifically at the transportation network in Columbia and how systematic infrastructure improvements can be made that support the goal of Columbia becoming an 8 to 80 city. A resilient city is one that balances the needs of different transportation users and offers multiple transportation options - network recommendations presented in this section reflect this concept.





“8-80” is a term coined by Gil Penalosa, the former Commissioner of Parks for the City of Bogota, Colombia and head of the Canadian-based non-profit “8-80 Cities.” To learn more about the organization, and access the walking, bicycling and transit-support resources that they offer, visit their website: www.8-80cities.org/

In order to create this balance in the transportation network, roadways will have varying priorities. For example, roadways that serve important motor-vehicle or freight connections will prioritize motor-vehicle and freight users. Corridors that provide connections to important walking, biking or transit destinations such as schools, job centers, retail centers and neighborhoods will prioritize walking, biking, and transit users. Some corridors provide important connectivity for all roadway users, therefore designing the roadway to balance user considerations or providing an equal, parallel connection while maintaining good walking and biking access along the main corridor is recommended.

The following sections discuss the needs of pedestrian and bicycle users of all ages and abilities, and present comprehensive network recommendations that address these needs. Network recommendations are intended to be implementable and meet user needs by reflecting best practices for walking and bicycling. The Team considered several factors in the development of these recommendations including (but not limited to):

- Existing roadway design and pedestrian/bicycle accommodations
- Roadway jurisdiction and applicable design policies and practices
- Existing and projected traffic volumes
- Traffic speed
- Public and stakeholder input
- Transit connectivity
- Trip origins and destinations and likely user types
- Freight traffic
- Accident reports
- National best practices in roadway design for pedestrians, bicyclists and transit users

All recommendations are feasible based on the information the team had available during Plan development and reflect national best practices in urban roadway design. These recommended practices have been proven in numerous cities across the US and should be followed to create a roadway network that best fulfills multiple user needs. However, due to a host of possible constraints, it may not possible for these recommendations to be followed in all instances. If a facility cannot be implemented as recommended, the City of Columbia should strive to implement the next best facility type for the roadway. For example, if cycle tracks are not possible at present on a roadway, buffered bike lanes should be considered as the next best alternative, with cycle tracks being the long-term desired facility-type. Also, network recommendations should be applied in tandem with other improvements for pedestrian and bicycle users such as enacting policies that support more walk and bike-friendly development city-wide and implementing programs that educate citizens on how to use these facilities and encourage them to do so safely. This, and other implementation considerations will be discussed in later sections of the Plan.



Pedestrian and Bicycle Infrastructure Types

Introduction

A variety of on and off-street pedestrian and bicycle facilities are recommended due to 1) the range of abilities and comfort levels of pedestrians and bicyclists; 2) the range of conditions for walking and bicycling on different roadway environments; and 3) local preferences identified through the public input process. This section presents an overview of these facility types in order to orient the reader to the network recommendations presented in the following sections. In addition, the project team is developed a set of Complete Street design guidelines specific to the policies and roadway conditions unique to the City of Columbia. This Guide, found in **Appendix XX** will present specific information on the design of the facility types presented here, as well as guidelines on other spot improvements such as traffic calming, intersection treatments, bicycle parking, transit stops, and other bicycle and walking appurtenances.

The recommended pedestrian and bicycle network substantially increases access to transit and is made up of the following core types of pedestrian and bicycle facilities:

On-road facilities
Cycle tracks
Buffered Bicycle Lanes
Bicycle lanes
Paved shoulders
Neighborhood Greenways/Bicycle Boulevards
Shared lane markings
Signed Bicycle routes
Off-road facilities
Shared use paths (also known as greenways and multi-use paths)
Sidepaths
Pedestrian facilities
Sidewalks
Signalized Intersection Improvements
Un-signalized Mid-block Crossing Improvements

The recommended strategies for implementing the proposed facilities include road widening, lane narrowing, lane reconfiguration, parking reduction, adding markings/signage, and new construction. In addition, strategic speed limit reductions and intersection improvements should be considered for improved pedestrian and bicycle safety and comfort throughout the City.

Pedestrian Facility Types

Pedestrian facility types recommended as a part of this planning effort fall into four categories: sidewalk improvements, signalized intersection improvements, unsignalized/mid-block crossing improvements, and off-road trails or paths. The first three of the four occur as part of the street network. An overview of what these improvement categories entail is provided below.

Sidewalks



Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic. Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped planting strip area. Sidewalks are a common application in both urban and suburban environments.

Attributes of well-designed sidewalks include the following:

- **Accessibility:** A network of sidewalks should be accessible to all users.
- **Adequate width:** Two people should be able to walk side-by-side and pass a third comfortably. Different walking speeds should be possible. In areas of intense pedestrian use, sidewalks should accommodate the high volume of walkers.
- **Safety:** Design features of the sidewalk should allow pedestrians to have a sense of security and predictability. Sidewalk users should not feel they are at risk due to the presence of adjacent traffic.
- **Continuity:** Walking routes should be obvious and should not require pedestrians to travel out of their way unnecessarily.
- **Landscaping:** Plantings and street trees should contribute to the overall psychological and visual comfort of sidewalk users, and be designed in a manner that contributes to the safety of people.
- **Drainage:** Sidewalks should be well graded to minimize standing water.
- **Social space:** There should be places for standing, visiting, and sitting. The sidewalk area should be a place where adults and children can safely participate in public life.
- **Quality of place:** Sidewalks should contribute to the character of neighborhoods and business districts.

While South Carolina laws do not dictate whether cyclists are allowed on sidewalks, Columbia disallows sidewalk riding in the central business district. In most cases, adult bicycle use on sidewalks is considered unsafe, and the use of bicycles should be limited to roadways and shared use paths.



Signalized Intersection Improvements



Signalized intersections are typically preferred crossing locations for pedestrians since traffic is typically stopped in one direction and motorists generally expect pedestrian crossing. However, vehicular turning speed, visibility, crossing distance and signal timing can be great barriers for pedestrians on roadways that are designed to primarily accommodate vehicular traffic.

Treatments such as high-visibility crosswalks, bulb-outs/curb extensions, roadway geometry improvements, adding pedestrian signals, lengthened/leading pedestrian crossing intervals and pedestrian median refuges can improve new or existing intersections for pedestrian users.

Unsignalized & Midblock Crossings



A marked/unsignalized crossing typically consists of a marked crossing area, signage and other markings to slow or stop traffic. This can occur at an unsignalized intersection or mid-block, where no intersection exists. The approach to designing crossings at unsignalized locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

When space is available, using a median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.

Active Warning Beacons (RRFB) and Hybrid Warning Beacons (HAWK) can also be used to enhance visibility at unsignalized crossings locations.

On-road Bicycle Facilities

On-road bikeway types are used typically on arterial, collector, and subcollector roadways where motor vehicle traffic volumes or speeds are relatively high. They are ordered hierarchically from greatest degree of bicycle/motor vehicle separation to lowest. In general, higher order facilities are preferable on higher-order roadways streets and vice versa.

Intersection Treatments



There are a variety of intersection treatments that can be applied to make a safer and more comfortable crossing environment for bicyclists. As seen in the example above, green paint delineates the preferred path of travel for the bicyclist through the intersection and indicates a potential conflict to motorists. A full set of potential intersection improvements can be viewed in the Design Guidelines found in **Appendix XX**.

Cycle tracks



A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks. In situations where on-street parking is allowed, cycle tracks are located to the curb-side of the parking (in contrast to bike lanes).

Cycle tracks may be one-way or two-way, and may be at street level, sidewalk level or at an intermediate level. If at sidewalk level, a curb or median separates them from motor traffic, while different pavement color/texture separates the cycle track from the sidewalk. If at street level, they can be separated from motor traffic by raised medians, on-street parking or bollards.

By separating bicyclists from motor traffic, cycle tracks can offer a higher level of comfort than bike lanes and are attractive to a wider spectrum of the public. Intersections and approaches must be carefully designed to promote safety and facilitate left-turns from the right side of the street.

Buffered Bicycle Lanes



Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes follow general guidance for buffered preferential vehicle lanes as per MUTCD guidelines.

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane and/or parked cars, providing more comfortable conditions for bicyclists. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Bicycle Lanes



A bicycle lane is a portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential and exclusive use of bicyclists. Bicycle lanes are always located on both sides of the road (except one way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is four feet; five- and six-foot bike lanes are typical for collector and arterial roads.

Where bicycle lanes are recommended in this plan, speed limit reduction should be strongly considered.



Paved Shoulders



Typically found in less dense areas, shoulder bikeways are roadways with paved, striped shoulders. While there is no minimum width for paved shoulders, 4’ or greater is preferred for cyclists. In addition to the safety and comfort benefits for cyclists, paved shoulders also reduce roadway maintenance, improve roadway drainage, provide a stable walking surface for pedestrians when sidewalks cannot be provided, reduce vehicular crashes, and provide emergency stopping space for broken-down vehicles.

Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary or rural treatment, with full bike lanes planned for construction if the roadway is widened or completed with curb and gutter.

Because some rural and neighborhood streets feature lower traffic volume and lower speeds, they travel. Bicycle travel on these roads is typically not separated from motor vehicle traffic.

Neighborhood Greenways/Bicycle Boulevards



Neighborhood greenways are low-volume, low-speed streets modified to enhance bicyclist comfort and safety by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. Pedestrian and bicycle cut-throughs (recommended in the following section) can also be integrated into the neighborhood greenways network to allow for continuous bike travel off of major corridors. These treatments allow through bicycle movements while discouraging motorized through-traffic.

Jurisdictions throughout the country use a wide variety of strategies to determine where specific treatments are applied. While no federal guidelines exist, several best practices have emerged. At a minimum, neighborhood greenways should include distinctive pavement markings and wayfinding signs. They can also use combinations of traffic calming, traffic diversion, and intersection treatments to improve the bicycling environment. The appropriate level of treatment to apply is dependent on roadway conditions, particularly motor vehicle speeds and volumes.

Traffic conditions on neighborhood greenways should be monitored to provide guidance on when and where treatments should be implemented. When motor vehicle speeds and volumes or bicyclist delay exceed the preferred limits, additional treatments should be considered for the neighborhood greenway.

Marked, Shared Roadways



A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane. Placed in a linear pattern along a corridor (typically every 100-250 feet), shared lane markings make motorists more aware of the potential presence of cyclists; direct cyclists to ride in the proper direction; and remind cyclists to ride further from parked cars to avoid “dooring” collisions.

In constrained conditions, the SLMs are placed in the middle of the lane. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles. In all conditions, SLMs should be placed outside of the door zone of parked cars and used on roadways with speed limits of 35 mph or less (below 30 mph preferred).



Signed Bike Routes or “Bike Friendly Roadways”

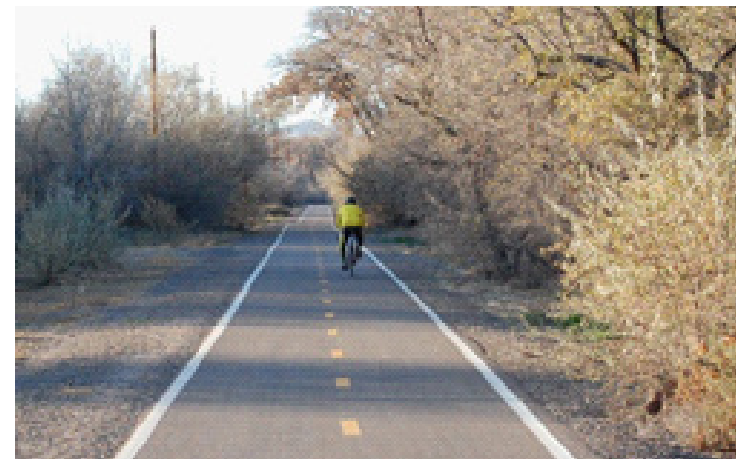


These routes are recommended on existing low-volume, bike-friendly roadways where bikeway signage and markings are used to guide bicyclists to popular destinations. Typically, these routes are recommended in locations that serve as alternate routes for roadways that are less comfortable for cycling due to higher motor vehicle volumes and/or speeds. They were chosen as part of the network because of the importance of overall system connectivity and connectivity to destinations such as parks and schools, but offer shorter connections than do neighborhood greenways or bicycle boulevards. Shared lane markings may be utilized to supplement wayfinding signage.

Off-Road Pedestrian & Bicycle Facilities

Off-road bikeways are intended to create completely separated spaces for pedestrians and bicyclists. These are the preferred facility for novice and average bicyclists. Special consideration must be given to environmental conditions and for all roadway crossings.

Shared Use Paths



A shared use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Path facilities can also include amenities such as lighting, signage, and fencing (where appropriate). Key features of shared use paths include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.

Sidepaths



Shared Use Paths along roadways, also called Sidepaths, are a type of path that run adjacent to a street. Because of operational concerns it is generally preferable to place paths within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available. When designed correctly, these facilities have the ability to provide a high level of comfort for pedestrians and bicyclists. However, the AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings. Where implemented, sidepaths should be coupled with strict access management regulations or improvements.



Pedestrian and Bicycle Network Recommendations

Introduction

The following sections present the pedestrian and bicycle network recommendations for the City of Columbia. The intent of these recommendations is to present a long-term vision for the walking and bicycling network, ensuring accessibility for potential pedestrians, bicyclists, and transit users in communities across the City and potential future areas of growth around Columbia.

The recommendations presented in the maps on the following pages directly reflect the information collected and presented in the Existing Conditions Analysis related to existing planning efforts, demand, equity, safety, public input, best practices and the City of Columbia’s high aspirations for becoming a premiere walk and bike-friendly community.

Pedestrian and Bicycle Project Development

Two distinct approaches are used in Walk Bike Columbia to develop the pedestrian and bicycle recommendations. The pedestrian recommendations reflect a more localized analysis of block-by-block infrastructure gaps and deficiencies along with specific generators of pedestrian travel demand, like transit stops. The bicycle recommendations reflect a city-wide and regional perspective of throughways and access routes.

Pedestrian Project Development

Sidewalk Project List Methodology

The universe of potential pedestrian sidewalk projects begins with the full roadway network, except limited access highways. This universe is first filtered by the following criteria:

- Demand – Any segment with a maximum demand score in the lowest two categories is removed (as shown in the Pedestrian Suitability Analysis).
- Supply – Any segment with a Level of Service of 1 or 2 (high comfort) is removed. In addition, roadways with a

higher posted speed (over 40 mph) and more than 2 lanes is removed where they meet a level of service of 3, since this is the best possible score for these roads. The best possible level of service is higher (indicating lower comfort) for higher-speed, multi-lane roads since those roads will never be as comfortable as local roads with well-designed pedestrian infrastructure.

In some cases, pedestrian improvements are recommended along roadways that already contain sidewalks on both sides. In these cases, a buffer is recommended.

Signalized Intersection Project List Methodology

The universe of potential signalized intersection improvement projects begins with all signalized intersections along major roadways. This universe is first filtered by the following criteria:

- Demand – Any intersection with a demand score in the lowest two categories is removed (as shown in the Pedestrian Suitability Analysis).
- Supply – Any intersection with a Level of Service of 1, 2 or 3 as shown on the Pedestrian Intersection Level of Service map is removed. In addition, any intersection with a higher posted speed (over 40 mph) and more than 2 lanes is removed where it meets a level of service of 4, since this is the best possible score for these intersections. The best possible level of service is higher (indicating lower comfort) for intersections on higher-speed, multi-lane roads since these roads are never as comfortable to cross as local roads with well-designed crossing infrastructure.

The resulting intersections are recommended for a variety of improvements. These may include installation of curb ramps, additional marked crosswalks, high-visibility marked crosswalks, or curb line adjustments to reduce crossing distances for pedestrians.

Unsignalized/Midblock Crossing Project List Methodology

The universe of possible unsignalized/mid-block crossings begins with all arterials and collectors. While these major roadways are difficult for pedestrians to cross safely between signalized intersections, the mobility needs of all modes along these roadways must be balanced with the desire to create safe crossings regularly for pedestrian travel. The following selection of roadways for possible unsignalized/mid-block



Recommended pedestrian and bicycle connections will comfortably and safely link Columbia neighborhoods to important local destinations such as schools, workplaces, food centers, retail destinations and recreation centers



crossings was chosen to balance those needs. The universe of arterials and collectors will be filtered by the following criteria:

- Demand – Any segment with a maximum demand score in the lowest three categories is removed (as shown in the Pedestrian Suitability Analysis).
- Supply – Any segment with a midblock crossing Level of Service of 1 or 2, as shown on the Midblock Crossing Analysis Map, is removed.
- Destinations – Any segment without a mapped destination (hospital, shopping center, school, or library) within a quarter mile is removed.

The resulting list of segments should be examined for possible crossing needs midblock or at unsignalized intersections. A crossing may not be appropriate for all of these segments.

Project Identification

The final step in the pedestrian project development methodology requires filtering each the three project lists based on a set of ranking criteria shown in **Table 11** on the next page. Through this final weighted scoring process, the pedestrian projects most suited to meet the goals and needs of the City of Columbia in the near term rise to the top as a targeted list of citywide priority projects.

Bikeway Project Development

Bikeway network development utilized a number of different analyses, described in the Existing Conditions section of this plan, and planning judgement to determine what project types are warranted along roadways throughout Columbia. These recommendations also include some new off-street bicycle accommodation recommendations where they serve a major connectivity function in the network. The ultimate goal of the bikeway network is providing connectivity to destinations such as retail centers, job centers, schools and recreation opportunities for all residents.

Nature of Recommendations

Recommended facilities for pedestrians and bicyclists strive to create a safe and comfortable walking or bicycling environment for users of all ages and abilities and reflect national best practices in considering conditions such as traffic volumes, traffic speeds, available roadway rights-of-way, and distances between crossing locations. Recommendations are considered planning-level, meaning that they should be used as a guide when implementing recommendations. In many cases, more detailed design studies will be required to examine specific site conditions and develop specific designs that reflect local conditions and constraints. In addition, these maps reflect the long-term vision for the network and implementation will not happen overnight. However, this Plan also contains an Implementation Plan, seen in the following sections, that provide a roadmap for implementing recommendations in a logical manner. The Implementation Plan prioritizes the most feasible projects that provide the greatest return in terms of need, safety improvement, and costs. The Implementation Plan also projects costs, develops a timeline for implementation and provides resources for project funding.

TABLE 11 - PEDESTRIAN PRIORITIZATION CRITERIA AND WEIGHTS

Criteria	Definition	Input	Score
Demand	Does the project promote walking by providing facilities in an area with high demand?	Pedestrian Suitability Analysis demand category: includes where people live, work, learn, play, and access transit	2 – 4 points (Higher points for higher demand score)
Supply	Does the project improve conditions on a segment with low quality pedestrian infrastructure?	Pedestrian level of service	1 – 4 points (Higher points for lower supply score)
Equity	Does the project benefit underserved communities?	Equity composite measure : includes 1) families living near or below the poverty line, 2) households with no vehicle available, 3) non-white populations, and 4) households with a limitation on English speaking ability	1 – 4 points (Higher points for higher equity score)
Previously Proposed Projects	Does the project have direct support expressed by inclusion in an adopted planning document?	2006 CMCOG Bicycle & Pedestrian Plan, Penny sales tax pedestrian project, 25 miles of planned sidewalks	3 points
Promote Safety	Does the project improve a location with a recorded safety concern?	Pedestrian collisions, 2010-2014	3 points
Public Input	Does the public support this project as a priority?	Online public input map	2 point



Recommendations Overview

Tables 12-18 below provide a summary of improvements shown in **Figures 19-33** on the following pages broken down by miles for linear facilities, or number of locations for spot improvements. Refer to the previous section for an overview of the different recommended improvement types.

Existing Facilities

TABLE 12 – EXISTING MILES OF COLUMBIA SIDEWALKS AND TRAILS

Type	Miles
Total Roadway Miles	740
Sidewalks	391
Paved Shared Use Path	20
Natural Surface Path	30
Singletrack trail	25

TABLE 13 – EXISTING MILES OF COLUMBIA BIKEWAYS

Type	Miles
Total Roadway Miles	740
Bike Lanes	19
Shared Lane Markings	0.5
Bike Routes	20

Recommended Pedestrian Facilities

TABLE 14 – SUMMARY OF PEDESTRIAN INTERSECTION IMPROVEMENTS BY PRIORITY SCORE

Category	Priority Score	Count
High	15 - 18	3
Medium High	13 - 14	4
Medium	11 - 12	8
Medium Low	9 - 10	11
Low	6 - 8	6

TABLE 15 – SUMMARY OF MILEAGES FOR RECOMMENDED SIDEWALKS BY PRIORITY LEVEL

Category	Priority Score	Miles
High	15 - 19	10
Medium High	13 - 14	38
Medium	11 - 12	69
Medium Low	9 - 10	221
Low	4 - 8	301

TABLE 16 – SUMMARY OF PEDESTRIAN INTERSECTION IMPROVEMENTS BY PRIORITY SCORE

Category	Priority Score	Number
High	13 - 17	11
Medium High	11 - 12	34
Medium	9 - 10	84
Medium Low	7 - 8	161
Low	4 - 6	99

Recommended Bicycle Facilities

TABLE 17 – SUMMARY OF MILEAGES FOR RECOMMENDED BIKEWAY FACILITIES

Type	Miles
Greenway	53
Sidepath	101
Cycle Track (1-way)	28
Cycle Track (2-way)	9
Buffered Bike Lanes	26
Bike Lanes	68
Paved Shoulders	11
Bike Boulevard	64
Shared Lane Markings	5
Signed Route	2
Infill Street	3

TABLE 18 – SUMMARY OF BICYCLE SPOT IMPROVEMENTS

Type	Number
Pedestrian/Bicycle Cut-through	6
Intersection Improvements	12



FIGURE 19 - COLUMBIA SIDEWALK RECOMMENDATIONS AND PRIORITIES (OVERVIEW)

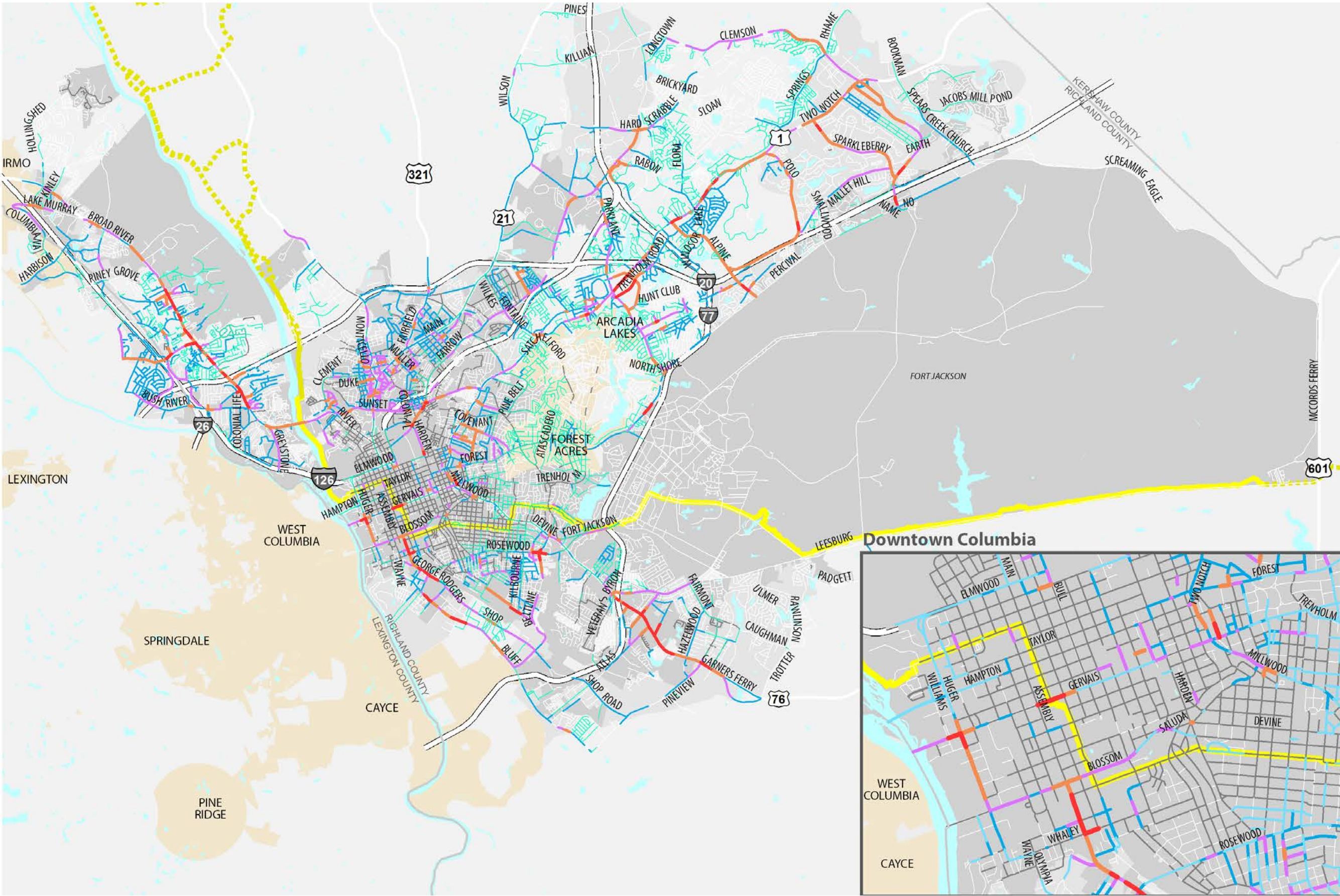
Preliminary Sidewalk Project Prioritization

Sidewalk Priority Score

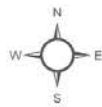
- 15 - 19
- 13 - 14
- 11 - 12
- 9 - 10
- 5 - 8
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Limited Access Highway
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created November, 2014.





FIGURE 20 – COLUMBIA RECOMMENDED SIGNALIZED INTERSECTION AND MID-BLOCK CROSSING IMPROVEMENTS (OVERVIEW)

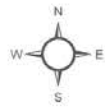
Major Crossing Improvement Prioritization

- Signalized Intersection Priority Score
- 13 - 17
 - 11 - 12
 - 9 - 10
 - 7 - 8
 - 4 - 6
- Street with Sidewalk(s)
— Street (white)

- Uncontrolled/Midblock Crossing Priority Score
- 15 - 18
 - 13 - 14
 - 11 - 12
 - 9 - 10
 - 6 - 8

- Legend
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - Limited Access Highway
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body

0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created November, 2014.

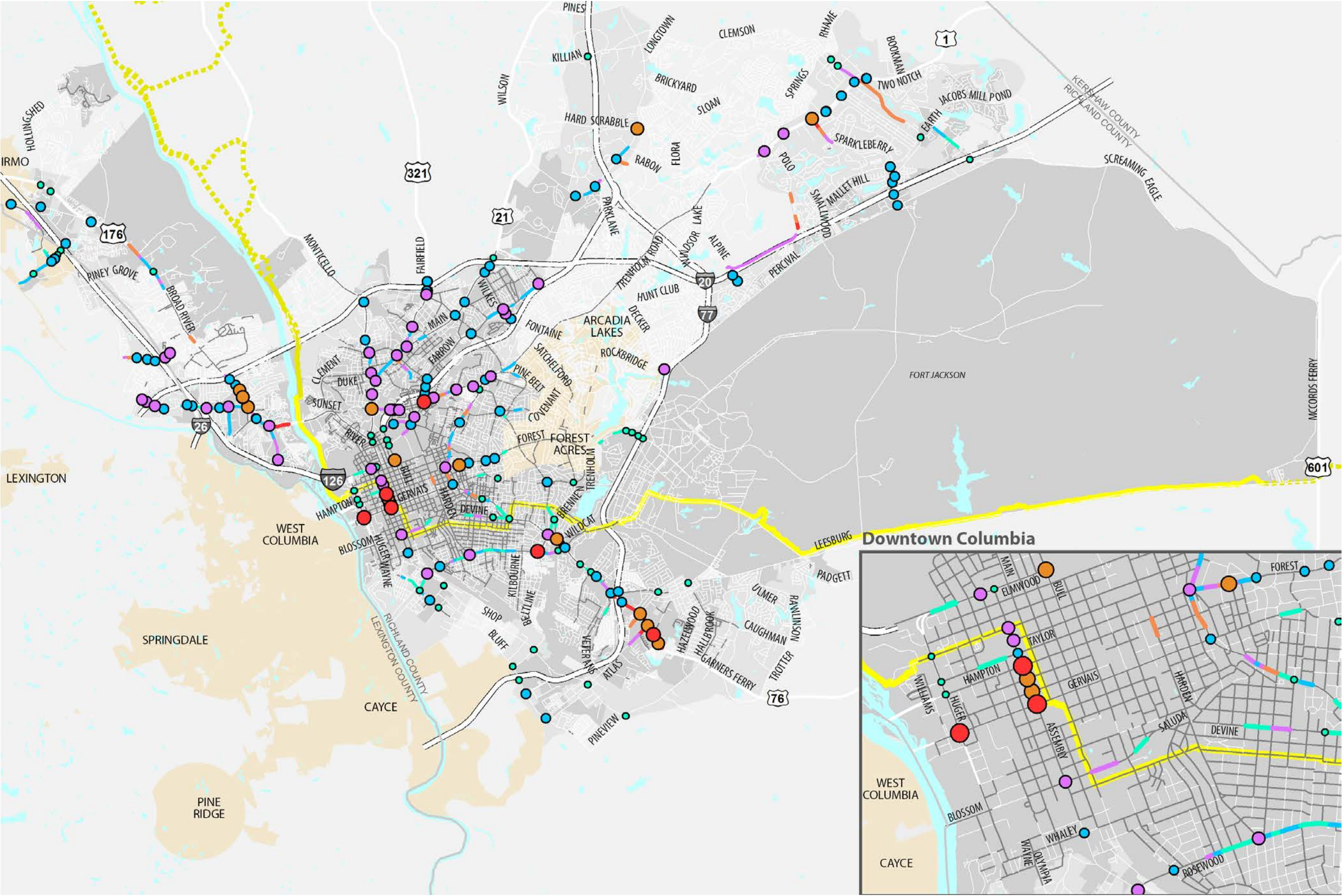




FIGURE 21 - COLUMBIA SIDEWALK RECOMMENDATIONS AND PRIORITIES (CITY CENTER)

Preliminary Sidewalk Project Prioritization ~Central~

Sidewalk Priority Score

- 15 - 19
- 13 - 14
- 11 - 12
- 9 - 10
- 5 - 8
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

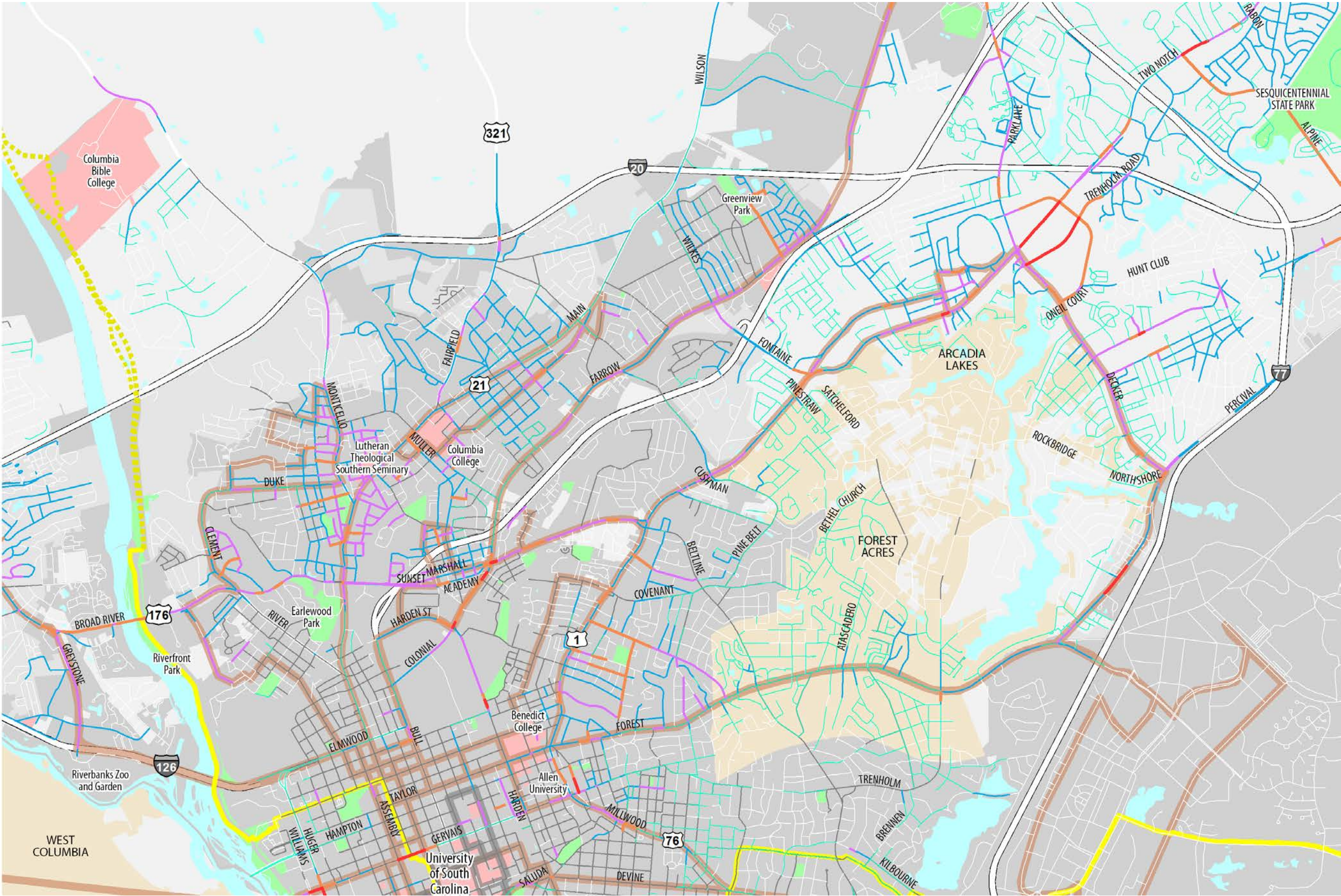




FIGURE 22 – COLUMBIA RECOMMENDED SIGNALIZED INTERSECTION AND MID-BLOCK CROSSING IMPROVEMENTS (CITY CENTER)

Major Crossing Improvement Prioritization ~Central~

Signalized Intersection Priority Score

- 13 - 17
 - 11 - 12
 - 9 - 10
 - 7 - 8
 - 4 - 6
- Street with Sidewalk(s)
Street (white)

Uncontrolled/Midblock Crossing Priority Score

- 15 - 18
- 13 - 14
- 11 - 12
- 9 - 10
- 6 - 8

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

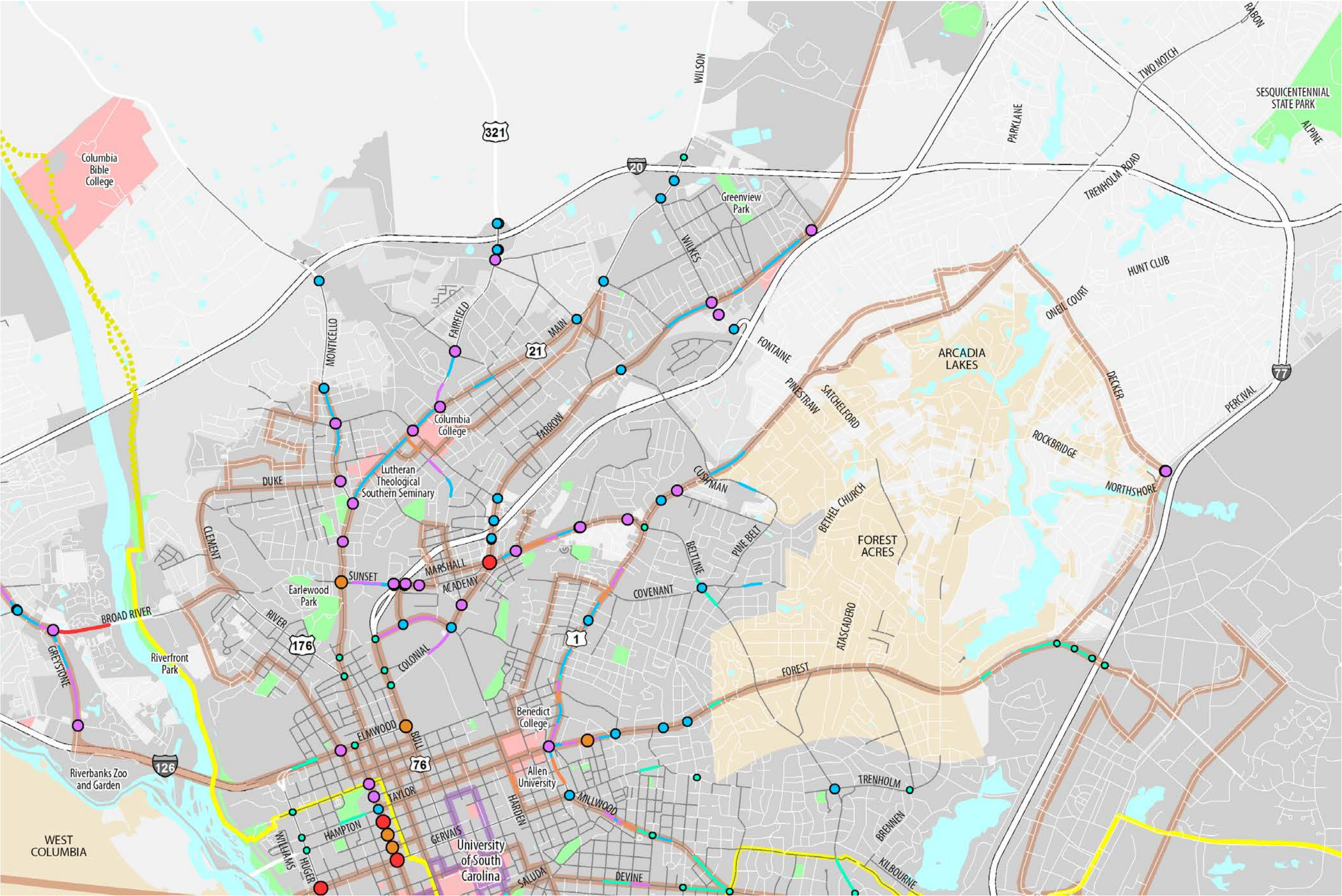




FIGURE 23 - COLUMBIA SIDEWALK RECOMMENDATIONS AND PRIORITIES (NORTHEAST)

Preliminary Sidewalk Project Prioritization ~Northeast~

Sidewalk Priority Score

- 15 - 19
- 13 - 14
- 11 - 12
- 9 - 10
- 5 - 8
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

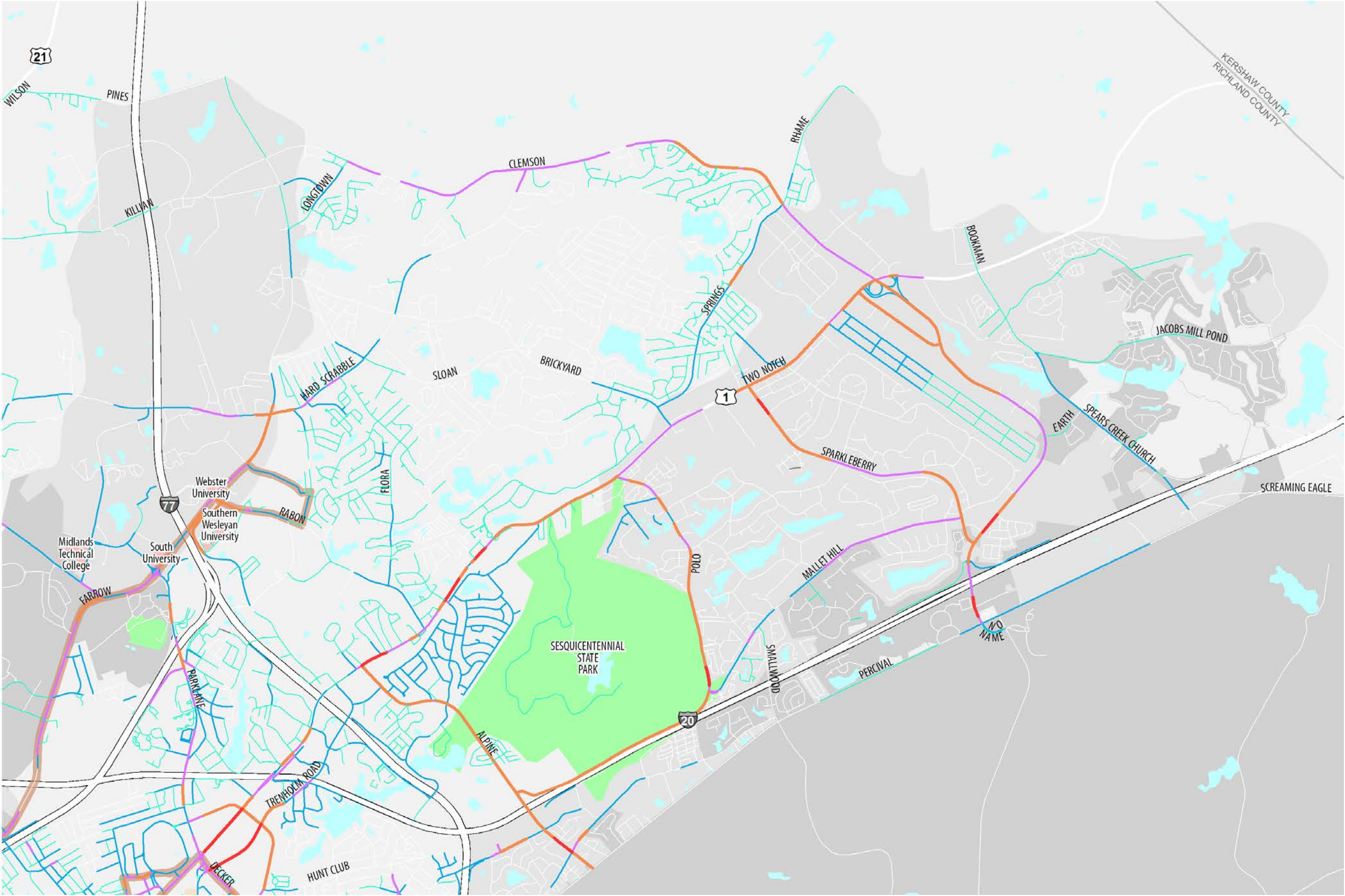




FIGURE 24 – COLUMBIA RECOMMENDED SIGNALIZED INTERSECTION AND MID-BLOCK CROSSING IMPROVEMENTS (NORTHEAST)

Major Crossing
Improvement
Prioritization
~Northeast~

Signalized Intersection
Priority Score

- 13 - 17
- 11 - 12
- 9 - 10
- 7 - 8
- 4 - 6

Street with Sidewalk(s)
Street (white)

Uncontrolled/Midblock
Crossing Priority Score

- 15 - 18
- 13 - 14
- 11 - 12
- 9 - 10
- 6 - 8

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of
Columbia and Central Midlands
Council of Governments.
Map created November, 2014.

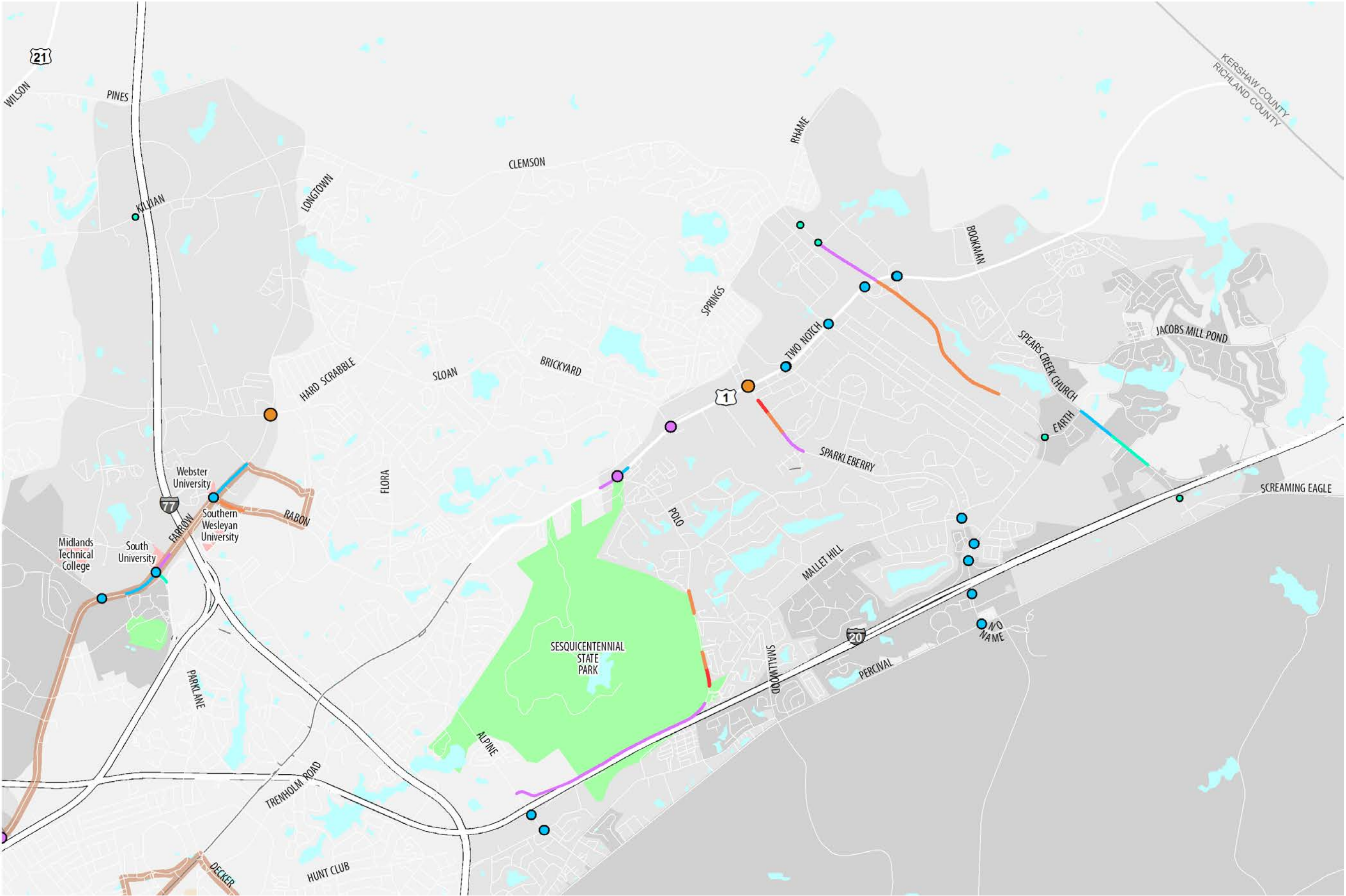




FIGURE 25 - COLUMBIA SIDEWALK RECOMMENDATIONS AND PRIORITIES (NORTHWEST)

Preliminary Sidewalk Project Prioritization ~Northwest~

Sidewalk Priority Score

- 15 - 19
- 13 - 14
- 11 - 12
- 9 - 10
- 5 - 8
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

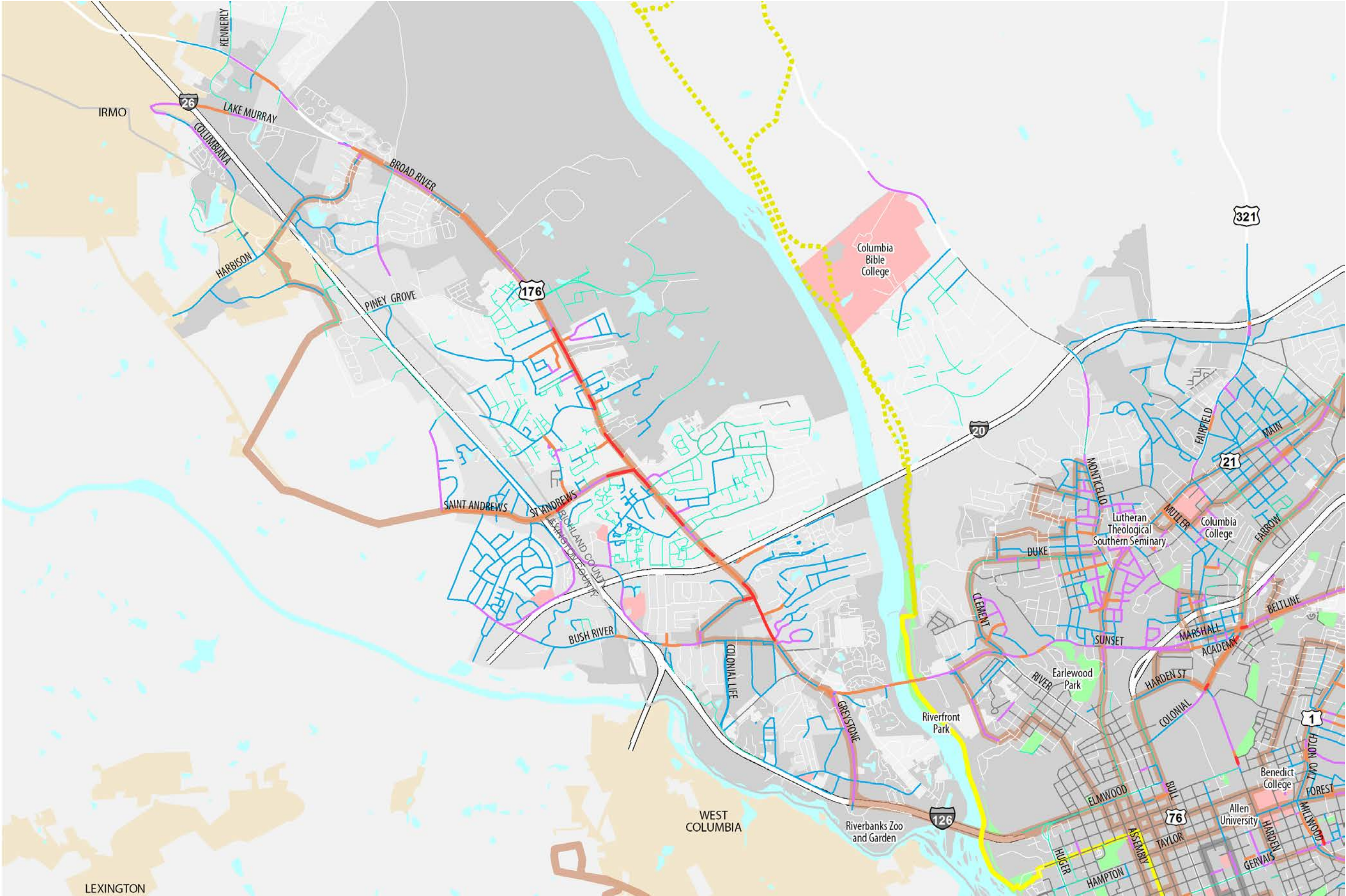




FIGURE 26 – COLUMBIA RECOMMENDED SIGNALIZED INTERSECTION AND MID-BLOCK CROSSING IMPROVEMENTS (NORTHWEST)

Major Crossing
Improvement
Prioritization
~Northwest~

Signalized Intersection
Priority Score

- 13 - 17
- 11 - 12
- 9 - 10
- 7 - 8
- 4 - 6

Street with Sidewalk(s)
Street (white)

Uncontrolled/Midblock
Crossing Priority Score

- 15 - 18
- 13 - 14
- 11 - 12
- 9 - 10
- 6 - 8

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of
Columbia and Central Midlands
Council of Governments.
Map created November, 2014.

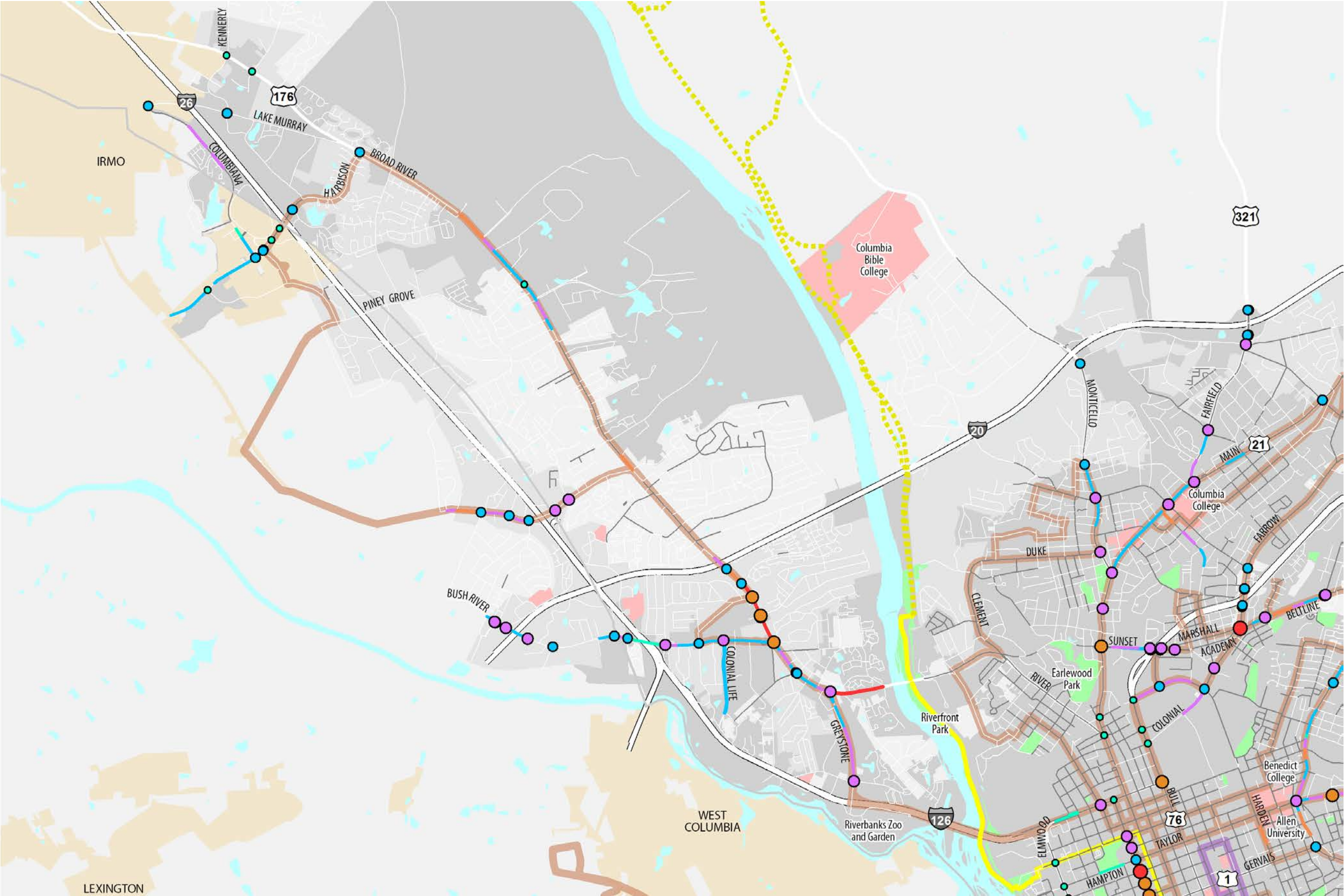




FIGURE 27 - COLUMBIA SIDEWALK RECOMMENDATIONS AND PRIORITIES (SOUTHWEST)

Preliminary Sidewalk Project Prioritization ~Southwest~

Sidewalk Priority Score

- 15 - 19
- 13 - 14
- 11 - 12
- 9 - 10
- 5 - 8
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

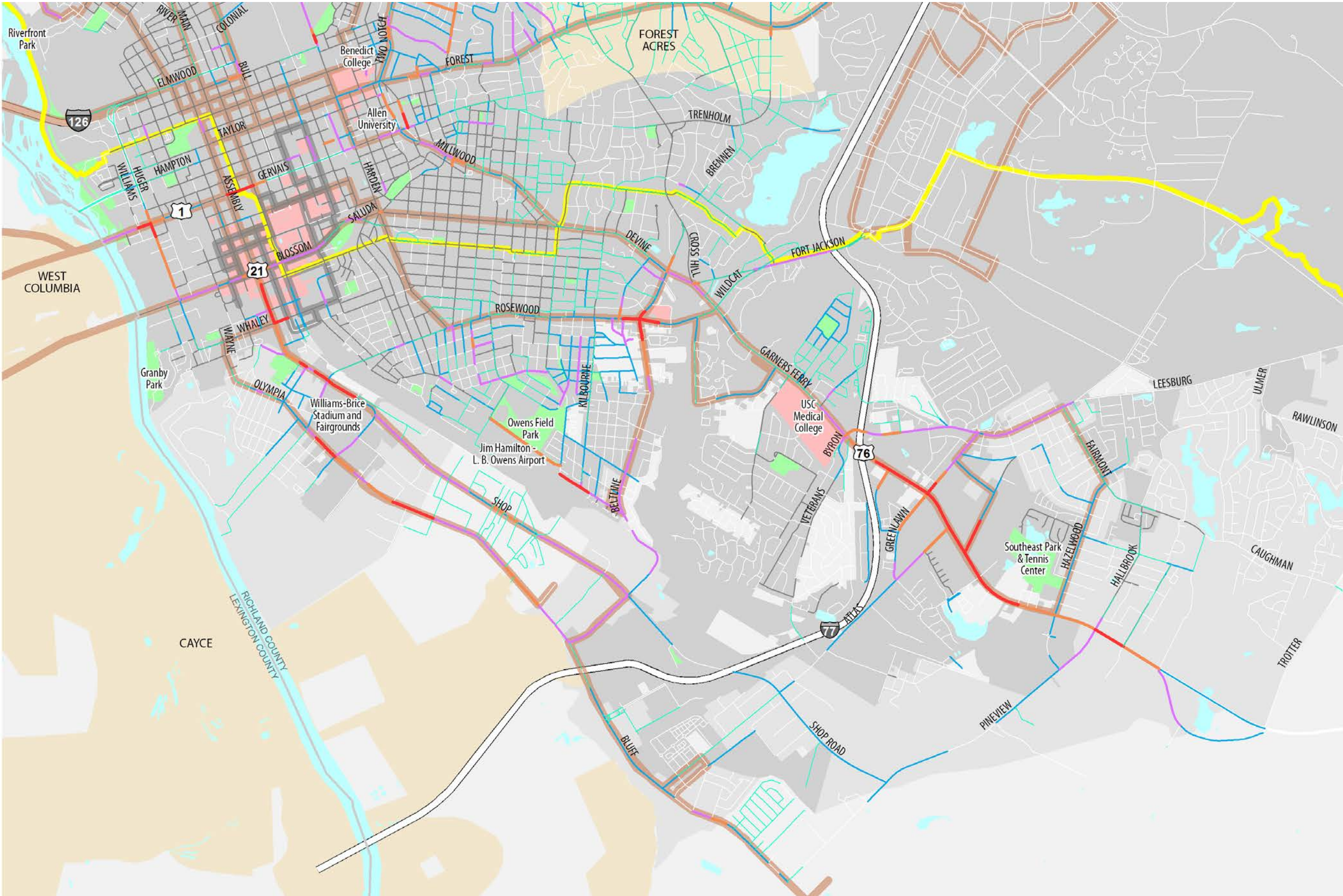




FIGURE 28 – COLUMBIA RECOMMENDED SIGNALIZED INTERSECTION AND MID-BLOCK CROSSING IMPROVEMENTS (SOUTHWEST)

Major Crossing Improvement Prioritization ~Southwest~

Signalized Intersection Priority Score

- 13 - 17
 - 11 - 12
 - 9 - 10
 - 7 - 8
 - 4 - 6
- Street with Sidewalk(s)
Street (white)

Uncontrolled/Midblock Crossing Priority Score

- 15 - 18
- 13 - 14
- 11 - 12
- 9 - 10
- 6 - 8

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

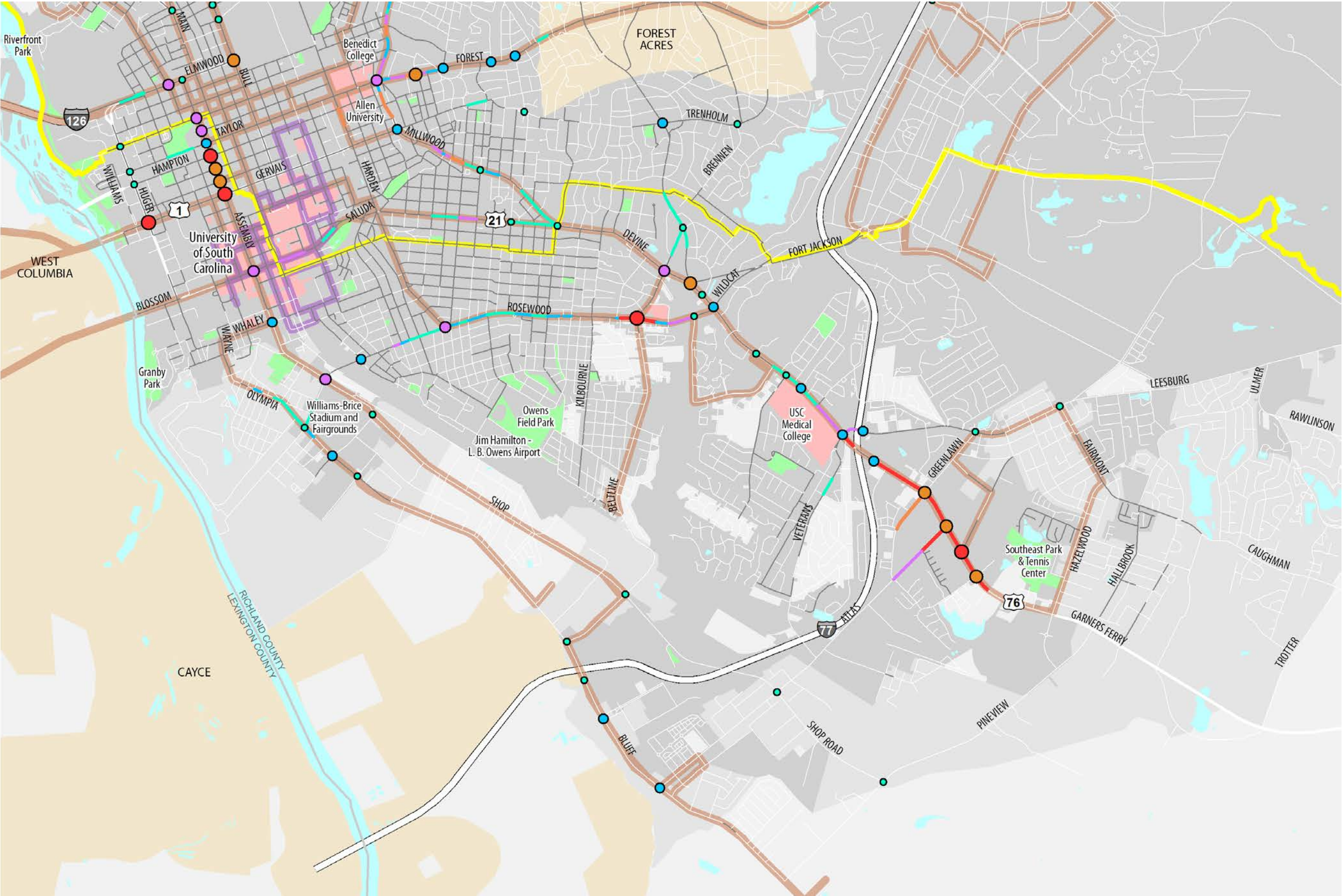




FIGURE 29 - COLUMBIA BICYCLE NETWORK AND SPOT RECOMMENDATIONS (OVERVIEW)

Proposed Bicycle Infrastructure

- Proposed Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes
- Existing Bikeways**
-

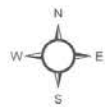
Other Proposed Improvements

- Bicycle/Pedestrian Cut-through
- Intersection Improvements
- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body

0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created November, 2014.

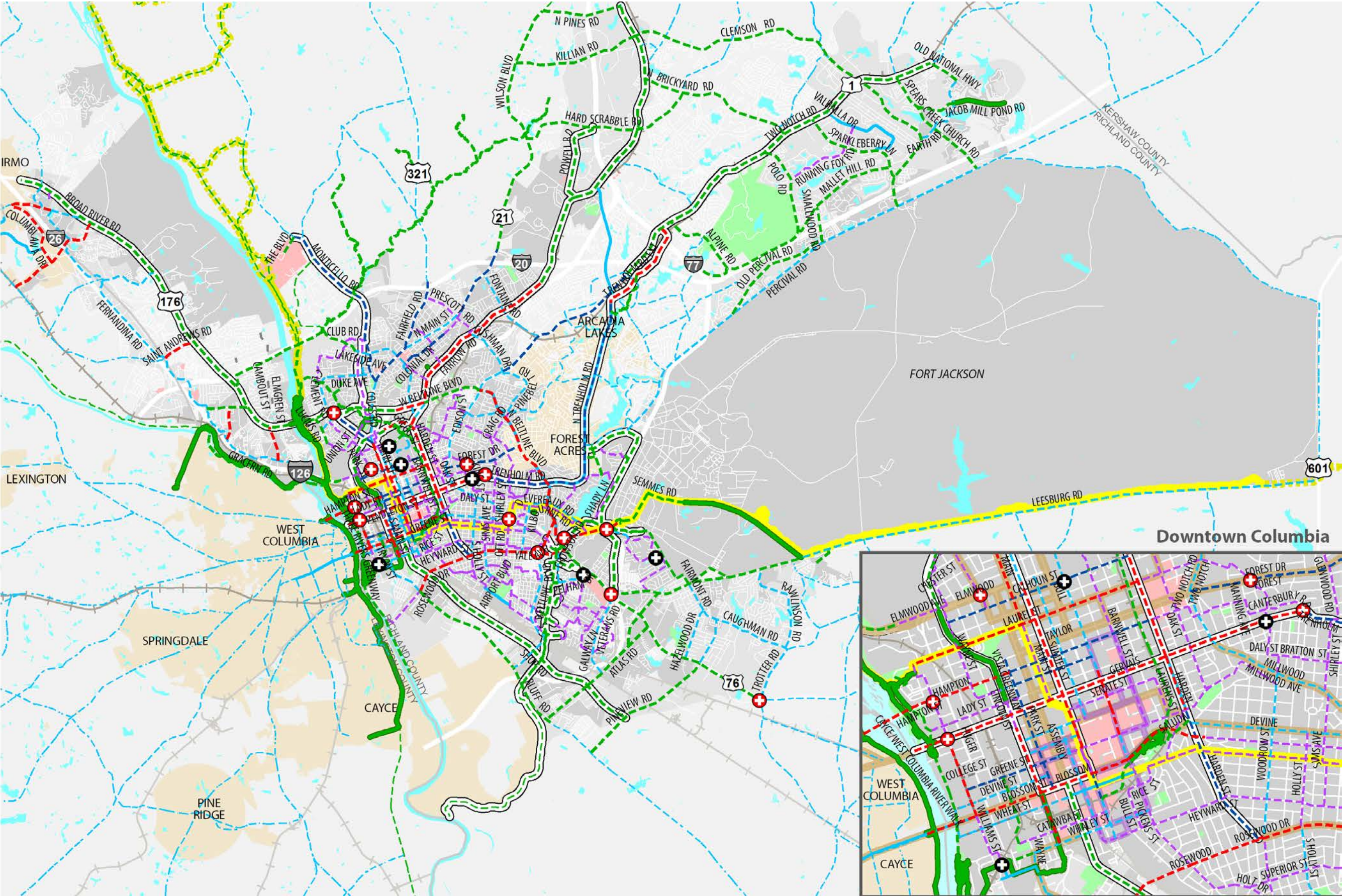




FIGURE 30 – COLUMBIA BICYCLE NETWORK AND SPOT RECOMMENDATIONS (CITY CENTER)

Proposed Bicycle Infrastructure ~Central~

- Proposed Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes
- Existing Bikeways**
-

- Other Proposed Improvements**
- Bicycle/Pedestrian Cut-through
 - Intersection Improvements
 - Infill Street
 - Proposed On-Road Bikeway (Other Jurisdiction)
 - Proposed Sidepath or Greenway (Other Jurisdiction)

- Legend**
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - COMET Route
 - USC Shuttle Route
 - Commuter Rail Line (Proposed)
 - Other Rail Line
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body

0 0.5 1 Miles

W E N S

Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created November, 2014.

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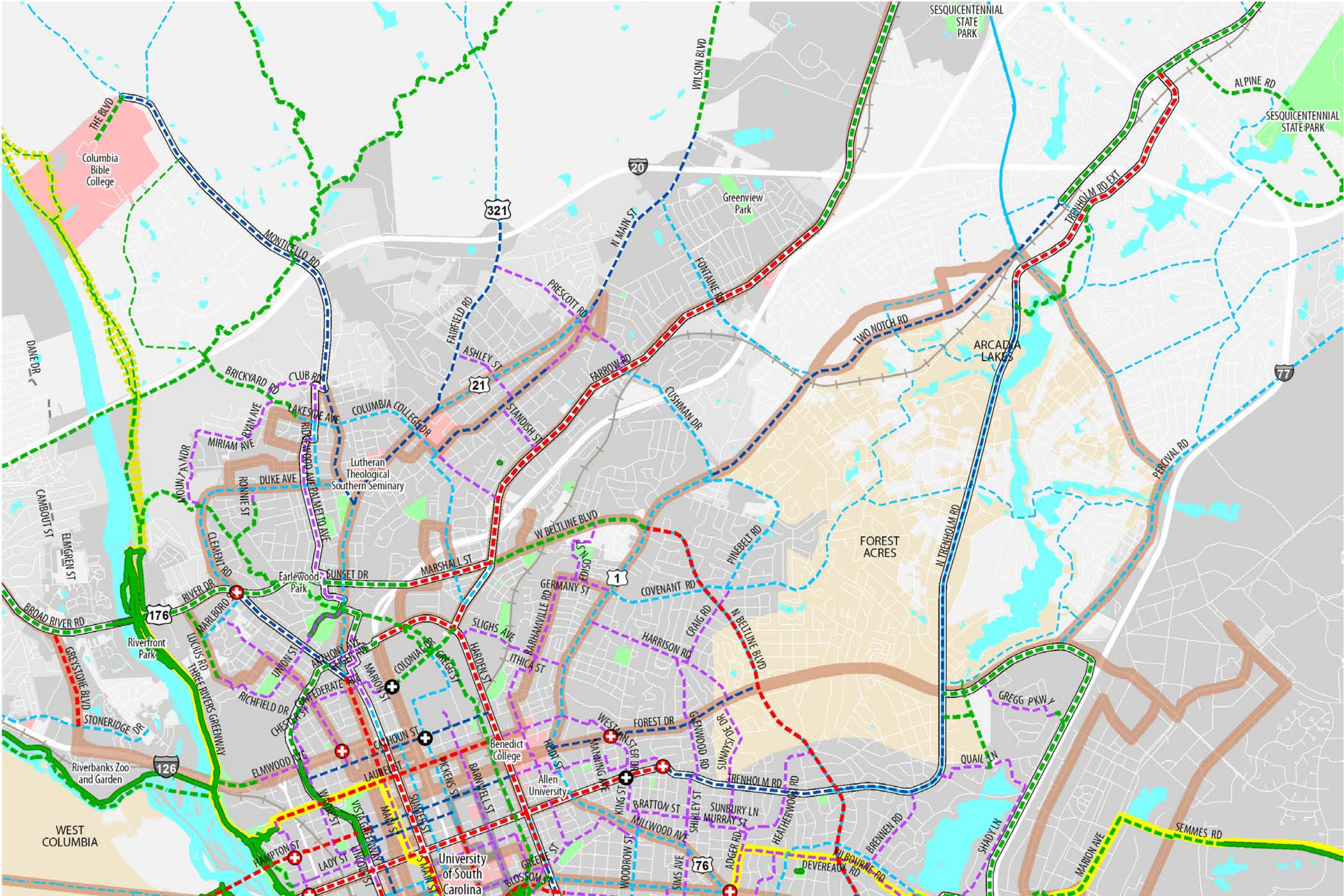




FIGURE 31 - COLUMBIA BICYCLE NETWORK AND SPOT RECOMMENDATIONS (NORTHEAST)

Proposed Bicycle Infrastructure ~Northeast~

Proposed Bikeways

- Sidepath or Greenway
- Cycle Track(s)
- Buffered Bike Lanes
- Bike Lanes/ Paved Shoulders
- Bike Boulevard/ Bike Route/ Shared Lane Markings

Primary All Ages and Abilities Routes

Other Proposed Improvements

- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- Commuter Rail Line (Proposed)
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

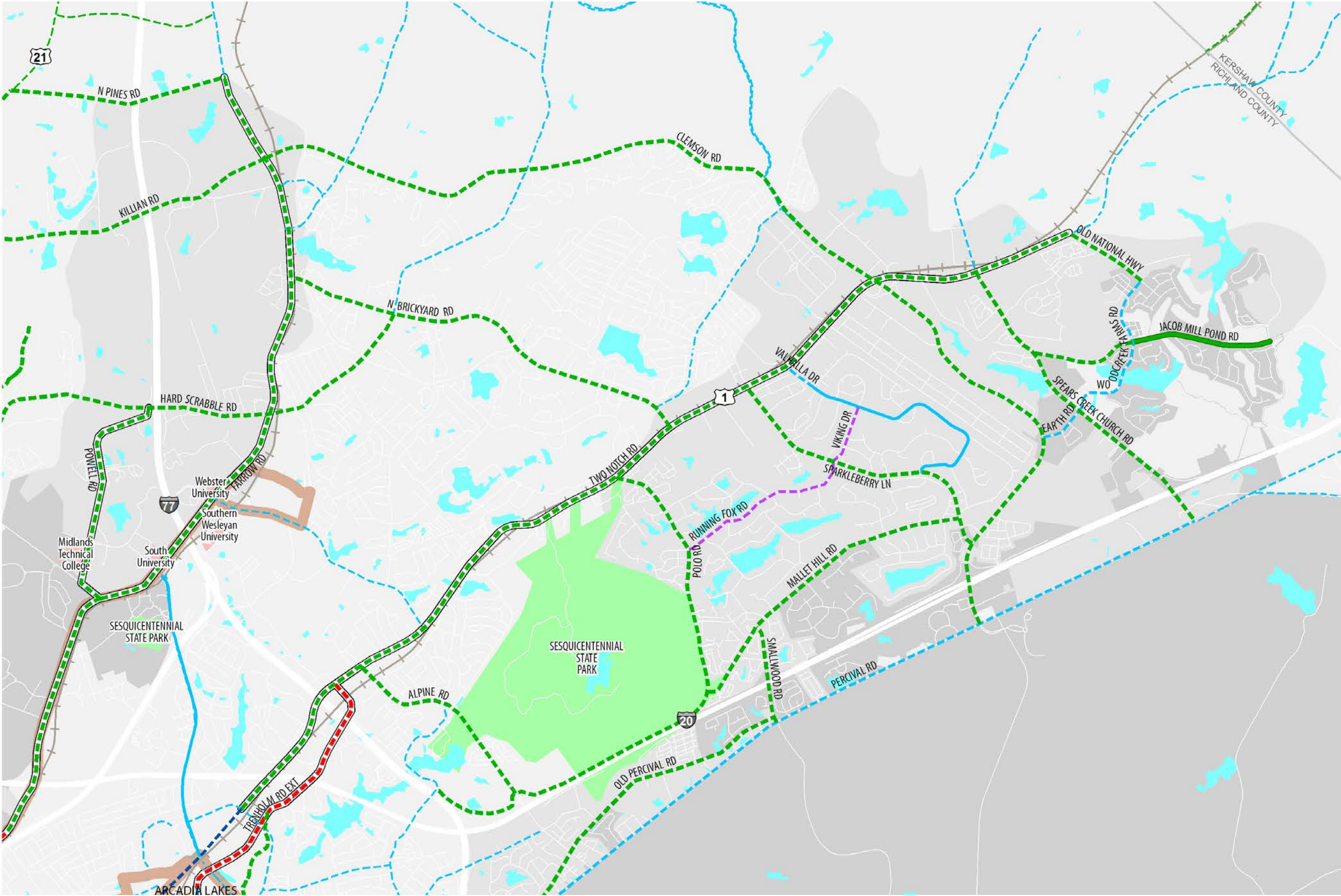




FIGURE 32 – COLUMBIA BICYCLE NETWORK AND SPOT RECOMMENDATIONS (NORTHWEST)

**Proposed
Bicycle Infrastructure
~Northwest~**

- Proposed Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes
- Existing Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes

- Other Proposed Improvements**
- Bicycle/Pedestrian Cut-through
 - Intersection Improvements
 - Infill Street
 - Proposed On-Road Bikeway (Other Jurisdiction)
 - Proposed Sidepath or Greenway (Other Jurisdiction)

- Legend**
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - COMET Route
 - USC Shuttle Route
 - Commuter Rail Line (Proposed)
 - Other Rail Line
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created November, 2014.

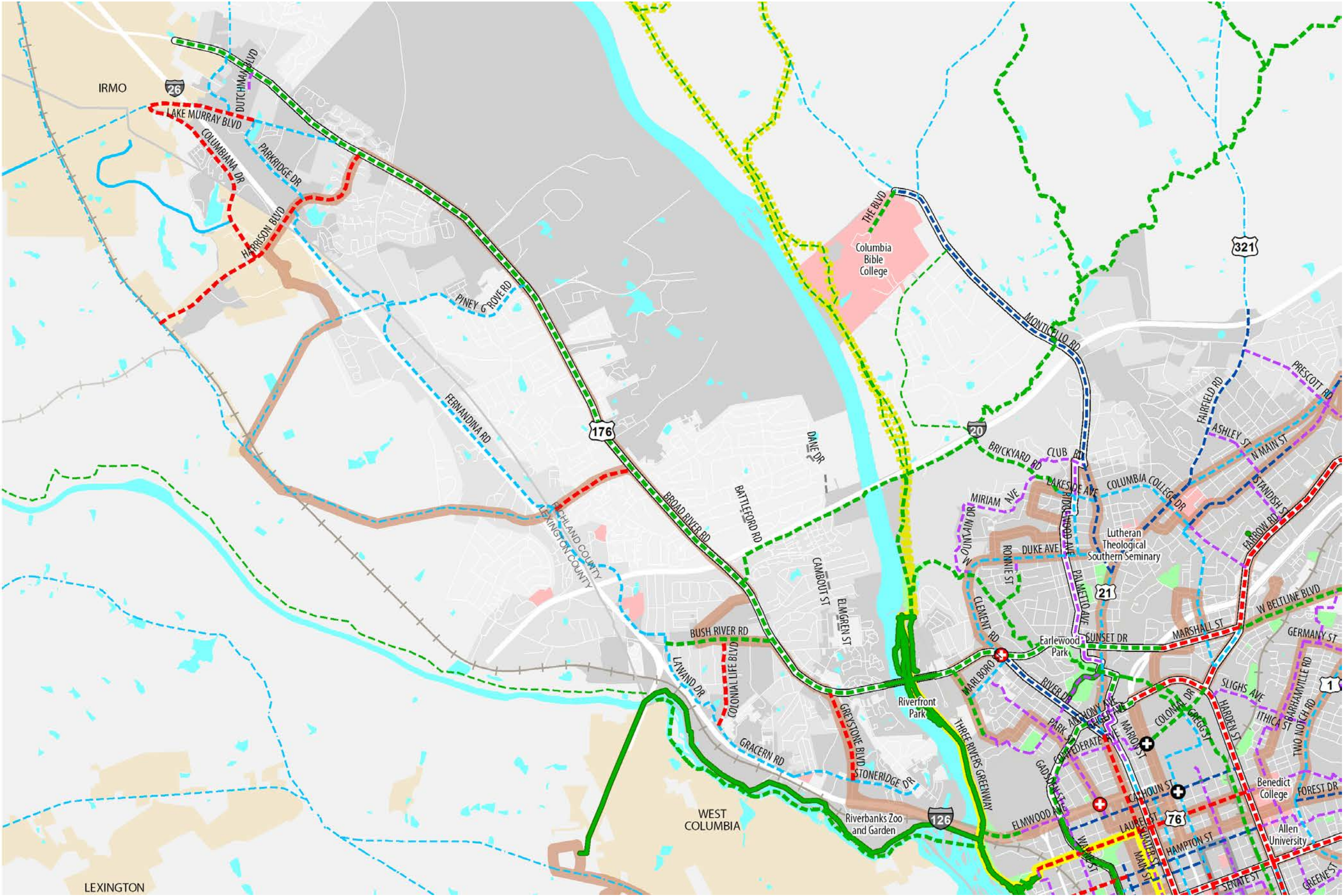




FIGURE 33 - COLUMBIA BICYCLE NETWORK AND SPOT RECOMMENDATIONS (SOUTHWEST)

Proposed Bicycle Infrastructure ~Southwest~

Proposed Bikeways

- Sidepath or Greenway
- Cycle Track(s)
- Buffered Bike Lanes
- Bike Lanes/ Paved Shoulders
- Bike Boulevard/ Bike Route/ Shared Lane Markings
- Primary All Ages and Abilities Routes

Other Proposed Improvements

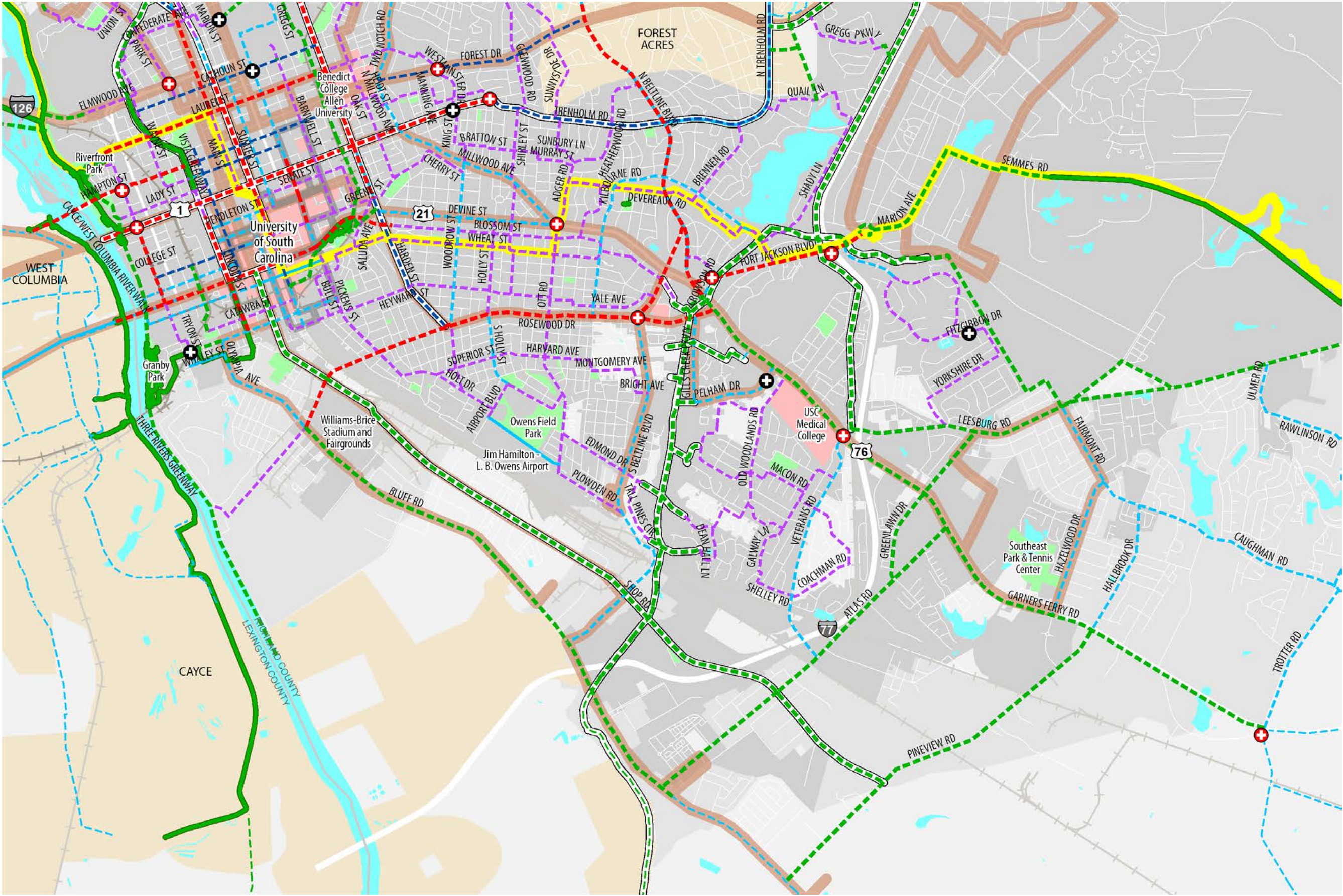
- Bicycle/Pedestrian Cut-through
- Intersection Improvements
- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created November, 2014.





Bicycle Parking Assessment and Recommendations

Introduction

This section provides an assessment of current bicycle parking conditions in the City of Columbia followed by recommendations. Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of two hours or less, or long-term parking for employees, students, residents, and commuters. By providing a variety of convenient bicycle parking options that meet the needs of everyday bicyclists, Columbia will send the message that bicyclists are welcome throughout the City and improve the viability of bicycling for transportation.

The following is a brief summary of bicycle parking facilities that are referenced throughout this section. Note that the Design Guidelines appendix of this master plan provide further detail of facility types.

Short-Term Bicycle Parking

Bicycle Racks: This generally refers to short-term bicycle parking meant to accommodate visitors, customers, and others expected to depart within two hours.

On-Street Bicycle Corral: These consist of bicycle racks grouped together in a common area within the street 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.

Long-Term Bicycle Parking

Bicycle Lockers: Bicycle lockers are intended to provide long-term bicycle storage for employees, students, residents, commuters, and others expected to park more than two hours. Long-term facilities protect the entire bicycle, its components

and accessories against theft and against inclement weather, including snow and wind-driven rain. Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle.

Secure Parking Areas (SPA): A Secure Parking Area for bicycles, also known as a Bike SPA or Bike & Ride (when located at transit stations), is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Accessible via key-card, combination locks, or keys, Bike SPAs provide high capacity parking for 10 to 100 or more bicycles. Increased security measures create an additional transportation option for those whose biggest concern is theft and vulnerability. Bike SPAs may occur as one component of a larger Bike Station or Bike Hub that provides multiple amenities for commuting cyclists, such as lockers, showers, bike maintenance services, and retail.





Bicycle Parking Assessment

Overview

Bicycle parking is abundant on the campus of the University of South Carolina, and the current bicycle parking initiative by the City of Columbia is improving city-wide availability. It is understood that some existing bicycle racks pre-date the current City of Columbia bicycle parking initiative and may not be reflected within the map and data shown below. Future data collection efforts should identify all bicycle rack locations and provide an assessment of upgrades need to the type or placement of older bicycle racks.

This assessment and subsequent recommendations focus on recently created data as part of the city-wide bicycle parking initiative as well as bicycle parking locations found on the University of South Carolina campus bicycle parking map. This section provides an assessment of current bicycle parking conditions, including the following:

- Existing Bicycle Rack Data
- Types and Locations
- Public Input
- Summary

TABLE 19 - EXISTING RACK COUNTS IN COLUMBIA

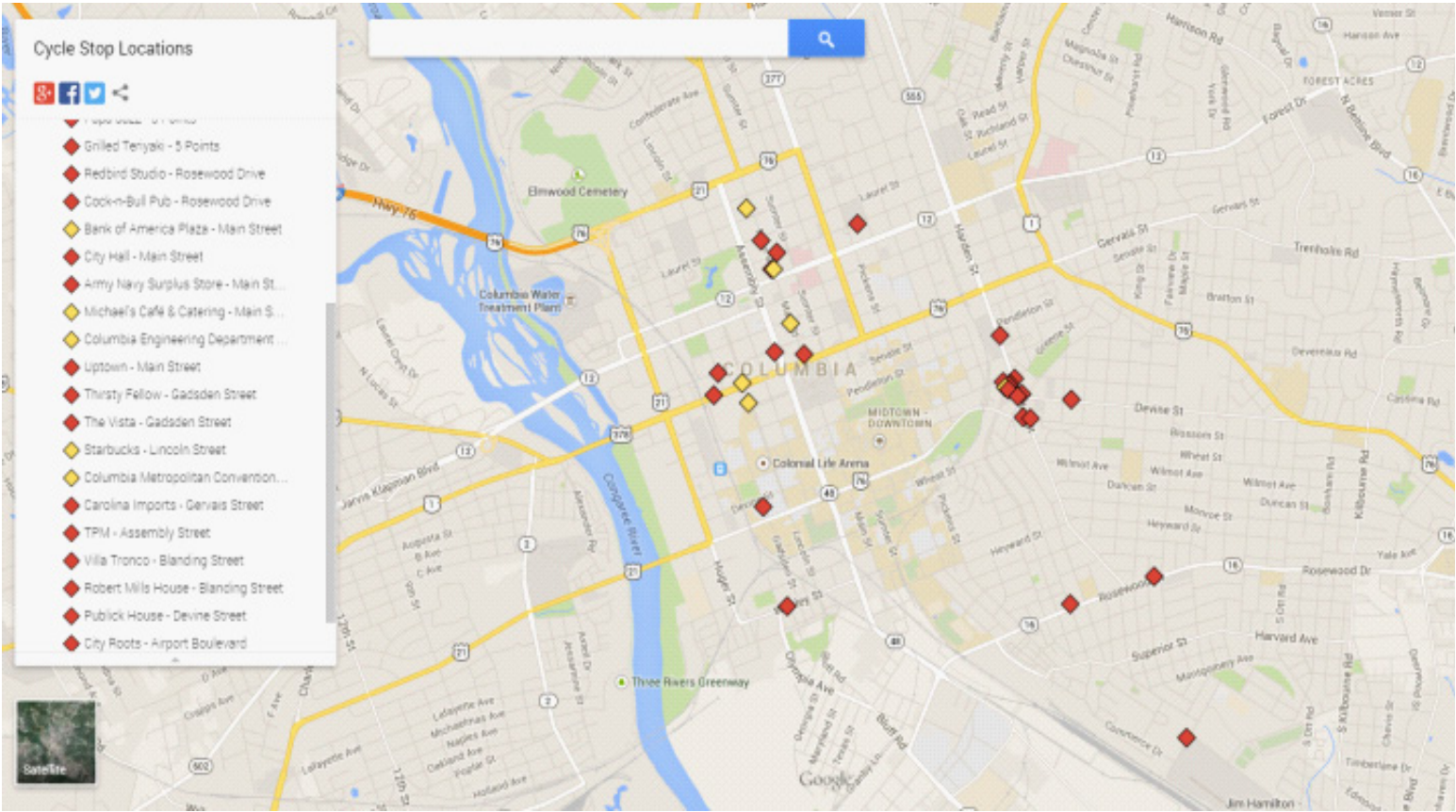
Managing Entity	Count - Rack Locations	Data Link
City of Columbia	34	Cycle Stops Bicycle Rack Locations
University of South Carolina	53	USC Bicycle Parking Information
Total	87	

Types and Locations

City of Columbia bicycle parking initiative: Bicycle racks and several on-street bicycle corrals are found in the City of Columbia. A bicycle parking initiative launched by the City of Columbia’s BikeColumbia Task Force, the Bicycle and Pedestrian Advisory Committee (BPAC), independent bicycle groups, and advocacy groups in 2013 has led to the installation of 34 bicycle racks (as of October 2014) and counting. Most of these locations include two-capacity bicycle racks. Four of these locations consist of on-street bicycle corrals with a capacity of 12 bicycles. Local bicycle rack manufacturer, Cycle Stops, has produced the custom-made racks which include a palmetto tree and bicycle within the diamond-shaped frame. The racks can be sponsored for as little as \$225 for one bike rack. Below is a map from the Cycle Stops website showing specific locations for most of the recent installations.



City of Columbia bicycle racks: Image from Cycle Stops website: <https://www.cyclestops.com/locations.html>



City of Columbia bicycle rack locations: Image from Cycle Stops website: - https://mapsengine.google.com/map/u/0/viewer?mid=zw0BImTe7Uxg.kz_4-lu03TUw



Bicycle racks are generally found in the following types of locations in Columbia:

Commercial/Entertainment areas:

- Five Points area
 - Abundant in the center of Five Points
 - Several along Devine Street
- Rosewood Drive

Downtown Central Business District

- Main Street north of the statehouse
- Gervais Street west of the statehouse

Other tourist areas

- Robert Mills historic neighborhood northeast of downtown

University of South Carolina campus bicycle parking: Bicycle racks are found frequently across the campus of the University of South Carolina. A total of 53 locations throughout campus have bicycle racks. Most of these consist of multi-capacity wave racks, which do not meet basic standards for bike rack design and often result in unstable bikes, as shown in the image below:

A map from the University of South Carolina’s website shows the location of all bicycle racks on campus (represented by yellow circles) at bottom right.

The COMET buses (City of Columbia) and Carolina Shuttle (University of South Carolina): All of the COMET buses in the City of Columbia bus system have bicycle racks that accommodate two bicycles on a first-come first-serve basis. Future upgrades will include bus racks that can accommodate three bicycles.

The University of South Carolina’s campus bus system, Carolina Shuttle, does not have bus racks, but future procurements are

recommended to include racks that can accommodate three bicycles.

Beyond the provision of on-bus bicycle racks, however, the COMET system offers little to no bicycle parking at transit stops. In the image below, a bicycle is parked along a fence at the downtown transit center.

Public Input

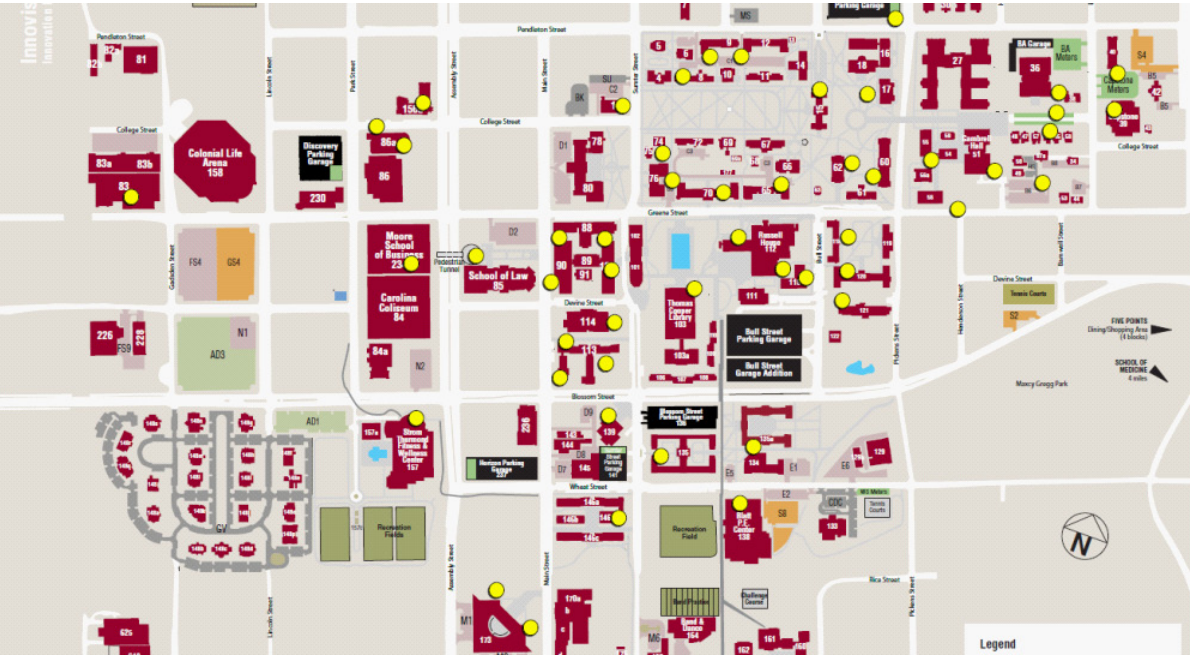
The public input process included several steering committee meetings, public workshops, stakeholder focus groups, and an online project website, survey (and hardcopy survey) and interactive map. Bicycle parking was highlighted several times through public comment, touching on the following general needs and desires:

Bus system

- Install or increase the number of bicycles that can be accommodated by the city and campus buses.



Bicycle rack in front of the Russell House University Union:
Image from Google Street View



University of South Carolina bicycle racks: Image from a link on the USC Vehicle Management & Parking Services website: - <http://www.sc.edu/vmps/cycle.html>

further in the following ‘Bicycle Parking Recommendations’ section.

- Program recommendation – Organize bike-on-bus demonstration at the downtown transit center to teach riders how to use a bus bike rack.

City-wide standards and policies – Develop city-wide bicycle parking standards and placement policies to ensure the addition of functional bicycle parking in downtown, neighborhoods, and at popular destinations around the city.

Wayfinding – Develop wayfinding signage that directs bicyclists around town and to bicycle parking areas.

Locations in need of bicycle parking – Survey participants were asked to list up to three locations where they would like to have bicycle parking. The most common locations cited were:

- Gervais Street
- The Vista
- Parks
- Trenholm Plaza
- Five Points
- Main Street
- Rosewood Drive
- Downtown
- Grocery stores and shopping centers

Summary

While the existing data shows extensive efforts in providing bicycle parking across USC campus and the City of Columbia, there is much room for improvement. The City currently lacks a bicycle parking ordinance that would complement existing bicycle parking initiatives. The City has done well to implement several on-street bicycle parking corrals to increase the volume of bicycle parking availability, but currently, no long-term bicycle parking exists in the City (in the form of bicycle lockers or SPAs). Specific locations and improvements are discussed



Above: parking garages often provide the space and user demand to bike parking SPAs.

Below: Increasing bicycle parking at transit hubs was also identified as a priority in Columbia. This topic is discussed on the following page.



Bicycle Parking Recommendations

While bicycle parking on the University of South Carolina campus is widely available and the recent bicycle parking initiative by the City of Columbia has increased bicycle parking city-wide, several improvements are needed to the system. This section includes recommendations for priority action steps to strengthen bicycle parking throughout Columbia.

Priority Action Steps

The following action steps specific to bicycle parking are key near-term and on-going efforts in which the City and local partners can lead. These recommendations include long- and short-term facility development along with formal requirements to serve as a multi-faceted approach serving bicycle parking needs more effectively and efficiently.

Bicycle Parking Requirements: Codify

Policy recommendations in this plan include that the City adopt general bicycle parking requirements that extend to all land uses and accommodate short-term and long-term bicycle parking. Combining codified bicycle parking requirements and

Formalizing temporary bike parking for city events is a great encouragement tool, especially if it is a free offering.



the City’s bicycle rack initiative with local partners will serve bicycle parking needs most efficiently and should serve as a high priority. Please reference the policy recommendations of this plan for further detail.

Security Parking Area (SPA): Implement long-term bicycle parking in highest demand areas

Security Parking Areas or ‘SPA’s are a version of long-term bicycle parking most suitable for major employers and highly centralized areas of activity such as transit bike ‘n’ ride areas or downtown commuter parking garages. The City of Columbia should assess downtown parking garage opportunities and work with landlords of high-occupancy downtown buildings to implement up to three Bike SPAs that offer access-controlled, long-term bicycle storage.

Bike Hub: Implement long-term bicycle parking in highest demand areas

A growing number of cities across the United States are incorporating Bike SPAs into a larger Bike Hub operation. Columbia has the opportunity to implement the first of this type of bicycle parking in the southeast region of the United States. The nearest example is the BikeStation® in Washington, DC that houses over 100 bicycles in 1,600 sq. ft. of free-standing ultra-modern glass and steel design. A variety of business models can be used to develop this type of facility, such as the Indy Bike Hub in Indianapolis, which is operated in partnership with the local YMCA.

Existing research suggests that capital costs of Bike Hubs total \$3,000 to \$5,000 per bicycle parking space, though costs differ significantly based on the breadth of services provided at the facility and design features. Annual operating costs can range from \$30,000 to \$200,000, but often total

about \$50,000. Though no universal formula exists, Bike Hub operators can often cover 40 percent of annual operating costs with revenues from fees services.

Transit: Expand Bicycle Parking

Currently all of the COMET buses have two-capacity bicycle racks mounted on the front of the bus with plans to upgrade to three. Bicycle parking is needed at transfer stations and stops. While USC buses (Carolina Shuttle) do not carry bicycle racks, future procurements are recommended to include three-bike racks. USC should continue to include bicycle parking at all bus stops. Central transfer stations should also include long-term parking. A bike-on bus demonstration should be incorporated into other encouragement/education programs (such as open streets events) to teach riders how to use a bus bike rack.

Providing bicycle storage at transit stops and stations allows commuters to combine their trips with greater convenience. The COMET’s Downtown Transit Center (and Greyhound stop) and the Amtrak passenger rail should include both short-term and long-term parking facilities located near loading zones and, when possible, in view of station attendants. Additionally, short-term bicycle parking should be available at key high-demand transit stops along the COMET routes. Future commuter and intercity rail systems should include bicycle carry-ons and long-term parking. These recommendations are based on the Intermodal Transit Analysis of this Plan.

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RECOMMENDATIONS: IMPLEMENTATION PLAN

Introduction

The long-term vision for walking, bicycling, and transit in Columbia has been set. Now the City and its partners must begin to implement the vision - but where do we start?

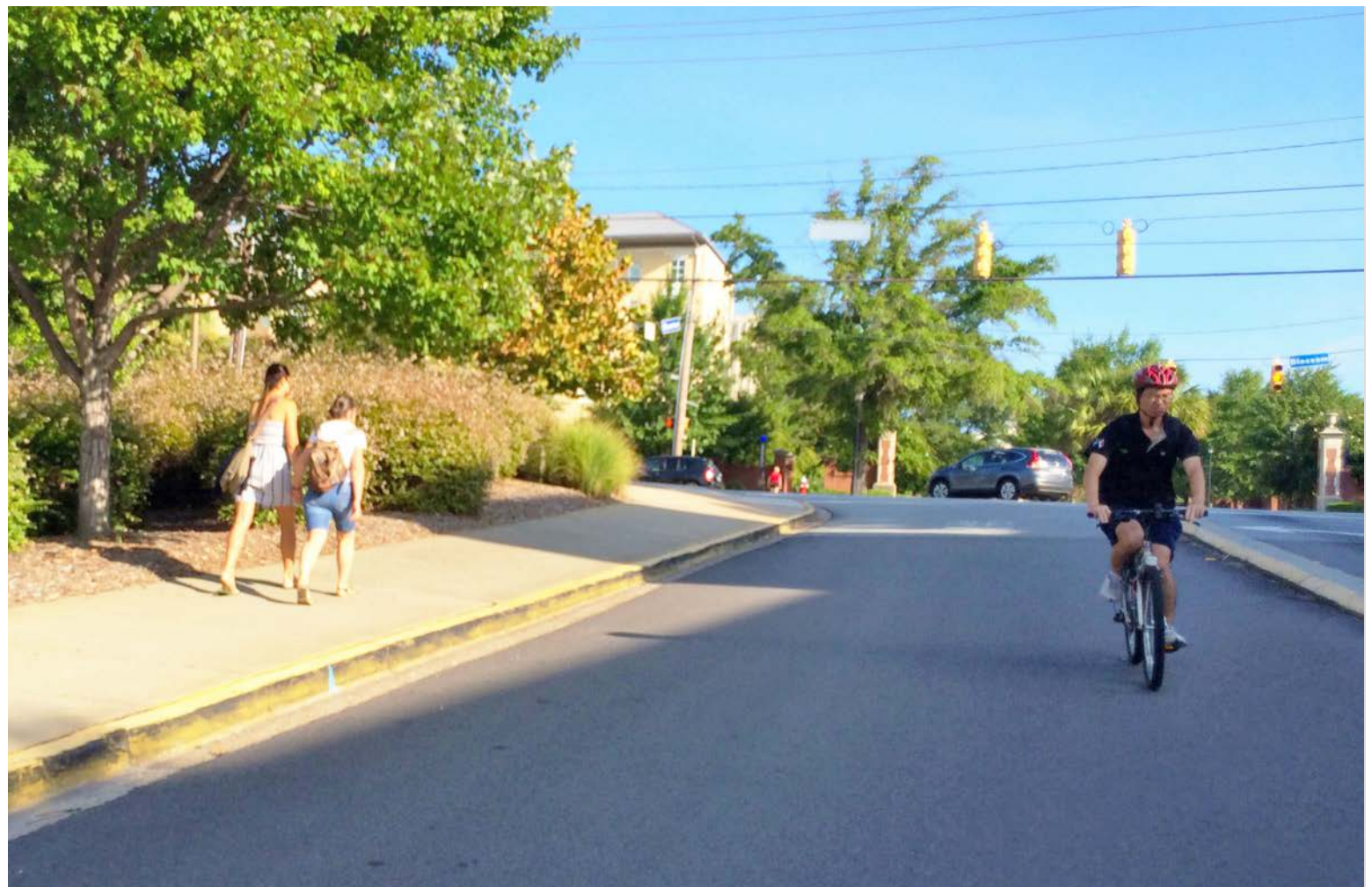
The following section answers this question and presents project prioritization, project funding needs, and programs projects into a digestible capital improvements plan. Also, select top-priority projects are discussed in more detail to help communicate potential needs and results of the first Plan projects implemented. Finally, a WFC and BFC Community Action Plan provides guidance towards advancing Walk and Bicycle-friendly Community recognition.

University of South Carolina is a substantial generator of pedestrian, bicycle and transit trips due to the high concentration of young people.

Recommendations in areas of high demand like these, among other factors, receive a higher project ranking priority.

The City and its partners should use this section as a guide for achieving the vision and goals established in the beginning of the Plan. As a general strategy, the City and its partners should regularly evaluate how well recommendations are being met and whether these recommendations still meet the needs of Columbia's residents and visitors. The goals presented in the introduction of this plan also serve as an evaluative tool with specific benchmarks defined for the all of the six "E's." **Implementation progress should be regularly tracked on at**

least an annual basis - an annual "state of walking, bicycling and transit" report is a good means of accomplishing this in a format that can be easily shared with the public to inform them on Plan progress. In addition, as best practices in pedestrian, bicycle and transit accommodation is a rapidly-evolving field, **the recommendations in this plan should be re-evaluated at least every five years** to ensure that these still constitute best-practices and still reflect Columbia's vision for walking, bicycling and transit.





Capital Improvements Plan

Introduction

The network recommendations presented in the previous section show the long-term vision for the walking and bicycling network. Achieving this vision will require: political support; local advocacy; coordination with project partners such as SCDOT; and adequate, and preferably dedicated, funding to cover installation and long-term maintenance of facilities.

To help obtain the highest value on investment, meet Plan goals and build support for improvements over time, both the pedestrian and bicycling network have been prioritized and divided into phases with the highest-priority projects being targeted for implementation first. The goal of prioritization is to ensure that improvements are distributed equitably, and that projects generating the greatest benefit while expending the least amount of resources are implemented first. Prioritization factors and weights are based upon feedback the project team received from the public and other key project stakeholders.

Prioritization Process

Pedestrian and bicycle projects recommended within this Plan are prioritized through two complementary, but distinct prioritization methods described in the following section. Because trail and greenway projects (those recommended outside of a road's rights-of-way) are conceptual in nature, involve a variety of landowners, and require further study to determine feasibility, a prioritization score is not provided for these facilities. They are, however, valuable components of the overall pedestrian and bicycle network and should be evaluated on an on-going basis, and in conjunction with adjacent or nearby on-street projects under development.

Pedestrian Prioritization

The Recommendations Chapter of this Plan describes the preliminary prioritization process used to identify important pedestrian improvements across the city. The project team took this process one step further by using the project's

priority score (based on the criteria shown in **Table 11**) to rank all improvements and identify those available for federal aid network funding, those increasing access to transit, and those already funded.

Bicycle Prioritization Methodology

Bikeway network development utilized a number of different analyses, described in the Existing Conditions section of this plan, and planning judgement to determine what project types are warranted along roadways throughout Columbia. These recommendations also include some new off-street bicycle accommodation recommendations where they serve a major connectivity function in the network. The ultimate goal of the bikeway network is providing connectivity to destinations such as retail centers, job centers, schools and recreation opportunities for all residents.

Prioritization looked at similar considerations to determine the need, cost and feasibility of implementing all on street and adjacent-to-street recommendations. The project team developed prioritization criteria and collectively determined the importance of each consideration by assigning each category an appropriate weight. These weights can be seen in **Table 21**.

Project Phasing and Cost Estimates

Cost Estimate Methodology

Cost estimates for projects were generated from a variety of sources including national datasets such as the *2013 Costs for Pedestrian and Bicyclist Infrastructure Improvements*, Conducted by the University of North Carolina , average costs for buffered bikeways and cycle tracks in the *2040 Hennepin County Transportation Plan* and recent, regional implementation experience. While these costs represent averages for pedestrian and bicycle projects in **2014 dollars**,

note that individual project costs can vary widely based on a number of conditions including, but not limited to:

- Facility design (width, frequency of material placement, demolition)
- Temporary traffic control requirements
- Environmental requirements
- Utility relocation
- Required right of way acquisition
- Contractor experience and material availability
- Project length or grouping (projects of longer length are typically less expensive than short projects)

Cost estimates and assumptions are presented in **Table 22**. These do not include additional considerations such as project design or contingency costs.

Columbia Pedestrian and Bicycle Projects

Following scoring, projects were divided into phases with the highest scoring projects being included in earlier phases. Phase breaks follow breaks in prioritization score for sidewalk and bicycle projects, and are generally 50 mile phases for bicycle and shared-use path projects. This is reflective of the Plan implementation goal: to build 50 miles of on-street bikeways by 2017. Recommended infill roads were also included in bikeways prioritization, although cost estimates were not generated for these improvements due to the wide potential variance in cost. **Figures 34 - 43** show Columbia pedestrian and bicycle projects broken down by phase. Summaries of sidewalk and bikeway projects are provided in **Tables 23 - 25**, including cost estimates and those projects which could be included as part of Richland County Penny Sales Tax funded projects. Because of their size, the



TABLE 21 - BICYCLE PRIORITIZATION CRITERIA AND WEIGHTS

Criteria	Definition	Input	Score
Demand	Does the project promote bicycling by providing facilities in an area with high demand?	Bicycle Suitability Analysis demand category: includes where people live, work, learn, play, and access transit	2 – 4 points (Higher points for higher demand score)
Supply	Does the project improve conditions on a segment with low quality bicycle infrastructure?	Bicycle level of traffic stress	1 – 4 points (Higher points for lower supply score)
Equity	Does the project benefit underserved communities?	Equity composite measure : includes 1) families living near or below the poverty line, 2) households with no vehicle available, 3) non-white populations, and 4) households with a limitation on English speaking ability	1 – 4 points (Higher points for higher equity score)
Previously Proposed	Does the project have direct support expressed by inclusion in an adopted planning document?	2006 CMCOG Bicycle & Pedestrian Plan, Penny sales tax bicycle projects	3 points
Promote Safety	Does the project improve a location with a recorded safety concern?	Bicycle collisions, 2010-2014	3 points
Public Input	Does the public support this project as a priority?	Online public input map	2 point
Ease of Implementation	Does the project require new construction or right of way acquisition?	BikeSpace Analysis	1-4 points (Higher points for lower implementation score)
Connectivity to Funded Project	Does the project connect to a proposed bikeway that is already funded?	Penny sales tax bicycle projects, others as identified by client	3 point
Added Pedestrian Benefit	Does the project provide a buffer to corridors where a pedestrian buffer is recommended?	Pedestrian Prioritization Sidewalk Results	1 point

pedestrian and bicycle master tables were left out of this planning document and rather provided to the City of Columbia as an internal working document.

In addition, there are a number of bicycle spot intersection improvements and cut-throughs recommended in this Plan as seen in the bicycle recommendations maps. These should be implemented in conjunction with linear bikeway improvements they correspond to. Due to the wide variation in improvement types and subsequent costs, this Plan does not include cost estimates for these improvement types.

TABLE 22 - COLUMBIA COST ESTIMATES

Facility Type	Cost per unit of measurement	Assumptions
Sidewalks w/o curb construction	\$ 70 per linear foot	No ROW purchase required
Sidewalks w/ curb construction	\$350 per linear foot (costs can typically range from \$300-\$400/ln.ft.)	No ROW purchase required; includes the installation of storm sewers.
Bicycle Boulevards and Bicycle Routes	\$45,000 per mile	Includes signage and pavement markings only
Bike Lanes	\$75,000 per mile	Pavement restriping costs only
Buffered Bike Lanes	\$130,000 per mile	Pavement restriping costs only
Cycle Tracks	\$160,000 per mile	Pavement restriping costs only
Greenway or Sidepath	\$600,000 per mile (costs typically range from \$500,000 to \$700,000. Can be higher if significant constraints are present).	10' asphalt path and no ROW purchase required.
4' Paved Shoulders	\$600,000 per mile	No ROW purchase required
6' Paved Shoulders	\$700,000 per mile	No ROW purchase required



Narrow parking along Devine Street could potentially be repurposed to add bicycle facilities.



TABLE 23 - COLUMBIA SIDEWALK PROJECT SUMMARY TABLE (PST = Penny Sales Tax funded projects)

Row Labels	Sum of MILES	Sum of Cost Estimate w/o curb construction (Assu. \$70/lf)	Sum of w/o curb construction + 10% contingency	Sum of Cost estimate w/curb construction (Assu. \$350/lf)	Sum of w/ curb construction + 10% contingency
PHASE I	10.03	\$6,615,000	\$7,277,000	\$33,075,000	\$36,383,000
Unfunded	7.25	\$4,677,000	\$5,145,000	\$23,386,000	\$25,725,000
PST	2.77	\$1,938,000	\$2,132,000	\$9,689,000	\$10,658,000
PHASE II	13.65	\$9,548,000	\$10,503,000	\$47,741,000	\$52,515,000
Unfunded	8.70	\$6,140,000	\$6,754,000	\$30,699,000	\$33,769,000
PST	4.94	\$3,408,000	\$3,749,000	\$17,042,000	\$18,746,000
PHASE III	22.08	\$15,666,000	\$17,232,000	\$78,329,000	\$86,162,000
Unfunded	14.74	\$10,505,000	\$11,556,000	\$52,526,000	\$57,779,000
PST	7.34	\$5,161,000	\$5,677,000	\$25,803,000	\$28,383,000
PHASE IV	25.85	\$18,023,000	\$19,825,000	\$90,113,000	\$99,124,000
Unfunded	18.75	\$13,276,000	\$14,603,000	\$66,379,000	\$73,016,000
PST	7.09	\$4,747,000	\$5,222,000	\$23,734,000	\$26,108,000
PHASE V	35.00	\$23,691,000	\$26,060,000	\$118,456,000	\$130,301,000
Unfunded	30.94	\$21,123,000	\$23,235,000	\$105,614,000	\$116,175,000
PST	4.06	\$2,568,000	\$2,825,000	\$12,842,000	\$14,126,000
PHASE VI	58.13	\$41,258,000	\$45,384,000	\$206,291,000	\$226,920,000
Unfunded	55.13	\$39,199,000	\$43,119,000	\$195,996,000	\$215,596,000
PST	3.00	\$2,059,000	\$2,265,000	\$10,295,000	\$11,325,000
LONG-TERM	172.23	\$116,883,000	\$128,571,000	\$584,416,000	\$642,857,000
Unfunded	171.93	\$116,705,000	\$128,375,000	\$583,523,000	\$641,876,000
PST	0.31	\$178,000	\$196,000	\$892,000	\$982,000
Unfunded Projects		\$211,625,000	\$232,787,000	\$1,058,124,000	\$1,163,936,000
Penny Sales Tax Projects		\$20,059,000	\$22,065,000	\$100,297,000	\$110,326,000
Grand Total	336.97	\$231,684,000	\$254,853,000	\$1,158,421,000	\$1,274,263,000



TABLE 24 - COLUMBIA BICYCLE PROJECT SUMMARY TABLE

PROJECT PHASE	PROPOSED IMPROVEMENT	Sum of MILES	Sum of COST ESTIMATE	Sum of COST + 10% CONTINGENCY
PHASE I	Bike Boulevard	18.6	\$838,000	\$922,000
	Bike Lanes	11.3	\$846,000	\$931,000
	Buffered Bike Lanes	9.1	\$1,181,000	\$1,299,000
	Cycle Track (1-way)	12.2	\$1,948,000	\$2,142,000
	Cycle Track (2-way)	3.0	\$482,000	\$531,000
	Sidepath	6.5	\$3,888,000	\$4,277,000
PHASE I Total		60.7	\$9,183,000	\$10,101,000
PHASE II	Bike Boulevard	6.8	\$307,000	\$338,000
	Bike Lanes	4.1	\$307,000	\$338,000
	Buffered Bike Lanes	9.1	\$1,185,000	\$1,304,000
	Cycle Track (1-way)	6.1	\$971,000	\$1,068,000
	Cycle Track (2-way)	1.9	\$296,000	\$326,000
	Shared Lane Markings	0.6	\$27,000	\$30,000
	Sidepath	12.4	\$7,449,000	\$8,194,000
PHASE II Total		41.0	\$10,544,000	\$11,598,000
PHASE III	Bike Boulevard	16.2	\$730,000	\$803,000
	Bike Lanes	14.9	\$1,115,000	\$1,226,000
	Buffered Bike Lanes	3.4	\$439,000	\$483,000
	Cycle Track (1-way)	5.8	\$930,000	\$1,023,000
	Cycle Track (2-way)	0.6	\$94,000	\$104,000
	Sidepath	19.1	\$11,474,000	\$12,622,000
	Signed Route	1.9	\$29,000	\$32,000
PHASE III Total		61.9	\$14,812,000	\$16,293,000
PHASE IV	Bike Boulevard	13.6	\$521,000	\$573,000
	Bike Lanes	13.8	\$1,032,000	\$1,135,000
	Buffered Bike Lanes	4.0	\$525,000	\$577,000
	Cycle Track (1-way)	1.6	\$258,000	\$284,000
	Cycle Track (2-way)	1.5	\$239,000	\$263,000
	Shared Lane Markings	4.3	\$194,000	\$213,000
	Sidepath	28.3	\$16,957,000	\$18,653,000
	Infill Street	0.3	-	-
PHASE IV Total		67.3	\$19,727,000	\$21,699,000

PROJECT PHASE	PROPOSED IMPROVEMENT	Sum of MILES	Sum of COST ESTIMATE	Sum of COST + 10% CONTINGENCY
PHASE V	Bike Boulevard	5.9	\$264,000	\$291,000
	Bike Lanes	20.2	\$1,479,000	\$1,627,000
	Buffered Bike Lanes	3.4	\$437,000	\$480,000
	Cycle Track (1-way)	1.4	\$222,000	\$244,000
	Cycle Track (2-way)	0.4	\$63,000	\$69,000
	Paved Shoulders	4.5	\$715,000	\$786,000
	Shared Lane Markings	2.3	\$102,000	\$112,000
	Sidepath	21.5	\$12,889,000	\$14,178,000
	Signed Route	0.5	\$8,000	\$9,000
	Infill Street	1.0	-	-
PHASE V Total		61.0	\$16,178,000	\$17,796,000
PHASE VI	Bike Boulevard	1.6	\$73,000	\$80,000
	Bike Lanes	4.1	\$311,000	\$342,000
	Cycle Track (2-way)	0.8	\$121,000	\$133,000
	Paved Shoulders	6.3	\$1,002,000	\$1,103,000
	Sidepath	10.7	\$6,395,000	\$7,035,000
	Infill Street	1.5	-	-
PHASE VI Total		24.9	\$7,902,000	\$8,692,000
Grand Total		316.8	\$78,345,000	\$86,179,000



Columbia Mid-block Crossing and Signalized Intersection Improvements

The Plan identifies and prioritizes several intersection improvements and midblock pedestrian crossings throughout Columbia. Due to the wide range of designs that these projects may require and the varying costs that these projects may incur, specific design concepts and cost estimates were not generated for these recommendations. While a particular phasing plan was not developed for these improvement types, the City should strive to implement **5 mid-block crossing**

and 5 signalized intersection improvements a year with highest-priority projects targeted for implementation first. Implementation of these improvements should be coordinated with other programmed improvements such as Richland County Penny Sales Tax-funded projects or roadway restriping wherever possible. A summary of these projects by priority ranking is provided in **Tables 26 and 27**.

TABLE 25 - COLUMBIA BICYCLE PROJECT PENNY SALES TAX FUNDING BY PHASE

PROJECT PHASE	PROPOSED IMPROVEMENT	Sum of MILES	Sum of COST ESTIMATE	Sum of COST + 10% CONTINGENCY
PHASE I	Partial Penny Sales Tax Funded	10.5	\$665,000	\$731,000
	Penny Sales Tax Funded	13.1	\$3,096,000	\$3,406,000
	Not Penny Sales Tax Funded	37.1	\$5,422,000	\$5,964,000
PHASE II	Partial Penny Sales Tax Funded	5.8	\$2,452,000	\$2,697,000
	Penny Sales Tax Funded	9.6	\$3,069,000	\$3,376,000
	Not Penny Sales Tax Funded	25.5	\$5,023,000	\$5,525,000
PHASE III	Partial Penny Sales Tax Funded	1.0	\$14,000	\$16,000
	Penny Sales Tax Funded	27.5	\$9,888,000	\$10,877,000
	Not Penny Sales Tax Funded	33.5	\$4,909,000	\$5,400,000
PHASE IV	Partial Penny Sales Tax Funded	1.4	\$61,000	\$67,000
	Penny Sales Tax Funded	17.6	\$8,888,000	\$9,777,000
	Not Penny Sales Tax Funded	48.4	\$10,777,000	\$11,855,000
PHASE V	Penny Sales Tax Funded	1.7	\$163,000	\$179,000
	Not Penny Sales Tax Funded	59.3	\$16,015,000	\$17,617,000
PHASE VI	Penny Sales Tax Funded	24.9	\$7,902,000	\$8,692,000
	Not Penny Sales Tax Funded	18.7	\$3,192,000	\$3,511,000
TOTALS	Partial Penny Sales Tax Funded	18.7	\$3,192,000	\$3,511,000
	Penny Sales Tax Funded	69.5	\$25,105,000	\$27,615,000
	Not Penny Sales Tax Funded	228.7	\$50,048,000	\$55,053,000
Grand Total		316.8	\$78,345,000	\$86,179,000

TABLE 26 - PEDESTRIAN INTERSECTION IMPROVEMENTS

Priority Ranking	Number of Projects
17	1 (1 Penny Sales Tax Funded)
16	2 (2 Penny Sales Tax Funded)
15	1
14	4
13	1
12	10 (3 Penny Sales Tax Funded)
11	17 (1 Penny Sales Tax Funded)
10	23 (5 Penny Sales Tax Funded)
9	38 (1 Penny Sales Tax Funded)
8	20 (1 Penny Sales Tax Funded)
7	26
6	17
5	8
4	2
Grand Total	170

TABLE 27 - MID-BLOCK CROSSING IMPROVEMENTS

Priority Ranking	Number of Projects
19	2
18	6
17	5
16	3
15	1
14	33
13	47
12	24
11	66
10	55
9	33
8	16
7	7
6	13
5	2
0	18
Grand Total	331



Implementation Strategies

The pedestrian and bicycle facility types presented in the network recommendations are considered the most appropriate facility types for the conditions observed. Considerations when selecting facility types included feasibility of implementation, intended user groups, current traffic and physical conditions, past safety incidents, public input and extensive site observations. While the City of Columbia and its implementation partners should strive to implement the network as it is presented herein, other unforeseen constraints may prevent this from being possible in all cases. **If unforeseen constraints prevent the recommended facility type from being feasible, the implementing agency should strive to implement the next best facility type in terms of user separation and safety.** For example, if cycle tracks are not feasible on a section of roadway, buffered bike lanes should be installed as the next best alternative.

In addition, many bikeway and sidewalk improvement recommendations in the Plan are located on South Carolina Department of Transportation jurisdiction roadways. While project phasing is representative of the identified project need and benefit and should be followed when possible, **the implementing agency should also look for opportunities to coordinate bikeways construction with SCDOT regularly-programmed maintenance activities**, even if this results in projects being implemented outside of their scheduled phasing. Coordinating with resurfacing and re-engineering projects that are already programmed will greatly reduce the costs of implementing recommended facilities in most cases.

Project prioritization targets high-impact, low-cost opportunities like sidewalk gaps in the pedestrian and bicycle network.

Project Funding

Above all else, engineering projects require adequate funding sources to ensure their implementation. As noted in the previous tables, projects funded with the Richland County One-Cent Sales Tax offer a near-term opportunity to get many pedestrian and bicycle recommendations implemented. However, additional funding sources must be secured to take recommendations in this Plan to implementation, and it is important to consider that not all construction activities will be accomplished with a single funding source.

This Plan recommends that the City investigate budgeting additional dedicated roadway funding for pedestrian and bicycle projects to ensure the regular implementation of these recommendations. Columbia should also pursue public and private grant sources that could be used to fund project implementation or support programs. **Appendix L** provides an extensive summary of potential federal, state, local private sources of funding for pedestrian and bicycle projects in Columbia, SC.



FIGURE 34 – COLUMBIA SIDEWALK RECOMMENDATIONS PHASING (OVERVIEW)

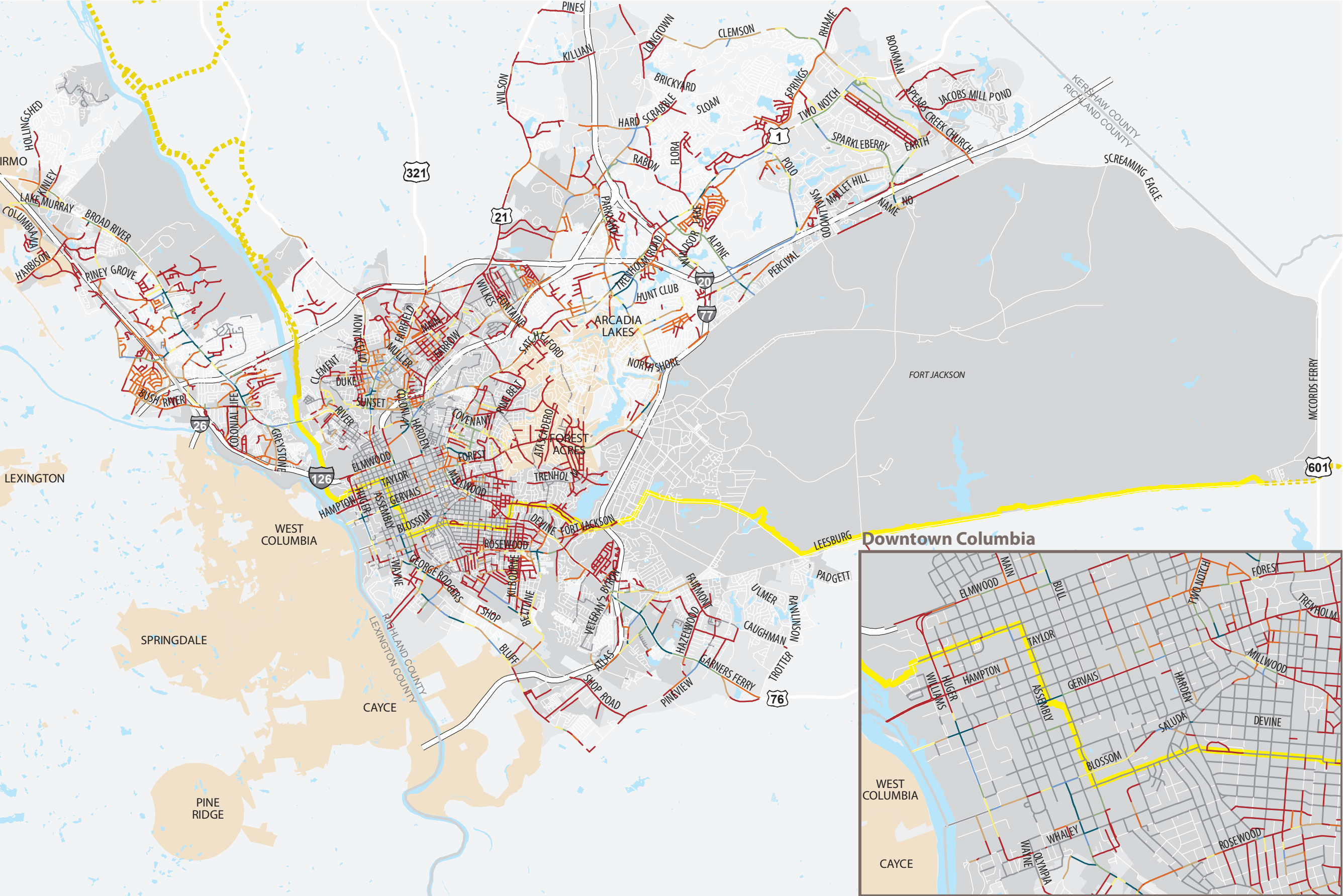
Sidewalk Project Phasing

PriorityScore_Ped

- Phase I
- Phase II
- Phase III
- Phase IV
- Phase V
- Phase VI
- Long-Term
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Limited Access Highway
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.





FIGURE 35 - COLUMBIA SIDEWALK RECOMMENDATIONS PHASING (CITY CENTER)

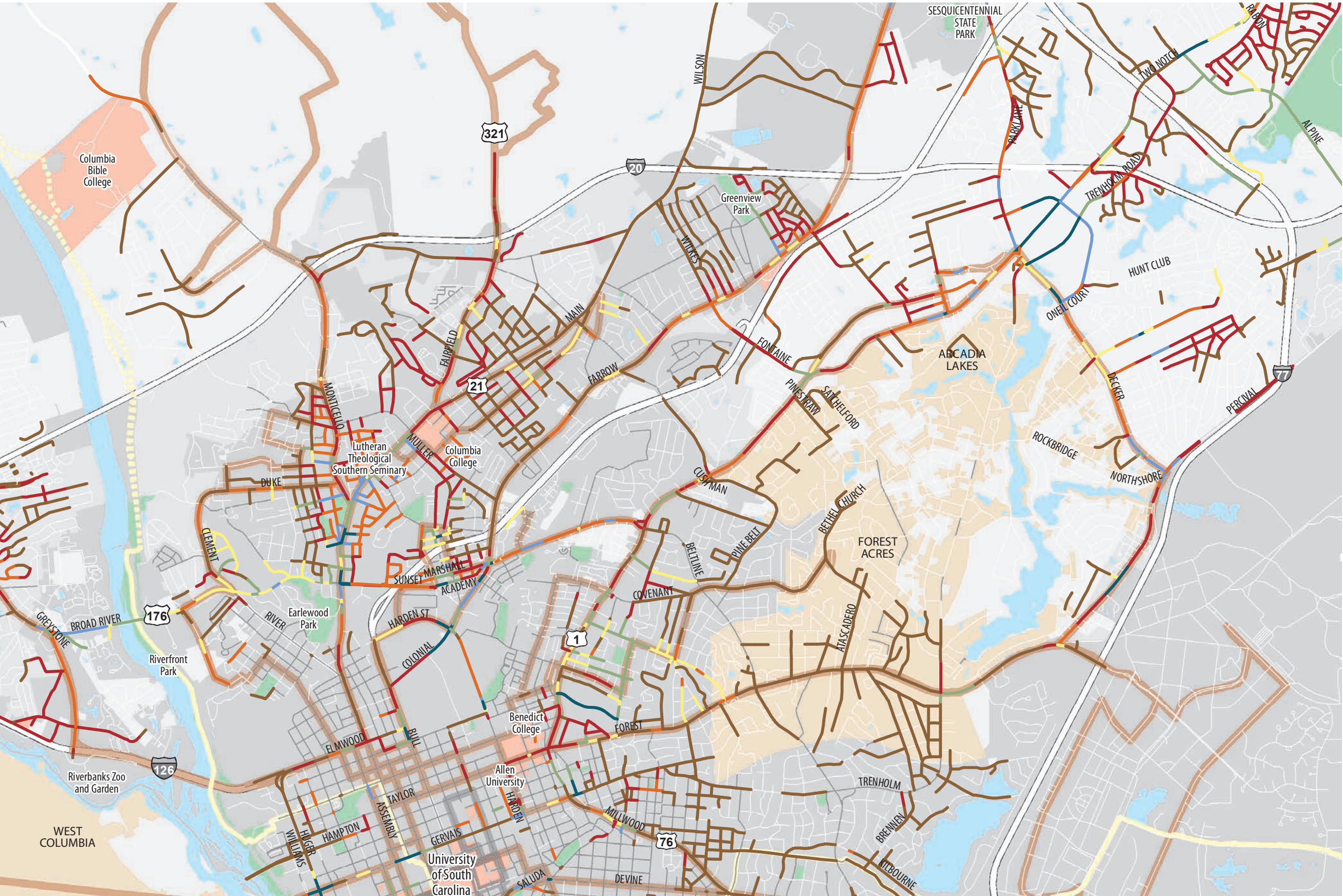
Sidewalk Project Phasing
~Central~

Sidewalk Phasing

- Phase I
- Phase II
- Phase III
- Phase IV
- Phase V
- Phase VI
- Long-Term
- Street with Sidewalk(s)
- Street (white)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- COMET Route
- USC Shuttle Route
- Limited Access Highway
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.

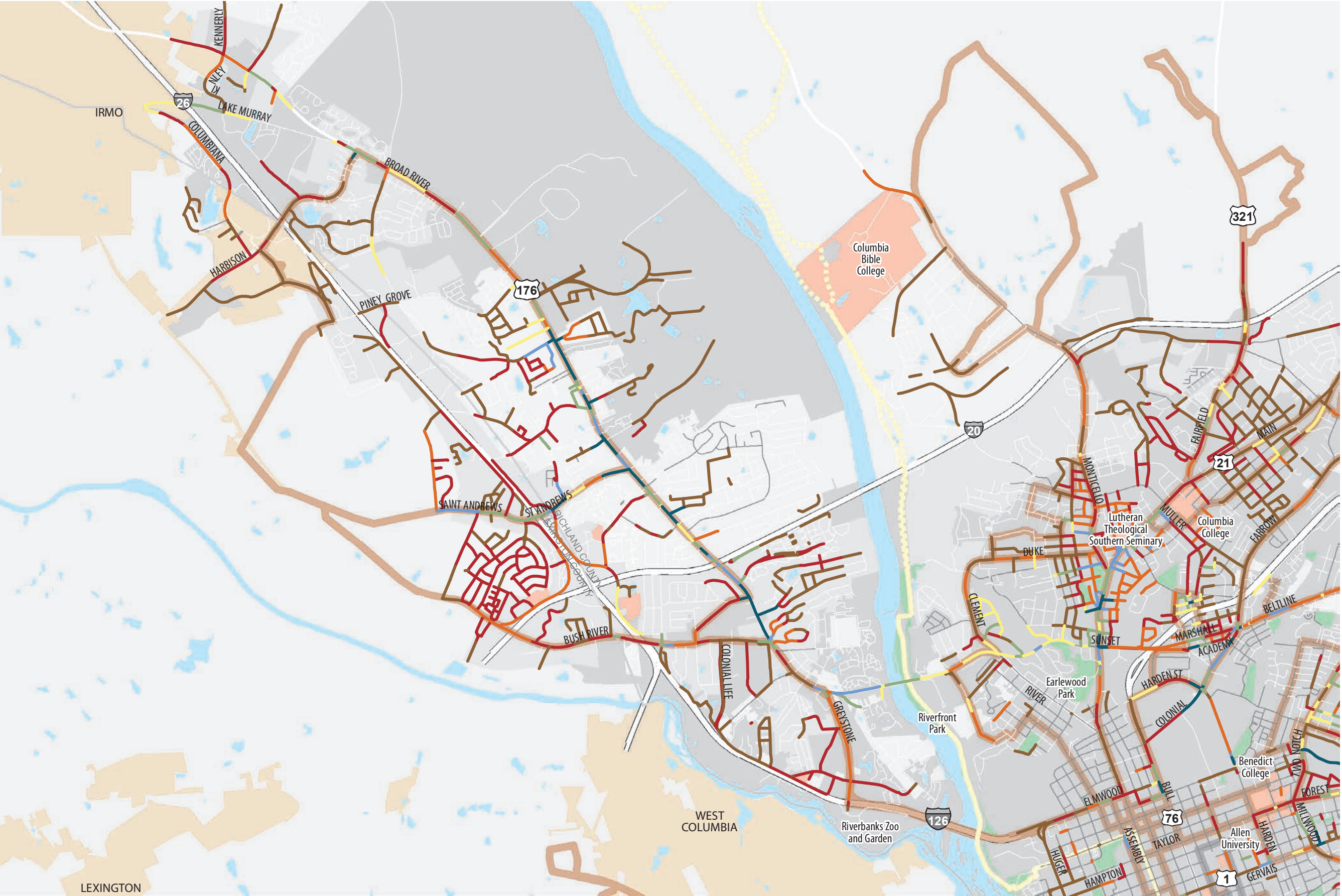




FIGURE 36 – COLUMBIA SIDEWALK RECOMMENDATIONS PHASING (NORTHWEST)

Sidewalk Project
Phasing
~Northwest~

- Sidewalk Phasing**
- Phase I
 - Phase II
 - Phase III
 - Phase IV
 - Phase V
 - Phase VI
 - Long-Term
- Legend**
- Street with Sidewalk(s)
 - Street (white)
 - Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - COMET Route
 - USC Shuttle Route
 - Limited Access Highway
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.





FIGURE 37 - COLUMBIA SIDEWALK RECOMMENDATIONS PHASING (NORTHEAST)

Sidewalk Project Phasing ~Northeast~

- Sidewalk Phasing**
- Phase I
 - Phase II
 - Phase III
 - Phase IV
 - Phase V
 - Phase VI
 - Long-Term
- Legend**
- Street with Sidewalk(s)
 - Street (white)
 - Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - COMET Route
 - USC Shuttle Route
 - Limited Access Highway
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.





FIGURE 38 - COLUMBIA SIDEWALK RECOMMENDATION PROJECT PHASING (SOUTHWEST)

Sidewalk Project Phasing
~Southwest~

- Sidewalk Phasing**
- Phase I
 - Phase II
 - Phase III
 - Phase IV
 - Phase V
 - Phase VI
 - Long-Term
 - Street with Sidewalk(s)
 - Street (white)
- Legend**
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - COMET Route
 - USC Shuttle Route
 - Limited Access Highway
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.





FIGURE 39 - COLUMBIA BICYCLE RECOMMENDATION PROJECT PHASING (OVERVIEW)

Proposed Bicycle Infrastructure Prioritization

- Proposed Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes
- Existing Bikeways**
-

- Other Proposed Improvements**
- Bicycle/Pedestrian Cut-through
 - Intersection Improvements
 - Infill Street
 - Proposed On-Road Bikeway (Other Jurisdiction)
 - Proposed Sidepath or Greenway (Other Jurisdiction)

- Legend**
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - Commuter Rail Line (Proposed)
 - Other Rail Line
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body

0 1 2 Miles



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.

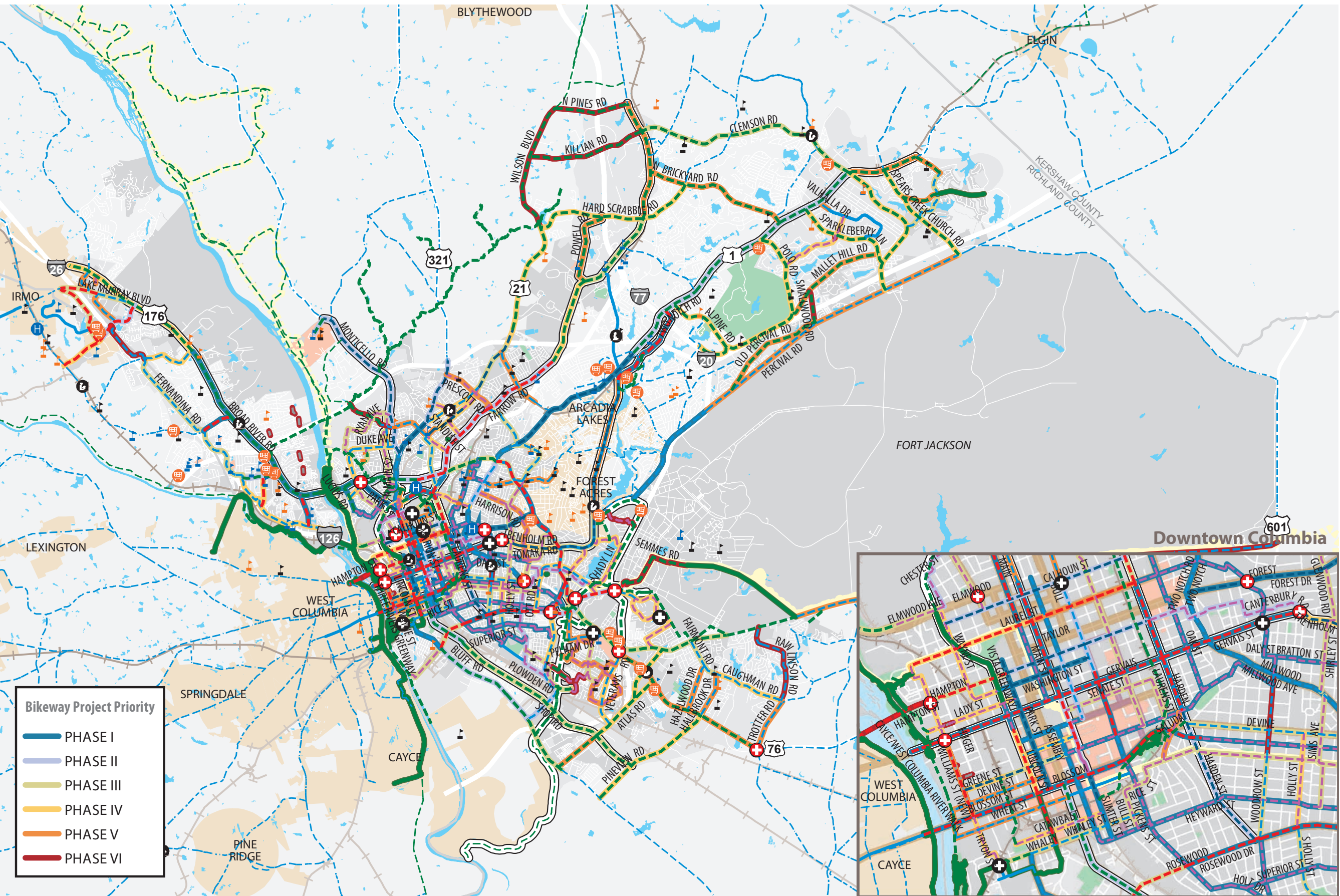




FIGURE 40 – COLUMBIA BICYCLE RECOMMENDATION PROJECT PHASING (CITY CENTER)

Proposed Bicycle Project Prioritization ~Central~

- Proposed Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes
- Existing Bikeways**
- Sidepath or Greenway
 - Cycle Track(s)
 - Buffered Bike Lanes
 - Bike Lanes/ Paved Shoulders
 - Bike Boulevard/ Bike Route/ Shared Lane Markings
 - Primary All Ages and Abilities Routes

- Other Proposed Improvements**
- Bicycle/Pedestrian Cut-through
 - Intersection Improvements
 - Infill Street
 - Proposed On-Road Bikeway (Other Jurisdiction)
 - Proposed Sidepath or Greenway (Other Jurisdiction)

- Legend**
- Existing Palmetto Trail
 - Palmetto Trail Gap Options
 - Commuter Rail Line (Proposed)
 - Other Rail Line
 - Park
 - College
 - City of Columbia Limits
 - Potential Future Annexation Areas
 - Other Jurisdiction
 - Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments. Map created December, 2014.

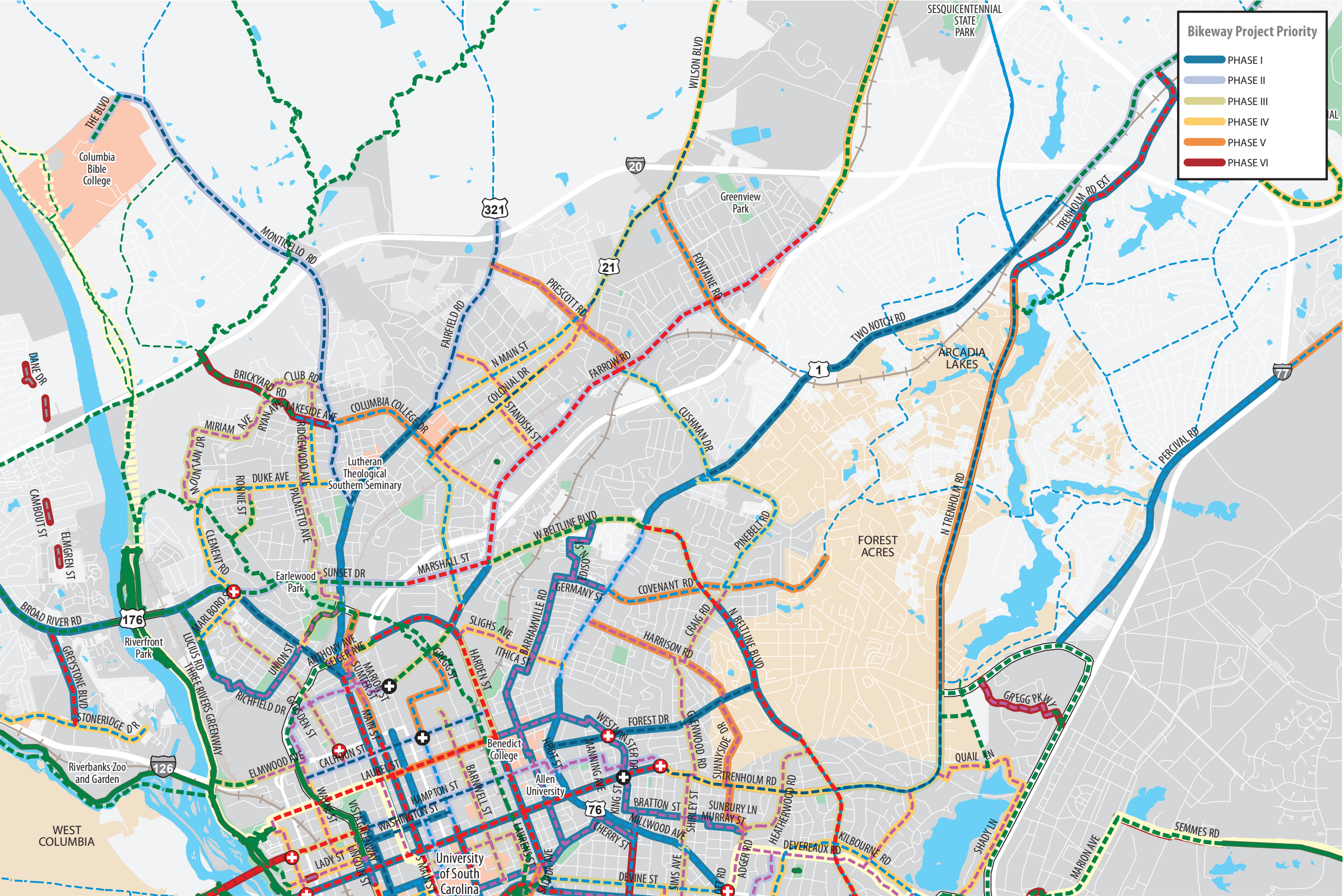




FIGURE 41 - COLUMBIA BICYCLE RECOMMENDATION PROJECT PHASING (NORTHWEST)

Proposed Bicycle Project Prioritization ~Northwest~

Proposed Bikeways

- Sidepath or Greenway
- Cycle Track(s)
- Buffered Bike Lanes
- Bike Lanes/ Paved Shoulders
- Bike Boulevard/ Bike Route/ Shared Lane Markings
- Primary All Ages and Abilities Routes

Existing Bikeways

Other Proposed Improvements

- Bicycle/Pedestrian Cut-through
- Intersection Improvements
- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body

Bikeway Project Priority

PHASE I

PHASE II

PHASE III

PHASE IV

PHASE V

PHASE VI



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.

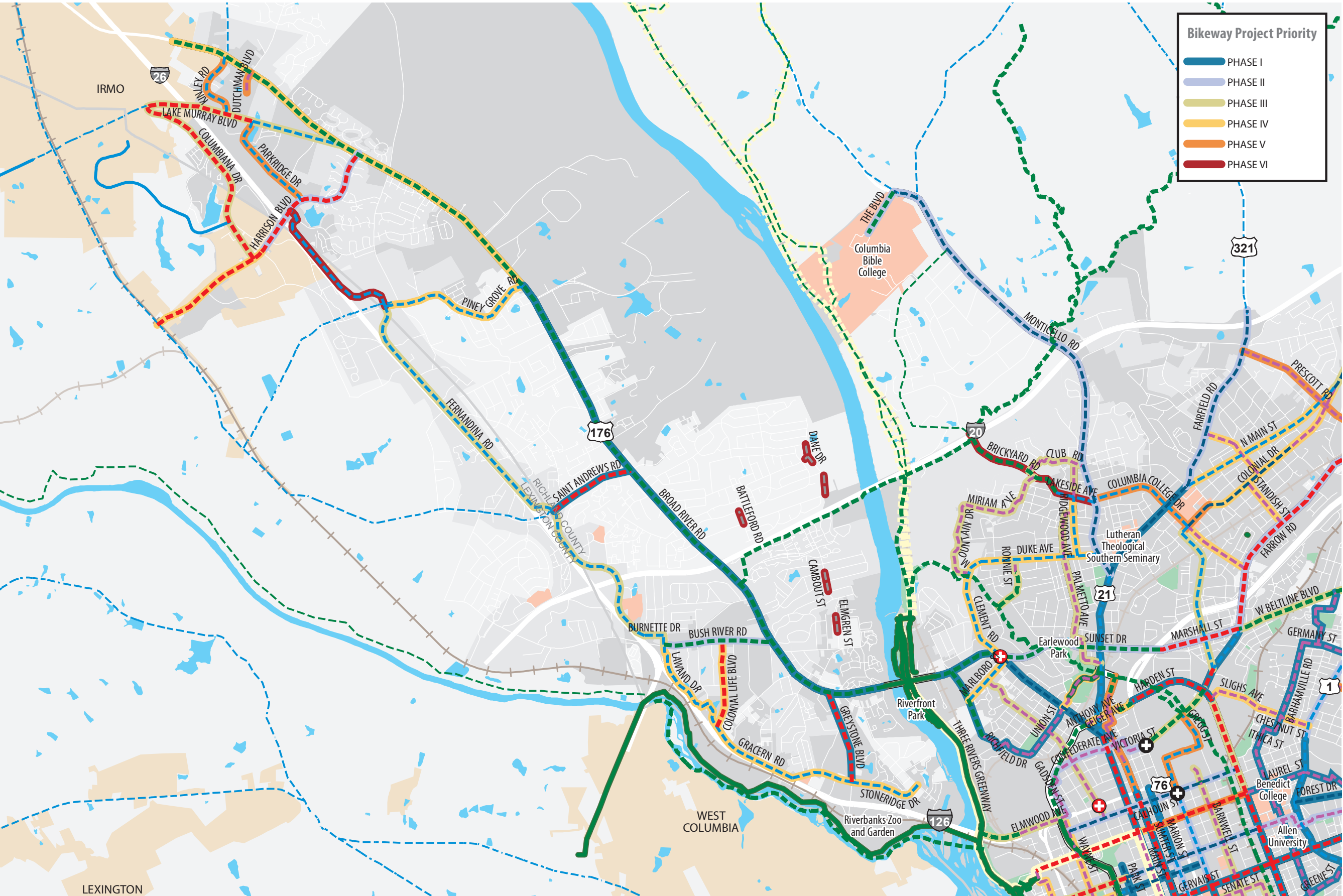




FIGURE 42 – COLUMBIA BICYCLE RECOMMENDATION PROJECT PHASING (NORTHEAST)

Proposed Bicycle Project Prioritization ~Northeast~

Proposed Bikeways

- Sidepath or Greenway
- Cycle Track(s)
- Buffered Bike Lanes
- Bike Lanes/ Paved Shoulders
- Bike Boulevard/ Bike Route/ Shared Lane Markings

Existing Bikeways

- Primary All Ages and Abilities Routes

Other Proposed Improvements

- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Commuter Rail Line (Proposed)
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.

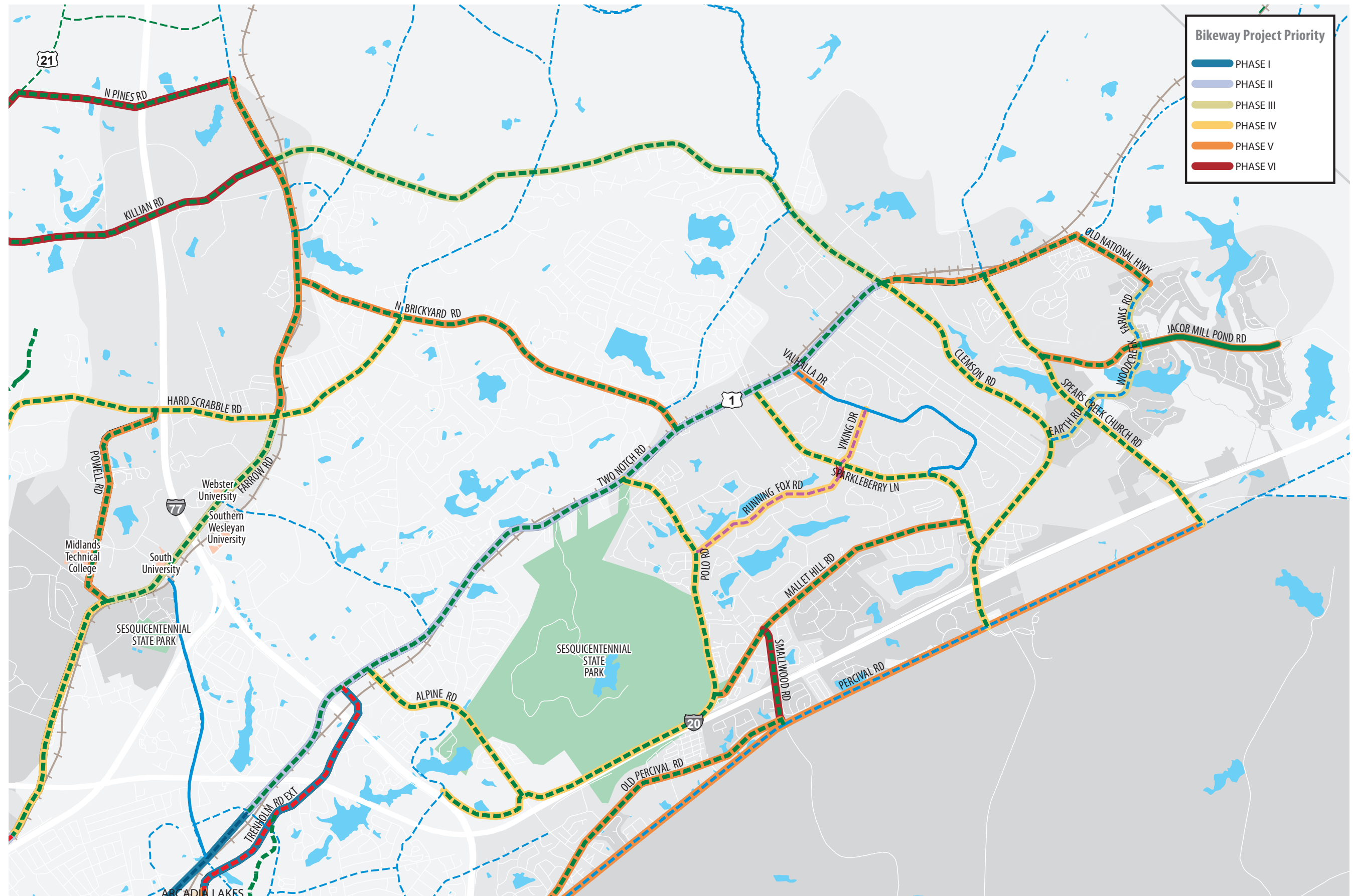




FIGURE 43 - COLUMBIA BICYCLE RECOMMENDATION PROJECT PHASING (SOUTHWEST)

Proposed Bicycle Project Prioritization ~Southwest~

Proposed Bikeways

- Sidepath or Greenway
- Cycle Track(s)
- Buffered Bike Lanes
- Bike Lanes/ Paved Shoulders
- Bike Boulevard/ Bike Route/ Shared Lane Markings
- Primary All Ages and Abilities Routes

Other Proposed Improvements

- Bicycle/Pedestrian Cut-through
- Intersection Improvements
- Infill Street
- Proposed On-Road Bikeway (Other Jurisdiction)
- Proposed Sidepath or Greenway (Other Jurisdiction)

Legend

- Existing Palmetto Trail
- Palmetto Trail Gap Options
- Commuter Rail Line (Proposed)
- Other Rail Line
- Park
- College
- City of Columbia Limits
- Potential Future Annexation Areas
- Other Jurisdiction
- Water Body

Bikeway Project Priority

PHASE I

PHASE II

PHASE III

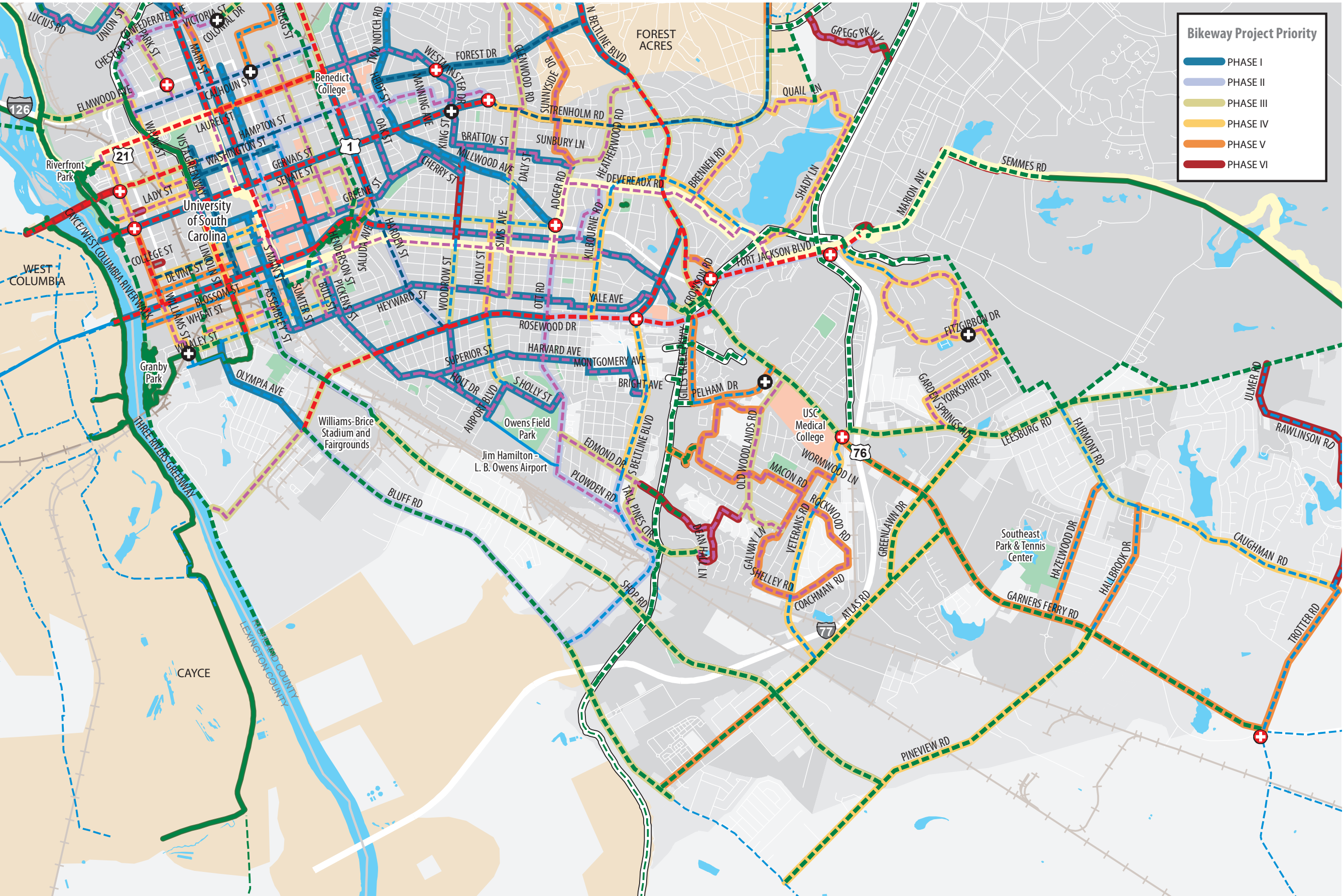
PHASE IV

PHASE V

PHASE VI



Data obtained from the City of Columbia and Central Midlands Council of Governments.
Map created December, 2014.





Catalyst Projects to Build Momentum

Introduction

The initial projects implemented from this Plan will be crucial to the long-term realization of the Plan's vision. It is key that the City of Columbia focus on projects that have a high latent demand for use, are high-profile corridors that many Columbians will see, and are relatively low impact/low-hanging fruit projects that will be easy to implement and are less controversial. The success of these initial projects will be an important catalyst for future projects - raising awareness on the types of improvements taking place and building excitement for walking, bicycling, and transit throughout Columbia.

The project team worked together to select four projects that fit these criteria for Columbia, while also providing design guidance for two projects already in progress. In addition to being high-impact low-cost/effort projects, the team made a conscious effort to ensure that these projects were spread equitably across the City and were located primarily on transit corridors to benefit multiple user groups. These projects are as follows:

North Main Street - Anthony Ave. to Fuller Ave.

Greene Street - Assembly St. to Gadsen St.

Garners Ferry Road - Atlas Rd. to Daphne Rd.

Farrow Road - Columbia College Dr. to Fontaine St.

Laurel Street - Bull St. to Harden St.

Sumter Street - Elmwood Ave. to Taylor St.

During the planning process, the City became the recipient of a \$10 million USDOT TIGER grant for rehabilitation of 16 blocks of North Main Street and also worked with the University of South Carolina, SCDOT, and other stakeholders to implement improvements along Greene Street at Innovista. For the remaining four projects, the team has developed priority project cutsheets to help communicate what these

improvements will potentially look like and what will be required to implement them. In addition, the team developed detailed traffic impact analyses for these four corridors to assist the City as they move forward with project development and implementation. These four project cutsheets are presented on the following pages. The results of the traffic impact analyses can be found in the Plan's appendix.

N Broadway St. in Chicago (shown below) is an example of a 5 lane to 3 lane road diet, much like the improvements proposed for Farrow Rd. and Sumter St. in Columbia.





Garners Ferry Rd

Pedestrian, Bicycle, and Transit Improvements

To/From: Atlas Rd. to Daphne Rd.

Project Highlights: Transit route, highest ranking pedestrian improvement, provides access to employment and commercial centers

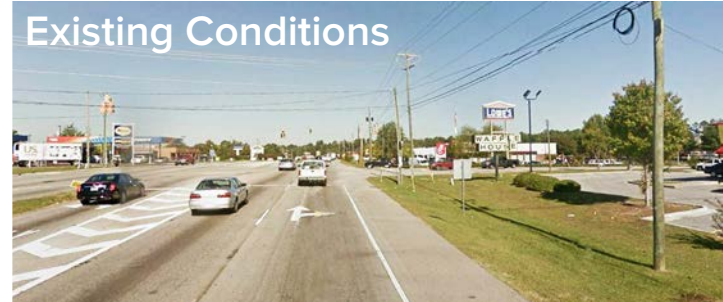
Richland County Sales Tax Project: No

Roadway Jurisdiction: SCDOT

Proposed Improvements: Sidewalks or Shared-use Paths. Transit stop improvements along corridor.

Implementation Strategy: Sidewalks and transit stop improvements are a near-term priority for the corridor. A minimum 8' shared-use path with 5' roadway buffer is the recommended bikeway and could substitute for sidewalk improvements on one, or both sides of road. These improvements could be coupled with additional streetscape improvements such as overhead line burial and street trees.

Existing Conditions



Sidewalk and Transit Improvements



Shared-use Path and Transit Improvements





Farrow Rd

Bicycle and Transit Improvements

To/From: Columbia College Dr. to Fontaine St.

Project Highlights: Transit route, parallel route to Highway 277

Richland County Sales Tax Project: No

Roadway Jurisdiction: SCDOT

Proposed Improvements: One-way cycle tracks on both sides of roadway, bicycle wayfinding signage and intersection improvements, transit stop upgrades.

Implementation Strategy: Outside lanes of existing 5 lane road would be restriped to add 9' minimum cycle tracks. Bicycle wayfinding signage directing bicyclists to nearby destinations should also be installed. Also include bicycle intersection improvements at intersections with side streets and signals. Pavement markings and signage will be used to indicate “mixing zones” at transit stops.

Existing Conditions



Proposed Improvements



Laurel St

Bicycle and Transit Improvements

To/From: Bull St. to Harden St.

Project Highlights: Transit route, east-west downtown connection, links to existing bicycle route.

Richland County Sales Tax Project: No

Roadway Jurisdiction: SCDOT

Proposed Improvements: One-way cycle tracks on both sides of roadway, bicycle wayfinding signage and intersection improvements, transit stop upgrades.

Implementation Strategy: 4 to 3 lane road diet (with removal of parking on one side of street as needed) to install 8'-9' one-way cycle tracks. Some parking could be relocated to side streets. Bicycle wayfinding signage directing bicyclists to nearby destinations should also be installed. Also include bicycle intersection improvements at intersections with side streets and signals. Pavement markings and signage will be used to indicate "mixing zones" at transit stops.

Existing Conditions



Proposed Improvements





Sumter St

Pedestrian, Bicycle and Transit Improvements

To/From: Elmwood Ave. to Taylor St.

Project Highlights: Transit route, north/south downtown connection, links University of South Carolina campus with student housing

Richland County Sales Tax Project: Yes

Roadway Jurisdiction: SCDOT

Proposed Improvements: One-way cycle tracks on both sides of roadway, transit stop improvements, streetscaping improvements including street trees.

Implementation Strategy: 5 to 3 lane road diet would provide space to add minimum 9' one-way cycle tracks. Bus stops could be “floated” between cycle track and traffic to provide safe boarding and alighting area. Streetscape improvements could include median planters, planter boxes along sidewalks, and intermittent street trees along sidewalks.

Existing Conditions



Proposed Improvements



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Walk-Friendly/Bike-Friendly Community Action Plans

Introduction

This Action Plan outlines a strategy for the City of Columbia to implement the programs and projects laid out in the Walk Bike Columbia Plan with the goal of achieving Silver and ultimately higher levels of Bicycle Friendly Community (BFC) and Walk Friendly Community (WFC) recognition. Columbia already completed the BFC application process in 2008 and 2013, and was awarded a Bronze level designation. This action plan serves as a guide for Columbia to build on that success to seek higher BFC award levels and to become the first Walk Friendly Community in the state.

The Columbia BFC and WFC Assessment, completed as part of this plan, evaluates the existing bicycling and walking environment in Columbia and identifies the City's strengths and weaknesses based on BFC and WFC application criteria. This action plan is informed by the results of the BFC and WFC Assessment, Columbia's 2008 BFC Application, and the League of American Bicyclists BFC Feedback for Columbia to identify how the City can further improve its pedestrian and bicycle environment and culture.

The key recommendations from the League of American Bicyclists BFC Feedback for Columbia included the following:

- Expand the Bicycle Coordinator's time focused on bicycle projects to help in scaling up your BFC efforts.
- Adopt the comprehensive bike master plan that is currently being prepared.
- Increase the amount of high quality bicycle parking at popular destinations such as major transit stops, schools, universities, recreational and entertainment facilities, retail stores, office buildings, and churches throughout the community.
- Continue to expand the bike network to increase network connectivity through the use of different types of bike

lanes, cycle tracks, and shared lane markings. Ensure smooth transitions for bicyclists between the trail network and the street network.

- Launch a bike share system that is open to the public.
- Encourage local public agencies, businesses, and organizations to promote cycling to the workplace and to seek recognition through the free Bicycle Friendly Business program.
- Design and publish a local bike map in paper and online, addressing diverse needs and skill levels (Commuter, recreational cyclist, sport cyclist, mountain biker, etc.).
- Ask police officers to target both motorist and cyclist infractions to ensure that laws are being followed by all road users. Ensure that bicycle/car crashes are investigated thoroughly and that citations are given fairly.

These recommendations were incorporated into the BFC/WFC Action Plan to present a clear picture of the expectations that the League of American Bicyclists has for Columbia as it pursues higher level BFC designations.

Applying for BFC/WFC Designation

There are two steps to apply for Bicycle Friendly Community status:

1. 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.
2. 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



Increasing the miles of sidewalks and on-street bikeways, especially delineated facilities like bike lanes and cycletracks, are a key to becoming recognized as a walk or bicycle-friendly community.



bicycling. Communities must reapply every four years to keep their status in good standing or to achieve a higher status.

The steps to apply for Walk Friendly Community status are similar to those for the BFC application:

1. The individual leading the WFC application effort will create a community profile that can be shared with the application team.
2. The team will then be required to address in detail the engineering, education, encouragement, enforcement, and evaluation and planning efforts related to walking in Columbia.

As of 2014, there are no designated Walk Friendly Communities in South Carolina. Columbia has the opportunity to be the first in the state. A WFC application will be completed as part of this planning effort and a high level WFC assessment was completed in the existing conditions portion of the plan.

The Five E's

The BFC evaluation and WFC evaluation are both structured based on the 5 “E’s”: Engineering, Education, Encouragement, Enforcement and Evaluation. A sixth “E”, Equity, is addressed throughout each application and in the BFC and WFC Action Plan. Each of the 5 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. The BFC program recently added a Diamond designation, the highest possible BFC award. Both programs also have an honorable mention category for communities that do not qualify for a higher level

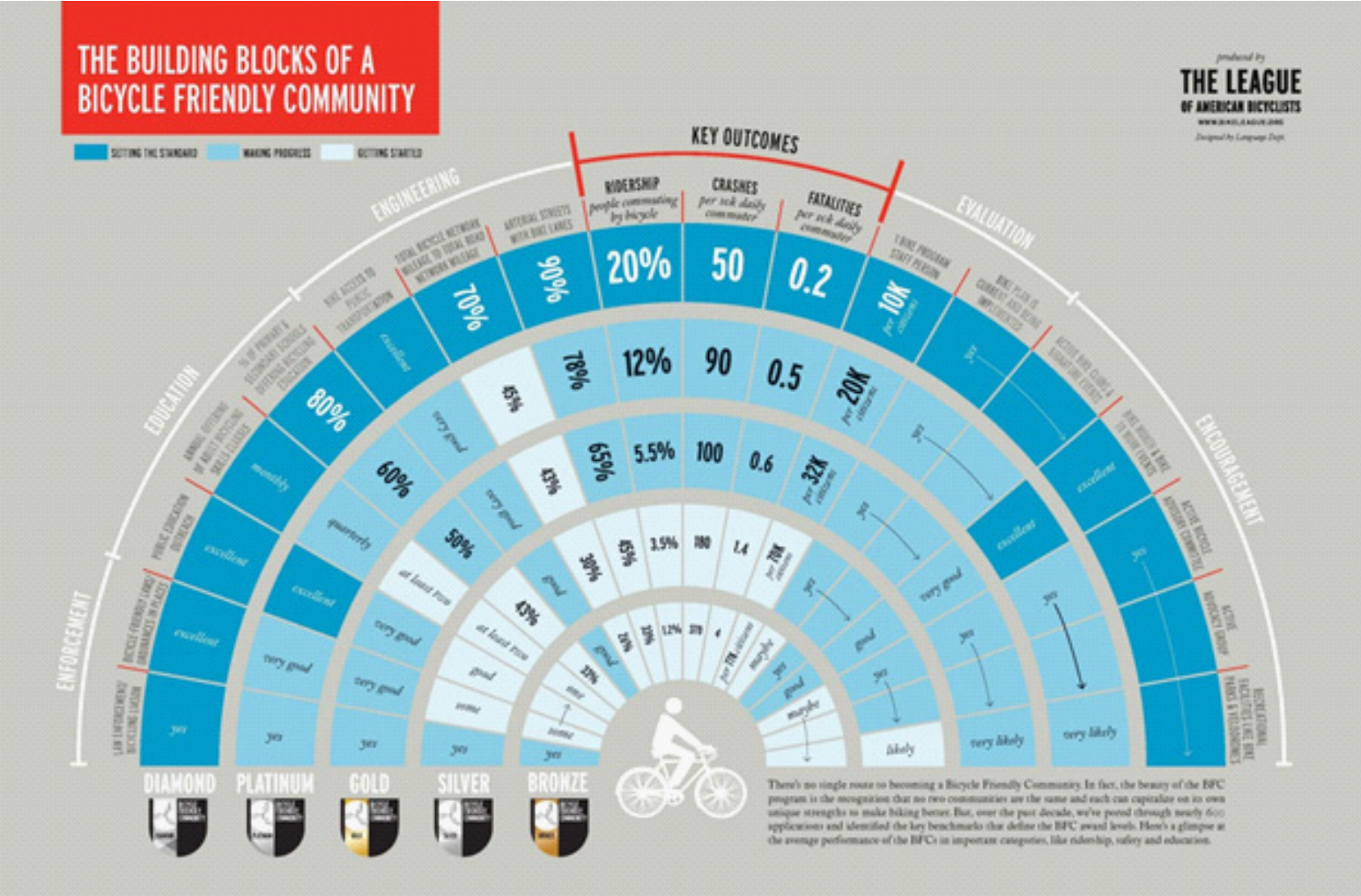
of award but have demonstrated progress towards future success.

Urban, rural and suburban communities throughout the U.S. have participated in the BFC and WFC programs. 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 and WFC applications is an education in itself, as communities identify

their strengths and opportunities for improvement in each of these categories. The Five “E’s” are summarized below.

Figure 44: The League of American Bicyclists has created this summary table of factors for various levels of Bike Friendly Communities in each of the 5 E categories.

FIGURE 44 – THE BUILDING BLOCKS OF A BICYCLE-FRIENDLY COMMUNITY





Engineering

Communities are asked about features of the built environment that promote bicycling or walking in the community. Included in this category are questions about the accommodation of pedestrians and bicyclists on public roads, pedestrian- and bicycle-friendly policies in place, and the existence of well-designed on-street bicycle facilities, sidewalks, crossings, 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 networks.

Education

The questions in this category are designed to determine the amount of education that is available for pedestrians, bicyclists, and motorists. Education includes teaching bicyclists of all ages how to ride safely, teaching children pedestrian safety and how to safely cross the street, as well as educating motorists on how to share the road safely with pedestrians and bicyclists. Some things that reviewers look for are the availability of bicycling education for adults and children, the number of



Mid-block crossings are effective at making a safer and more comfortable pedestrian environment - by reducing distances between crossing locations.

League Cycling Instructors in the community, the presence of Safe Routes to School programs, and other ways that safety information is distributed to both pedestrians, bicyclists , 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 and walking. This can be done through Bike Month and Bike to Work Week events, bike and walk maps, wayfinding signage, community bike rides and walks, commuter incentive programs, and having a Safe Routes to School program. In addition, some questions focus on infrastructure that has been built to promote a bicycling and walking 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 evaluate the connections between pedestrians, bicyclists, and law enforcement. Questions address whether or not the law enforcement community has a liaison with the bicycling community, if there are bicycle and on-foot divisions of the law enforcement or public safety communities, if the community uses targeted enforcement to encourage pedestrians, bicyclists, and motorists to share the road safely, and the existence of pedestrian and bicycle related laws.

Evaluation & Planning

In this section, the community is judged on the systems that they have in place to plan for bicycling and walking and to evaluate the progress of plans, projects, and policies. Questions are focused on measuring the amount of bicycling and walking taking place in the community, city crash and fatality rates, and ways that the community works to track and improve these numbers. Communities are asked about whether or not they have a pedestrian or bicycle plan, how much of the plan has been implemented, and what the next steps are for improvement.

BFC and WFC Action Plan

The action plan provided in the table on the following pages is organized by the 5 “E’s” to correspond with the organization of the BFC and WFC applications. The Engineering action steps presented here are intended to be coupled with the infrastructure recommendations presented in this plan. Infrastructure improvements will be an essential component to achieve higher levels of BFC and WFC recognition. The action steps presented for Education, Encouragement, Enforcement, and Evaluation and Planning are intended to be coupled with the program recommendations made in the Programs Chapter of the plan. Action steps in these sections are organized by program title for reference.

Each action step is described in detail with a suggested lead agency, supporting partners, the expected deliverables or outcome, and the timeframe for when an action step should begin. These steps will help to guide the implementation of projects, programs, and policies over the next several years to improve pedestrian and bicycle conditions and awareness in Columbia. As plan implementation progresses, lead agencies and partners should track action steps that are underway or completed so that these can be reported in Columbia’s next rounds of BFC and WFC applications.



TABLE 28 - WFC AND BFC ACTION STEPS

Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
EDUCATION							
Expand Media Campaign to Educate Motorists, Pedestrians, and Bicyclists	Further promote the Safe Streets Save Lives Campaign within Columbia	Advertise the campaign via social media, public access channel, local TV and radio outlets, and on public transit	City of Columbia	Palmetto Cycling Coalition, Columbia BPAC, COMET, USC, CMCOG, COC Public Relations	Links to campaign website online, educational videos on public access channel, short TV and radio ads, bus placards and posters	Spring 2015 and ongoing	Per year: Number of media spots; number of web hits; follow up recognition survey
	Work with local organizations, businesses, and schools to promote the campaign	Provide neighborhood groups, local businesses such as bike shops, and schools with Safe Streets Save Lives materials to display and distribute in the community and at events	City of Columbia	Palmetto Cycling Coalition, Columbia BPAC, COMET, USC, neighborhood groups, health care community	Brochures, flyers, bumper stickers, and other branded informational materials	Spring 2015 and ongoing	Per year: Number of community partners and sponsors/ supporters
Professional Training Opportunities	Provide pedestrian and bicycle related professional development courses for public staff	Local agencies should host APBP webinars and other online trainings via a membership cost sharing strategy, with a consistent meeting location and time	City of Columbia Planning and Development Services Department	CMCOG, Richland County, USC depts.	Monthly to quarterly training opportunities on pedestrian and bicycle related topics	Spring 2015 and ongoing	Number of trainings per year; number of participants
Walk Bike Ambassador Program and Classes	Train a group of staff and volunteers to serve as educators and mentors of walking and bicycling safety throughout Columbia	Bring together individuals with experience or interest in education, fitness, health, traffic safety, or community activism to serve as ambassadors that will empower, train, and lead community volunteers	Columbia BPAC	City of Columbia, Palmetto Cycling Coalition, CMCOG, Healthy Columbia, local bike clubs, universities/ colleges, City of Columbia Engineering Serviced Department	Trained Walk Bike Ambassadors who can lead events, coordinate volunteers, and spread bicycling and walking safety and awareness throughout Columbia	Summer 2015 and ongoing	Number of ambassadors trained. Goal: 12 trained by 2016; 36 by 2017
	Develop Walk Bike Ambassador courses such as bike rodeos for children, adult bicycling classes, workplace education, and school education	Develop and host walking and bicycling classes that reach youth, adults, workers, students, and traditionally underserved populations	Columbia BPAC	City of Columbia, Palmetto Cycling Coalition, CMCOG, Healthy Columbia, local bike clubs, colleges/ universities, City of Columbia Engineering Serviced Department	Monthly presentations, classes, and course materials that teach safe walking and bicycling, such as Traffic Skills 101 classes	Summer 2015 and ongoing	Number of programs held. Goals: Two Traffic Skills courses by 2016; Quarterly courses by 2017. Monthly presentations on walking, biking, or SRTS by 2016.
	Build League of American Bicyclists League Cycling Instructor (LCI) Program	Increase the number of LCIs in Columbia to contribute to the Walk Bike Ambassador program and provide more bicycling mentors and educators within the community	Columbia BPAC	Local volunteers, current LCIs	LCI training courses	Summer 2015 and ongoing	Number of LCIs. Goal: 6 by 2016; 12 by 2017



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
Traffic Ticket Diversion Program	Collaborate with Columbia Police Department, USC, and local colleges to explore the feasibility of a traffic ticket diversion program	Add an educational component to enforcement by allowing first-time traffic offenders to take a diversion course in lieu of a fine or for reduced driver's license points	Columbia Police Department	USC, local colleges, City of Columbia staff	Traffic Ticket Diversion course, course materials	Summer 2015 and ongoing	Number of diversion courses/ participants
Expand Safe Routes to School Efforts	Launch a youth pedestrian and bicycle skills and safety program in all elementary and middle schools in Columbia	Dedicate in-class instruction, PE time, and/or an afterschool program to teaching biking and walking safety, riding skills, and bike maintenance	SRTS Planning Committees, Walk Bike Ambassadors	Local LCIs, City of Columbia staff, local volunteers, school administration and faculty, SCDOT	Classroom and on-bike education course, annual bike rodeo, in-school or after-school bike classes or camps	Fall 2015 and ongoing	Number of courses; numbers of students trained
	Provide walking education and encouragement programs in all elementary and middle schools in Columbia	Develop a Walking Wednesdays program, walking school buses to school, or similar program	SRTS Planning Committees, Walk Bike Ambassadors	Local volunteers, School administration and faculty, City of Columbia staff, SCDOT	Regularly scheduled walking opportunities to school, walking school bus groups, and in-school or after-school walking events	Fall 2015 and ongoing	Number of schools participating
ENCOURAGEMENT							
Open Streets Events	Work with health groups to organize an annual or semi-annual open streets event in Downtown Columbia	Choose a street to close to motor traffic and open to the public. Sundays are ideal days for open streets events. Activities could include a bike rodeo, fitness activities, field day-style events, and bicycle maintenance education.	Columbia Parks and Recreation Department	Healthy Columbia, Columbia BPAC, health care providers, local health and fitness groups, PCC, USC	Temporary street closure, education and encouragement materials, increased number of people visiting downtown by foot or by bike	Spring 2015 and annually/ semi-annually	Number of participants per year and per event
Commute Trip Reduction and Employer Incentives Program	Establish partnerships with 1-2 major employers within Columbia to encourage workers to walk, bike, and take transit to work	Work with local employers to offer commuter information and incentives to workers	COMET, CMCOG, City of Columbia Planning	City of Columbia, Walk Bike Ambassadors, USC, major employers, Chamber	Commuter information packets for workers, discounted bus passes or free trials, presentations on commuter transportation options	Spring 2015 and ongoing	Number of employers involved in program, total number of employees participating in program
	Develop a Bike Month (May) and Walk Month (October) commuter challenge for local employers	During May & October, coordinate with employers to encourage workers to bike and walk to work. Resources can be found on the League of American Bicyclists website: http://bikeleague.org/bikemonth	Columbia BPAC	City of Columbia, Walk Bike Ambassadors, CMCOG, PCC	Bike to Work groups, Walk to Work groups, Walk at Lunch challenge, commuter challenge with prizes for winning employer/ workers, workplace posters, brochures	Spring (May) and Fall (October) 2015	Number of participants per year



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
Walking and Bicycling Programs for Underrepresented Groups	Develop walking and bicycling programs that cater to women, minorities, seniors, persons with disabilities, and other traditionally underrepresented groups	Provide classes, rides, walks, and other events that reach out to underrepresented groups and encourage them to participate in walking and bicycling activities (such as GirlTrek, bicycle maintenance classes for women, senior strolls, etc.)	Healthy Columbia, Local community leaders	Health care providers, local health organizations, faith groups, colleges/ universities	Walking and bicycling programs, events, and materials; increased participation of underrepresented groups in bicycling and walking activities	Fall 2015 and ongoing	Number of groups and people reached
Bicycle Friendly Business Districts	Create a BFBD within Columbia to reduce motor vehicle trips and encourage walking and bicycling to, from, and within the district	Gather support from local businesses for the creation of a formal BFBD	Columbia Planning and Development Department, City of Columbia Economic Development Department	Business Districts, neighborhood organizations, local businesses	Formal designation of the BFBD by the City of Columbia and local business district	Winter 2015	Number of BFBDs
	Improve bicycle infrastructure and bicycle parking within the district	Foster a bike-friendly environment and culture within the BFBD with more convenient and visible facilities and parking	City of Columbia Planning Development Services, City of Columbia Parking Services	City of Columbia Planning and Development Department, business district	Additional bike racks, bike facilities, and signage within and connecting to the BFBD	Spring 2016 and ongoing	Number of bike racks, increases in bike counts and bike access of district
	Increase the number of LAB-certified Bicycle Friendly Businesses (BFBs) in Columbia	Encourage and advise local businesses on applying for BFB status with the LAB	BPAC	Local businesses, PCC, local business groups	Marketing materials on BFB program, increased participation in Bike to Work Day, increased number of BFBs within Columbia	Spring 2016 and ongoing	Number of BFBs
Walking and Bicycling Map with Online Route Planning Tool	Develop a walk and bike map for Columbia with both hard copy and online versions	Show existing facilities, low-traffic routes, difficult connections, and key destinations	Columbia Planning and Development, GIS Departments	City of Columbia IT staff, Parks and Recreation Department, USC, COMET	Walk and bike map available both in hard copy and online	Spring 2016	Number of users; number of maps distributed
	Create an online route planning tool or app for pedestrians, bicyclists, and transit users	A route planning tool would provide a convenient resource for Columbia residents to plan trips by foot, bike, or transit	Columbia Planning and Development, GIS Departments, COMET	City of Columbia IT staff	Online and/or mobile map app	Fall 2016	Number of users
ENFORCEMENT							
Targeted Enforcement and Speed Feedback Signs	Target speed enforcement near schools, parks, in downtown, and along major pedestrian and bicycle corridors and crossing points	Identify locations with high pedestrian and bicycle volumes, a high pedestrian or bicycle crash risk, or frequent speeding problems to reduce motor vehicle speeding offenses	Columbia Police Department	City of Columbia IT staff, Traffic Engineering Department, local schools, USC police	“Back to School Blitz” program targeting speed enforcement near schools, increased police presence and ticketing in areas that are a safety risk to pedestrians and bicyclists	Spring 2015 and ongoing	Number of citations; percent increase in compliance



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
	Deploy temporary speed feedback signs in problem areas, along new pedestrian and bicycle facilities, and as part of a citizen request program	This program will help to raise awareness of speeding and traffic safety in at-risk areas, such as corridors with high pedestrian and bicyclist volumes, along new pedestrian and bicycle facilities, and near schools and parks	Columbia Traffic Engineering Division	City of Columbia Planning and Development Services Department, City of Columbia Utilities and Engineering Department	Phone hotline and online request form for citizens and neighborhood associations to request a temporary (e.g., 2-week) speed feedback sign	Summer 2015 and ongoing	Percent increase in compliance
Crosswalk Enforcement Action Program	Train police officers in crosswalk enforcement actions.	This program will help to address pedestrian safety issues at high crash risk locations. The Pedestrian and Bicycle Information Center offers webinars and in-person training courses for law enforcement on implementing crosswalk enforcement actions (http://www.pedbikeinfo.org/training/gettraining.cfm).	Columbia Police Department	City of Columbia Traffic Engineering Department, Planning and Development Department, USC police	Increased number of police officers who are trained in pedestrian safety, laws, and crosswalk enforcement action protocol.	Summer 2015 and ongoing	Number of officers trained
	Deploy the program in target locations throughout Columbia, based on community feedback, crash and traffic data, and officer input.	Potential locations include crossings near schools, colleges and universities, parks, commercial centers, bus stops, and in downtown. Prominent community leaders could participate in the program to help raise awareness of pedestrian safety.	Columbia Police Department	City of Columbia Traffic Engineering Department, Planning and Development Department, USC police	Increased ticketing for drivers who do not yield to pedestrians in crosswalks, pedestrian safety brochures to give to motorists	Fall 2015 and ongoing	Number of warnings and citations; percent increase in compliance
EVALUATION & PLANNING							
Improve Pedestrian and Bicycle Related Policies	City Council and city staff should work together to improve existing policies and develop new policies that address the needs of pedestrians and bicyclists, as outlined in this plan	Examples include a policy requiring sidewalks on both side of arterial streets, a connectivity policy, connectivity standards for development, etc.	City of Columbia City Council, City of Columbia Planning and Development Services Department, City of Columbia Utilities and Engineering Department	City of Columbia Planning and Development Department, City of Columbia Public Works Department	New and updated policies	Spring 2015	Number of pedestrian- and bicycle-friendly policies
Citywide Pedestrian and Bicycle Counts Program	Deploy volunteers and install automated counters at locations throughout Columbia to collect data on walking and bicycling activity	Use a collection of counters to track walking and bicycling activity over time, particularly at pinch points, along major corridors or trails, and near schools and other key destinations	City of Columbia Traffic Engineering Department	City of Columbia Planning and Development Department, BPAC, USC	Hand counts, intercept surveys, and Automated pedestrian and bicycle count system, data reports	Fall 2015 and ongoing	Year-round and bi-annual counts; % change per year
	Produce and present semi-annual count reports of walking and bicycling activity to City Council and the Columbia BPAC	Reports should describe count results, both at individual facilities and citywide, with biannual and annual count totals to compare over time	City of Columbia Traffic Engineering Department	City of Columbia Planning and Development Department, BPAC	Biannual count reports and presentations made available to the public	Fall 2016 and semi-annually	Year-round and semi-annual counts, compared over time



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
Walking, Bicycling, and Greenways Report Card	Develop a report of existing walking and bicycling conditions, recent successes, and ongoing progress	A bicycling and walking report card will track improvements over time to evaluate the effectiveness of efforts and Columbia's progress toward becoming a more bike- and walk-friendly community	City of Columbia Planning and Development Services Department, City of Columbia Parks and Recreation Department	Traffic Engineering, and Police Departments, BPAC	Annual report documenting the progress of bicycling and walking in Columbia	Winter 2015 and annually	Annual report card
"Measuring the Street" Pre- and Post-Evaluation Program	For upcoming projects, track pedestrian and bicycle conditions before and after the new facility or improvement is constructed	Maintain a database for evaluation data. Traffic counts and speeds, user surveys, and crash analyses will help the city track the effectiveness of pedestrian and bicycle improvements	City of Columbia Traffic Engineering Department	City of Columbia Planning and Development Department, BPAC	Before and after data on infrastructure improvements	Fall 2016 and ongoing	Traffic counts, traffic speeds, public survey questions about the effectiveness of a facility, number of crashes before and after treatment
	Gather and analyze pre- and post-evaluation data and produce an annual report to present to City Council	Report on changes in bicycling and walking conditions before and after project construction, as well as any realized side benefits such as increased sales revenues, property values, and feedback from citizens and local businesses	City of Columbia Traffic Engineering Department, Planning and Development Department	BPAC	Annual reports to City Council on the progress and effectiveness of bicycling and walking improvements	Winter 2016 and annually	Traffic counts, traffic speeds, public survey questions about the effectiveness of a facility, number of crashes before and after treatment; also compare these data to citywide data and over time as more projects are implemented
Assign full-time pedestrian/bicycle coordinators	Identify duties, funding, and location for a full-time equivalent (FTE) staffer to oversee pedestrian and bicycle issues.	This could be a shared position funded by multiple agencies/partners.	City of Columbia	USC, PCF, BPAC, CMCOG	FTE Equivalent bike/ped staff. For Silver level BFC designation, the LAB recommends 1 FTE for bike related issues per 70,000 citizens.	Winter 2016	Number of FTE per 10,000 population (2015 population in City of Columbia is estimated to reach 136,511. By 2018 the estimated population increase will exceed 140,00. This estimate is anticipated to occur earlier with the development of over 3,000 student units.
Develop, adopt, and implement an ADA Transition Plan for the public right of way	Designate an ADA Coordinator to lead the planning process, implementation of the plan, and monitor progress and/or could fall under the duties of the full time pedestrian bicycle coordinator.	This could be a shared position funded by multiple agencies/partners, and/or could fall under the duties of the full-time pedestrian/bicycle coordinator	City of Columbia	USC, BPAC, CMCOG	ADA Coordinator staff person	Winter 2016 and ongoing	Designation of an ADA coordinator



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
	Develop an ADA Transition Plan	This plan will guide the City of Columbia through the process of updating its policies, design standards, and practices to meet the requirements of the 1990 Americans with Disabilities Act. The planning and adoption process should establish a grievance procedure for persons with disabilities to report issues, update design standards and policies to meet ADA requirements, and include a schedule and budget for the Transition Plan	City of Columbia Planning and Development Department	City of Columbia Traffic Engineering Department, BPAC	Adopted ADA Transition Plan	Spring 2017	Adopted ADA Transition Plan
ENGINEERING							
Increase Pedestrian Facility Mileage	Increase the pedestrian facility mileage in Columbia by implementing the priority sidewalk and trail projects identified in this plan	A larger, more connected pedestrian network will create more opportunities for walking in the community and support Columbia's application for WFC designation	City of Columbia Utilities and Engineering Department, City of Columbia Public Works Department	City of Columbia Planning and Development Department	Greater pedestrian network mileage to support WFC designation	Spring 2015 and ongoing	Number of new miles per year, percent increase per year
	Maintain an up-to-date inventory for sidewalks, curb ramps, and crosswalks	Using the City's existing prioritization process, fund new pedestrian infrastructure and maintenance projects over time	City of Columbia Traffic Engineering Department, City of Columbia Public Works	City of Columbia GIS	List of completed, funded, and unaddressed projects each year	Spring 2015 and ongoing	Number of new and maintained curb ramps, crosswalks, and miles of sidewalk per year
Increase Bicycle Facility Mileage	Increase the ratio of total bicycle network mileage to total road network mileage to 30%	Increase the centerline mileage of bicycle facilities to equal 30% or more of the total centerline mileage of the road network. 30% is the target ratio for Bicycle Friendly Communities seeking a Silver level designation from the LAB.	City of Columbia Utilities and Engineering Department	City of Columbia Planning and Development Department, City of Columbia Traffic Engineering, BPAC	Greater bicycle network mileage to support Silver level BFC designation	Spring 2015 and ongoing	Number of new miles per year, percent increase per year
	Increase the ratio of total bicycle network mileage to total road network mileage to 43%	Increase the centerline mileage of bicycle facilities to equal 43% or more of the total centerline mileage of the road network. 43% is the target ratio for Bicycle Friendly Communities seeking a Gold level designation from the LAB.	City of Columbia Utilities and Engineering Department	City of Columbia Planning and Development Department, City of Columbia Traffic Engineering, BPAC	Greater bicycle network mileage to support Gold level BFC designation	Spring 2017 and ongoing	Number of new miles per year, percent increase per year
Increase the Number of Arterial Streets with Bike Lanes	Increase the percentage of arterial streets that have bike lanes to 45%	Add bike lanes to arterial streets throughout Columbia. 45% is the target percentage for Bicycle Friendly Communities seeking a Silver level designation from the LAB.	City of Columbia Utilities and Engineering Department	City of Columbia Planning and Development Department, City of Columbia Traffic Engineering, BPAC	Greater percentage of arterial streets with bike lanes to support Silver level BFC designation	Spring 2015 and ongoing	Percent increase per year



Strategy/Program Title	Action Step	Description	Lead Agency	Supporting Partners	Deliverables/Outcome	Timeframe	Evaluation Metrics
	Increase the percentage of arterial streets that have bike lanes to 65%	Add bike lanes to arterial streets throughout Columbia. 65% is the target percentage for Bicycle Friendly Communities seeking a Gold level designation from the LAB.	City of Columbia Utilities and Engineering Department	City of Columbia Planning and Development Department, City of Columbia Traffic Engineering, BPAC	Greater percentage of arterial streets with bike lanes to support Gold level BFC designation	Spring 2017 and ongoing	Percent increase per year
Improve the Quantity and Quality of Bicycle Parking	Provide an option on the city website for citizens to request bike parking at a specific location.	Evaluate and respond to requests for new or improved bicycle parking.	City of Columbia IT Staff, City of Columbia Parking Services, City of Columbia GIS	City of Columbia Public Works Department	Functional, easy-to-use online form for requesting bicycle parking	Spring 2015 and ongoing	Updated, operational citizen request form
	Map bicycle parking locations throughout the city to identify areas where more bicycle parking is needed.	Identify destinations such as schools, parks, downtown, business districts, shopping centers, community centers, libraries, transit stops, trailheads, and other key locations that lack bicycle parking and track progress as new bicycle parking is installed.	City of Columbia Planning and Development Department, City of Columbia Parking Services	City of Columbia Traffic Engineering Department, City of Columbia Public Works Department	Up-to-date map of bicycle parking locations, list of locations in need of bicycling parking and the number/type of bike racks recommended	Fall 2015 and ongoing	Total number of bicycle parking spots within Columbia, number of new bicycle parking spots installed each year
	Install new bicycle parking and improve policies as described throughout this plan, including both short- and long-term bicycle parking options.	Evaluate the needs of bicyclists at each location to determine if short-term parking, long-term parking, or a combination of the two is most appropriate. Follow the bicycle parking design guidelines found in the Design Guidelines Appendix of this plan.	City of Columbia Planning and Development Department, City of Columbia Parking Services	City of Columbia Traffic Engineering Department, City of Columbia Public Works	New and improved bicycle parking for public use	Winter 2015 and ongoing	Improved policies for bicycle parking, accommodation of both short- and long-term bicycle parking options, number of new bicycle parking spots installed each year, total number of bicycle parking spots in Columbia over time
Implement a Citywide Bike Share System	Install and operate bike share stations at key locations throughout Columbia	Provide bike share stations to increase local bike trips and raise awareness of bicycling in Columbia	City of Columbia, CMOG, USC	City of Columbia, CMOG, USC	Operational bike share system with dedicated stations, bikes, and staff; designated bike share webpage for registration and information	Spring 2016 and ongoing	Number of bikes; number of trips; number of members
Develop a Citywide Pedestrian and Bicycle Wayfinding System	Plan and implement a pedestrian and bicycle wayfinding system that will direct users to popular destinations, on-street walking and bicycling routes, and trails.	Use directional signage, maps, kiosks, pavement markings, and other useful tools to create a comprehensive wayfinding package. This package should be implemented citywide so that pedestrians and bicyclists throughout town will benefit from clear markers and directional routing.	City of Columbia Planning and Development Department	City of Columbia Traffic Engineering Department, Parks & Recreation Department, City of Columbia GIS	Comprehensive wayfinding package with directional signs to destinations (with walking and bicycling times), maps, informational kiosks, and pavement markings.	Summer 2018 and ongoing	Number of signed/marked miles; number of informational kiosks/maps

**AN ADVANCED CITY IS
NOT ONE WHERE EVEN
THE POOR USE CARS,
BUT RATHER ONE WHERE
EVEN THE RICH USE
PUBLIC TRANSPORT.**



-- ENRIQUE PEÑALOSA,
MAYOR OF BOGOTÁ, COLUMBIA



APPENDIX A: DEMAND AND BENEFITS ANALYSIS DETAILED REPORT

Introduction

Walking and bicycling are gaining new interest from communities across the United States after decades of neglect in which a one-size-fits-all approach to roadway design focused on motor vehicle transportation. With low levels of funding and comparatively low mode share, walking and bicycling face an uphill battle to prove their utility as viable, efficient modes of transportation. Many of walking and bicycling's greatest strengths – such as improving community health through physical activity – are not accounted for when evaluating transportation projects. Quantifying these factors demonstrates the importance of walking and bicycling transportation and help compare benefits with costs.

The benefits created by walking and bicycling are directly linked to levels of use or activity. For each additional mile traveled by walking or bicycling instead of driving, about one pound of greenhouse gas emissions are prevented, a few less cents are spent on gas, and a person gets a few minutes closer to reaching their recommended healthy levels of physical activity for the week. People who bike and walk to work – which, according to 2010-2012 American Community Survey (ACS) data, is likely around 8,000 employees in Columbia every weekday – free up additional road area and parking spaces that are shared among the remainder of the population who drive and carpool.

When walking and bicycling rates increase, these associated benefits add up to create healthier and more affordable communities. Increasing bicycling and walking transportation increases physical activity in a community. Because walking and bicycling are transportation activities, they play a role in a person's set of daily behaviors, keeping a person physically active on a regular basis such as through daily commuting, but also trips to school, social visits or trips to the grocery store.

To calculate the current benefits of walking and bicycling in Columbia, the first step is to estimate existing levels of use.



Estimating Walking and Bicycling Activity

Introduction

A number of tools for measuring walking and bicycling activity exist, however, each falls short of establishing a complete picture current activity. The following section describes the strengths and weaknesses of the most commonly used tools, and presents a methodology for estimating activity across an entire community.

User Counts

User counts, typically conducted at points across the street network during peak travel hours, capture levels of walking and bicycling activity on street or paths during a short period of time. While user counts can be instructive in comparing relative levels of use between one street and another, they do not fully capture the spectrum of walking and bicycling activity happening across the community over the length of the year. Counts are well suited to studying where people walk and bike, but do not provide answers to other important questions, such as:

- What destinations are people walking and bicycling to, and where are they coming from?
- How far are they traveling?
- What is the purpose of their trip?
- How often do they make similar walking or bicycling trips?
- How often do they make other kinds of walking or bicycling trips?
- Do other residents also make similar types of trips by walking and bicycling, or do they typically travel by another mode?

Therefore, while user counts are a good tool for measuring walking and bicycling at a certain location, user surveys are needed to estimate the overall role of bicycling and walking in the transportation patterns of residents across the region.

User Surveys

Transportation user surveys often ask respondents about their perceptions – e.g., their feeling of safety on a street – and about their usual travel behavior. The American Community Survey (ACS), an ongoing survey conducted by the US Census Bureau, collects social, economic and demographic information from respondents, and includes a question on respondents’ commute to work. Sampling over 250,000 households per month, the ACS is the largest survey that asks Americans about their transportation habits, and the most widely available source of walking and bicycling data in communities. According to the 2010-2012 ACS , 0.42% of workers in Columbia bicycle to work, while 12.96% walk to work. These percentages are known as commute mode share; the percentage of a community’s population making their journey to work by a certain mode of transportation compared to all modes.

Although commute mode share data is able to capture wider information about walking and bicycling than user counts alone, work commutes are just one type of trip. Columbia residents make many other types of trips (to school, college, go shopping, etc.) by a variety of modes. Detailed household travel surveys can provide more information on travel patterns and help measure the full spectrum of walking and bicycling trips happening in the community.

HOUSEHOLD TRAVEL SURVEYS

Household travel surveys are usually conducted by phone, where an operator interviews each respondent using a detailed script to record a travel diary. To complete a travel diary, respondents are asked to recall all of their trips during a recent period of time, usually the last 24 hours or the previous full day. Detailed information is collected on the qualities of each trip, including the trip purpose, time of day, duration, length, mode, and other factors. By collecting this data from a large sample of people across the population, household travel surveys

can provide information on where, why, and how far people are walking and bicycling for transportation. Though a recent household travel survey for the Columbia is not available, national data from the 2009 National Household Travel Survey (NHTS 2009) can be used to estimate the number of other types of bicycling and walking trips being made in addition to work trips.



Estimating Overall Activity

EMPLOYED WORKERS AND ADULTS

Overall adult bicycling and walking activity can be estimated by combining available local data such as ACS commute mode share with national trip purpose information from NHTS 2009. On average, 1.6 utilitarian bicycle trips are made for every bicycle-to-work trip in the United States, and 4.3 utilitarian walk trips are made for every walk-to-work trip. An additional 3.9 social/recreational walking trip and 4.8 bicycling trips are made for each walking or bicycling commute trip, respectively (see Figure 1 and Figure 2). Assuming travel behavior in Columbia is similar to these national averages shows how walking and bicycling trips can add up beyond just commute trips, and provide a significant portion of the physical activity necessary to meet the health needs of the community.

COLLEGE STUDENTS

Student commute trips to school and college are estimated independently of ACS data, because the populations making those trips are substantially different from the employed workforce surveyed by ACS. National data on walking and bicycling college trip mode share from NHTS 2009 was used to represent trips to local colleges and universities like the University of South Carolina.

SCHOOL CHILDREN

National baseline K-8 school trip data from Safe Routes to School (SRTS) was used to estimate mode share for K-12 school trips such as those in Richland County School District One or other local school systems. For each type of trip, average trip distance applied to estimate the total distance traveled by walking and bicycling. National average trip distance multipliers are sourced from NHTS and SRTS, ranging from 0.36 miles for the K-12 walk to school to 3.54 miles per adult bike commute trip.

FIGURE 1 - RATIO OF BICYCLE-TO-WORK TRIPS TO OTHER BICYCLE TRIPS (SOURCE: NHTS 2009)

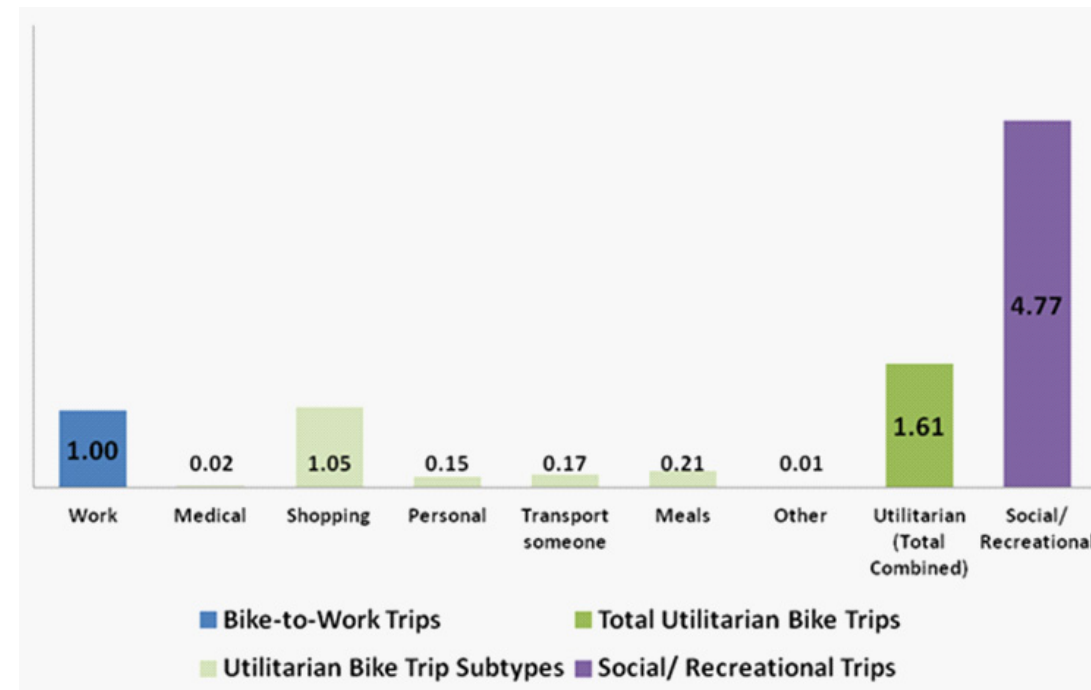
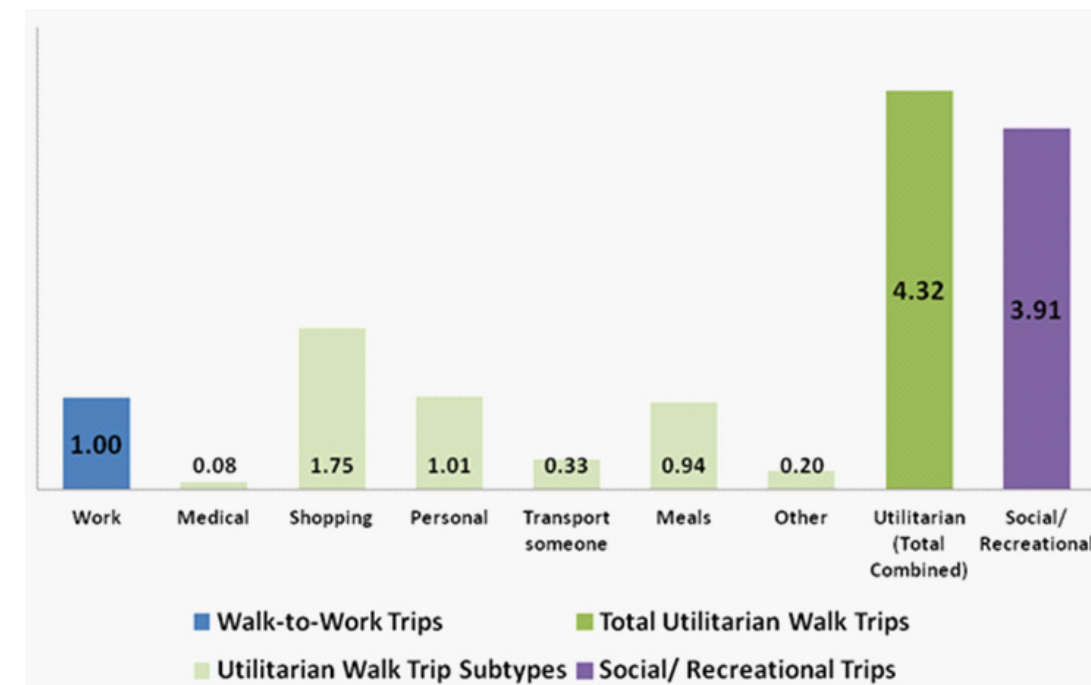


FIGURE 2 - RATIO OF BICYCLE-TO-WORK TRIPS TO OTHER BICYCLE TRIPS (SOURCE: NHTS 2009)





BICYCLING AND WALKING ACTIVITY
ESTIMATE REFERENCES AND METHODOLOGY

Figure 3 provides a visual depiction of the steps used to translate local and national transportation data into an annual estimate of bicycling and walking activity currently happening in Columbia.

The scale of health benefits created by bicycling and walking are based on the number of people using walking and bicycling for transportation, the rate at which they walk and bike, and the distance they travel using active transportation. By multiplying estimates of overall bicycling and walking trips with average trip distances and normal travel speeds, these data can be used to estimate quantities of physical activity generated by current transportation behaviors in the community at large.

FIGURE 3 - COLOMBIA EXISTING WALKING AND BICYCLING OVERALL ACTIVITY ESTIMATE METHODOLOGY

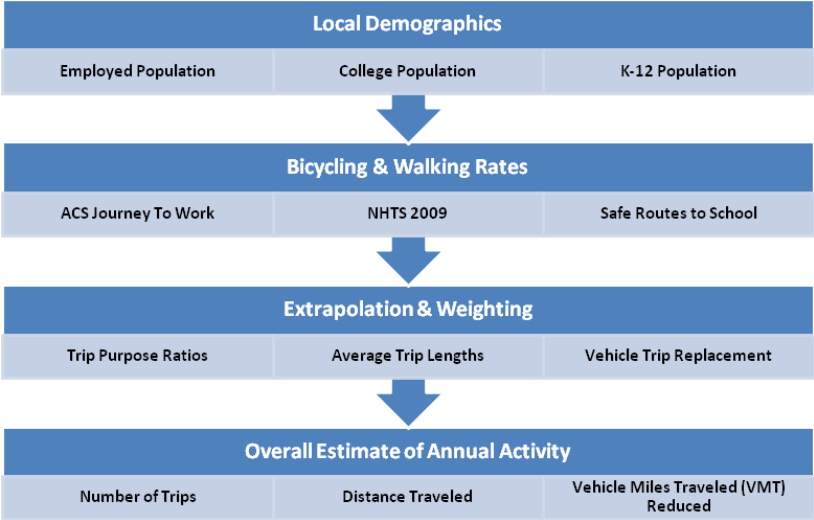


TABLE 1 – BICYCLING AND WALKING ACTIVITY ESTIMATION REFERENCES - TRIP PURPOSE MULTIPLIERS

Overall Bike/Walk Activity Extrapolation - Trip Purpose Multipliers		
Factor	Value	Source/Note
Commuter Trip Mode Share		
- Bike:	0.42%	ACS 2010-12
- Walk:	12.96%	ACS 2010-12
College Trip Mode Share		
- Bike:	1.67%	NHTS 2009
- Walk:	6.82%	NHTS 2009
School Trip Mode Share (K-12)		
- Bike:	1.00%	SRTS Baseline, 2010
- Walk:	13.35%	SRTS Baseline, 2010
Utilitarian Trip Multiplier		
- Bike:	1.61%	NHTS 2009 (avg. number of utilitarian trips per commute)
- Walk:	4.32%	NHTS 2009 (avg. number of utilitarian trips per commute)
Social/Recreational Trip Multiplier		
- Bike:	4.77%	NHTS 2009 (avg. number of soc./rec. trips per commute trip)
- Walk:	3.91%	NHTS 2009 (avg. number of soc./rec. trips per commute trip)

* 2009 National Household Travel Survey (<http://nhts.ornl.gov/det/Extraction3.aspx>)

** Safe Routes to School Travel Data: A Look at Baseline Results. National Center for Safe Routes to School, 2010 (http://www.sacog.org/complete-streets/toolkit/files/docs/NCSRTS_SRTS%20Travel%20Data.pdf).



TABLE 2 – BICYCLING AND WALKING ACTIVITY ESTIMATION REFERENCES - TRIP DISTANCE MULTIPLIERS

Overall Bike/Walk Activity Extrapolation - Trip Purpose Multipliers		
Factor	Value	Source/Note
Commute Trip Distance (miles)		
- Bike:	3.54	NHTS 2009
- Walk:	0.67	NHTS 2009
College Trip Distance (miles)		
- Bike:	2.09	NHTS 2009
- Walk:	0.48	NHTS 2009
School Trip Distance (K-12)		
- Bike:	0.77	SRTS Baseline, 2010
- Walk:	0.36	SRTS Baseline, 2010
Utilitarian Trip Distance (miles)		
- Bike:	1.89	NHTS 2009
- Walk:	0.67	NHTS 2009
Social/Recreational Trip Distance (miles)		
- Bike:	2.20	NHTS 2009
- Walk:	0.78	NHTS 2009

TABLE 3 – BICYCLING AND WALKING ACTIVITY ESTIMATION REFERENCES - ANNUAL MULTIPLIERS

Overall Bike/Walk Activity Extrapolation - Trip Purpose Multipliers		
Factor	Value	Source/Note
Annual Work Days	251	261 Weekdays - 10 Federal Holidays
Annual College Class Days	150	Assumes two 15-week semesters/three 10-weel quarters
Annual K-12 School Days	180	South Carolina state minimum*

* Number of Instructional Days/Hours in the School Year, Education Commission of the States, 2008 (<http://www.ecs.org/html/Document.asp?chouseid=7824>).



Physical Activity Benefits of Active Transportation

Introduction

Current levels of bicycling in Columbia are just slightly lower than the national average, at 0.42%, but walking rates are some of the highest in the country at nearly 13%.

Together walking and bicycling activity in Columbia returns significant benefits to the region. The Centers for Disease Control and Prevention (CDC) recognizes bicycling and walking are common activities that people can participate in to be physically active and increase their health. By walking and bicycling for transportation, Columbia residents can incorporate meaningful physical activity into their daily schedule. Exercise from bicycling and walking transportation typically falls under moderate intensity physical activity (see Table 4).

TABLE 4 – BICYCLING AND WALKING ACTIVITY ESTIMATION REFERENCES - TRIP PURPOSE MULTIPLIERS

Moderate Intensity
- Walking Briskly (3 miles per hour or faster, but not race-walking)
- Water aerobics
- Bicycling slower than 10 miles per hour
- Tennis (doubles)
- Ballroom dancing
- General gardening

Vigorous Intensity
- Race-walking, jogging, or running
- Swimming laps
- Tennis (singles)
- Aerobic dancing
- Bicycling 10 miles per hour or faster
- Jumping rope
- Heavy gardening (continuous digging or hoeing)
- Hiking uphill or with a heavy backpack

For many Columbia residents, meeting the CDC’s recommended minimum guideline of 150 minutes of moderate intensity physical activity per week could be as simple as commuting or making daily errands by walking and bicycling. A walk commute of three quarters of a mile each way, or a bicycle commute of 2.5 miles each way, five times per week, is sufficient to meet the CDC’s recommended guideline.

Current levels of bicycling and walking transportation already make a significant contribution to the overall level of physical activity and health of residents in the community. Using the estimates of annual bicycling and walking activity using the methodology described above, **Columbia residents bike and walk a combined 40 million trips annually, traveling a total of 30 million miles. This translates into about 9 million hours of moderate intensity physical activity annual from walking and bicycling** (see Table 6, Table 7 and Table 8).

TABLE 5 - EXAMPLE PHYSICAL ACTIVITY BENEFITS FROM DAILY ACTIVE TRANSPORTATION

Example Physical Activity Benefits from Active Transportation			
Active Transportation Mode	Commute Distance (miles, round trip)	Assumed Speed	Weekly Minutes of Exercise (assumes 5 day work week)
Walking	1.5	3 mph	150
Bicycling	5.0	10 mph	150
CDC recommended weekly physical activity (minutes)			150

TABLE 6 - COLUMBIA ESTIMATED ANNUAL ACTIVE TRANSPORTATION TRIPS

Columbia Estimated Physical Activity Benefits of Active Transportation	
Estimated Annual Walking Trips	38,546,736
Commute walking trips	4,029,554
Utilitarian walking trips	17,421,580
K-12 walking trips	815,963
College commute walking trips	515,215
Social/recreational walking trips	15,764,424
Estimated Annual Bicycling Transportation Trips	1,161,821
Commute walking trips	132,023
Utilitarian walking trips	212,709
K-12 walking trips	61,121
College commute walking trips	126,469
Social/recreational walking trips	629,497
CDC recommended weekly physical activity (minutes)	39,708,557



TABLE 7 - COLUMBIA TRANSPORTATION PHYSICAL ACTIVITY BENEFITS - DISTANCE TRAVELLED

Columbia Estimated Physical Activity Benefits of Active Transportation		
Estimated Annual Miles Walked	Average Distance (miles)	Total Annual Distance (miles)
Commute walking trips	0.67	2,699,801
Utilitarian walking trips	0.67	11,614,445
K-12 school walking trips	0.36	289,765
College commute walking trips	0.48	247,299
Social/recreational walking trips	0.78	12,250,882
Walking Subtotal	-	27,108,191
Estimated Annual Miles Biked	Average Distance (miles)	Total Annual Distance (miles)
Commute bicycling trips	3.54	467,372
Utilitarian bicycling trips	1.89	402,727
K-12 school bicycling trips	0.77	46,939
College commute bicycling trips	2.09	263,918
Social/recreational bicycling trips	2.20	1,384,412
Bicycling Subtotal	-	2,565,369
Estimated Annual Miles Traveled Using Active Transportation		29,667,560

TABLE 8 - COLUMBIA ACTIVE TRANSPORTATION PHYSICAL ACTIVITY BENEFITS - HOURS OF ACTIVITY

Columbia Estimated Physical Activity benefits of Active Transportation			
Active Transportation mode	Distance Traveled (miles)	Assumed Speed	Total Hours of Exercise
Walking Trips	27,102,191	3 mph	9,034,064
Bicycling Trips	2,565,369	10 mph	256,537
Total	29,667,560	-	9,290,601



Potential Increased Benefits

Columbia is taking steps to improve the accessibility, safety, and quality of the walking and bicycling environment. The League of American Bicyclists has recognized Columbia as a Bronze Bicycle Friendly Community (BFC) since 2008. The city’s new movement toward investing in bicycling and walking network improvements is starting to show results, and further improvements that increase walking and bicycling rates could return greater annual health benefits to the community.

Other cities awarded BFC designation can provide a valuable reference point for setting goals and creating a vision for what role bicycling could play in the future. Around the state, five other cities, 16 businesses, and two universities have achieved Bicycle Friendly status from the League of American Bicyclists. Many BFCs have reputations for their livability and the quality of their walking environment in addition to bicycling, providing examples for how active transportation can help create healthier, livable communities. Table 9 shows existing walking and bicycling rates in Columbia compared to other, similarly sized Bronze- and Silver-level BFC cities. It is also worth noting that, while there are currently no communities in South Carolina designated as a Walk Friendly Community (a program begun in 2010 and administered by the UNC Highway Safety Research Center’s Pedestrian and Bicycle Information Center.), the following peer cities have earned the designation at the level noted:

- Tallahassee, FL: Silver
- Fort Collins, CO: Bronze
- Charlottesville, VA: Gold

The League of American Bicyclists reports that BFC-awarded cities have seen 80% growth in bicycling between 2000 and 2011. Although many Bronze-level BFC cities in the South have bicycle commuting rates similar to the national average, the average Silver-level bike friendly community has bicycling rates several times the national average. In these communities, commute mode choice data from ACS shows that many residents are able to get regular exercise by walking and bicycling for transportation.

TABLE 9 - COMPARISON WALKING AND BICYCLING RATES

Peer City Bicycling and Walking Rate Comparisons						
Geography	BFC Level	Population	Employed Population	Bicycle Mode Share	Walk Mode Share	Transit Mode Share
United States	-	306,603,772	139,488,206	0.53%	2.83%	4.99%
Tallahassee, FL	Bronze	184,079	86,782	0.86%	3.39%	2.22%
Fort Collins, Colorado	Platinum	146,235	75,098	6.39%	3.82%	1.55%
Columbia, South Carolina	Bronze	130,596	61,915	0.42%	12.96%	1.75%
Charleston, South Carolina	Bronze	123,226	62,300	2.52%	5.55%	2.92%
Athens & Clarke County, Georgia	Bronze	117,331	49,342	2.14%	5.72%	2.95%
Portsmouth, Virginia	Bronze	95,915	41,095	0.55%	3.92%	2.02%
Charlottesville, Virginia	Silver	43,644	20,773	3.29%	11.32%	8.21%

Population and modeshare data obtained from 2012 American Community Survey 3-year Estimates



If bicycling rates in Columbia could grow similarly to BFC cities, health and other benefits to the city would increase significantly. Table 10 and Table 11 explore the potential benefits of increased bicycling rates in Columbia at several example increased rates.

TABLE 10 - POTENTIAL AIR QUALITY AND MONETIZED BENEFITS OF INCREASED BICYCLING IN COLUMBIA

Columbia Potential Annual Bicycle Benefits			
	Current	Double Current Bike Mode Share	Example Silver BFC (Charlottesville)
Bicycle Commute Mode Share	0.42%	0.84%	3.29%
Annual VMT Reduced	846,000	1,690,000	6,630,000
Air Quality			
CO2 Emissions Reduced (pounds)	688,000	1,380,000	5,390,000
Other Vehicle Emissions Reduced (pounds)	27,000	54,000	212,000
Total Vehicle Emissions Costs Reduced	\$20,000	\$40,000	\$157,000
Social Benefits			
Reduced Traffic Congestion Costs	\$42,000	\$84,000	\$329,000
Reduced Vehicle Crash Costs	\$304,000	\$610,000	\$2,380,000
Reduced Road Maintenance Costs	\$127,000	\$250,000	\$990,000
Individual Benefits			
Household Vehicle Operation Cost Savings	\$478,000	\$960,000	\$3,740,000
Health Care Cost Savings from Physical Activity	\$98,000	\$196,000	\$770,000
Total Benefits:	\$1,069,000	\$2,140,000	\$8,370,000

Note: Estimates reflect conceptual benefits that would be generated at given increases in bicycle use as if they existed in Columbia today. Values are rounded for readability. Values are not discounted and do not reflect future demographic growth, cost changes or other multiplier changes.

TABLE 11 - POTENTIAL PHYSICAL ACTIVITY BENEFITS OF INCREASED BICYCLING IN COLUMBIA

Columbia Potential Annual Bicycle Benefits			
	Current	Double Current Bike Mode Share	Example Silver BFC (Charlottesville)
Bicycle Commute Mode Share	0.42%	0.84%	3.29%
Annual Bicycling Trips	1,160,000	2,320,000	8,980,000
Annual Miles Biked	2,570,000	5,140,000	19,890,000
Annual Hours of Physical Activity	300,000	600,000	2,320,000

Note: Estimates reflect conceptual benefits that would be generated at given increases in walking use as if they existed in Columbia today. Values are rounded for readability and do not reflect future demographic growth or other multiplier changes.



Bicycling rates are typically more responsive to changes in transportation infrastructure than walking. While national bicycling rates have trended upward for the last decade – growing nearly 50% over that time –walking rates are still declining slowly at the national level. Because walking is heavily dependent on the availability of short trips – generally under one mile – walking is more dependent on factors, such as land use, that are slow to change. It is quicker to build a bike boulevard or install a cycle track than it is to incent walkable, mixed-use development, which is dependent on private developers and the health of the real estate market. Bicycling rates in Columbia are therefore more likely to increase at a faster relative rate than walking, and may hold greater short-term potential for creating health benefits to the region. Table 12 and Table 13 below show the benefits of walking at example increased rates; it may be challenging to increase walking rates to levels shown, since current walking rates in Columbia are already among the highest in the nation.

TABLE 12 - POTENTIAL AIR QUALITY AND MONETIZED BENEFITS OF INCREASED WALKING IN COLUMBIA

Columbia Potential Annual Bicycle Benefits			
Walk Commute Mode Share (key activity indicator)	Current 13.0%	Example 2% Walk Mode Share Increase 15.0%	Example 4% Walk Mode Share Increase 17.0%
Annual VMT Reduced	11,846,000	13,670,000	15,500,000
Air Quality			
CO2 Emissions Reduced (pounds)	9,637,000	11,120,000	12,610,000
Other Vehicle Emissions Reduced (pounds)	384,000	440,000	500,000
Total Vehicle Emissions Costs Reduced	\$276,000	\$320,000	\$360,000
Social Benefits			
Reduced Traffic Congestion Costs	\$598,000	\$84,000	\$329,000
Reduced Vehicle Crash Costs	\$4,265,000	\$4,920,000	\$5,580,000
Reduced Road Maintenance Costs	\$1,777,000	\$2,050,000	\$2,330,000
Individual Benefits			
Household Vehicle Operation Cost Savings	\$6,693,000	\$7,730,000	\$8,760,000
Health Care Cost Savings from Physical Activity	\$1,213,000	\$1,400,000	\$1,590,000
Total Benefits:	\$14,815,000	\$17,100,000	\$19,400,000

Note: Estimates reflect conceptual benefits that would be generated at given increases in walking use as if they existed in Columbia today. Values are rounded for readability. Values are not discounted and do not reflect future demographic growth, cost changes or other multiplier changes.

TABLE 13 - POTENTIAL PHYSICAL ACTIVITY BENEFITS OF INCREASED WALKING IN COLUMBIA

Columbia Potential Annual Bicycle Benefits			
Walking Commute Mode Share	Current 12.96%	Example 2% Walk Mode Share Increase 14.96%	Example 4% Walk Mode Share Increase 16.96%
Annual Bicycling Trips	38,550,000	44,500,000	50,440,000
Annual Miles Biked	27,100,000	31,280,000	35,460,000
Annual Hours of Physical Activity	9,000,000	10,390,000	11,780,000

Note: Estimates reflect conceptual benefits that would be generated at given increases in walking use as if they existed in Columbia today. Values are rounded for readability and do not reflect future demographic growth or other multiplier changes.



Key Findings

The demand analysis reveals that Columbia residents are already walking, biking, and accessing transit with a combined total of 40 million trips annually. This equates to a total of 30 million miles traveled by bike or on foot each year and about 9 million hours of moderate intensity physical activity.

When translating existing demand into measurable benefits to the Columbia community, the analysis reveals that **Columbia is already realizing over \$1 million in community-wide benefits from existing bicycling activity, and over \$14 million in community-wide benefits from existing walking activity.** With incremental increases in mode share for bicycling and walking, those monetary benefits will grow exponentially, equating to a significant return on investment when it comes to bicycling and walking infrastructure, policies, and programs.

By doubling the current bicycling mode share and increasing walking rates by two percentage points, Columbia could increase those benefits to more than \$19 million in community-wide impact. **By reaching the bicycling mode share of a peer Silver-level Bicycle Friendly Community and increasing walking mode share by a total of four percentage points, Columbia could realize an estimated \$27.7 million in economic benefits resulting from bicycling and walking activity,** nearly doubling the current estimated benefits.





APPENDIX B: BFC AND WFC ASSESSMENT

Introduction

The Bicycle Friendly Community (BFC) and Walk Friendly Community (WFC) programs are two national initiatives designed to encourage cities and towns across the country to improve the bicycling and walking environments in their communities and to recognize communities that are successfully doing so. The programs provide communities with invaluable resources related to bicycle and pedestrian planning, help communities identify projects and programs to improve the bicycling and walking environment, and also generate positive media attention at the national and local level for communities that earn a designation.

The BFC program is administered by the League of American Bicyclists, a national bicycling advocacy organization based in Washington, D.C. Since the program began, the League has awarded over 300 communities with “bicycle-friendly” status. There are currently 6 BFCs in South Carolina. In 2011, the Pedestrian and Bicycle Information Center, based in Chapel Hill, North Carolina, announced the development of the WFC Program. There are currently 47 “walk-friendly” designated communities around the country, but none yet in South Carolina.

Both the WFC and BFC program use the five “E’s” of bicycle and pedestrian planning as the framework for identifying successful biking and walking communities. The five “E’s” are: Engineering, Encouragement, Education, Enforcement, and Evaluation. Each program has its own detailed questionnaire that a city or town must complete online in order to apply for recognition. Five levels of award designation are possible in the BFC program: Bronze, Silver, Gold, Platinum, and Diamond. The WFC program offers four award levels: Bronze, Silver, Gold, and Platinum. Both programs offer an Honorable Mention category, as well.

In 2008, Columbia applied for BFC designation and received a Bronze level award. Columbia is one of five Bronze level communities in South Carolina, alongside Charleston, Greenville, Spartanburg, and Rock Hill. Hilton Head is the only Silver level community in the state; no South Carolina communities have reached Gold, Platinum, or Diamond BFC designation. There are two opportunities each year to apply to both the BFC and WFC programs: BFC deadlines are in the spring and fall of each year, and WFC deadlines are in the summer and winter of each year.

As part of the scope of this project, Walk Bike Columbia will include a BFC Action Plan to set clear action steps for Columbia to reach Gold level BFC status. This project will also involve completing and submitting Columbia’s WFC application in the spring of 2015, along with a WFC Action Plan for Columbia to become the first Walk Friendly Community in the state.



BFC Assessment

The BFC application involves a detailed list of questions organized around the 5 “E’s”. The following scorecard uses this application framework to evaluate the current bicycling environment in Columbia. This scorecard is not intended to be a complete picture of BFC-readiness, but rather a useful snapshot of Columbia’s strengths and weaknesses based on our understanding of the selection criteria.

The BFC scorecard shows that:

- Columbia has a strong collection of Education and Encouragement efforts to develop a safer and more welcoming bicycling environment.
- Some Engineering and Enforcement initiatives promote bicycle safety, convenience, and comfort, but several policies and programs are lacking in these categories that could further improve Columbia’s bicycling environment.
- Columbia scores weakest on Evaluation & Planning; this planning process, the Bicycle and Pedestrian Advisory Committee, and the Safe Streets Save Lives Campaign provide a good foundation, but there is room for improvement. In particular, the City currently lacks a dedicated bicycle coordinator position and long-term tracking of valuable bicycle-related data, such as crashes, motor vehicle traffic volumes and speeds, and bicycle counts to target improvements and track progress.

With a total score of 18.5 out of 29 possible points, the City of Columbia shows its commitment to maintaining its BFC status and potential for a Silver level designation within the near-term. A higher range of points are needed to evidence a likelihood of attaining Silver (20-24) or Gold (25-29) level status.

TABLE 14 - BICYCLE FRIENDLY COMMUNITY SCORECARD FOR THE CITY OF COLUMBIA

Engineering	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Does Columbia have a complete streets policy or other policy that requires the accommodation of pedestrians and cyclists in all new road construction and reconstruction projects?				Adopted July 21, 2010 by resolution R2010-054.
Does Columbia have guidelines for bicycle facility design or provide regular training to engineers and planners regarding bicycle facility design?				FHWA/NHI training course, APBP webinars, send staff to training/conferences, NACTO Urban Bikeway Design Guide adoption. Design manual under development.
Does your community have a comprehensive, connected and well-maintained bicycling network?				75 miles of off-road facilities. 19 miles of bike lanes, 0.5 miles of sharrows, 20 miles of bike routes out of 740 total road miles.
Is bike parking readily available throughout the community?				The City does not currently have comprehensive bike parking requirements, but is installing bike corrals in key locations.
Are all bridges accessible to bicyclists?				Some bridges are unsafe or inaccessible to bicyclists.
Does the City employ traffic calming measures to slow motor vehicle traffic on city streets (such as road diets, ≤ 20 mph speed limits, speed tables, etc.)?				Traffic calming has been implemented in some neighborhoods in the city.
Are all public transit buses equipped with front-mounted bike racks?				All public buses are equipped with bike racks (USC buses are not).
Does Columbia have a citywide bicycle way-finding system?				Palmetto Trail signage guides user through the City and a pilot way-finding program is planned for the Vista Greenway.
Engineering Score Total				5.8/8



Education & Encouragement	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Has Columbia implemented Safe Routes to School (SRTS) programs in elementary and middle schools within the last 18 months? Does it include bicycle education?				51-75% of elementary schools & 26-50% of middle schools have SRTS programs with bicycle education.
Are adult bicycling education and skills courses regularly offered in Columbia?				Traffic Skills 101 class, cycling skills classes, commuter classes, bicycle maintenance classes.
Has Columbia implemented a program in the last 18 months to educate motorists, pedestrians and cyclists on their rights and responsibilities as road users (e.g., as part of drivers education curriculum, test, manual, or bus driver training)?				Safe Streets Save Lives Campaign, public service announcements, Share the Road videos and signage, dedicated page on City website.
Does Columbia have an up-to-date bicycle map available online and in print?				
Does Columbia celebrate bicycling during National Bike Month with community rides, Bike to Work Day or media outreach?				Bike to Work Day, mayor-led ride, public education and outreach.
Is there an active bicycle advocacy group in Columbia?				Palmetto Cycling Coalition, Columbia BPAC, Palmetto Conservation Foundation, Friends of Harbison State Forest, USC Bike Advisory Committee.
Has Columbia implemented any education and training programs related to bicycle education or safety for city staff?				Bicycle education through Bike to Work Day, safety materials distributed during Bike Month.
Does Columbia have an active bicycle club?				Carolina Cyclers, Midlands SORBA, Summit Cycles Riders, Outspokin' Ride Group.
Does Columbia host any signature events that promote bicycling (such as car-free streets)?				Weekly bike rides, family rides, races, charity rides, parades, workshops, guided trail rides.
Does Columbia have recreational bicycle facilities such as bike parks, greenway trails, mountain bike trails, and velodromes?				20 miles of paved shared use paths, Vista Greenway, 30 miles of natural surface paths, 25 miles of singletrack.
Does Columbia have a ticket diversion program (i.e., where road users who receive a traffic citation can waive their fines by attending a bicycle and pedestrian education course)?				
Education & Encouragement Total				8.5/11



Enforcement	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Does Columbia have Traffic Safety officers that are trained in traffic law as it applies to bicyclists?				Law Enforcement Bicycle Association training, Smart Cycling course, LCI class.
Does Columbia have law enforcement or other public safety officers on bikes?				1-10% of officers patrol on bikes.
Does Columbia have laws in place that protect bicyclists, such as penalties for motorists who fail to yield to a cyclist when turning, or a ban on cell phone use while driving?				It is illegal to park or drive in a bike lane, penalties for motorists that “door” cyclists, safe passing distance law, ban on texting while driving.
Do police work regularly with traffic engineers and planners to review sites in need of safety?				
Enforcement Total				2/4

Evaluation & Planning	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Is there an active Bicycle Advisory Committee that meets regularly?				The Bicycle Pedestrian Advisory Committee meets monthly.
Is there a specific plan or program to reduce cyclist/motor vehicle crashes?				Safe Streets Save Lives Campaign, BPAC efforts.
Does Columbia conduct regular bicycle counts and/or surveys for long-term benchmark analysis of bicycling mode share?				Columbia will undertake its first bicycle and pedestrian counts as part of Walk Bike Columbia.
Does Columbia collect data related to bicycle-vehicle crashes, traffic volumes, and motor vehicle speeds on existing or future corridor improvement projects?				This process will be started by the bicycle and pedestrian plan under development.
Does Columbia have a bicycle master plan that is being implemented?				Under development.
Do you have a full-time Bicycle Coordinator or staff person responsible for bicycle-related issues?				About 10% of the Planning Administrator’s time is devoted to bicycling issues.
Enforcement Total				2.5/6
Bicycle Friendly Total				18.5/29



WFC Assessment

The WFC application involves a detailed list of questions organized around the 5 “E’s”. The following scorecard uses this application framework to evaluate the current walking environment in Columbia. This scorecard is not intended to be a complete picture of WFC-readiness, but rather a useful snapshot of Columbia’s strengths and weaknesses based on our understanding of the selection criteria.

Based on the WFC scorecard:

- Columbia has been **successful at implementing a variety of Education & Encouragement programs** related to walking.
- **Some Engineering and Enforcement practices and policies are positively influencing the walking environment**, while others currently limit pedestrian activity and safety.
- **Evaluation & Planning for pedestrians is the area most in need of improvement.** The City currently lacks a dedicated pedestrian coordinator position, a full range of planning initiatives and policies related to pedestrian safety and accessibility, and long-term tracking of valuable pedestrian-related data such as crashes, motor vehicle traffic volumes and speeds, and pedestrian counts to target improvements and track progress.

With a total score of 15 out of 32 possible points, the City of Columbia is identified as a candidate for Bronze level WFC status. A higher range of points are needed to evidence a likelihood of attaining Silver (19-25) or Gold (26-32) level status.

TABLE 15 - WALK FRIENDLY COMMUNITY SCORECARD FOR THE CITY OF COLUMBIA

Engineering	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Does Columbia have a complete streets policy or other policy that requires the accommodation of pedestrians and cyclists in all new road construction and reconstruction projects?				Adopted July 21, 2010 by resolution R2010-054.
Does Columbia have guidelines for pedestrian facility design or provide regular training to engineers and planners regarding pedestrian facility design?				FHWA/NHI training course, APBP webinars, send staff to training/conferences. Design manual under development.
Does Columbia have a connected network of sidewalks, trails, and/or paths in the city?				The City has 391 miles of sidewalk along 740 total road miles, plus 20 miles of paved shared use paths and 30 miles of natural surface paths, but there are still major gaps in the sidewalk network.
Does Columbia have a sidewalk condition and curb ramp inventory process?				
Are all bridges accessible to pedestrians?				Some bridges are unsafe or inaccessible to pedestrians.
Are crosswalks provided at all street intersections and at areas with high demand for pedestrian traffic?				Some street intersections and areas with high pedestrian demand lack crosswalks.
Are accommodations for persons with disabilities, such as curb ramps or audible signals, provided throughout Columbia?				Curb ramps are provided at some intersections. Audible signals are lacking.
Does the City employ traffic calming measures to slow motor vehicle traffic on city streets (such as road diets, ≤20 mph speed limits, speed tables, etc.)?				Traffic calming has been implemented in some neighborhoods in the city.
Engineering Score Total				4.5/8



Education & Encouragement	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Has Columbia implemented Safe Routes to School (STRS) programs elementary and middle schools within the last 18 months? Does it include pedestrian education?				51-75% of elementary schools & 26-50% of middle schools have SRTS programs with bicycle education.
Has Columbia implemented a program within the last 18 months to educate motorists, pedestrians and cyclists on their rights and responsibilities as road users (e.g., as part of drivers education curriculum, test, manual, or bus driver training)?				Safe Streets Save Lives Campaign focuses on bicyclist safety, but also benefits pedestrians. The BPAC promote pedestrian safety through education initiatives, recommendations, and programs.
Does Columbia celebrate walking with International Walk to School Day, regular walking events, Walk to Work Day, or media outreach?				National Walk @ Lunch Day Event.
Is there an active pedestrian advocacy group in Columbia?				Columbia BPAC, Palmetto Conservation Foundation, Friends of Harbison State Forest, Eat Smart Move More.
Has Columbia implemented any education and training programs related to pedestrian education or safety for city staff?				
Does Columbia promote the health and environmental benefits of walking?				Eat Smart Move More Obesity Summit, National Walk @ Lunch Day.
Does Columbia offer walking route maps, guides, or tours for residents and visitors?				Self-guided walking tours, historic tours, guided neighborhood tours, trail maps.
Does Columbia host any events that promote walking (such as car-free streets)?				Fun runs and walks, Walk @ Lunch Day, marathon races, parades, guided hikes.
Does Columbia have a ticket diversion program (i.e., where road users who receive a traffic citation can waive their fines by attending a bicycle and pedestrian education course)?				
Education & Encouragement Total				5.5/9

Education & Encouragement	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Does Columbia have Traffic Safety officers that are trained in traffic law as it applies to pedestrians?				Columbia Police Department Traffic Safety Unit, Crossing Guard Unit.
Does Columbia use targeted enforcement programs to promote pedestrian safety in crosswalks (such as a “crosswalk sting”, media campaign regarding pedestrian-related laws, progressive ticketing, etc.)?				
Does Columbia have a systematic strategy for selecting locations and countermeasures for traffic and pedestrian safety?				Traffic study and traffic calming request program.
Do police work regularly with traffic engineers and planners to review sites in need of safety?				
Enforcement Total				1.5/4



Education & Encouragement	Yes (1 pt)	Partial (0.5 pt)	No (0 pt)	Description
Is there a Pedestrian Advisory Committee that meets regularly?				The Bicycle Pedestrian Advisory Committee meets monthly.
Is there a specific plan or program to reduce pedestrian/motor vehicle crashes in Columbia?				Safe Streets Save Lives Campaign, BPAC efforts.
Does Columbia conduct regular pedestrian counts and/or surveys for long-term benchmark analysis of walking mode share?				Columbia will conduct its first bicycle and pedestrian counts as part of Walk Bike Columbia.
Does Columbia collect data related to pedestrian-vehicle crashes, traffic volumes, and motor vehicle speeds on existing or future corridor improvement projects?				This process will be started by the bicycle and pedestrian plan under development.
Does Columbia have a pedestrian master plan or pedestrian safety action plan?				Under development.
Does Columbia have a trails plan?				Multiple trail planning and development efforts exist and are being reflected in the current master planning process.
Does Columbia have a trails plan?				Multiple trail planning and development efforts exist and are being reflected in the current master planning process.
Has Columbia adopted an ADA Transition Plan for the public right of way?				
Does Columbia have a policy requiring sidewalks on both sides of arterial streets?				
Has Columbia established a connectivity policy, pedestrian-friendly block length standards, and connectivity standards for new developments, or convenient pedestrian access requirements?				Columbia requires that new student housing developments provide sidewalks, but broader policies are not in place.
Does Columbia have a full-time Pedestrian Coordinator or staff person responsible for pedestrian-related issues?				About 10% of the Planning Administrator's time is devoted to pedestrian issues.
Is Columbia served by public transportation?				
Evaluation & Planning				3.5/11
Walk Friendly Total				15/32





APPENDIX C: PLANNING, POLICY, AND MUNICIPAL CODE REVIEW

This section provides a summary of the planning, policy, and municipal code review completed as it relates to bicycle, pedestrian, and transit-related efforts in Columbia.



Review of Existing Planning Efforts

Introduction

This section provides a summary of bicycle, pedestrian, and transit planning-related efforts in Columbia. Twenty relevant plans were reviewed for information and recommendations relevant to walking and bicycling. The documents reviewed for this Plan are listed in Table 16 and described on the following pages.

TABLE 16 - THE BACKGROUND DOCUMENT REVIEW INCLUDED AN ASSESSMENT OF PLANNING DOCUMENTS RELATED TO BICYCLE AND PEDESTRIAN PLANNING

Plan	Agency	Year
Columbia Owens Master Plan	South Columbia Development Corporation and Columbia Empowerment Zone	2002
A Plan for the Redevelopment of East Central City	East Central City Consortium, City of Columbia	2004
The Master Plan for The Villages of North Columbia	City of Columbia	2005
Five Points “FutureFive” Redevelopment and Master Plan	The Five Points Association	2006
Lower Waverly Catalyst Redevelopment Plan	City of Columbia Planning Department	2006
Bike and Pedestrian Pathways Plan	Central Midland Council of Governments (CMCOG)	2006
Central Midlands Commuter Rail Feasibility Study	CMCOG	2006
Innovista Master Plan	University of South Carolina, City of Columbia	2007
Midlands Tomorrow Household Travel Survey Report	CMCOG	2007
Midlands Tomorrow – 2035 Long Range Transportation Plan	CMCOG	2008
South Carolina Statewide Multimodal Transportation Plan – At a Crossroads	South Carolina Department of Transportation (SCDOT)	2008
The Columbia Plan: The Comprehensive Plan for Columbia, South Carolina, 2008-2018	City of Columbia Planning Department	2008
Southeast Lower Richland Sub-Area Transportation Study	CMCOG	2008
Columbia Area Transportation Study Transportation Improvement Program	CMCOG	2009
Regional Pathways Plan	CMCOG	2010
University of South Carolina Vision for a Sustainable Future: 2010 Master Plan	University of South Carolina	2010
Broad River Road Corridor and Community Master Plan	CMCOG and Richland County	2010
Irmo/Dutch Fork Sub-Area Transportation Study	CMCOG	2010
Central Midlands Regional Transportation Authority Comprehensive Operational Analysis Report	Central Midlands Regional Transit Authority (CMRTA)	2010
Central Midlands Regional Transportation Authority Park-and-Ride Study	CMRTA	2010
Columbia Connectivity: Linking Main Street and the Vista	Urban Land Institute - South Carolina	2011
COMET Vision: 2020	CMRTA	2012
Rosewood Plan: A Corridor & Neighborhood Plan	City of Columbia Planning & Development Department	2012
Joint Land Use Study Implementation for Fort Jackson – McGrady Training Center – McEntire JNGB	CMCOG	2013
City of Columbia Parks and Recreation Master Plan	City of Columbia	2013
Newberry-Columbia Alternatives Analysis	CMCOG	2014
Devine Street/Fort Jackson Boulevard Commercial Node Plan	CMCOG	2014



Summary of Planning Efforts

RELEVANT PLANS

Columbia Owens Master Plan

Year: 2002

Description: The purpose of this plan is to identify infrastructure investments and other improvements that can be made to stimulate economic development in the Columbia Owens area and Rosewood community. The plan identifies the primary weaknesses of the area as 1) a lack of direct truck access into the commercial/light industrial area, 2) poor storm drainage, and 3) litter, neglect of properties, poor maintenance, and the perception of crime. Recommendations include constructing a new spine road through the community to alleviate existing motor vehicle traffic congestion, with sidewalks included to improve pedestrian access through the area. This road and any other roadway or streetscape projects through the Columbia Owens/Rosewood community should be examined for opportunities to include bicycle and pedestrian improvements.

Recommendations:

- Traffic Improvements via a Spine Road (p. 28)
- Landscaping and Streetscape Improvements (p. 30)

A Plan for the Redevelopment of East Central City

Year: 2004

Description: This document is a Master Land Use and Redevelopment Plan for the East Central City area. The Land Use Plan presents strategies for the area's development and revitalization opportunities, and the Redevelopment Plan identifies catalyst projects for redeveloping twelve core Columbia neighborhoods. Key goals of the Master Plan are to create a pedestrian friendly environment; preserve, enhance, and create public open space, including linear trail space; and to develop high-density, mixed-use commercial activity nodes that include improvements for quality pedestrian, bicycle, and transit access. The plan also includes a Design Guidelines section with design specifications for pedestrian and bicycle improvements.

Recommendations:

- Recommendations (Section 2, p. 14-15)
- Land Use Plan (Section 4A, p. 3-6)
- Clusters (Section 4C, p. 2-15)
- Catalyst Projects (Section 5, p. 1-39)

The Master Plan for The Villages of North Columbia

Year: 2005

Description: This Master Plan presents a community vision and strategies to guide development in North Columbia as the area continues to grow. Included in the plan are several sites for catalyst projects that, through new construction and redevelopment, are intended to spur growth and activity in the area. Many recommendations are made to make North Columbia more pedestrian- and bicycle-friendly, including new and improved crosswalks, sidewalks, bike lanes, trail connections, and streetscape enhancements.

Recommendations:

- Master Plan (Section 1, p. 12-13)
- Vision and Goals (Section 3, p. 83)
- Neighborhood Villages (Section 3, p. 84-130)
- Catalysts (Section 4, p. 138-176)



Five Points “FutureFive” Redevelopment and Master Plan

Year: 2006

Description: The Five Points “Future Five” Plan identifies opportunities for development and redevelopment in order to promote economic vitality, livability, and the unique character of the Five Points area. The goals and objectives of the plan highlight the importance of creating pedestrian-friendly environments to attract residents, visitors, and businesses to the area. Pedestrian-related recommendations include encouraging interconnectivity and density along major streets to promote more pedestrian activity; developing strategies for pedestrian scaled signage; and improving the design of crosswalks and pedestrian lighting to improve safety.

Recommendations:

- Goals and Objectives (p. 3-4)
- Master Plan Overview (p. 46)
- mplementation Recommendations (p. 49-55)

Lower Waverly Catalyst Redevelopment Plan

Year: 2006

Description: The purpose of the Lower Waverly Catalyst Redevelopment Plan is to identify conservation areas and blighted areas within the community that have opportunities for revitalization projects. The eastern portion of the Lower Waverly neighborhood was highlighted as an area that has not yet seen the same focus on redevelopment that is occurring in surrounding communities. The Lower Waverly plan recommends that the catalyst projects included in A Plan for the Redevelopment of East Central City be implemented to promote the revitalization of the area, including new sidewalks and streetscape improvements.

Recommendations:

- Appendices 6-8: Catalyst Project 1-2 (p. 52-54)

Bike and Pedestrian Pathways Plan

Year: 2006

Description: The 2006 Bike and Pedestrian Pathways Plan provides recommendations for sidewalks, on-road bicycle improvements, off-road multi-use trails, and over 35 program and policy strategies for improving the bicycle and pedestrian network in the Columbia Area Transportation Study (COATS) region. The plan identifies key local issues with walking and bicycling: a lack of sidewalks and shoulders; inadequate route signage; roadway debris; a lack of development regulations requiring pedestrian and bicycle facilities; and a lack of bicycle and pedestrian safety education and enforcement. The Bike and Pedestrian Strategies and Early Action Projects in the plan are designed to address these challenges through a series of phased infrastructure, programmatic, and policy improvements.

Recommendations:

- Bike and Pedestrian Strategies (p. 33-42)
- Early Action Projects (p. 43-53)
- Preliminary Routing (p. 53-55)
- Three Rivers Greenway Additions (p. 55-56)
- Implementation Plan (p. 57-59)



Central Midlands Commuter Rail Feasibility Study

Year: 2006

Description: The Central Midlands Council of Governments (CMCOG) completed this study to evaluate the feasibility of developing and operating commuter rail in the Central Midlands region. The study also assessed the feasibility of other high-capacity transit alternatives, such as Bus Rapid Transit (BRT). The study investigated three corridors for potential service: Newberry to Columbia, Camden to Columbia, and Batesburg-Leesville to Columbia. The Camden corridor ranked best in the comparative analysis. This study does not include recommendations specific to bicycle and pedestrian planning, but providing walking and bicycling access to transit and amenities (such as sidewalks, bikeways, and bicycle parking) will be important as transit improvements along the Camden corridor or other corridors are pursued.

Innovista Master Plan

Year: 2007

Description: The Innovista Master Plan presents a vision for a vibrant, mixed-use urban neighborhood in the Innovista planning area near downtown Columbia. The plan seeks to revitalize this historically industrial area through redevelopment and the reuse of vacant properties and parking lots, extension and redesign of the historic street grid, and development of a grand waterfront park. Some streets in the planning area are identified for improvements to primarily serve pedestrian and bicycle traffic, (“A” streets) while other streets will remain designed primarily for automobile traffic (“B” streets). Two trails are planned as part of the waterfront park and restored Columbia Canal to complete the twelve-mile long Three Rivers Greenway regional trail system.

Recommendations:

- Community Goals (p. 23)
- Urban Design Concept (p. 24-27)
- Open Space (p. 28-30)
- Circulation (p. 31-37)
- Greene Street Corridor (p. 40-57)
- Implementation (p. 81-82)

Midlands Tomorrow Household Travel Survey Report

Year: 2007

Description: The Central Midlands Council of Governments (CMCOG) sponsored the Midlands Tomorrow Household Travel Survey to obtain demographic information and travel behavior data from Columbia residents. This information is used to update data inputs for the regional transportation model, which predicts future travel demand on the region’s roadways. When respondents were asked how important it is to them to have sidewalks in their neighborhood, 56.9 percent answered “Important” or “Very Important” When asked how important it is to them to have neighborhood bike paths, 42.6 percent answered “Important” or “Very Important”. When asked to rate their neighborhood sidewalk and bike path networks, 46.4 and 35.2 percent rated their sidewalk network and bike path network as average or worse (grade “C” to “F”), respectively. No recommendations were included in the report.



Midlands Tomorrow 2035 Long Range Transportation Plan

Year: 2008

Description: The Midlands Tomorrow: 2035 Long Range Transportation Plan is the regional transportation plan for the Columbia metropolitan area prepared by the Central Midlands Council of Governments (CMCOG). CMCOG is the MPO for the urbanized area around Columbia, the Columbia Area Transportation Study (COATS), and is responsible for developing, maintaining, and administering the region’s LRTP. Chapter 5, “Quality of Life,” covers bicycle and pedestrian planning initiatives and recommends a multimodal system that improves the quality of life for residents by providing bicycling and walking facilities, greenway trails, and walkable downtowns. The LRTP lists the twenty-six Early Action Projects from the Bike and Pedestrian Pathways Plan to fill critical gaps that exist in the current network and to build momentum for other bicycle and pedestrian initiatives. A series of Transportation Network Design Principles are outlined in the plan to guide facility development, along with complete streets design standards.

Recommendations:

- Goals for the 2035 LRTP (p. 5)
- Chapter 5: Quality of Life (p.69-87)
- CMCOG Regional Pathways Plan (Appendix A)
- Mitigation Strategies for Congested Corridors (p. 142-143) establishes five major mitigation strategies including, “shifting trips from automobiles to other modes”
- Over 900 people responded to the LRTP Transportation Survey. The issues that survey respondents would like to see addressed in the future include, “More sidewalks in subdivisions” and “More bike/walking facilities”.

The Columbia Plan: The Comprehensive Plan for Columbia, South Carolina, 2008-2018

Year: 2008

Description: The Columbia Plan was developed by the City of Columbia Planning Department to guide the city’s growth and development over the next ten years. The plan’s Transportation Element includes recommendations to better coordinate the regional transportation system – including the bicycle and pedestrian network – with land use planning and policies. Suggested pedestrian and bicycle improvements include hiring a Bike/Pedestrian Coordinator, conducting Holistic Design and Planning, requiring Walking and Biking Oriented Neighborhood Design, and implementing Streetscape projects along major transportation corridors. No specific locations are identified for pedestrian and bicycle improvements. The plan’s goals, policies, and objectives provide general planning and policy guidance for future detailed studies, plans, and recommendations.

Recommendations:

- Pedestrian and Bicycle Facilities (p. 204-206)
- Goals, Policies and Objectives (p. 211-233)

Southeast Lower Richland Sub-Area Transportation Study

Year: 2008

Description: This report provides an analysis of the existing multimodal transportation system for Lower/Southeast Richland County, development trends, transportation needs, and recommended improvements. Multimodal improvements were identified for roadways, public transportation services, intersections, bicycle facilities, and pedestrian facilities.

Recommendations:

- Suggested Bicycle and Pedestrian Improvements (p. 40-45)
- Potential New Developments (p. 56-57)
- Roadway and Intersection Improvements (p. 92)
- Bicycle and Pedestrian Needs (p. 93-104)
- Policy Needs and Recommendations (p. 126-127)



Columbia Area Transportation Study (COATS) Transportation Improvement Program

Year: 2009

Description: The Transportation Improvement Program (TIP) establishes a list of agreed-upon transportation capital projects that are anticipated to receive federal funds for the next 7 years (2009-2015). The majority of projects are aimed at increasing the safety and efficiency of the existing transportation systems. Relevant bicycle and pedestrian improvements listed in the TIP include sidewalks, bikeways, wide outside shoulders, trails, intersection improvements, medians, street lighting, and other streetscaping. The TIP also includes a list of resurfacing projects, which may provide an opportunity to concurrently implement bicycle and pedestrian improvements.

CMCOG Regional Pathways Plan

Year: 2010

Description: The Regional Pathways Plan highlights twenty-eight existing and proposed greenway, bikeway, and sidewalk projects to connect local and regional destinations, including major employment centers, Downtown Columbia, tourist and recreational attractions, schools, parks, places of worship, and shopping centers. This vision plan includes over 272 miles of existing and proposed facilities to create a regional bicycle and pedestrian pathways network. Phase I summarizes the existing conditions, gaps, and recommendations from various recent transportation, bicycle, and pedestrian studies. Phase II will involve more detailed analysis of specific corridors, short- and long-term recommendations, and identification of funding and implementation strategies.

Recommendations:

- Regional Pathway Index (p. 8)

University of South Carolina Vision for a Sustainable Future: 2010 Master Plan

Year: 2010

Description: The University of South Carolina completed the 2010 Master Plan to address the University's existing facility needs and projected future development. In addition to providing a development framework for the campus as a whole, the plan includes a long range vision to improve USC's South Campus with a linear park, student recreation area, and improved pedestrian connections to Williams Brice Stadium. Improved connections between the historic core campus, Innovista, and South Campus are also addressed. Three streets are recommended as pedestrian and bicycle priority streets – Greene Street, Main Street, and Sumter Street – to provide better walking and bicycling connections between areas of campus and to surrounding areas. The recommended restoration of Rocky Branch Creek into a campus linear park would include multi-use trails that link to a regional parks and trails network.

Recommendations:

- Goals (p. 6)
- The Vision Plan for South Campus (p. 16-17)
- Pedestrian and Vehicular Circulation and Parking (p. 21-25)

Broad River Road Corridor and Community Master Plan

Year: 2010

Description: This plan outlines strategies for the development and redevelopment of the Broad River Road Corridor, a conventional suburban corridor from the Broad River Bridge to Harbison State Forest that connects downtown Columbia to the surrounding region. The goals of the plan include developing an integrated land use and transportation system, introducing improved multimodal networks, encouraging transit oriented mixed-use developments, and enhancing connectivity to neighborhoods. Analysis for the plan included a Walkability Index study. Recommendations include a detailed alignment and feasibility study for developing a multi-use trail along Board River, multiple trailheads, and bicycle lanes and sidewalks on Broad River Road where right-of-way exists.

Recommendations:

- Project Goals (p. 5)
- Master Plan Guiding Principles (p. 17)
- Objectives (p. 28)
- Concept Plan (p. 29)
- Action Strategies (p. 46-47, 55, 75)
- Pedestrian Circulation and Walkability (p. 61-69)
- Bike Lanes (p. 70-71)
- Implementation Program (p. 100-106)



Irmo/Dutch Fork Sub-Area Transportation Study

Year: 2010

Description: The purpose of this study is to guide the development of multimodal transportation improvements in the Irmo/Dutch Fork region. The study examines the existing transportation system, including bicycle and pedestrian facilities and transit service. A key issue identified in the document is a lack of sidewalk connections to schools, shopping, and parks throughout the study area. The study survey found that, on average, residents would like to see the majority of transportation funding spent on a combination of pedestrian facilities (15.5% of total funding, on average), bicycle facilities (12.4%), and transit service (23.5%). To address this demand and the current lack of bicycle and pedestrian connectivity, the plan recommends creating “complete streets”, developing dense mixed-use and transit-oriented development centers where appropriate, and maximizing the availability of transportation options by providing sidewalk, bike lanes, and expanded public transit.

Recommendations:

- Sidewalk Recommendations and Crossing Improvements (p. 38)
- Bicycle Facility and Multi-Purpose Path Recommendations (p. 39-40)
- Public Transit Needs and Recommendations (p. 41-44)
- Intersection Improvements (p.45-46)
- Access Management Recommendations (p. 47-48)

Central Midlands Regional Transportation Authority Comprehensive Operational Analysis Report

Year: 2010

Description: The CMRTA Comprehensive Operational Analysis identifies near-term, short-range, and long-range transit service recommendations to expand transit opportunities for Columbia-area residents. The report identifies three major themes and stages for improving transit: improving service reliability in the Near-Term Plan, enhancing service connectivity in the Short-Range Plan, and increasing transit accessibility in the Long-Range Plan. While the document does not include any specific pedestrian or bicycle recommendations, walking is recognized as an important transit access and egress mode. According to a CMRTA survey, 83.9% of transit users walk to the bus, and 87.1% walk from the bus to their final destination. Pedestrian facilities should therefore be a priority along current and proposed transit corridors (p. 55) and to connect proposed locations for future transfer centers (p. 43).

Central Midlands Regional Transportation Authority Park-and-Ride Study

Year: 2010

Description: The purpose of the CMRTA Park-and-Ride Study is to analyze potential park-and-ride facilities in the region and assess which areas are best suited for the development of park-and-ride sites. The CMRTA does not currently have any designated park-and-ride facilities within its service area. Because this study is focused on opportunities to drive to and take transit, it does not include any specific pedestrian and bicycle recommendations. However, the study does list sidewalk facilities, bike racks, and bike lockers as items that should be included at each park-and-ride facility to provide pedestrian and bicycle access to transit.

Columbia Connectivity: Linking Main Street and the Vista

Year: 2011

Description: This report explores ways to improve connections between Main Street, the University of South Carolina campus, the Innovista, and the Vista – particularly for pedestrians and bicyclists – to support the development and revitalization of downtown Columbia. Some of the major recommendations of the study that affect bicycle and pedestrian travel include: repurpose Assembly Street for multimodal use, establish connections between adjoining neighborhoods, launch a traffic safety and multimodal transportation public awareness campaign, conduct a road diet on Gervais Street, and improve north-south streetscapes.

Recommendations:

- Panel Recommendations (p. 15-21)

CMRTA COMET Vision: 2020

Year: 2012

Description: Vision: 2020 is a visionary plan to restructure and rebrand public transportation service in the Central Midlands region. The purpose of the effort is to create a transit system that is more innovative and intelligent, more connected throughout the region, and more accessible to all residents. Major efforts recommended in the plan are an upgrade to natural gas fueled buses, an improved downtown Transit Center, high-frequency service along high-capacity corridors, using smaller buses to serve neighborhoods with lower-density routes, offering reloadable smartcard passes, and providing real-time bus information via smartphones and online. Larger-capacity bicycle racks are recommended at bus stops and stations to support bicycle access to transit. No pedestrian or bicycle infrastructure recommendations are made, although it will be important to accommodate walking and bicycling access to transit along all routes.



Rosewood Plan: A Corridor & Neighborhood Plan

Year: 2012

Description: This plan serves as a guide for the future growth, development, and redevelopment of the Rosewood corridor and neighborhood. In terms of pedestrian amenities, the community is defined as being isolated from the overall pedestrian network, with Rosewood Drive acting as a barrier to pedestrian activity. At the time of the plan’s writing, most streets in the neighborhood lack sidewalks, including many streets near the community’s four elementary schools. Bicycle connectivity is also rated as being low both within the neighborhood and along the Rosewood corridor. The plan includes several recommendations for improving the walking and bicycling environment, including: identify cyclist and pedestrian priority streets, reduce residential speed limits to 20 miles per hour, and installing traffic calming improvements on priority streets.

Recommendations:

- Rosewood Transportation Vision and Goals (p. 56)
- Recommendations (p. 57-64)
- Priority Transportation Projects (p. B-34)

Joint Land Use Study Implementation for Fort Jackson – McGrady Training Center – McEntire JNGB

Year: 2013

Description: The 2013 Joint Land Use Study provides a plan for implementation of the 2009 Fort Jackson/McEntire Joint Land Use Study (JLUS). The plan includes two small area plans, one for the McEntire JNGB Study Area and one for the Fort Jackson-McCrary Training Center Study Area, that identify a timeline and action plan for implementing strategies from the 2009 JLUS. The plan’s recommendations focus on land use compatibility, zoning changes, and community-military coordination; they do not specifically include bicycle and pedestrian improvements. As infrastructure and development projects are planned in these areas, opportunities for bicycle and pedestrian facilities should be examined and included as appropriate.

City of Columbia Parks and Recreation Master Plan

Year: 2013

Description: The purpose of this plan is to provide a five-year vision of leisure services for the City of Columbia, with an understanding of and plan for the long-term recreation needs of the community. The plan recognizes the importance of providing for bicycle and pedestrian recreation and defines three types of park trails that accommodate different user groups and needs within the community. One key recommendation made in the plan is to remove underutilized facilities at current parks and replace with walking trails, picnic areas, and natural woods areas with limited trails. The plan also calls for a greater focus on system-wide park linkages through greenways and waterway features, which could include trail access.

Recommendations:

- Recommendations (p. 131-158)

Newberry – Columbia Alternatives Analysis

Year: 2014

Description: The CMCOG conducted an analysis of the Newberry-Columbia corridor to evaluate the benefits and costs of transit improvements to the corridor. The study screened the feasibility of several different types of transit, including conventional bus, bus rapid transit in mixed traffic, bus rapid transit in dedicated right-of-way, modern streetcar, light rail, heavy rail, and commuter rail. Walking and bicycling are not a focus of the analysis, but are discussed as transit access modes. The study identifies “Good Transit Stops that are Accessible by All Modes,” “Pleasant Pedestrian and Bicycle Environment,” and “Adequate Parking,” including bicycle parking, as three key characteristics of successful transit corridors. Sidewalks, bike programs, convenient bike parking, and dense mixed-use development are all identified as ways to improve pedestrian and bicycle access to transit.

Recommendations:

- Pedestrian and Bicycle Facilities (p. 17-19)
- Goals and Objectives (p. 51-52)
- Characteristics of Successful Transit Corridors (p. C-4-C-7)
- Newberry-Columbia Corridor Districts and Guiding Principles (p. C-8-C-14)



Devine Street/Fort Jackson Boulevard
Commercial Node Plan

Year: 2014

Description: The purpose of this plan is to inform investment and identify catalyst projects to pursue in and around the Devine Street/Fort Jackson Boulevard Commercial Node. This area, comprising approximately 300 acres on the east side of Columbia near Fort Jackson, is a primary gateway and commercial center in Columbia. The Commercial Node Plan identifies a series of key issues that are limiting development, traffic, and interest in the area, including a lack of safe pedestrian connections, lack of bicycle facilities, and poor streetscape conditions. A series of Mobility Recommendations are made to address bicycle and pedestrian connectivity, safety, and access to destinations.

Recommendations:

- Mobility Recommendations (p. 29-35)
- General Urban Design and Placemaking Recommendations (p. 36-38)
- Open Space Recommendations (p. 39-40)

OTHER RELEVANT PLANNING EFFORTS

South Carolina Statewide Multimodal
Transportation Plan – At a Crossroads

Year: 2008

Description: The South Carolina Statewide Multimodal Transportation Plan provides a comprehensive evaluation and needs assessment of all transportation modes for the State of South Carolina. The plan outlines SCDOT’s recommendations for transportation investments across all modes through the year 2030. The plan’s recommendations for pedestrian and bicycle facilities are 1) Work to provide paved shoulders on routes in the statewide bicycle tour network, 2) Work with each MPO to implement low-cost bike improvements wherever feasible, such as when roads are resurfaced, 3) Include bike/pedestrian provisions in new projects wherever appropriate or where requested by local government officials. The next iteration of the plan, Charting a Course to 2040, is currently under development.

Recommendations:

- Goals (p. 3)
- Bike and Pedestrian Needs (p. 27)
- Recommendations (p. 32-35)

ONGOING PLANNING EFFORTS

Other planning efforts that are currently underway include:

- City of Columbia Parking Master Plan Update
- West Gervais Commercial Plan
- South Carolina Statewide Multimodal Transportation Plan – Charting a Course to 2040

At the time of this writing, these planning efforts were ongoing and not yet available in draft form. As materials become available, these plans and other future plans should be reviewed and their recommendations checked for consistency with this plan.

Key Findings

These plans, studies, and reports help to identify the gaps that exist in the current bicycle and pedestrian network and underscore the demand for investment in improved facilities for walking and bicycling. Several of the plans repeatedly stress the importance of developing complete streets that make the transportation network and local and regional destinations accessible not just by automobile, but also by foot, bike, and transit. Key themes from previous planning efforts include:

- Improve bicycle and pedestrian connections to schools, parks, and employment centers; along major corridors; within commercial nodes; and within and between neighborhoods.
- Provide multi-use trails to link destinations throughout Columbia and the surrounding region.
- Improve bicycle and pedestrian access to transit with more sidewalks, bikeways, and amenities.
- Integrate complete streets design on new and existing roadways.
- Revise development regulations and policies to include standards for the provision of bicycle and pedestrian infrastructure and amenities.

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Policy Regulatory Review for the City of Columbia

TABLE 17 - POLICY REVIEW FOR THE CITY OF COLUMBIA

Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
DEFINITIONS and SUPPORTING ORDINANCES		
1.1 Does “Street” definition include pedestrian, cyclist, and transit reference?	<p>Needs improvement. Definition of “street” Includes pedestrian infrastructure, but does not reflect City’s Complete Streets policy or intent.</p> <p><i>From CO Sec. 1-2:</i></p> <p>Roadway. <i>The term “roadway” means that portion of a street improved, designated or ordinarily used for vehicular travel.</i></p> <p>Street. <i>The term “street” includes avenues, boulevards, highways, roads, alleys, lanes, viaducts, bridges and the approaches thereto and all other public thoroughfares in the city, and means the entire width thereof between opposed abutting property lines. It shall be construed to include a sidewalk or footpath, unless the contrary is expressed or unless such construction would be inconsistent with the manifest intent of the city council.</i></p>	<p>Consider adding language to reflect City’s Complete Streets policy intent and specifically to include references to user groups including pedestrians, cyclists, transit users, etc:</p> <p><i>The term “street” includes avenues, boulevards, highways, roads, alleys, lanes, viaducts, bridges and the approaches thereto and all other public thoroughfares in the city, and means the entire width thereof between opposed abutting property lines. It shall be construed to include a sidewalk or footpath [ADD: and accommodations for bicyclists, transit riders, and persons of all abilities as deemed contextually appropriate] unless the contrary is expressed or unless such construction would be inconsistent with the manifest intent of the city council.</i></p>
1.2 Vehicle	No definition listed	<p>Some states’ definition of ‘vehicle’ includes the bicycle. However, the State of South Carolina’s definition of ‘vehicle’ does not include bicycles. See SC 56-3-20 Definitions –</p> <p><i>(1) “Vehicle” means every device in, upon, or by which a person or property is or may be transported or drawn upon a highway, except devices moved by human power or used exclusively upon stationary rails or tracks.</i></p>
1.3 Definition of Sidewalk	<p>Yes. Includes pedestrian reference.</p> <p><i>From CO Sec. 1-2: Sidewalk. The term “sidewalk” means any portion of a street between the curbline, or the lateral line of a roadway where there is no curb, and the adjacent property line, intended for the use of pedestrians.</i></p>	<p>Good. Very similar to MUTCD Definition: <i>That portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians.</i></p>
1.4 Definition of Bicycle	No definition of bicycle found	MUTCD Definition: <i>A pedal-powered vehicle upon which the human operator sits.</i>



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
1.6 General ordinances Supporting Pedestrian and Bicycle Safety	<p>Very good.</p> <p>CO Chapter 12 – Motor Vehicles and Traffic includes several regulations that are supportive of pedestrian and bicyclist safety and comfort including:</p> <ul style="list-style-type: none">• Prohibition of bicycles on sidewalks in downtown Columbia (Sec. 12-3)• Requirement to remove trees, shrubs or other plants from streets and sidewalks (Sec. 12-6)• Requirement to remove dangerous structures or obstructions from streets and “public ways” (Sec. 12-7)• Prohibition on driving on sidewalks (Sec. 12-8)• Prohibition on opening doors into traffic (Sec. 12-11)• Authorizing Play Streets (Sec. 12-14)• Definition of speed limits for trucks and other motor vehicles in business districts (max. 20-25mph) and residential areas (max. 30mph) and school zones (25mph) (Sec. 12-16 and 12-17)• Prohibition on e-mailing, texting on mobile device while driving (Sec. 12-19)	<p>The regulations in this section are some of the most progressive in Columbia's ordinances and are extremely progressive compared to many other cities. The authorization of play streets, the limited speed limits in business districts, and the ban on mobile device use while driving are especially commendable for supporting pedestrian and bicycle comfort and safety.</p> <p>Changes and additions to consider include:</p> <ul style="list-style-type: none">• Reducing the maximum allowable speed limits in residential areas to 20 or 25 mph• Disallowing driving, parking, or blocking designated bikeways, including bike lanes• Other allowances for and restrictions on bicycle travel such as prohibitions on wrong-way riding, riding without lights, riding without headphones,• Other protections for cyclists and pedestrians including: anti-harassment ordinances, safe passing of cyclists requirements, etc. <p>See the following documents for comprehensive recommendations for policy and regulatory tools to support walking and bicycling and transit access:</p> <ul style="list-style-type: none">• Making Neighborhoods More Walkable and Bikeable, ChangeLab Solutions: http://changelabsolutions.org/sites/default/files/MoveThisWay_FINAL-20130905.pdf• Getting the Wheels Rolling: A Guide to Using Policy to Create Bicycle Friendly Communities, ChangeLab Solutions http://changelabsolutions.org/bike-policies
STREET ELEMENTS AND CONFIGURATION		
2.1 Pedestrian accommodations required during new development or redevelopment	<p>Very limited. Needs significant improvement. No pedestrian or bikeway improvements currently required with new development with the exception of the very limited standard below.</p> <p>CO Sec. 17-512(15): Access to parks, schools, etc. Streets shall be designed or walkways dedicated to ensure convenient access to adjoining parks, playgrounds, schools and other places of public assembly. Dedicated walkways shall not be less than 15 feet in width.</p>	<p>Include access to transit in the list of priority destinations for sidewalk provisions.</p> <p>For good model language, see City of Wilson, NC UDO, Section 6.3: Required Improvements for All Development (and related sections that follow) http://www.wilsonnc.org/attachments/pages/545/CH%206-Infrastructure%20Standards.pdf</p> <p>Consider adding requirements for greenway reservation, dedication, or provision in new developments where a greenway or trail is shown on an adopted plan or where a property connects to an existing or proposed greenway.</p> <p>See requirements in Wake Forest, NC UDO, Section 6..8.2 Greenways: “When required by Wake Forest Open Space & Greenways Plan or the Wake Forest Transportation Plan, greenways and multi-use paths shall be provided according to the provisions [that follow in the section cited above].” http://www.wakeforestnc.gov/udo.aspx</p>
2.2 Bike accommodations (bike lanes, shoulders, etc) required during new or redevelopment		
2.3 New sidewalks, bike lanes, greenways, etc - connect to existing facilities, general connectivity requirements		



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
2.4 Use of Utility Rights-of-Way for walkways, bikeways, trails		<p>Kershaw County’s ZLDR Article 5:1-8 Utility Easements and Rights-of-Way contains a good example with respect to sewer rights-of-way. See below.</p> <p><i>b) - The Planning and Zoning Commission or Planning Official, as applicable, may approve the installation of sidewalks, trails, and greenways as required in this Article within the Kershaw County public sewer rights-of-way. All proposed sidewalks, trails, and greenways including any proposed hardscaping shall have approval from the Utilities Director prior to sketch plan or site plan submittal to the Planning Official or Planning and Zoning Commission, as applicable.</i></p> <p>This provision could be further improved/expanded to allow sidewalks, trails, and greenways in other utility rights-of-way such as water, power, etc.</p>
2.6 Cross-Access between adjacent land parcels	<p>Needs Improvement. Currently vague and difficult to enforce.</p> <p>CO Sec. 17-512 (8): <i>Street access to unsubdivided property. Where it is deemed necessary to the development of a logical street pattern and transportation network, streets and rights-of-way shall be extended to the boundary of adjoining property. Incompatible characteristics of adjoining property shall be given due consideration in making a determination of what shall constitute a logical street pattern. Reserve strips adjoining street rights-of-way for the purpose of preventing access to adjacent property shall not be permitted.</i></p>	<p>Add section in subdivision regulations to require cross-access between adjacent parcels to facilitate non-motorized (pedestrian and bicycle) access, at least. Requiring cross-access between adjacent parcels of land is a great tool for reducing the amount of traffic on major roads while increasing connectivity for pedestrians, bicycles, and cars.</p> <p>See City of Charlotte Subdivision Ordinance, Section 20-23 for example of connectivity requirements and block standards: http://www.charmeck.org/Planning/Subdivision/SubdivisionOrdinanceCity.pdf</p> <p>Example language from the City of Wilson, NC, Unified Development Ordinance, Section 6.4: http://www.wilsonnc.org/departments/developmentservices/unifieddevelopmentordinance/</p>
2.7 Block size	<p>Needs improvement to promote walking, biking and transit access.</p> <p>CO Sec. 17-513. Blocks.</p> <p><i>(b) Residential block length. In order that there may be convenient access between various parts of a subdivision, and in order to help prevent traffic congestion and undue inconvenience, the length of blocks hereafter established shall not exceed 1,800 feet or be less than 600 feet.</i></p>	<p>Small block size is important to intersection density and interconnectivity which serve to enhance walking, bicycling, and transit-access opportunities. Ideally, block size should not exceed 1000'-1200' feet for low density residential development and where blocks exceed this length, a crosswalk easement (as suggested in current text) should be required and not made an optional provision. In higher density areas, blocks can be as narrow as 200-400' wide. Block length should be tied to density of development.</p> <p>See City of Charlotte Subdivision Ordinance, Section 20-23 for example of connectivity requirements and block standards: http://www.charmeck.org/Planning/Subdivision/SubdivisionOrdinanceCity.pdf</p> <p>See City of Wilson, NC, Unified Development Ordinance Section 6.4 for excellent connectivity requirements, including bicycle and pedestrian connections: http://www.wilsonnc.org/departments/developmentservices/unifieddevelopmentordinance/.</p>



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
2.8 Dead end streets	Needs Improvement CO Sec. 17-513. Blocks. <i>(d) Cul-de-sac length. Culs-de-sac shall not exceed 1,000 feet.</i>	Street interconnectivity is critical to successful bicycle/pedestrian networks. Furthermore, long dead-end streets are create challenges for pedestrians, cyclists, and effective transit and other public services. Consider replacing this section with the following: <i>Cul-de-sacs may be permitted only where topographic conditions and/or exterior lot line configurations offer no practical alternatives for connection or through traffic. Cul-de-sacs, if permitted, shall not exceed 250 ft in length from the nearest intersection with a street providing through access (not a cul-de-sac). A close is preferred over a cul-de-sac. Cul-de-sacs shall have pedestrian and bicycle neighborhood access trails at the ends to connect to adjacent streets. (For similar language, see the Town of Davidson, NC, Planning Ordinance - http://www.ci.davidson.nc.us/index.aspx?nid=598)</i>
PEDESTRIAN FRIENDLY BUILDINGS AND SITE DESIGN STANDARDS		
3.1 Off-street motorized vehicle parking is behind or to side of buildings		Consider requiring motorized vehicle parking that is behind or to the side of buildings in pedestrian-oriented zoning districts to improve the pedestrian-orientation of buildings and to minimize the need for pedestrians to walk through parking lots to access buildings.
3.2 Maximum automobile parking requirements defined		Limiting off-street parking allows for more dynamic use of space which will enhance bicycle and pedestrian opportunities.



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
3.3 Bicycle parking requirements	<p>Very limited. Bicycle parking is only required for Private Dormitory uses per CO Sec. 17-321:</p> <p><i>Parking requirements for a private dormitory shall be as follows: in RG-3, C-4, M-1, M-2, and MX-2 districts the ratio shall be 0.75 on-site vehicular parking space and .25 on-site bicycle parking space per bedroom. In the C-5 zoning district the ratio shall be 0.5 vehicular parking space located within 800 feet of the dormitory's main entrance and 0.25 on-site bicycle parking space per bedroom. Seventy-five (75) percent of required bicycle parking in all districts shall be located in an enclosed and secured area.</i></p>	<p>Incorporate bicycle parking requirements throughout CO Chapter 17, especially Article III, Division 10: Off-Street Parking & Loading Facilities</p> <p>City of Greenville Bicycle Parking Ordinance (good, complete example for southeastern city, however, only includes provisions for short term parking -- e.g., racks -- and does not include requirements or guidelines for long term parking and facilities for employee, resident, or student parking): https://www.greenvillesc.gov/ParksRec/trails/forms/GreenvilleBicycleParkingOrdinance_Article%2019-6.1.pdf</p> <p>City of Charleston's bike parking requirements are much less detailed and complete than Greenville's (Sec. 54-320.): https://library.municode.com/index.aspx?clientId=14049&stateId=40&stateName=South%20Carolina</p> <p>City of Charlotte's bike parking requirements include standards for short term and long term bicycle parking, but do not include requirements for showers or lockers for active transport commuters: http://ww.charmeck.org/Planning/ZoningOrdinance/ZoningOrdCityChapter12.pdf</p> <p>References for best practices in bicycle parking requirements:</p> <ul style="list-style-type: none">• Bicycle Parking Model Ordinance, Change Lab Solutions: http://changelabsolutions.org/publications/bike-parking• Bicycle Parking Guidelines, 2nd Edition – by the Association of Pedestrian and Bicycle Professionals (APBP; available for purchase)• The Model Bicycle Parking Ordinance developed by the Public Health Law & Policy group provides excellent model language for bicycle parking requirements and related amenities, including showers and changing areas: http://www.atpolicy.org/sites/default/files/Model%20Bike%20Parking%20Ordinance%20with%20Annotations%20-%20Public%20Health%20Law%20and%20Policy.pdf
3.11 Site Amenities for Cyclists and others (Showers, Changing areas, etc)	No guidelines or requirements found	<p>Consider requiring or providing incentives to encourage the installation of site amenities such as showers, storage lockers/changing areas for bicyclists and others for employment and educational sites. The Model Bicycle Parking Ordinance developed by the Public Health Law & Policy group provides excellent model language for bicycle parking requirements and related amenities, including showers and changing areas: http://www.atpolicy.org/sites/default/files/Model%20Bike%20Parking%20Ordinance%20with%20Annotations%20-%20Public%20Health%20Law%20and%20Policy.pdf</p>



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
3.4 Other place-supportive parking regulations (On-street parking, shared parking, pricing, employer incentives/ programs, etc)	No guidelines found	Require or incentivize shared parking and parking reductions in pedestrian-oriented districts, especially downtown.
3.5 Form-based or design-based codes are used	The Bull Street PUD provides a local example of form-based requirements, however, these standards apply only to a single master planned development: https://columbiasc.gov/depts/planning-development/docs/bullstreetpudoctober22012.pdf	<p>These types of codes offer flexibility in allowing mixed use while unifying streetscape design. These types of regulations are fundamentally pedestrian-oriented.</p> <p>The City of Spartanburg adopted a form-based code for its downtown area in 2011: http://www.cityofspartanburg.org/cms_assets/Downtown%20Code.pdf</p> <p>Another example can be found in the Beaufort, SC, Unified Development Ordinance; specific to their Boundary Street and Bladen Street Redevelopment Districts - http://www.cityofbeaufort.org/Data/Sites/1/media/City_Ordinances/udo-revised-september-2012-web.pdf</p>
3.12 Pedestrian-scale lighting (< 15' tall) required along sidewalks, paths and in parking areas	No guidelines or requirements found.	Incorporate human-scale lighting (<15' tall) considerations for bicyclists and pedestrians where appropriate.
PEDESTRIAN FACILITY DESIGN		
4.2 Minimum sidewalk width by context	No guidelines found	<p>Best standards would require or provide sidewalks on both sides of all collector and arterial streets and on at least one side of local streets where warranted by density and/or system connectivity.</p> <p>Five foot wide sidewalks along local streets and six foot wide sidewalks along collectors and arterials are preferred minimum widths. Five feet is the minimum width required for two adults to walk side-by-side. In areas of higher density and mixed-use development, the minimum required width for sidewalks should be six feet or more. The land use context and density of development necessitates a greater level of requirement for sidewalk specifications. In areas such as downtown with buildings at the back of the sidewalk and ground level retail, sidewalks should be as wide as 10-18 feet wide.</p>



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
4.3 Street Trees	<p>Needs improvement. Not required between sidewalk and the curb.</p> <p>CO Sec. 17-418. Street protective yard</p> <p><i>(a)Purpose, definition and applicability.</i></p> <p><i>(1) Purpose and definition. A street protective yard is a landscaped area located parallel and adjacent to a recorded public street right-of-way. This area contains plantings of trees and other vegetation designed to: provide more pleasing views along city travel ways; provide for continuity of vegetation throughout Columbia; reduce the amount of impervious surface and thereby reduce stormwater runoff; provide shade; and preserve a remnant of Columbia’s natural vegetative cover.</i></p> <p>CO Sec. 17-531(10) Street trees. <i>The planting of street trees is not required. However, if the subdivider chooses to plant trees along the street to enhance the appearance of a subdivision, the trees shall not be planted on any street right-of-way of less than 60 feet unless it can be conclusively shown that there will be no future conflict with vehicles or with utility lines either above or below the ground surface.</i></p>	<p>In addition to their value for improving the air quality, water quality, and beauty of a community, street trees can help slow traffic and improve comfort for pedestrians. Trees add visual interest to streets and narrow the street’s visual corridor, which may cause drivers to slow down. When planted in a planting strip between the sidewalk and the curb, street trees also provide a buffer between the pedestrian zone and the street.</p> <p>See NCDOT <i>Complete Streets Planning and Design Guidelines</i> (Chapter 4) for context-based pedestrian and “green” zone recommendations: http://www.completestreetsnc.org/wp-content/themes/CompleteStreets_Custom/pdfs/NCDOT-Complete-Streets-Planning-Design-Guidelines.pdf</p> <p>See also, Town of Wendell UDO Chapter 8, especially section 8.8, Street Trees: http://files.wendell.gethifi.com/departments/planning/zoning/udo-unified-development-ordinance/Chapter_8_-_amended_092611.pdf</p>
BICYCLE FACILITY DESIGN		
5.1 Types of Facilities Specified or Allowed	The City of Columbia officially endorsed and adopted the NACTO Urban Bikeway Design Guide in 2013: http://nacto.org/wp-content/uploads/2014/01/ColumbiaSC_Urban-Bikeway-Design-Guide-Resolution_05.21.13.pdf . However, development requirements or City Street Design standards do not currently reference or reflect the NACTO guidance.	Incorporate bicycle facility design best practices into CO and other appropriate City design requirements. The Design Guidelines developed for this Plan, as well as the following resources, will provide specific design guidelines and reference to national design guidelines.
5.3 Bicycle Accommodations at Intersections		
COMPLETE STREETS SUPPORTING POLICIES AND MANUALS		
6.1 Complete Streets Policy	<p>Yes. Complete Streets Resolution presented to council in 2010 and adopted:</p> <p>http://www.columbiasc.net/depts/city-council/docs/old_downloads/07_21_2010_Agenda_Items/Resolution_2010_054%20Complete%20Streets%202_Final.pdf</p>	<p>The Complete Streets Policy needs to have an associated design guide with context-based provisions for all modes of transport, including walking, biking, and transit. The design guidance should be integrated into development standards for new development, as was done with the <i>Raleigh Street Design Manual</i> (http://www.raleighnc.gov/content/extra/Books/PlanDev/StreetDesignManual/#1) and the <i>Charlotte Urban Street Design Guidelines</i>: http://charmeck.org/city/charlotte/transportation/plansprojects/pages/urban%20street%20design%20guidelines.aspx</p>



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
6.2 Design Manual for Pedestrian and/or Bicycle Facilities	The City of Columbia officially endorsed and adopted the NACTO Urban Bikeway Design Guide in 2013: http://nacto.org/wp-content/uploads/2014/01/ColumbiaSC_Urban-Bikeway-Design-Guide-Resolution_05.21.13.pdf	The City's CS Policy states that the City will prepare draft regulations to implement the policy. The following resources may be used in referencing best practices guidelines and policy specific to each point in the far left column:
6.3 Complete Street Design Guidelines for a variety of contexts	Needs improvement. Street classification system (CO. Sec. 17-512) does not provide context-sensitive options and does not provide detailed guidance for installation of sidewalks or any guidance for selection or provision of bikeways.	NACTO <i>Urban Bikeway Design Guide</i> (National Association of City Transportation Officials); [adopted by City of Columbia]
6.4 Existence of street hierarchy plan by context		NACTO <i>Urban Street Design Guidelines</i> <i>Complete Streets Local Policy Workbook</i> – by the National Complete Streets Coalition and Smart Growth America
6.5 Traffic Calming programs, policies, and/or manuals	None found.	City of Charlotte, NC <i>Urban Street Design Guidelines</i> and related development standards: http://charmeck.org/city/charlotte/transportation/plansprojects/pages/urban%20street%20design%20guidelines.aspx City of Raleigh, NC <i>Raleigh Street Design Manual</i> : http://www.raleighnc.gov/content/extra/Books/PlanDev/StreetDesignManual/#1 The National Complete Streets Coalition provides good guidelines for traffic calming through their best practices manual: (http://www.completestreets.org/resources/complete-streets-best-practices/).
6.8 Consideration of pedestrian and bicycle concerns and Level of Service (LOS) in Traffic Impact Analyses and other required engineering studies	None found.	Consider adopting multi-modal of service standards for new development where active transportation and transit use are expected to be high. Consideration of bicycle and pedestrian levels of service assure adequate facilities for bicyclists and pedestrians. The City of Raleigh uses multimodal level of service approach in determining road improvements and traffic mitigation: http://www.raleighnc.gov/content/extra/Books/PlanDev/StreetDesignManual/#71 Charlotte, NC uses Pedestrian LOS and Bicycle LOS Methodologies for intersection improvements in their <i>Urban Street Design Guidelines</i> : http://charmeck.org/city/charlotte/transportation/plansprojects/pages/urban%20street%20design%20guidelines.aspx
6.9 Access management program or policy	None found.	Consider adding language across all types of development pertaining to non-motorized vehicle and pedestrian access management; this could broadly be incorporated into zoning districts requirements or street design standards.



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
6.10 Sidewalk Retrofit/Infill Program or Policy	CO Chapter 22 Streets, Sidewalks and Other Public Places, Article II Permanent Improvements and Special Assessments requires owner consent and potential property owner contributions of up to one-half the costs to “permanent improvements to any streets or sidewalks or parts of either” where improvements are “to be assessed against the abutting property.”	<p>The communities should consider developing sidewalk infill and maintenance program where City staff periodically inventory the street network to identify sidewalk gaps, and develop strategies, project prioritization criteria and funding for completing these gaps. Potential project prioritization criteria include filling gaps along key pedestrian routes, near major pedestrian trip generators like schools, transit routes, and along streets with high vehicle volumes.</p> <p>The City of Greenville, SC’s NSTEP program provides a good example of a sidewalk infill policy and program: http://www.greenvillesc.gov/publicworks/CivilEngineering.aspx</p> <p>See City of Charlotte sidewalk retrofit policy for an example - http://charmeck.org/city/charlotte/Transportation/PedBike/Documents/Sidewalk%20Retrofit%20Policy%20Amendments%20FINAL.pdf</p>
6.11 Sidewalk Maintenance Requirements and Obstructions	<p>CO Chapter 8, Article VII. Sidewalk Maintenance provides good provision for property owner-required maintenance of sidewalks and pedestrian area within the right-of-way.</p> <p>CO Chapter 22 Streets, Sidewalks and Other Public Places, Article III, Obstructions provides good language regarding sidewalk obstructions and legal remedies and requirements to remove.</p>	Enforcement of the obstructions language is critical and could provide a basis for removal of all kinds of temporary (e.g., trash cans) and more fixed obstructions in pedestrian ways (e.g., utility poles, sign poles).



Topic	Review	
	City of Columbia Code of Ordinances (CO) or Other Regulations	Comments and Suggestions
ITEMS REVIEWED		
7.1 Names of Resources	<p>GUIDELINES AND REGULATIONS:</p> <ul style="list-style-type: none">City of Columbia, South Carolina Code of Ordinances (CO): https://library.municode.com/index.aspx?clientId=13167 <p>ADDITIONAL POLICIES AND ORDINANCES:</p> <ul style="list-style-type: none">City of Columbia Complete Streets Resolution 2010: http://www.columbiasc.net/depts/city-council/docs/old_downloads/07_21_2010_Agenda_Items/Resolution_2010_054%20Complete%20Streets%202_Final.pdfCity of Columbia Endorsement of NACTO Urban Bikeway Design Guide, 2013: http://nacto.org/wp-content/uploads/2014/01/ColumbiaSC_Urban-Bikeway-Design-Guide-Resolution_05.21.13.pdf	<p>REFERENCES AND HELPFUL RESOURCES</p> <ul style="list-style-type: none"><i>Making Neighborhoods More Walkable and Bikeable</i>, ChangeLab Solutions: http://changelabsolutions.org/sites/default/files/MoveThisWay_FINAL-20130905.pdf<i>Getting the Wheels Rolling: A Guide to Using Policy to Create Bicycle Friendly Communities</i>, ChangeLab Solutions http://changelabsolutions.org/bike-policies<i>Bicycle Parking Guidelines, 2nd Edition</i> – by the Association of Pedestrian and Bicycle Professionals (APBP)<i>Complete Streets Local Policy Workbook</i> – by the National Complete Streets Coalition and Smart Growth America<i>NACTO Urban Bikeway Design Guide</i> – by the National Association of City Transportation Officials (NACTO)City of Beaufort, SC, Unified Development Code - http://www.cityofbeaufort.org/Data/Sites/1/media/City_Ordinances/udo-revised-september-2012-web.pdfCity of Charlotte Sidewalk Retrofit Policy - http://charmack.org/city/charlotte/Transportation/PedBike/Documents/Sidewalk%20Retrofit%20Policy%20Amendments%20FINAL.pdfCity of Wilson, NC, Unified Development Ordinance provides - http://www.wilsonnc.org/departments/development/services/unifieddevelopmentordinance/Form-Based Codes Institute (FBCI) - http://www.formbasedcodes.org/2010 ADA Standards for Accessible Design - http://www.ada.gov/2010ADAstandards_index.htm



Municipal Code Review

Introduction

The consultant team reviewed existing development policy and regulatory documents for the City of Columbia. This task included a review of available policies and standards directly related to pedestrian and/or bicyclist safety within the City. The review focused on the City’s Code of Ordinances (CO), but also included a review of the City of Columbia 2010 Complete Streets Resolution.

The full policy and regulatory review is provided in the attached policy matrix.

Planning and development regulations provide guidelines and requirements for most of what is developed in the City and as such are fundamental to the area’s walk- and bike-friendliness. Since most new development in Columbia is provided through private investment or investment by non-City agencies, the provision of walk- and bike-friendly development policies and ordinances are one of the most cost-effective means that the City has to establish walkable and bikeable infrastructure for its neighborhoods and districts.

Key Findings

The City of Columbia has a number of very positive policies and regulations that support walkable and bikeable environments. However, it is also evident that the City could significantly strengthen many areas of policy regarding complete streets (including transit access), bicycle parking, and bicycle and pedestrian facility requirements and enhancements within the context of development ordinances. Policies and standards geared toward retrofit of existing facilities are also recommended and discussed within the attached policy matrix. Table 18 describes key strengths identified within the existing ordiancnes and policies of the City, as well as priority areas for improvement.

TABLE 18 - COMPARISON WALKING AND BICYCLING RATES

City of Columbia Ordinances and Policies	
Strengths	Policy Areas for Improvement
Complete Streets Resolution	Development of comprehensive Complete Streets design guidance for new development and public investment
Adoption of NACTO <i>Urban Bikeway Design Guide</i>	Require pedestrian improvements with new development and redevelopment (sidewalks, lighting, street trees, etc.)
Good base of ordinances supporting pedestrian and bike safety (including prohibition on using mobile devices while driving, etc.)	Good base of ordinances supporting pedestrian and bike safety (including prohibition on using mobile devices while driving, etc.)
Good ordinance language requiring property owner participation in sidewalk maintenance	Update very suburban, auto-oriented development standards to be more context-based and pedestrian-friendly
Clear language prohibiting obstructions to sidewalks	Develop policy and ordinances for improved access to transit and improved safety requirements for heavy commercial vehicle operation within the City



Conclusion

What is evident is that a more holistic approach to facilitating walkable and bikeable new development is required. The City development standards are very much oriented towards automobile access first and foremost. Walkability begins with access to destinations and to the extent politically feasible, the City and its partners at County and State agencies should promote development that is proximate to existing infrastructure, residential development, and existing destinations for education, employment, commerce, and civic activities. This begins with allowing and promoting a mixture of land uses and density of land uses that support walking and bicycle access in the built up areas of the city. For current residents who do not drive or have access to a car and for future residents and visitors who are looking to visit or invest in a place where walking and biking are part of the transportation options, walkable land use patterns are critical to quality of life.

Second, promoting “complete” infrastructure and transportation linkages between land uses is what is required to make sure that places that are proximate in distance are indeed comfortable and safe to walk or bike to and from. This will require a thorough review and refinement of existing development standards to ensure that pedestrian and bicycle access and access to transit is considered in every requirement from the development of sidewalks to provision of bicycle parking and street trees and pedestrian-scaled lighting. Development standards should also consider whether or not buildings and lots are oriented for pedestrian and bicycle access. The City of Columbia recently adopted a Complete Streets resolution and endorsed the NACTO Urban Bikeway Design Guide, which are great first steps in this direction.

The comments in the tables below outline many opportunities for making local development standards more pedestrian and bicycle friendly. This plan suggests that City staff and appropriate appointed committees develop proposed text amendments for any “low hanging fruit” amendments noted below. For more holistic changes, staff, committees, and the Plan committee members should incorporate changes into the upcoming comprehensive audit and rewrite of development standards over the next 12-18 months. The outcome of such an effort will be development standards that are predictable and sustainable for investors and developers, but that also promote active living, aging in place, quality of life, and transportation and recreation choices; and respect the local character of the City.





APPENDIX D: PUBLIC INPUT AND BICYCLE COUNTS

Introduction

This memo presents a summary of public input efforts for Walk Bike Columbia: Columbia Pedestrian and Bicycle Master Plan and Bike Share Plan. The consultant team conducted a multifaceted public outreach effort over a period of four months, from May 2014 to August 2014. The purpose of the effort was to gather local knowledge and community input to guide the plan’s development. The project team’s public engagement events and efforts included the following:

- Steering Committee meetings
- 4 public workshops with interactive project boards and maps
- 8 stakeholder focus groups
- Citizen survey (available both online and in hard copy)
- Project website with project information, videos, and relevant links
- Online interactive map and input tool
- Flyers for public workshops
- Social media promotion
- Spanish language materials and interpreters at public events

These efforts were offered across the city and through a variety of media in order to provide the representatives and residents of Columbia with many opportunities and different mechanisms for contributing to the plan’s development. The following sections present key findings of the public outreach process and a summary of the outreach efforts and their results.

Key Findings

The Walk Bike Columbia public outreach process confirmed that Columbia citizens value access to active transportation and public transit. This is reflected in the low marks given to Columbia’s existing pedestrian and bicycle network and its transit operations, as well as in the fact that 81 % of respondents said walking and bicycling improvements are “very important” and 61% of respondents said that transit improvements are “very important.”

The primary concerns of residents when it comes to both walking and biking are the lack of safe roads and/or sidewalks, the need for improved design and/or maintenance of existing facilities, and the distance between destinations. The latter item points to a critical link between land use planning/land development and transportation planning/network development. The current efforts by the City and County to work collaboratively to update their land use plans and policies present a unique opportunity to address that important element. In addition to these priority concerns, citizens also noted bicycle parking as a key deterrent to bicycling activity and transit users stressed the need to improve and enhance transit operations (route network, headways, and reliability) while also improving walking and biking access to transit.

Key non-infrastructure strategies for encouraging safe walking, bicycling, and transit usage that are likely to have an impact in Columbia fall into the following categories:

- Education & Enforcement:
 - safety education media campaign
 - law enforcement sting targeted to motorists, bicyclists, and pedestrians
 - awareness campaign regarding the benefits and availability of walking, bicycling, and transit usage
- Encouragement:
 - employer-based incentives

- wayfinding signage for the complete multi-modal network
- informal, family-friendly events like ‘Open Streets’ (also known as Ciclovía)
- Evaluation:
 - Policies, plans, programs, and funding that prioritizes Safe Routes to School
 - Policies, plans, programs, and funding that prioritizes Safe Routes to Transit
 - Coordination of land use planning and transportation planning
 - Updated and improved design standards and design guidance for pedestrian and bicycle infrastructure, transit stop infrastructure, bicycle parking, and ADA accessibility

Regarding infrastructure improvements, citizens expressed a preference for sidewalks, trails, and shared-use paths and intersection improvements. For on-street bicycle facilities, buffered bicycle lanes and cycle tracks are preferable to standard bicycle lanes or shared roadways. Citizens also clearly stated neighborhood connectivity and access to parks and trails as city-wide priorities.

A majority of responses supports the concept of bike share in Columbia. Concerns regarding the distance between destinations and the low levels of bicycling for transportation that currently exist were expressed in terms of potential bike share usage. For a local bike share program to be deemed successful, citizens and stakeholders identified the following as the primary outcomes:

- Reduce the number of cars on the road.
- Reduce the number of car trips and vehicle miles traveled in private vehicles.
- Improve options and access to healthy living and active transportation.



Project Website and Online Mapping

The project website, www.walkbikecolumbia.org, provided information to the public about the plan and the planning process. The website included information on complete streets and bike share, background on the plan and existing conditions in Columbia, upcoming public workshops and meetings, informational videos and links, and relevant planning documents. Several thousand people accessed the website during the planning process; from mid-July to mid-August alone, over 3,300 unique viewers visited the project website.

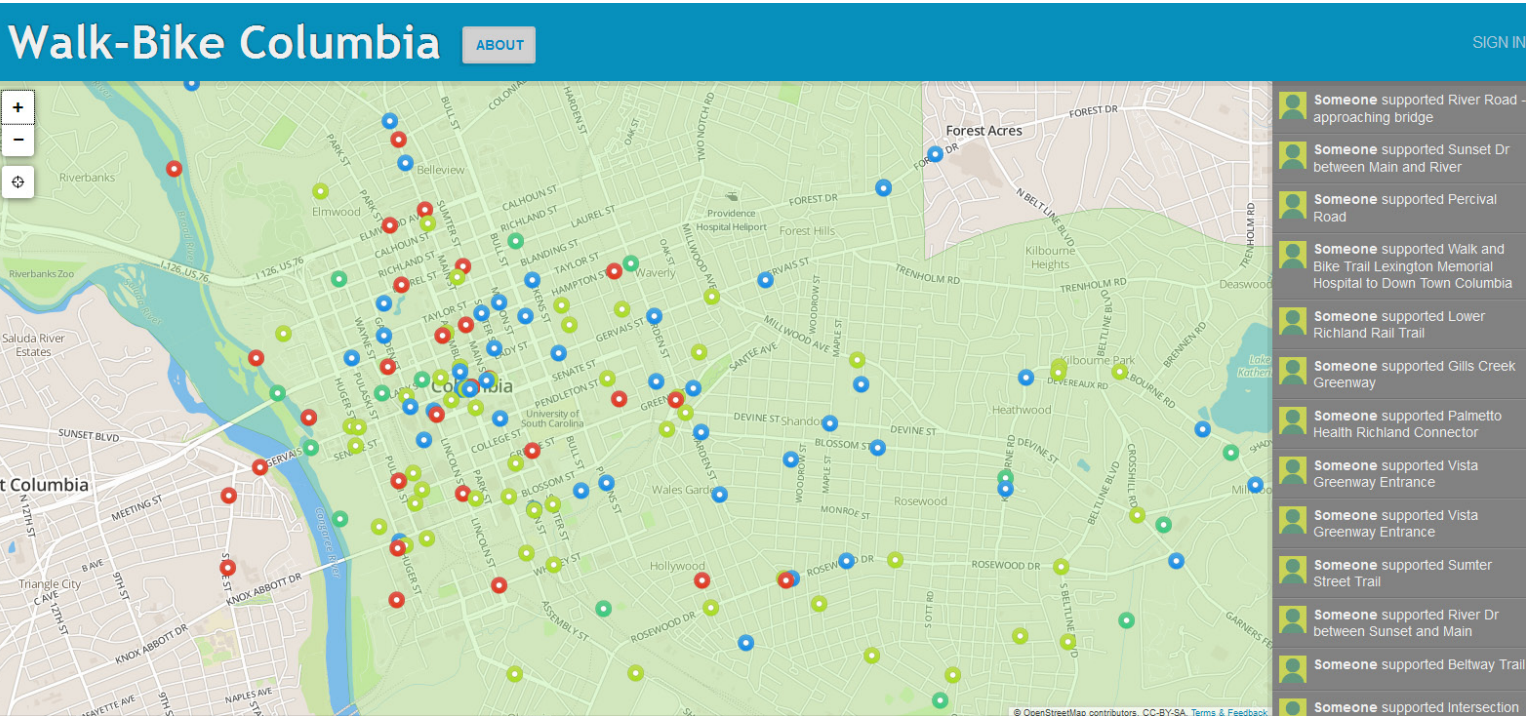
The website also included a link to the online Walk-Bike Columbia mapping tool, which provided an interactive map of the study area to invite public input. Web users were able to place points with comments to identify areas of safety concern; ideal routes for trails, on-road bicycle facilities, sidewalks, and bike share stations; and intersections and crossings that need improvement. The map below shows the online mapping interface with points that were placed by users. The different pin colors on the map represent different types of recommendations made. Altogether, users placed 193 points on the map and provided 89 additional comments.

Users were able to view other users' points and comments, and could vote to "support" a peer's recommended project. The following is a list of user-proposed projects that received the greatest support:

- Rosewood corridor bike lanes (13 votes of support)
- Safer crossing across Assembly Street at the Richland County Public Library (11 votes of support)
- Dedicated bicycle path connecting Shandon/Rosewood to Downtown (8 votes of support)
- Assembly Street bike lane from Elmwood Avenue to Shop Road (8 votes of support)
- River Drive bike lane between Main and Sunset (7 votes of support)

Other projects that received 6 votes of support included constructing the Vista Greenway from Park Street to Finlay Park, a road diet and bike lanes on Devine Street from Millwood to Harden, bike lanes along the length of Gervais, connecting the Three Rivers Greenway between Columbia Canal Dam and Granby Park, intersection improvements at Whaley and Main, Millwood Avenue bike lanes with frequent crosswalks and pedestrian refuge islands, intersection improvements at Garner's Ferry and Rosewood, keeping the Fort Jackson Boulevard Gate (Gate #1) open for longer hours for bicyclists to pass through, and bike lanes and sidewalks on Kilbourne Road between Rosewood and Devine.

FIGURE 4 – WALK BIKE COLUMBIA ONLINE MAPPING TOOL





The top voted locations for bike share stations included the following:

- Riverfront Park (6 votes of support)
- Richland County Public Library (6 votes of support)
- Aspyre and Olympia & Granby Mills (4 votes of support)
- River Walk Amphitheater (4 votes of support)
- Rosewood corridor (4 votes of support)
- Williams-Bryce Stadium and tailgate lot (3 votes of support)
- River Rat Brewery (3 votes of support)
- Main and Hampton (3 votes of support)
- Pinehurst Park (3 votes of support)
- Elmwood Park (3 votes of support)

The following maps show points by location, classified by number of votes of support, for proposed bicycle improvements, pedestrian improvements, trail improvements, and bike share stations, respectively. Users placed 69 points for bicycle improvements, 68 points for pedestrian improvements, 23 points for trail improvements, and 33 points for bike share stations. The majority of all points and comments were concentrated in the downtown area.

FIGURE 5 – PROPOSED BICYCLE IMPROVEMENTS FROM ONLINE INPUT MAP

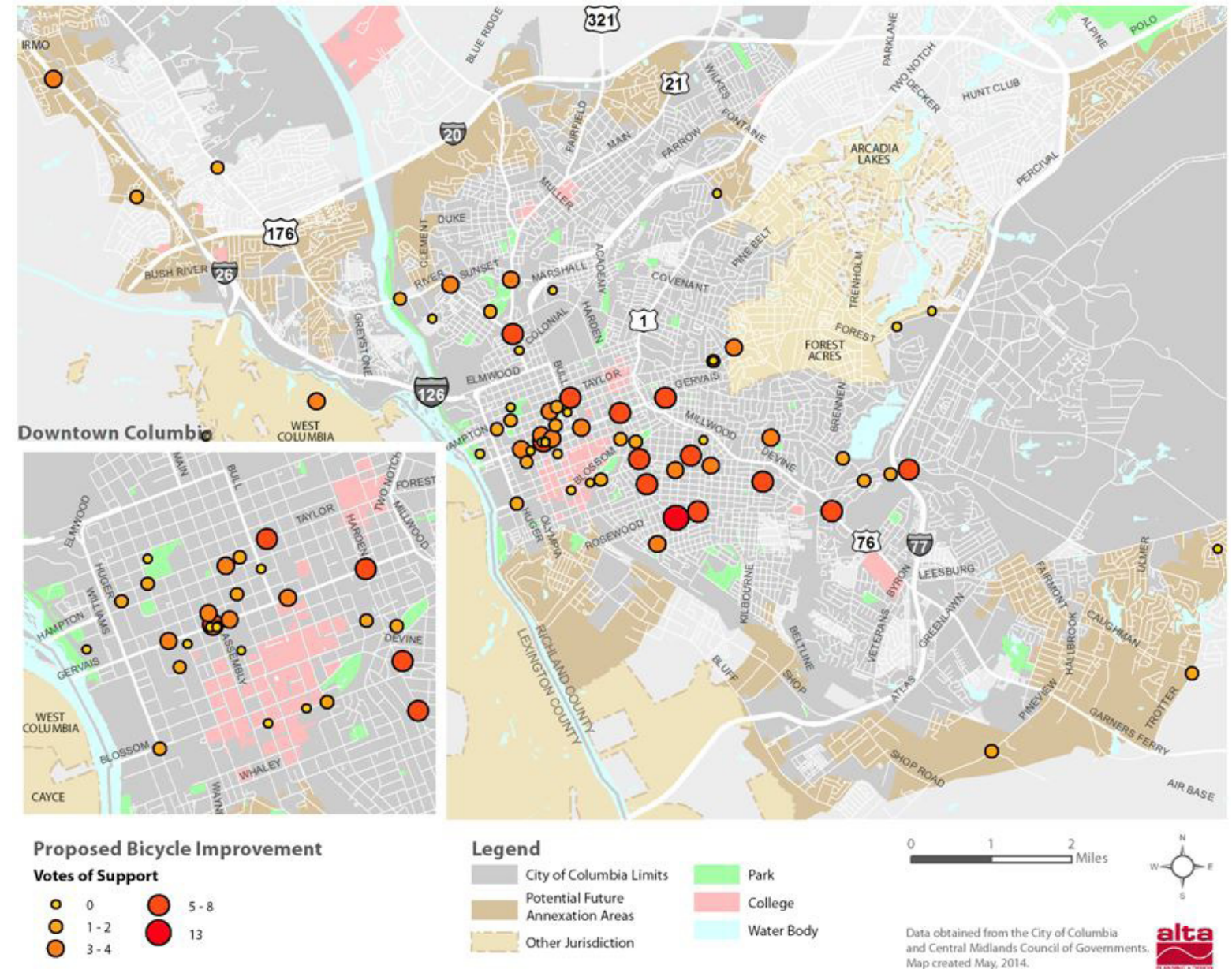




FIGURE 6 – PROPOSED PEDESTRIAN IMPROVEMENTS FROM ONLINE INPUT MAP

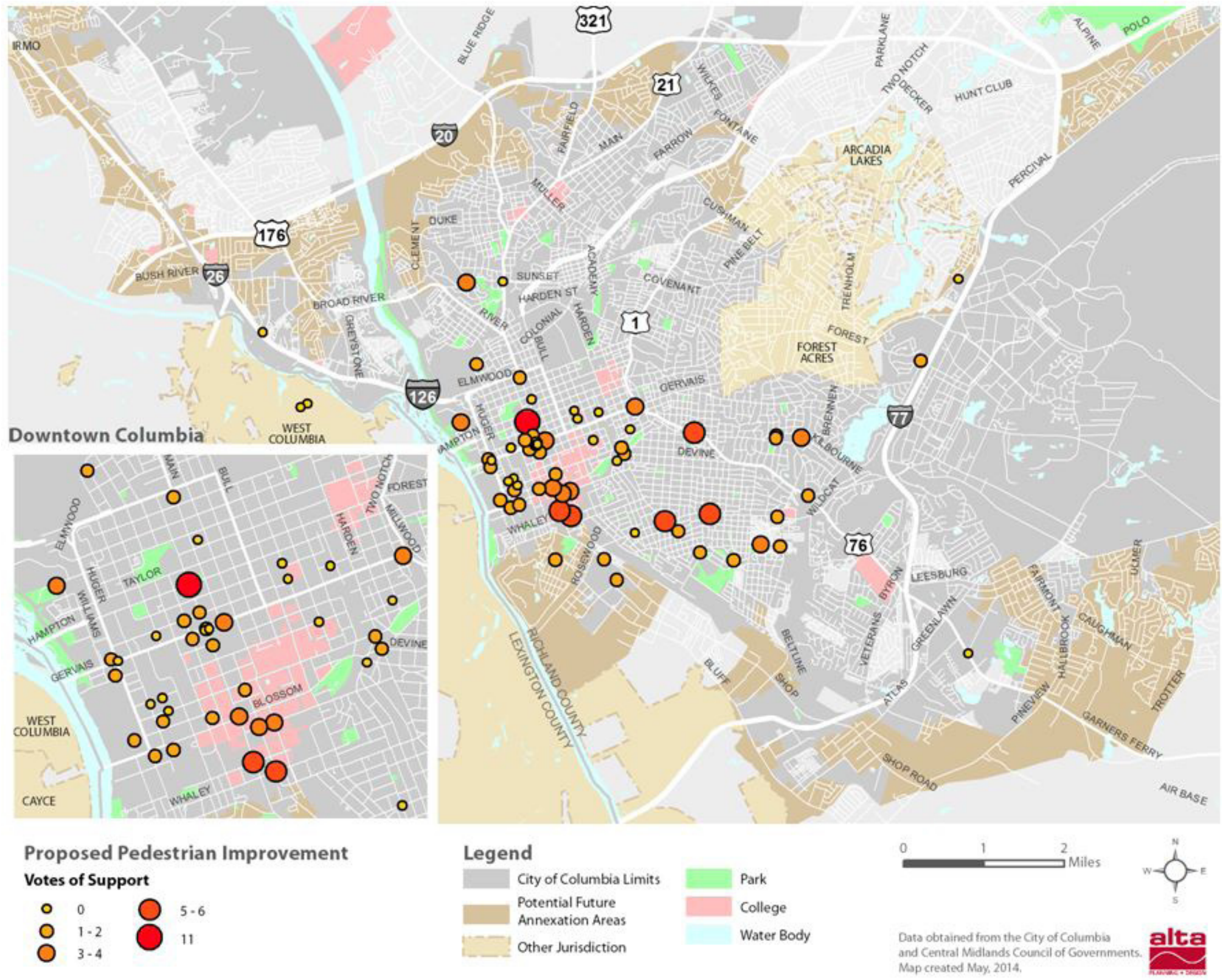




FIGURE 7 - PROPOSED TRAIL IMPROVEMENTS FROM ONLINE INPUT MAP

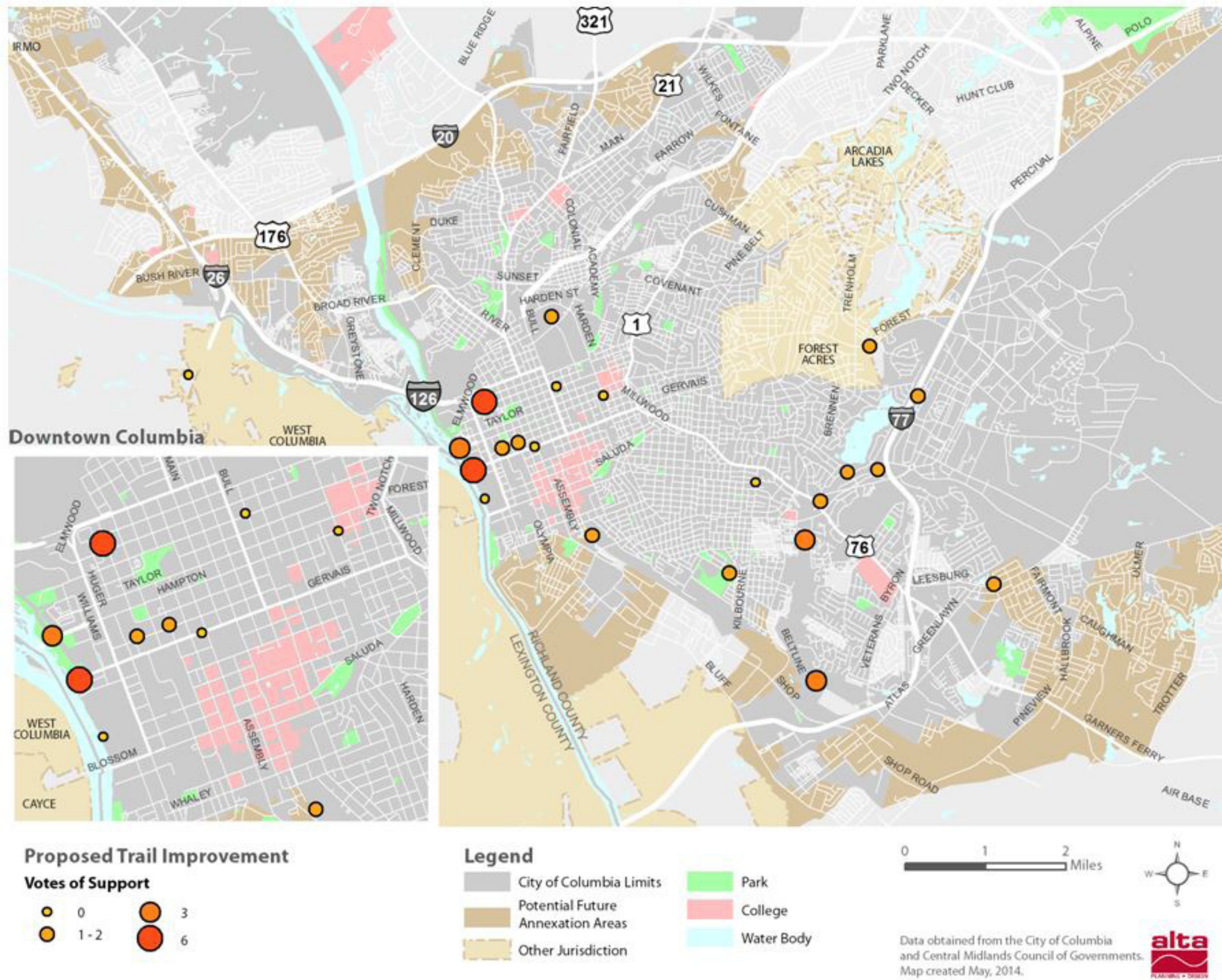
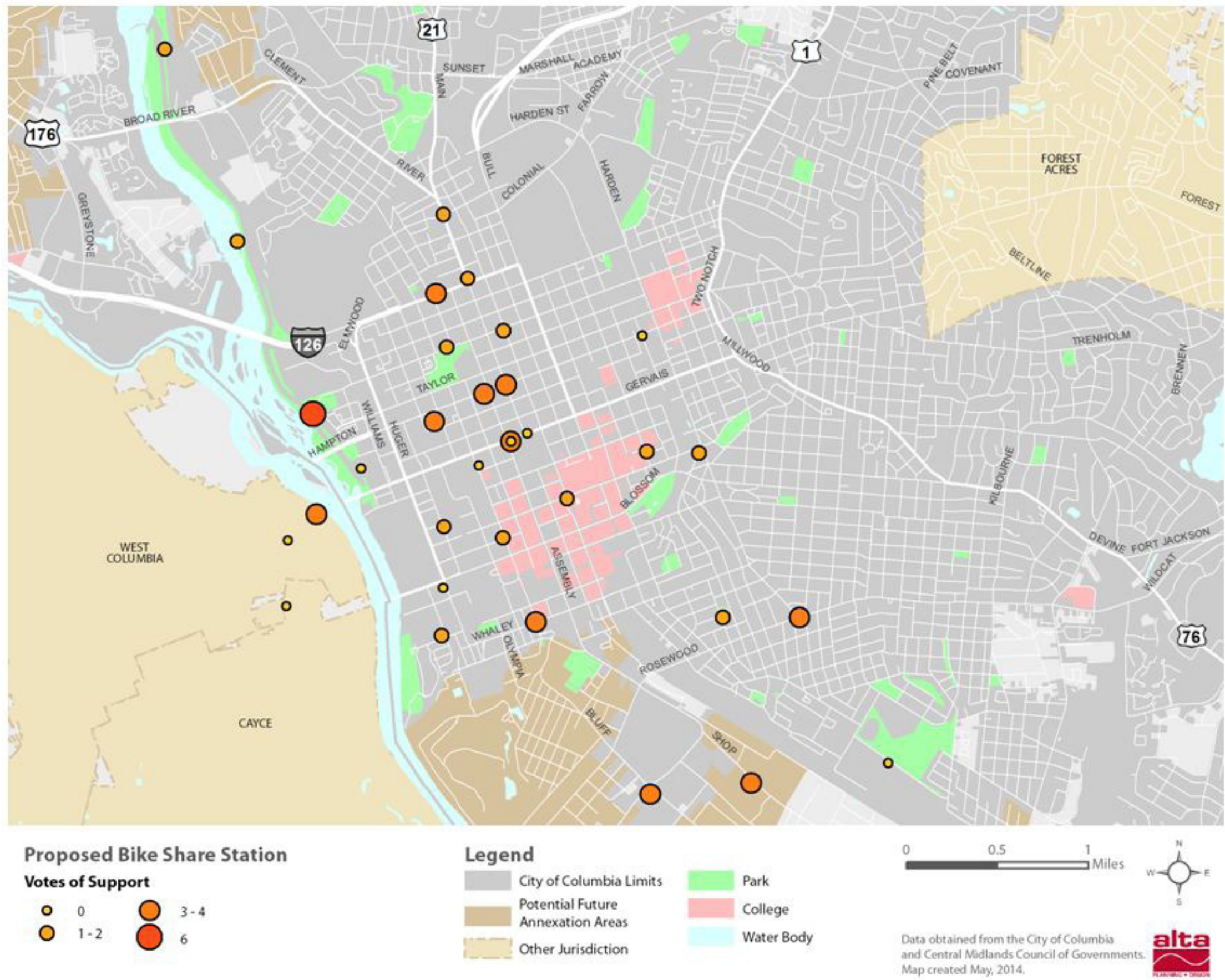




FIGURE 8 – PROPOSED BIKE SHARE STATIONS FROM ONLINE INPUT MAP





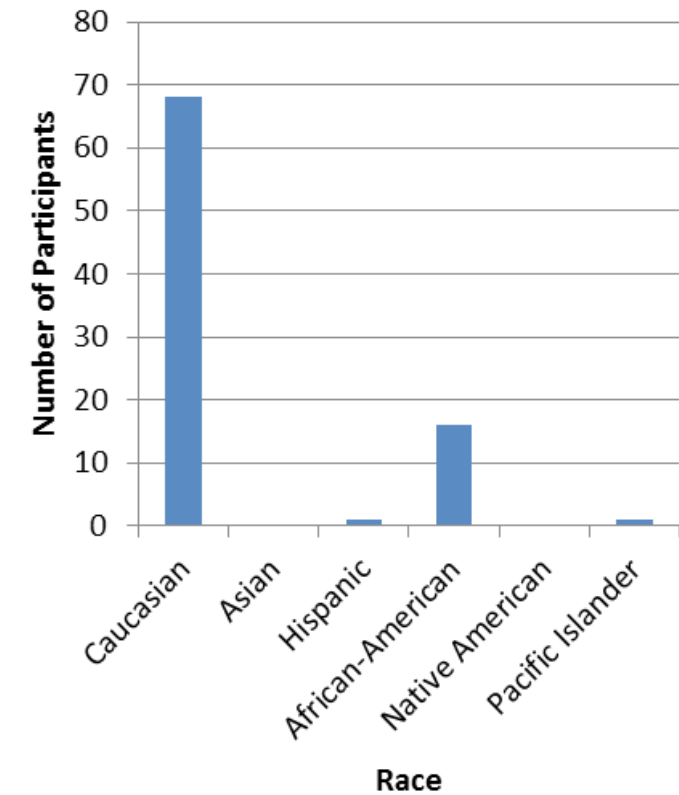
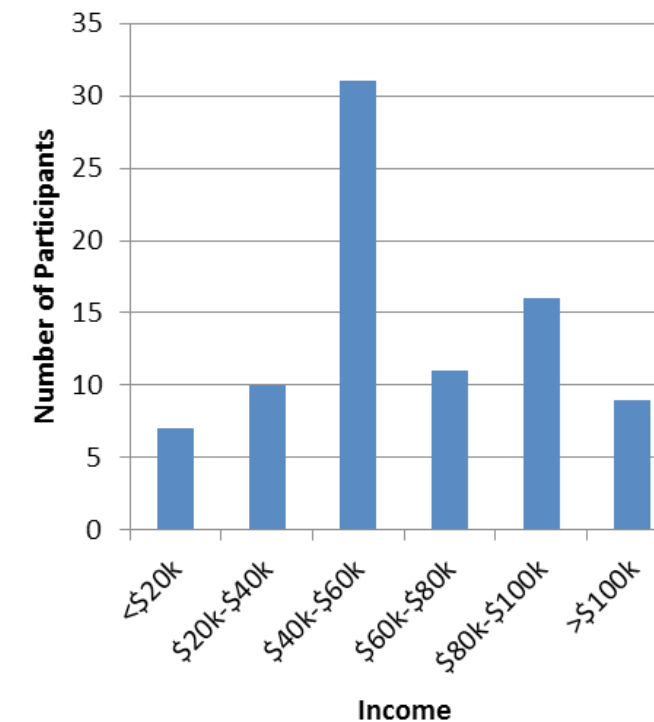
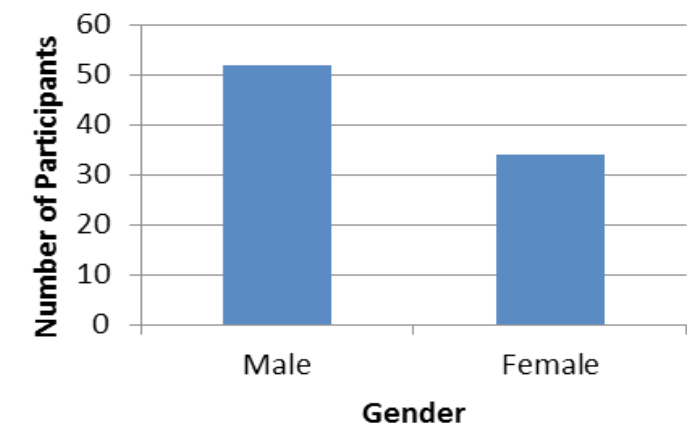
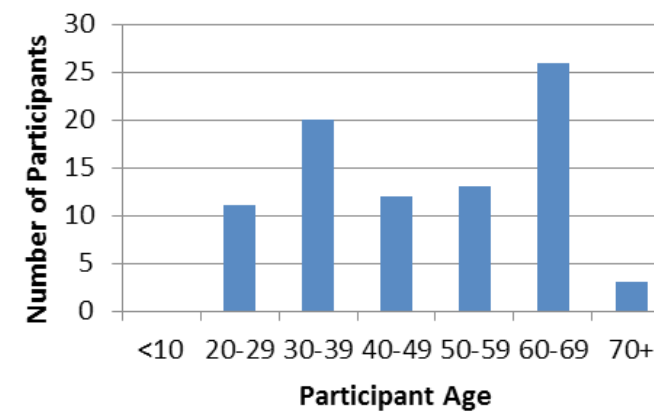
Public Workshops

The project team held a series of public workshops during the existing conditions assessment phase of the Walk Bike Columbia planning process to collect input from different resident stakeholders around the City of Columbia. Four meetings were held at the end of July in different Districts around Columbia:

- District 1 – July 29, 2014, 5:30 to 7:30 PM, Eau Claire Print Building, 3907 Ensor Street
- District 2 – July 30, 2014, 11:30 to 1:30 PM, Capstone Building, 898 Barnwell Street
- District 3 – July 30, 2014, 5:30 to 7:30 PM, MLK Park Community Center, 2300 Greene Street
- District 4 – July 31, 2014, 5:30 to 7:30 PM, Woodland Park Community Center, 6500 Olde Knight Parkway

The meeting promotion strategy, location selection, and variation in meeting times were all intended to attract stakeholders with diverse backgrounds and needs. The meetings were all held in a drop-in format, allowing participants to arrive, participate in the exercises, and ask questions at their leisure. The project team set up and operated several display boards with information on the Plan; maps of existing and proposed bikeways, walkways and transit in Columbia; and exercises to help determine preferences related to types of infrastructure as well as non-infrastructure walking and bicycling support programs. A Spanish language interpreter was present at two of the four events.

The following graphs show the demographics of attendees across all meetings based on the workshop exit surveys, which were voluntary and not completed by all attendees. The meetings attracted people from a broad range of ages and income levels, and approximately 40% of participants were women. According to the exit surveys, the majority of attendees were Caucasian, though there was a modest representation of minority participants.





SUMMARY OF COMMENTS ON THE EXISTING WALKING AND BICYCLING NETWORK, BIKE SHARE, AND TRANSIT

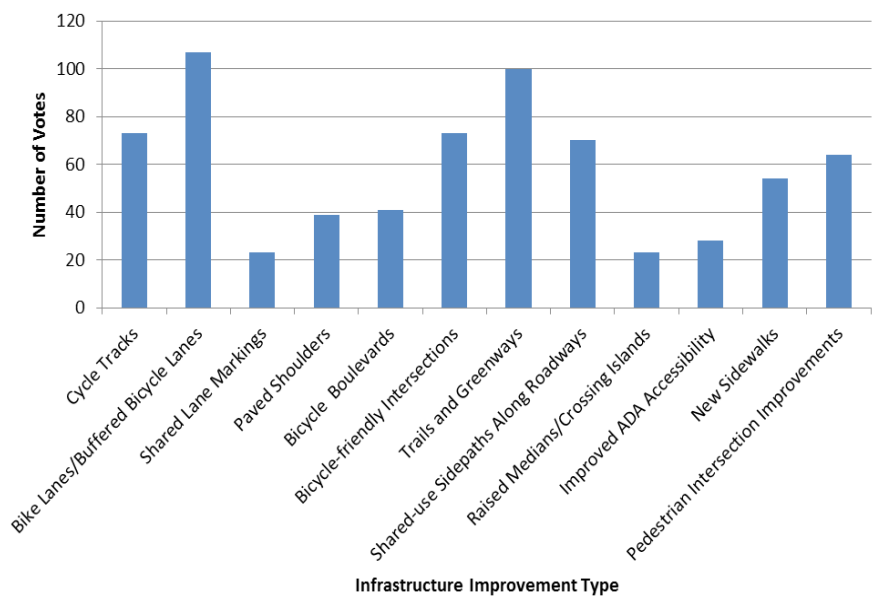
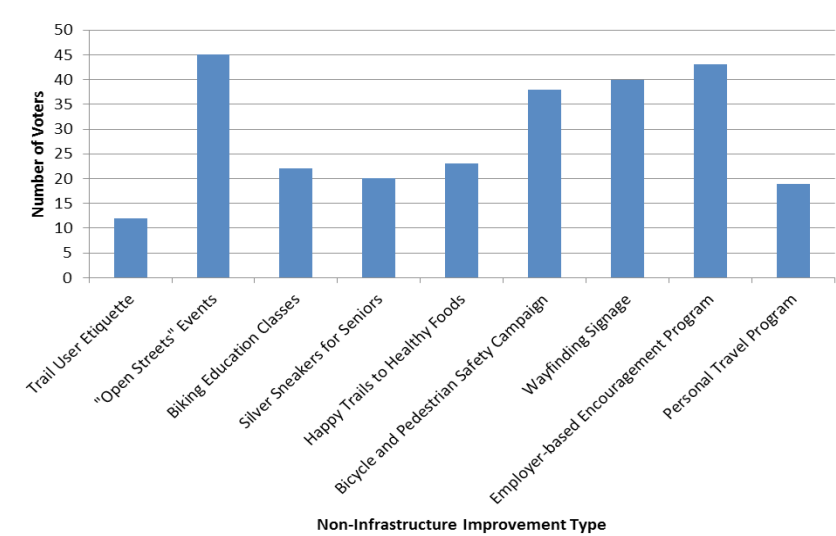
Across all meetings, comments on specific infrastructure focused on connectivity across barriers such as railways and rivers, as well as improvements for bicycling and walking along major corridors around the City such as Assembly Street, Garner’s Ferry Road, and Gervais Street.

Bike sharing was seen as being the most successful around the colleges and universities, Five Points, downtown, the greenways, and the Vista Business District. In terms of transit improvements, participants generally desired more amenities at bus stops such as shelters and better route information, better sidewalk connectivity to bus stops, and more frequent and extensive service.

SUMMARY OF COMMENTS ON INFRASTRUCTURE AND NON-INFRASTRUCTURE IMPROVEMENT TYPES

Attendees were asked to vote with a fixed number of stickers (6) on pedestrian and bicycle infrastructure improvements that they would like to see in Columbia. As shown in the chart below, separated on-street bicycle facilities (bike lanes/ buffered bike lanes and cycle tracks) and trails were the most favored improvements. More shared-use paths and better intersection treatments for pedestrians and bicyclists were also popular choices. Shared lane markings, bicycle boulevards, and pedestrian crossing islands were the least requested.

Attendees were asked to vote on pedestrian and bicycling education, encouragement, and enforcement programs they would like to see around Columbia, and again vote with (3) stickers on the programs they prefer. The chart below shows that participants desired various programs with “open streets” type events, bicycle and pedestrian safety campaigns, wayfinding signage, and employer-based encouragement programs.





Citizen Survey

A citizen survey was developed for Walk Bike Columbia and made available in both hardcopy and online form. The purpose of the survey was to gain a better understanding of Columbia residents’ walking, bicycling, and transit behavior; their opinions on existing walking, bicycling, and transit conditions in Columbia; and their thoughts on how walking, bicycling, and transit in Columbia could be improved. The comment form was available online for nearly four months, from May 2014 to August 2014. To maximize the responses to the online form, the web address was distributed at steering committee meetings, public workshops, to local interest groups, in newsletters, in newspaper public service announcements, on the website and through social media, and on flyers throughout the city. Volunteers and staff set up booths to provide hard copy surveys on multiple days at the downtown transit center and the Soda City Market. Nearly 850 people completed the citizen survey.

SURVEY RESPONDENTS

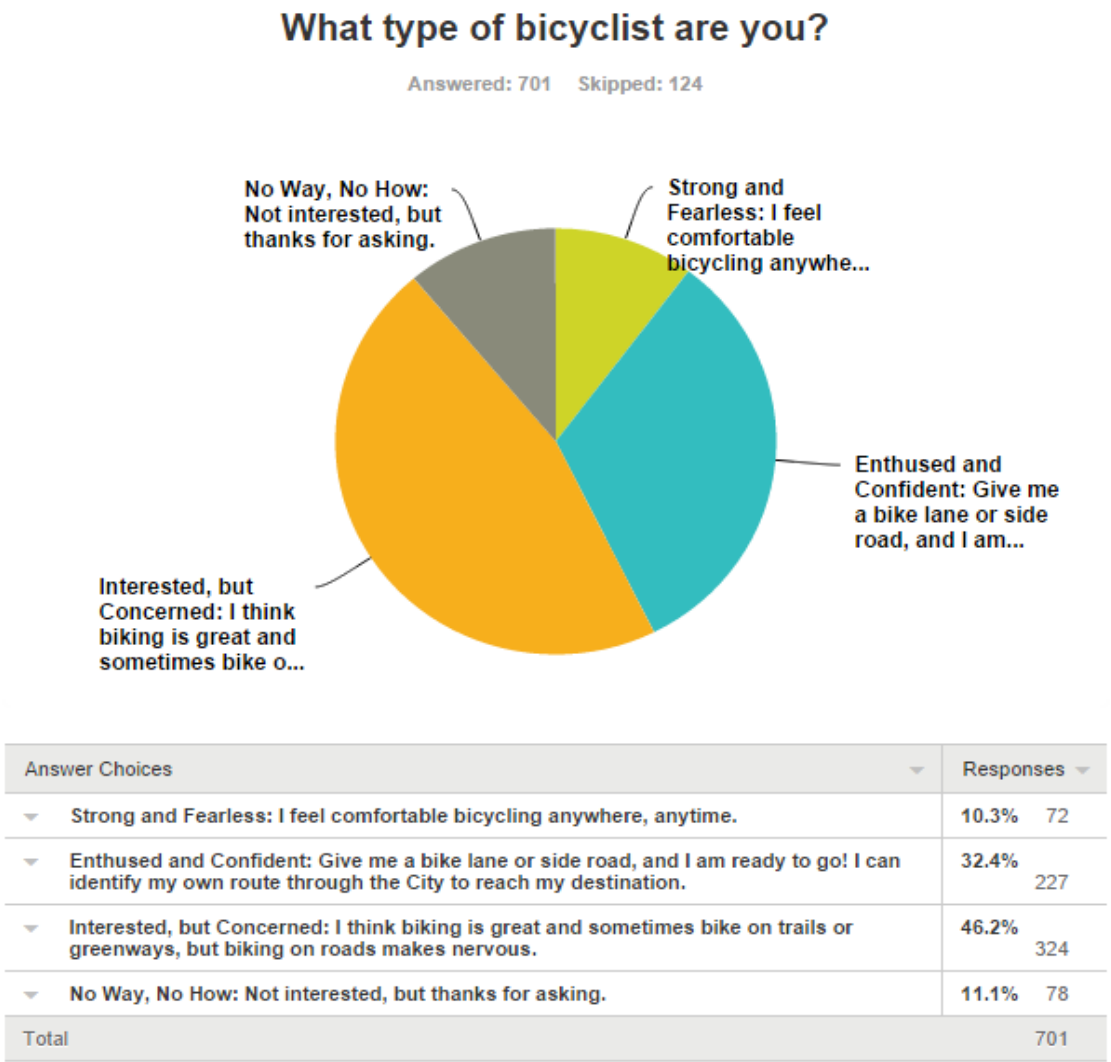
The survey included several questions to gather information about the survey respondents. Participants were asked about their age range, gender, disability status, where they live, where they work, and what type of bicyclist they identify as.

A wide range of age groups were well represented:

- 18% of respondents were age 20-29
- 27% were age 30-39, 19% were age 40-49
- 21% were age 50-59
- 12% were age 60-69

Men and women were evenly represented, with 50.1% female respondents and 49.9% male respondents. Nearly 30% of respondents stated that they are aware of one or more **resident in their neighborhood with a disability that affects that person’s ability to walk or drive.**

Most participants reported living in the City of Columbia (64%), Richland County (21%), or Lexington County (14%). An even greater proportion, **77%, reported working in Columbia. When asked, “What type of bicyclist are you?” the large majority (78%) responded “Enthusied and Confident” (32%) or “Interested, but Concerned” (46%).** Only 10% identified as “Strong and Fearless” and 11% answered “No Way, No How” (Not interested in bicycling).



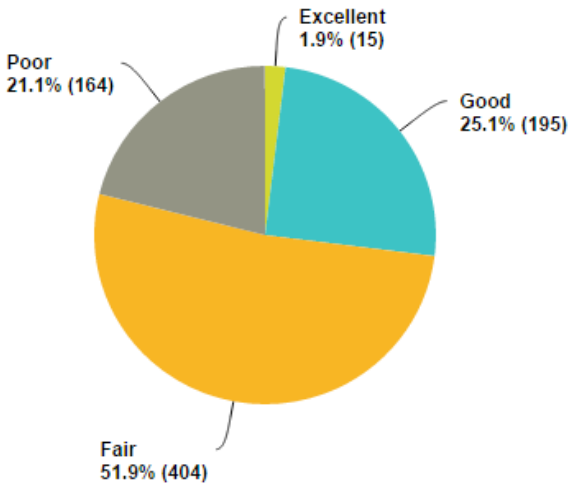


SURVEY RESPONSES – WALKING AND BICYCLING CONDITIONS

Overall, **walking and bicycling conditions in Columbia are viewed as fair to poor**. Survey participants view the existing bicycling conditions more negatively than the existing walking conditions. **Over 70% of respondents said that walking conditions are “fair” (52%) or “poor” (21%)**, while 25% said “good” and just 2% said “excellent”. **For bicycling conditions, nearly 80% said that conditions are “fair” (45%) or “poor” (44%)**, 10% said “good”, and just 1% responded “excellent”. For many residents, the sidewalk network is insufficiently connected. Survey participants were asked, “Is the sidewalk network near your home complete?” and only 20% responded “Yes”. The other **80% reported that their sidewalk network is some degree of incomplete**: 26% reported it as mostly complete, but with gaps; 27% reported that “The sidewalks are spotty at best”; and 27% said “There are no sidewalks where I live”.

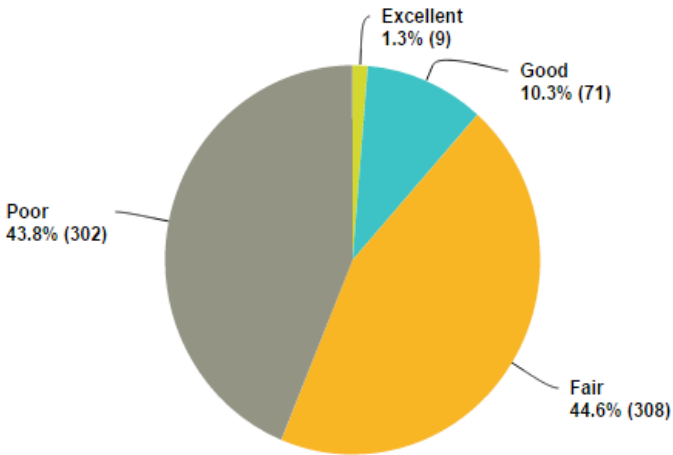
How do you rate overall walking conditions in the City of Columbia?

Answered: 778 Skipped: 47



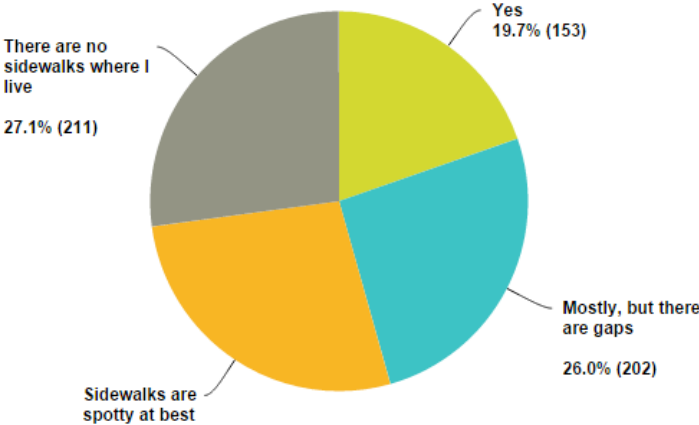
How do rate the overall bicycling conditions in Columbia?

Answered: 690 Skipped: 135



Is the sidewalk network near your home complete?

Answered: 778 Skipped: 47





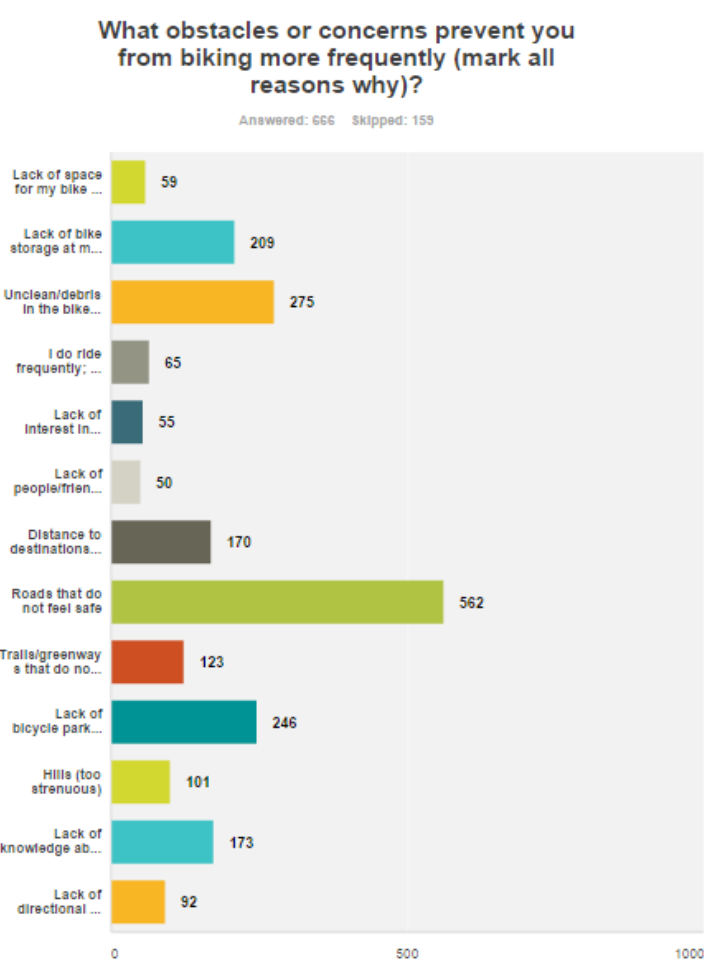
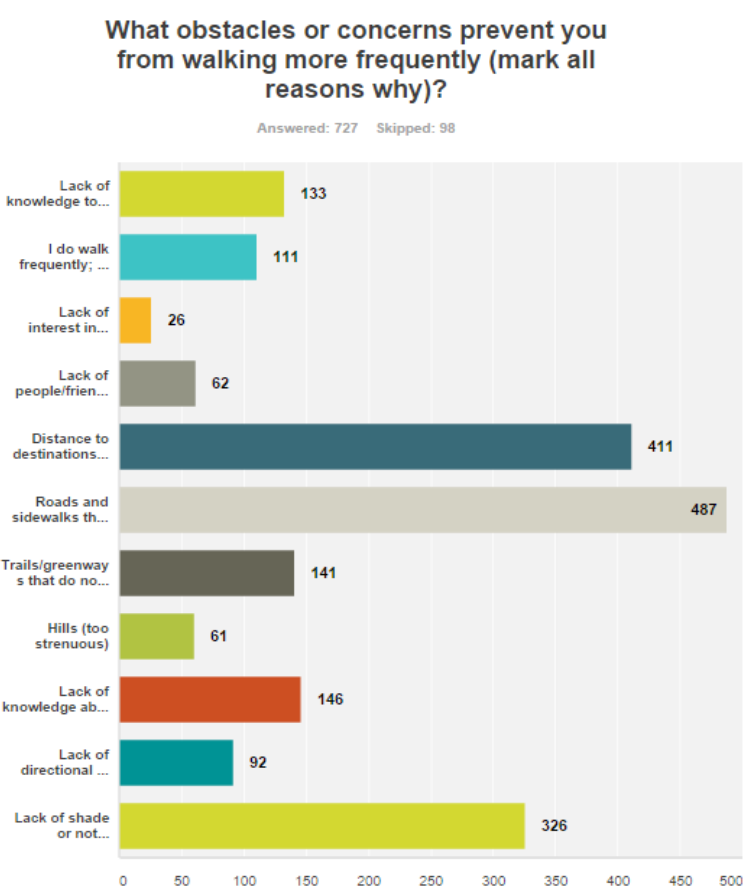
Factors That Influence Walking and Bicycling

Respondents were asked to rank a series of factors in terms of how influential each factor is on the respondent’s decision to walk instead of drive. **The factors that are most influential are walking for health reasons, walking to spend time outdoors, walking to see things that are missed while driving, and walking for environmental reasons.** The factors that were reported to be the least influential on the decision to walk are “Walking and/or bus transit are my primary forms of transportation” and “Walking is the most practical/convenient way for me to get to my destination.”

Respondents were asked a similar question about bicycling facilities, in which they had to rank facilities based on how likely they were to influence the respondent to bike more often, with 1 being most likely and 4 being very unlikely. **The facilities that were reported as the most influential in encouraging people to bike are paved off-street paths/greenways (average rank 1.36), intersection improvements for bicyclists (average rank 1.41), striped bike lanes (average rank 1.46), cycle tracks (average rank 1.57), and bicycle boulevards (average rank 1.59).**

Factors That Prevent Walking and Bicycling

When survey participants were asked, **“What obstacles or concerns prevent you from walking more frequently (mark all reasons why)?”** the most popular answer was **“Roads and sidewalks that do not feel safe” (67%)**. Other top responses were “Distance to destinations too far” (57%) and “Lack of shade or not well-maintained” (45%). **When asked a similar question for bicycling, the standout answer was “Roads that do not feel safe” (84%)**. Other common responses were “Unclean/debris in the bike lane” (41%), “Lack of bicycle parking at destinations” (37%), and “Lack of bike storage at my destination” (31%).



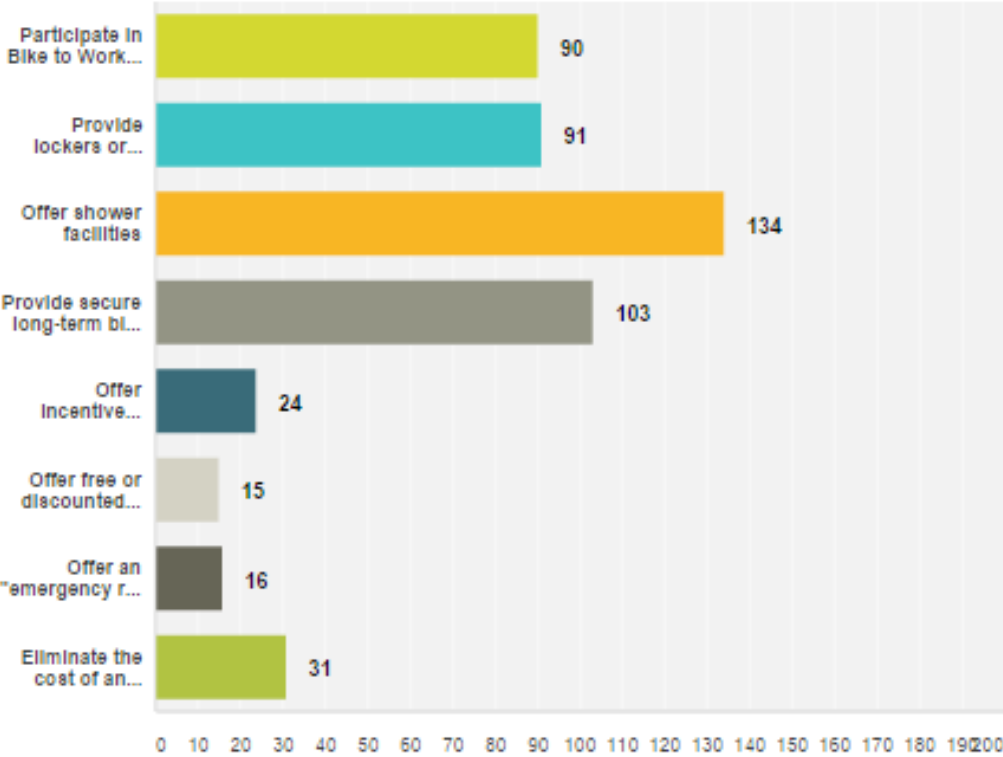


Employer Support for Alternative Transportation

Employer supported programs that encourage walking, bicycling, and transit can help to encourage employees to commute by these modes. When asked, **“How does your place of work support employees who walk, bike, or take transit?”** the most commonly reported response was **“Offer shower facilities”**, followed by “Provide secure long-term bike parking”, “Provide lockers or storage for personal items”, and “Participate in Bike to Work Day or other biking/walking events.”

How does your place of work support employees who walk, bike, or take transit?

Answered: 255 Skipped: 570





SURVEY RESPONSES – BICYCLING AND WALKING IMPROVEMENTS

Importance of Walking and Bicycling Improvements

When asked, “How important is it to you to improve the bicycle and pedestrian environment in Columbia?” the response was overwhelmingly supportive. **Nearly all (98%) of the respondents believe that it is very important (81%) or somewhat important (17%) to improve the bicycle and pedestrian environment in the city.**

Walking Destinations

The top destinations that people in Columbia would **most like to be able to walk to** are **parks and trails (66%), restaurants or bars (66%), shopping or errands (60%), no particular destination – just walking for fitness or leisure (57%), houses of friends or family (53%), and to work (39%).**

Bicycling Destinations

The **top destinations** that people in Columbia would **most like to be able to bike to** are **parks and trails (70%), no particular destination – just biking for fitness or leisure (64%), houses of friends or family (62%), shopping or errands (60%), restaurants or bars (57%), and to work (56%).**

Priority Roadway Corridors for Walking Improvements, Pedestrian Intersection Improvements, and Bicycling Improvements

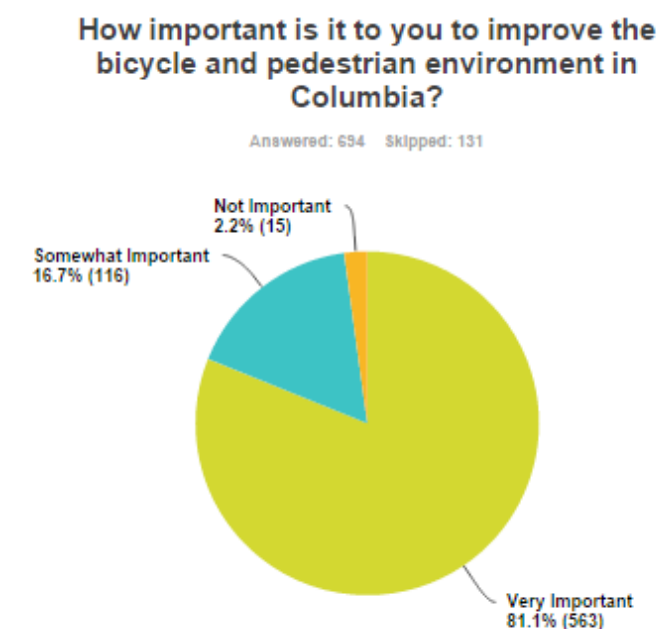
Survey respondents were asked to name one roadway corridor that they would most like to see improved to accommodate walking, safe pedestrian crossings, and bicycling, respectively. The **most common answers for walking improvements were Gervais, Assembly, Rosewood, Beltline, Garners Ferry, Trenholm, and Vista.**

Several of the most commonly listed roadways for walking improvements were also in the lists of top corridors for intersection improvements and bicycling improvements. The **top answers for pedestrian intersection improvements were**

Assembly, Gervais, Huger, Elmwood, Devine, Broad River, and Rosewood. The most common responses for bicycling improvements were Gervais, Assembly, Harden, Downtown, Forest Drive, Main Street, and Vista.

Priority Locations for Bicycle Parking

Participants were asked to list up to three locations where they would like to have **bicycle parking**. The **most common answers were Publix, Gervais, Vista, parks, Trenholm Plaza, Five Points, Main Street, Rosewood, shopping centers, and Downtown.**



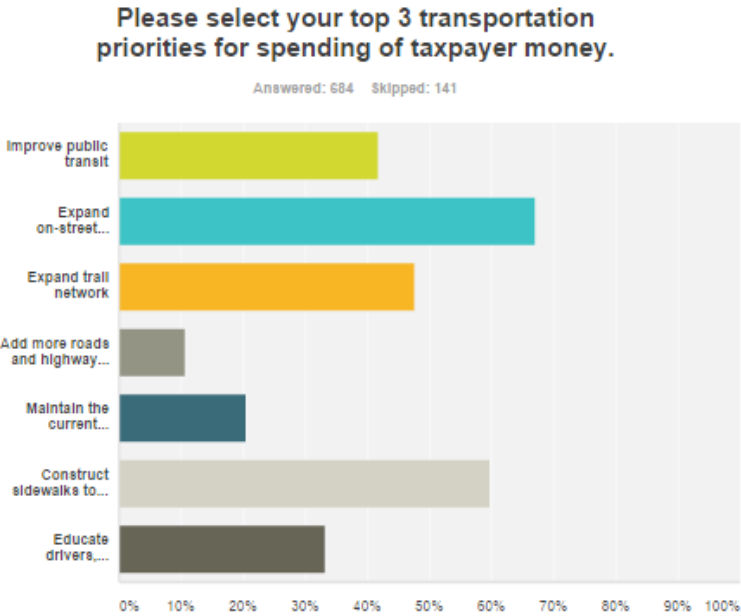
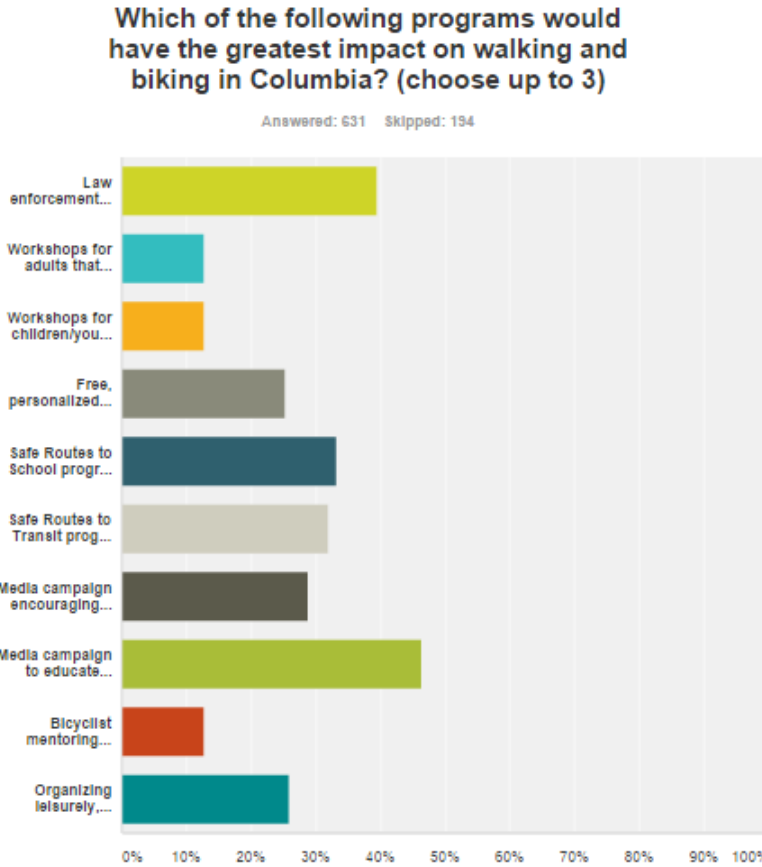


Walking and Bicycling Programs

As part of the Walk Bike Columbia effort, the plan includes a series of program recommendations to increase education and awareness around walking and bicycling, improve traffic safety, and encourage people to walk and bike more for transportation and recreation. **Survey participants were asked to choose the top 3 programs that they believe would have the greatest impact on walking and biking in Columbia, and the overriding theme in the responses was a need to address safety concerns through education and enforcement.** A media campaign to educate to educate motorists, bicyclists, and pedestrians was the number one choice, with 46% of respondents placing it in their top 3. The second and third most popular choices, respectively, were “Law enforcement programs targeting motorists, bicyclists, and pedestrians” (39%) and “Safe Routes to School Program to engage schools, parents, and local officials (33%).

Transportation Funding Priorities

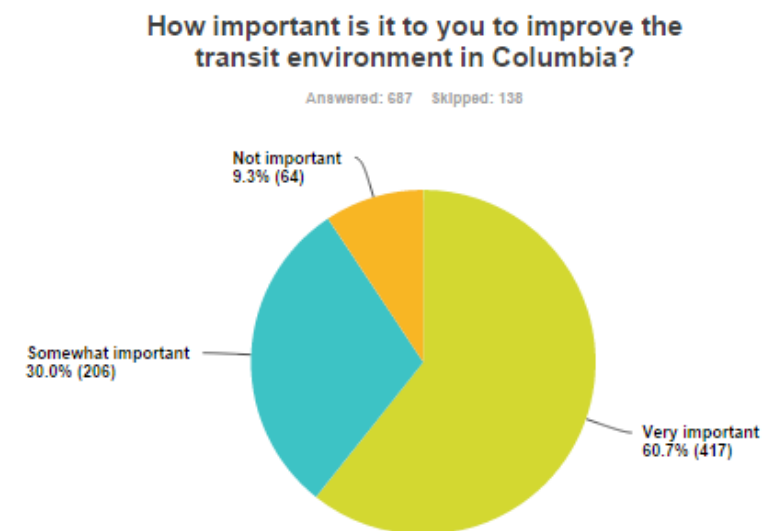
Survey participants were asked to select **their top 3 transportation funding priorities to which taxpayer funding should be dedicated. The top choice was to expand the on-street bicycle network (selected by 67% of respondents), followed by “construct sidewalks to increase pedestrian connectivity” (selected by 60%) and “expand the trail network” (48%).** The least popular response was “Add more roads and highway lanes for vehicles and freight,” with just 11% of respondents choosing this as one of their top 3 choices.





SURVEY RESPONSES - TRANSIT

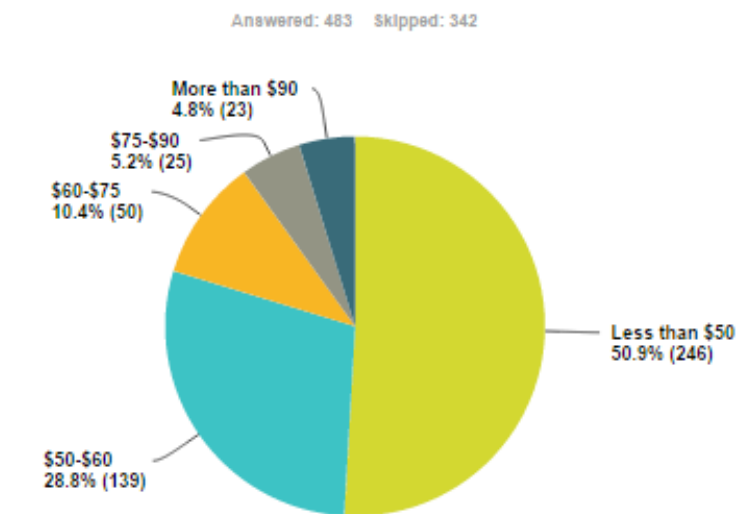
Survey participants were asked a series of questions related to transit use and potential transit improvements for Columbia. When asked, **“How do you use transit in Columbia?” 41% answered “I do not use transit, but I would like to”** and 41% answered “I do not use transit.” **Of those who did report using transit, the most popular trip purposes were to get to or from work (43% of transit users) and to run errands (39% of transit users). More than 90% of survey respondents feel that it is important to improve the transit environment in Columbia;** 61% said it was “Very Important” and 30% said it was “Somewhat Important.” **The roadway corridors that respondents would most like to see improved for transit access include Rosewood, Gervais, Assembly, Downtown, Garners Ferry, Huger, and Two Notch.**



SURVEY RESPONSES – BIKE SHARE

The Walk Bike Columbia survey included a series of questions about bike share to gauge Columbia residents' interest in and willingness to pay for a bike share system in the city. Of the survey respondents, 26.4% have used a bike share system in another city, while 73.6% have not. However, **the majority of respondents expressed interest in bike share: 62% said they are interested in a bike share program for Columbia,** and 38% said they are not. **When asked, “How much would you be willing to pay for an annual membership?” most respondents (51%) answered that they would pay less than \$50 per year for a bike share membership,** and an additional 29% said they would pay between \$50 and \$60 for a membership.

If so, how much would you be willing to pay for an annual membership?





Stakeholder Focus Groups

Stakeholder focus groups added targeted feedback to the broader public outreach strategy for Walk Bike Columbia. A total of 8 stakeholder focus groups were held on June 17th and 18th, 2014, to gather input from organizations and residents representing a range of interests related to walking and bicycling in Columbia. The meetings were held at the City of Columbia Parking Services conference room, 820 Washington Street. Comments and feedback received during the meetings were used to inform both the Pedestrian and Bicycle Master Plan and the Bike Share Plan for Columbia. The following is a list of the 8 focus groups that were convened for this portion of the public outreach effort:

- Bicycle Culture
- Target Populations
- Neighborhoods
- County and State Agencies
- Colleges and Universities
- Tourism and Businesses
- Major Employers
- City and University Support Services

At each meeting, the project consultant team led a discussion of vision and goals for the future of walking and bicycling in Columbia, opportunities and strengths of the existing network, constraints and challenges of the existing network, ideas for new and improved programs and policies, and the feasibility of a bike share system for Columbia, including potential station locations, partners and operators, and pricing. A thematic summary of focus group input is provided below.

VISION AND GOALS

At the start of each meeting, each focus group participant was asked to provide a 10-year vision and goals for walking, bicycling, and transit in Columbia. Participants touched upon several important themes to make Columbia a more walk-, bicycle-, and transit-friendly community, including the following:

- Connectivity and Coordination:
 - More and better connections between neighborhoods, outlying areas, and downtown
 - Capitalize on neighborhood network with bike routes
 - Leverage downtown neighborhoods
 - Coordinate efforts across agencies, jurisdictions, and modes
- Safety:
 - Develop facilities for all ages and abilities
 - Design for interested but concerned riders (90% of bike customers at local bike shop)
 - Become competitive among peer cities by meeting best practices
- Easier transportation choices and range of choices:
 - Multi-modal choices for college students and residents
 - Increase investments in bike paths/lanes and improve pedestrian access
 - Increase the mode share for bicycling and walking
 - Make public transit viable and practical for choice riders and change the negative mindset
 - Increase the mode share for transit
 - Pursue a light rail line in the next 10 years

- Environment & Recreation:
 - Connect people to natural resources
 - Build more greenways
- Health:
 - Promote active commuting

OPPORTUNITIES AND STRENGTHS

Focus groups were asked to identify the existing strengths of the current walking and bicycling environment in Columbia, as well as key opportunities for improvement. Some of the strengths and opportunities in the City include existing and potential walk- and bicycle-friendly routes and infrastructure, strong community engagement, college and university presence, partnerships, access to destinations, strong neighborhoods, and recent improvements.

- Existing and potential walk- and bicycle-friendly routes and infrastructure: Some streets in Columbia already provide a safe and comfortable environment for walking and biking, such as Greene, Lincoln, Wheat, and Blossom Street. The riverfront trails are popular with residents and visitors, and the dense street grid network downtown makes it easy to reach many destinations within a short distance. The wide existing right of way and over supply of parking on many roads also provides opportunities to add new bicycle and pedestrian facilities.
- Strong community engagement: The Columbia bike community is well-connected and very active in supporting projects and events. The River Alliance has helped to plan and fund projects, and a new non-profit group is advocating for improved local transit options.
- College and university presence: Local colleges and universities help to create a vibrant walking and bicycling



environment in Columbia and supplement city-provided services. Many college students already regularly walk to major destinations such as Five Points, and USC provides a student shuttle that could potentially be expanded to include city residents through a partnership between USC and the City. USC also has a bike shop on campus and a Bicycle Advisory Committee that could serve as partners for future projects and programming. There is also potential to further promote alternative transportation through the colleges and universities by restricting vehicles on campus. For example, freshmen at Allen University cannot have cars, and more than 75% live on campus.

- Partnerships and funding: There are ample opportunities to expand existing partnerships and build new partnerships within Columbia. The City has a positive relationship with USC and other colleges and universities, and the City and County are currently collaborating to make joint updates to their land use plans. These partnerships will be important to funding and implementing future bicycle and pedestrian projects. The Penny Sales Tax revenue is also a valuable source of funding for alternative transportation efforts.
- Access to destinations: Some destinations in Columbia are already accessible by walking, biking, and transit, such as some parts of downtown, USC, and the riverfront trails. Grocery stores are located near residential areas throughout Columbia, which makes it possible for some residents to walk or bike to the store.
- Strong neighborhoods: Columbia is made up of a series of neighborhoods with a strong sense of community and a culture of walking. The Rosewood neighborhood, for example, has many transit users, walkers, and bicyclists, and is close to USC, downtown, and other key destinations. Neighborhoods along Millwood also have a high proportion of people walking throughout the day.

- Recent and ongoing improvements: Several ongoing improvements are contributing to a better walking, bicycling, and transit environment in Columbia. Focus group participants noted that bus service around the city is improving. The recent Assembly Street project improved the pedestrian environment by narrowing the road, installing curb bulb-outs, and making intersection improvements to provide safer crossing opportunities. Some crosswalks in town were also recently updated to comply with ADA accessibility standards. Upcoming developments, such as the Bull Street property redevelopment, present ideal opportunities to develop safe and comfortable bicycle and pedestrian facilities.

CONSTRAINTS AND CHALLENGES

The focus groups identified several existing constraints on bicycling and walking in Columbia, and challenges to improving those conditions. The major issues discussed included safety concerns and barriers to using existing facilities, key areas that need safety improvements, difficulty partnering on some projects, and a lack of bicycle, pedestrian, and transit access and connectivity around the city.

- Partnerships: There is a lack of coordination among departments and agencies, both at the city level as well as between the City and regional and state agencies.
- Safety concerns and barriers to using existing facilities:
 - The bicycling environment does not feel safe because of uneven roadway surfaces, a lack of bike lane maintenance and enforcement, and rumble strips on roadways in rural areas. Driver behavior also adds to the safety concerns; vehicles regularly run stop signs or pull through crosswalks without yielding to pedestrians and bicyclists.
 - Arterial roadways are major barriers to walking and biking.

- Transit signage and travel information is lacking.
- Key areas that need safety improvements:
 - Provide a safe connection from the riverfront to campus and downtown
 - Add “Watch for Pedestrians” signage and other safety awareness signage at popular crossing points, such as across Assembly, Taylor, and near the Post Office
 - Provide traffic calming along roadways with a large amount of bicycle and pedestrian traffic, such as along Millwood by the high school
 - Provide better and more safe crossings across all major arterials in Columbia
- Priority corridors for facility improvements: The roadway corridors that were regularly mentioned for bicycle, pedestrian, and transit improvements include Assembly, Rosewood, North Main, Eugene, Elmwood, Whaley, Olympia/Granby Mills, Taylor, and Shop Road.
- Lack of access and connectivity:
 - Expand sidewalks and bicycle facilities into neighborhoods that are within walking and biking distance of downtown and already have a high proportion of pedestrians and bicyclists, such as Rosewood and the Olympia area.
 - Improve access to key destinations, such as connections to the riverfront trails, downtown, neighborhoods, grocery and convenience stores, and hospitals.
 - Provide more bike racks on buses to improve bicyclist access to and coordination with transit.
 - Develop key east-west and north-south cross-town connections.



PROGRAM AND POLICY IDEAS

At each focus group meeting, participants were asked to identify programs or policies that they believe would help to improve bicycling, walking, and transit opportunities in Columbia. Many of the ideas centered on education and awareness campaigns, though participants also identified a need for improved transportation and land use policies as well as encouragement programs:

- Education and awareness programs:
 - Provide more education to the community on the option of walking, bicycling, or taking transit for transportation.
 - Develop a Share the Road campaign for Columbia to increase bicycle safety awareness among all road users.
 - Set-up a bike-on-bus demonstration at the downtown transit center to teach riders how to use the bus bike racks.
 - Develop a series of Public Service Announcements on bicycling and walking safety, education, and upcoming events that could be broadcasted through TV, radio, on the city website, or via social media.
 - Start a Bicycle mentor program to pair experienced cyclists with less experienced cyclists.
 - Increase public awareness and traffic safety education for bicyclists, pedestrians, and motorists
- Transportation and land use policies and planning:
 - Coordinate transportation planning and implementation with the land use planning process.
 - Improve land use policies and planning to promote infill and limit sprawl.
 - Develop citywide bicycle parking standards and placement policies, and add functional bike parking downtown, to neighborhoods, and at popular destinations around the city.

- Develop wayfinding signage that direct bicyclists and pedestrians around town and to bike parking areas.
- Encouragement programs:
 - Develop a “transit for everyone” campaign that highlights the benefits of using transit and brands transit as “cool to ride”.
 - Develop encouragement programs that use new technologies, such as apps with wayfinding information, walking routes and tours, bus information, hike and bike maps, and other tools to encourage people to walk, bike, and take transit in Columbia.

BIKE SHARE

Focus group participants were asked about the possibility of a bike share program for Columbia, what the program’s goals should be, where stations should be located, and ideas on potential program partners and operators, membership schemes, and pricing. Participants identified three major goals for a Columbia bike share system:

- Reduce the number of cars on the road.
 - Reduce the number of car trips and vehicle miles traveled in private vehicles.
 - Improve options and access to healthy living and active transportation.
- Participants also developed a list of the places in Columbia that, if a bike share system is developed, should have a bike share station and be included in the bike share network. The locations identified included the following:
- Downtown
 - USC
 - State house

- Five Points
- Decker Mall
- 3 Rivers Greenway
- Stations connecting from the greenway trails to the Vista
- Libraries
- Government Services

The focus groups identified a wide range of potential bike share operators and partners who could help to fund and manage a bike share system for Columbia. The following agencies and organizations were named as potential operators:

- City of Columbia
- USC
- City/County partnership
- USC/City/County partnership
- Transit
- Private operator
- Library system

Lastly, focus group participants discussed ideas for bike share membership and pricing schemes. One idea posed is to have an annual membership fee with a tiered pricing structure for bike use depending on how long a bike is checked out. Some participants identified the potential to include the bike share fee within the student fee at local colleges and universities, which would encourage students to use the system. The fee could be priced and included in student fees similar to the way a student meal plan or a parking pass is priced.

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Bicycle and Pedestrian Counts

Introduction

Annual counts conducted in a systematic manner provide strong benchmarking information on bicycling and walking activity and related benefits. Count data adds to Columbia’s understanding of existing bicycling and pedestrian patterns and needs, allows for more strategic planning of future bikeway and walkway investments, and provides a means of evaluating the impact of programs and facilities. **While count data will not provide comprehensive mode share data, it offers a snapshot of peak bicycle and pedestrian activity on a typical day.** It can also provide important baseline data for before-after studies where new investments are planned and provide insight into overall trends in Columbia’s walking and bicycling environment over time.

This report outlines Alta’s proposed bicycle and pedestrian count methodology and process for implementation. The approach is based on the National Bicycle and Pedestrian Documentation project, an annual bicycle and pedestrian count and survey effort sponsored by Alta Planning + Design with support from the Institute of Transportation Engineers (ITE).

The count analysis will inform Walk Bike Columbia’s summary of existing conditions regarding bicycle and walking activity, as well as the plan’s recommended bicycling and walking network. Additionally, it will serve as a useful complement to the Demand and Benefits Analysis completed for this Plan.

Data Collection Methodology

A regular bicycle and pedestrian count program is instrumental for measuring change over time. This empirical data can be used to monitor Walk Bike Columbia’s success at helping residents and visitors of Columbia walk and bicycle more. This section identifies a methodology for an annual bicycle and pedestrian count data collection program. It includes 2014 count dates and times, pre-count preparation steps, and

resources that will help agency staff with ongoing count efforts. The end of this section identifies the 28 count locations to include in the count program.

PEDESTRIAN AND BICYCLE COUNTS PROGRAM

The purpose of initiating a count program in Columbia is to gather important benchmarking information about walking and bicycling rates. This information will be useful to City and CMCOG staff, and local and regional stakeholders, for understanding whether there is an association between plan implementation and walking and bicycling activity. **An ongoing, manual count program, with annual data collection efforts, requires the partnership of community members.** In Columbia, likely partners are the institutions of higher education (and especially, departments or institutes related to public health, planning, transportation, and engineering), Eat Smart Move More, the Palmetto Conservation Foundation, advisory committees such as the City’s Bicycle and Pedestrian Advisory Committee, ABLE SC, the COMET staff and transit advocates, Safe Routes to School, and cycling clubs.

At a minimum, this program should tally the number of pedestrians and bicyclists at key locations around the City (particularly at pinch points, in downtowns, near schools, and on trails); **the same locations should be counted in the same manner annually** (or more often up to four times per year, if resources permit, to track seasonal and other variations). If major on-street or off-street infrastructure projects are planned, baseline and post-construction user counts can be performed through this coordinated annual count process for maximum efficiency. Similarly, if land use developments are occurring that impact a specific user group, **pre- and post-construction counts** can be performed to track more refined information about growth of walking and bicycling. Examples of this could be new student housing within walking or biking distance of campus, or new multi-family housing near transit stops.

It is recommended that the data collection program use the methodology developed by the National Bicycle and Pedestrian Documentation Project (NBPD). Counters can be volunteers or agency staff, as long as proper training and support is provided.

As recommended by NBPD, the City will conduct screenline counts. Screenline counts document the number of users passing an imaginary line at either a mid-block or intersection location. They are primarily used to identify general trends in volumes, and to see how demographics, land use, and other factors influence walking and bicycling. For the inaugural count in September 2014, Alta provided a training webinar, which will occur one week prior to the counts and will be mandatory for all participating counters.

If desired, **future iterations of the annual count program could include intersection counts or surveys.** Depending on the volumes of bicyclists and pedestrians, intersection counts may be more complicated and require additional counters because they record two streets as well as turning movements. Surveys allow an agency to learn more detailed user information such as demographics, trip origin/destinations, trip purpose, and perceived benefits of bicycling and walking. The NBPD website includes count and survey instructions, forms, and participant training materials: <http://bikepeddocumentation.org>.

Over time, the City and partners should invest in permanent and mobile automated counters and integrate bicycle and pedestrian counts into regularly scheduled, on-going traffic count programs and required traffic impact analysis studies so that data on pedestrian and bicycle usage are a regular part of the City’s transportation data collection. Even as automated counters are used in the future, manual counts can supplement the body of data, as needed.



COUNT DATES AND TIMES

The national count days chosen by NBPD are September 9-14, 2014. Because the University of South Carolina had a home football game on September 13th, which could have significantly impacted traffic, as well as volunteer recruitment, Alta recommended that Columbia conduct counts on the following week, which represents an away-game weekend. The National Count Date represents a peak period for walking and bicycling, in which weather conditions across the country are generally conducive; schools and colleges have been underway for several weeks; and people have returned from vacations and are back at work.

At least one weekday and one weekend day should be included to obtain a sampling of weekday and weekend activity levels. There should be little statistical difference between counts conducted on a Tuesday, Wednesday, or Thursday of the same week, and this provides agencies and organizations some scheduling flexibility. For the 2014 counts, the team chose September 16th, 17th and 18th for the weekday counts and Saturday, September 20th for the weekend count.

Though NBPD recommends evening peak periods on the weekday, Columbia conducted counts during the morning peak period. The morning period presents a greater opportunity to capture school and campus travel data, in addition to work commute data. NBPD’s recommended weekend time period is Noon to 2pm, however, given Columbia’s potential heat in September, the team adjusted the time to 10am to Noon. **Note that it is important that count data reflect the same time periods for all future counts in order to be consistent.**

Table 19 summarizes Columbia’s count dates and times:

TABLE 19 - COUNT TIMES

Day	Date	Time
Weekday (Tuesday, Wednesday, or Thursday)	September 16, 17, 18	7:30 AM to 9:30 AM
Saturday	September 20	10 AM to Noon

Count Locations

NUMBER OF COUNT LOCATIONS

One count location per 15,000 of population is a useful rule of thumb for determining an appropriate minimum number of count locations. This equates to approximately ten locations in Columbia. **Given the level of planning underway for Walk Bike Columbia and the anticipated near-term investment in bicycling and walking infrastructure, the project team selected 28 count locations.** If Columbia desires greater geographic parity in its count program, or as new projects and new developments occur, additional count locations can be added.

RECOMMENDED COUNT LOCATIONS

The NBPD website provides guidelines for selecting count locations, based on access to transit, proximity to main entrances for shopping or employment areas, and high density downtown or residential areas. Locations with recently completed or planned bicycle or pedestrian projects were also considered. The following 28 locations are proposed for inclusion in an annual count program.

TABLE 20 - COUNT LOCATIONS

Map ID	Corridor	Between	Reason for Location
1	Blossom St	William St and Huger St	Existing Bike Lane; Bridge Access
2	Wheat St	Pickens St and Sumter St	Existing Bike Lane; Palmetto Trail
3	Sumter St	Greene St and Pendleton St	Existing Sharrow; Palmetto Trail
4	N. Beltline Rd	Two Notch Rd and Dubard St	Existing Bike Lane; Collision History (bicycle)
5	Kilbourne Rd	Wheat St and Bloomwood Rd	Potential Future Investment
6	Rosewood Dr	S. Ravenel St and S. Ott Rd	Existing Sidewalk and Crossing; School; Planned Improvement
7	Bull St	Confederate Ave and Victoria St	Collision History (bike & ped)
8	Broad River Rd	St. Andrews Pkwy and Farrington Way	Transit Stops; Collision History (bike & ped)
9	Laurel St	Sumter St and Main St	Transit Center
10	Bluff Rd	Market Rd and Eden St	Collision History (bike & ped); Transit Stops; Planned Improvements
11	Greene St	Laurens St and Saluda Ave	Planned Improvements; Collision History (bike & ped)



Map ID	Corridor	Between	Reason for Location
12	Garners Ferry Rd	Leesburg Rd and Dorn Dr	Grocery Store; VA Medical Center; Collision History (bike & ped)
13	Harbison Blvd	Park Terrace Dr and Columbiana Dr	Commercial/Employment Center
14	Blossom St	Park St and Lincoln St	Collision History (pedestrian)
15	Taylor St	Lincoln St to Gadsden St	Park; Planned Improvements
16	Lake Murray Blvd	Kinley Rd and Parkridge Dr	Healthcare/Employment Center
17	Gervais St	Lincoln St and Park St	Retail and Visitor Destinations
18	Taylor St	Oak St and Pine St	Benedict and Allen Colleges
19	Fairfield Rd (321)	Amberley Rd and Wimet Dr	Collision History (pedestrian); School; Transit Stops
20	Holly St	Montgomery Ave and Huron St	Transit Stops; Park; Planned Improvement; Collision History (bike & ped)
21	Sumter St	Hampton St and Washington St	New Student Housing
22	River Dr	Gibson St and Pearl St	Access to Trail; Planned Improvement; Collision History (bike & ped)
23	Devine St	Beltline Blvd and Cross Hill Rd	Grocery; Planned Improvements; Transit Stop
24	Sunset Dr	Elmhurst Rd and N. Main St	Planned Improvements
25	Harden St	Greene St and Devine St	Planned Improvements; Collision History (pedestrian)
26	Assembly St (three count locations)	Washington St and Hampton St	Library; Transit Stop; Planned Improvements
27	Harden St.	Blanding St and Taylor St	Benedict and Allen Colleges
28	Jackson Blvd	Kilbourne Rd	



Count Results and Analysis

PEDESTRIAN AND BICYCLE WEEKDAY COUNT

Volunteers conducted pedestrian and bicycle weekday counts between Tuesday, September 16th and Thursday September 18th. Most of the counts took place on September 16th in the morning between 7:30 and 9:30am. A few counts took place at different times due to scheduling conflicts. The weather was reported as being mild in the lower 70's and overcast (some volunteers reported a light drizzle). No data was recorded for locations 3, 7 and 10.

A summary of the weekday count data is provided to the right:

Top 3 locations for Bicyclists from Weekday Counts:

- Wheat Street between Pickens Street and Sumter Street – 47 bikes
- Greene Street between Laurens Street and Saluda Avenue – 45 bikes
- Harden Street between Greene Street and Devine Street – 29 bikes

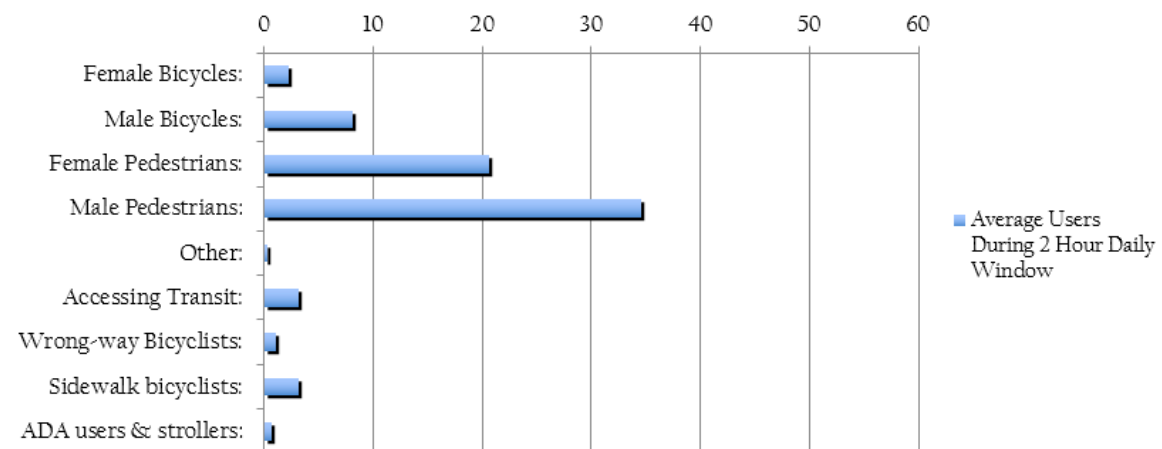
Top 3 locations for Pedestrians from Weekday Counts

- Blossom Street between Park Street and Lincoln Street – 185 pedestrians
- Harden Street between Greene Street and Devine Street – 121 pedestrians
- Laurel Street between Sumter Street and Main Street – 128 pedestrians

TABLE 21 - WEEKDAY COUNT DATA

User Types	Total Users During 2 Hour Counts	Average Users During 2 Hour Counts
Female Bicycles:	56	2
Male Bicycles:	203	8
Female Pedestrians:	516	21
Male Pedestrians:	865	35
Other:	6	0
Accessing Transit:	79	3
Wrong-way Bicyclists:	28	1
Sidewalk bicyclists:	79	3

Average Number of Users During 2 Hour Daily Window on Weekdays





PEDESTRIAN AND BICYCLE WEEKEND COUNT

Volunteers conducted pedestrian and bicycle weekend counts on Saturday, September 20th. Most of the counts took place on September 16th in the morning between 7:30 and 9:30am. One count took place at a different time due to scheduling conflicts. The weather was reported as being mild in the lower 70’s and sunny. No data was recorded for locations 1, 7, 16, 20, 21, 22, 26 C, and 27.

A summary of the weekend count data is provided to the right:

Top 3 locations for Bicyclists from Weekend Counts:

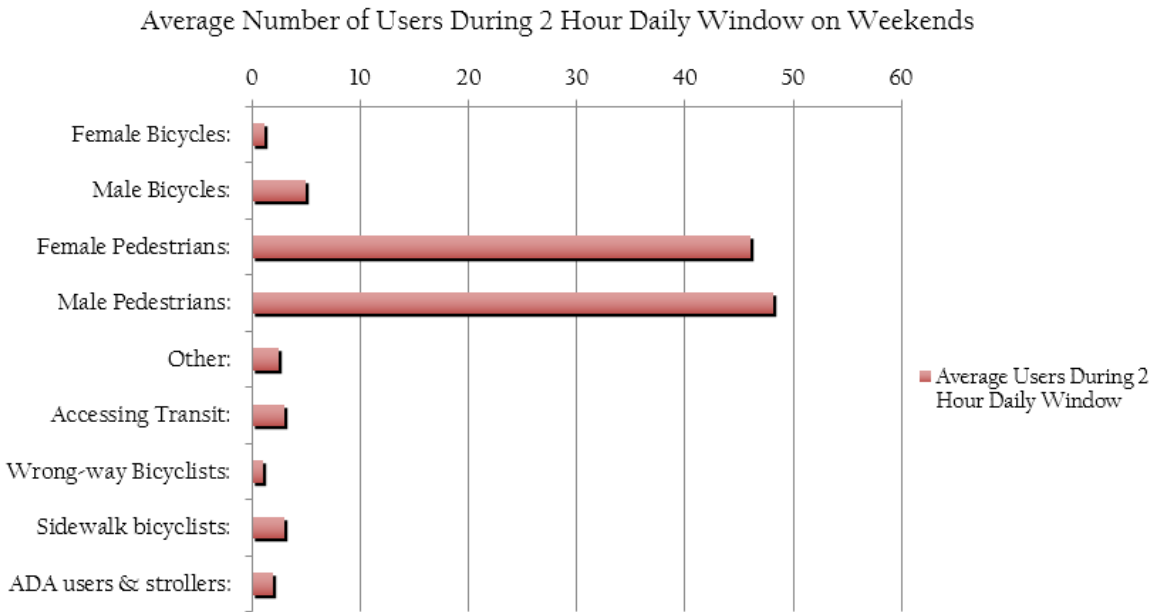
- Broad River Road between St. Andrews Pkwy and Farrington Way – 18 bicyclists
- Sumter Street between Greene Street and Pendleton Street – 11 bicyclists
- Wheat Street between William Street and Huger Street– 9 bicyclists

Top 3 locations for Pedestrians from Weekend Counts:

- Hampton Street between Assembly and Park Street –462 pedestrians
- Sumter Street between Greene Street and Pendleton Street – 329 pedestrians
- Gervais Street between Lincoln Street and Park Street – 279 pedestrians

TABLE 22 - WEEKEND COUNT DATA

User Types	Total Users During 2 Hour Counts	Average Users During 2 Hour Counts
Female Bicycles:	23	1
Male Bicycles:	100	5
Female Pedestrians:	920	46
Male Pedestrians:	962	48
Other:	50	3
Accessing Transit:	59	3
Wrong-way Bicyclists:	21	1
Sidewalk bicyclists:	59	3





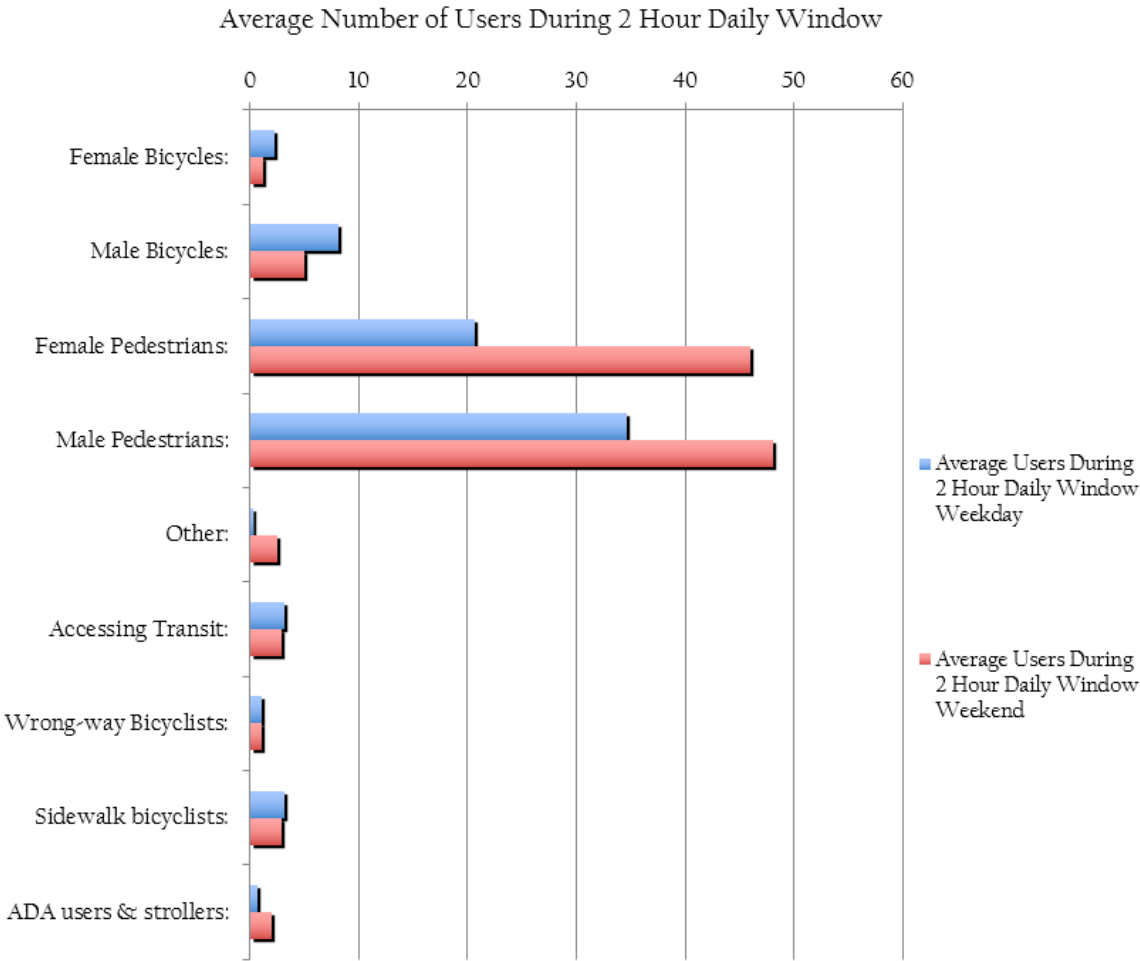
Pedestrian and Bicycle Counts Analysis

As seen from both the weekday and the weekend counts, Columbia has a substantial amount of pedestrian and bicycle traffic occurring throughout the City. Much of this traffic observed during the counts implementation is occurring around popular destinations for bicycling and walking such as recreation centers, civic buildings, college and university campuses and downtown.

Pedestrian levels are indicative of the City’s census-reported high rates of walking commuting. Anecdotally, many surveyors noted unsafe jaywalking occurring at several of the count locations. Weekend events such as the Soda-City Market, South Carolina Pride Festival and Greek Festival also likely increased walking rates.

The count results also suggest that many people in Columbia are bicycling for commuting purposes to work and/or school as higher numbers of these users are bicycling during typical weekday commute times. The counts also show a high instance of sidewalk bicycle riding, even occurring on streets with existing bike lanes. This is typically an indicator that users don’t feel comfortable riding in the roadway due to inadequate bicycle facilities for roadway conditions.

A comparison of the weekday and weekend counts are provided below. Full count results can be found in **Attachment A**.







APPENDIX E: EXISTING CONDITIONS ANALYSIS DETAILED REPORTS

This appendix section houses the analysis and reports for the Pedestrian Level of Service analysis, the Bicycle Level of Traffic Stress analysis, and the pedestrian and bicycle counts. The methodology, findings, conclusions, and maps and figures for the analyses and counts are included and discussed in detail.



Pedestrian Level of Service & Bicycle Level of Stress Analysis

Overview

INTRODUCTION

This memorandum details the methods and results of a Pedestrian Level of Service Analysis (PLOS) and Bicycle Level of Traffic Stress Analysis (BLTS) for the City of Columbia. Each analysis incorporates the recent research on factors that impact bicycle and pedestrian comfort and safety, and was tailored to the City of Columbia using the data available. Each model analyzed the full roadway network within Columbia’s Urban Service Area (and adjacent areas where they border the urban service area on both sides), excluding limited access highways, to provide a full picture of connectivity around the city.

DATA SOURCES

The following data inputs were incorporated into the PLOS and BLTS analyses. Table 23 displays each variable, its source, and notes on limitations of the available data and assumptions that were made.

TABLE 23 - SOURCES OF MODEL INPUTS

Model Input	Source	Notes
Posted Speed Limit	City of Columbia Streets Database	
Number of Travel Lanes	2005 Regional Demand Model	Not available for all streets. Streets without data were assumed to contain two travel lanes.
Annual Average Daily Traffic Volumes (AADT)	SCDOT 2012 Traffic Volumes	Not available for all streets. Collector streets without data were assumed to carry between 3,000 – 10,000 AADT. Local streets without data were assumed to carry less than 3,000 AADT.
Traffic Signals	SCDOT & City of Columbia	Four-way stops were identified using aerial imagery. Where local roads meet collector or arterial roads, the local roads were assumed to be stop-controlled.
Bicycle Lanes	City of Columbia	
Shared Lane Markings ('Sharrows')	City of Columbia	
On-Street Parking	City of Columbia	Comprehensive for downtown Columbia
Speed Control Structures	City of Columbia	
Sidewalks	City of Columbia	Updated in January, 2014
Crosswalks	City of Columbia	
Curb Ramps	City of Columbia	



Pedestrian Conditions - Level of Service Analysis

PEDESTRIAN LEVEL OF SERVICE ANALYSIS METHODOLOGY

The Pedestrian Level of Service Analysis treats segments and intersections separately. A level of service was identified for each roadway segment in the study area, apart from limited access highways, while intersections were examined along roadways with a functional classification of ‘collector’ or ‘arterial’. These higher order roadways present the greatest obstacle to pedestrians, and more data was available for analysis along these corridors.

The selected segment-based Pedestrian Level of Service Analysis (PLOS) is rooted in the concept that a doubling of travel speed results in a four-fold increase in stopping time and resulting crash severity. According to one study, speed has the following impact on pedestrian fatalities¹.

- At 20 mph the odds of pedestrian fatality are 5%
- At 30 mph the odds of pedestrian fatality are 45%
- At 40 mph the odds of pedestrian fatality are 85%

While other studies have found some variation, these approximate numbers are reported consistently across the literature.

It is imperative that dedicated travel facilities are provided to create safe travel conditions for pedestrians. This PLOS analysis is based primarily on safety and does not consider factors of the built environment known to make walking an attractive and preferred form of transportation. While built environment factors are not explicitly considered, lower posted speeds and more dedicated pedestrian space will typically correlate with places people want to walk based on the surrounding land uses and urban form (e.g., residential neighborhoods and commercial uses in lower speed urban areas).

The segment-based Pedestrian Level of Service Analysis (PLOS) measures pedestrian safety using four factors: posted speed limit, roadway width (number of travel lanes), pedestrian buffer (on-street parking or bicycle lanes), and the presence of sidewalks. Table 24 outlines the scoring methodology of the PLOS analysis. The PLOS follows a five-point scale, with 1 representing the highest comfort level. Generally, more pedestrian space on a lower speed roadway segment correlates to a higher comfort level. Where sidewalks are only provided on one side of the roadway, pedestrian comfort degrades on multi-lane roadways since pedestrians are forced to cross more than two lanes of traffic to reach that sidewalk. Bicycle lanes or on-street parking act as buffers between pedestrians and motor vehicle traffic, increasing comfort.

TABLE 24 - SEGMENT SCORING MATRIX FOR PEDESTRIAN LEVEL OF SERVICE. 1 = HIGHEST COMFORT LEVEL

Pedestrian Space	Speed Limit (MPH)					
	<= 25 MPH**		30 - 35 MPH		>= 40 MPH	
	2 lanes	> 2 lanes	2 lanes	> 2 lanes	2 lanes	> 2 lanes
Complete sidewalk on both sides next to a buffer*	1	1	1	1	2	3
Complete sidewalk on both sides	1	1	2	3	3	4
Complete sidewalk on one side next to a buffer*	2	2	2	3	3	4
Complete sidewalk on one side	2	3	3	4	4	5
No dedicated space next to a buffer*	2	3	3	4	4	5
No dedicated space	2	3	4	5	5	5

*Bicycle lanes and/or on-street parking

**Scores also apply to 30 mph roadways with traffic calming

¹ Killing Speed and Saving Lives, UK Dept. of Transportation, London, England. See also Limpert, Rudolph. Motor Vehicle Accident Reconstruction and Cause Analysis. Fourth Edition. Charlottesville, VA. The Michie Company, 1994, p. 663.



The selected intersection-based Pedestrian Level of Service is rooted in evidence on pedestrian crash reduction factors related to design treatments or interventions².

- Installation of a pedestrian crossing reduces crashes by 25%
- Conversion of an unsignalized intersection to a roundabout reduces crashes by 27%
- Installation of a raised median and crosswalk reduces crashes by 56%
- Speed reduction by enforcement reduces crashes by 71%

Each intersection leg was scored based on the characteristics of the crossing. Like the segment-based scoring, 1 represents the highest level of service. Intersection scoring is additive - scores start at 1 or 2 depending on speed, and then increase with missing infrastructure. Stop-controlled or uncontrolled crossings receive additional points since pedestrians must find gaps in traffic.

TABLE 25 - INTERSECTION SCORING MATRIX FOR PEDESTRIAN LEVEL OF SERVICE. 1 = HIGHEST COMFORT LEVEL

Characteristics of Crossing Leg	Posted Speed Limit		
	<= 25 mph**	30 - 35 mph	>= 40 mph
Baseline	1	1	2
More than 2 lanes*	1	2	2
No Marked crosswalk	0	1	1

*Bicycle lanes and/or on-street parking

**Scores also apply to 30 mph roadways with traffic calming

PEDESTRIAN LEVEL OF SERVICE ANALYSIS RESULTS

Segment Analysis

The results of the pedestrian segment-based supply analysis can be seen in Figure 9 on the following page. Low speed roadways with buffers and sidewalks, the links with the highest level of pedestrian comfort, are shown in dark green. Roads with a higher level of stress for pedestrians are shown in orange and red. The highest levels of comfort are found in the downtown area, largely due to the extensive sidewalk network there, and in low-speed neighborhoods. Collector and Arterial corridors near downtown have medium levels of comfort due to sidewalks and moderate speed limits, but comfort decreases on major roadways further out as speed limits and numbers of lanes increase and sidewalk infrastructure disappears. Throughout the urban service area there are clusters of high-comfort pedestrian networks along local roads, but these safe walking environments are segmented from one another by low comfort links.

Intersection Analysis

The results of the pedestrian intersection-based supply analysis can be seen in Figure 10. Intersection level of service scores were calculated along collector and arterial roadways. These roadways present a large barrier to pedestrians between signalized intersections, particularly in the outer areas of the City. Trenholm Road, Two Notch Road, Beltline Boulevard, Garners Ferry Road, Leesburg Road, Broad River Road, and Clemson Road are some of the greatest barriers to pedestrian travel, with long stretches between safe crossings.

²Source: Federal Highway Administration. Desktop Reference for Crash Reduction Factors. <http://safety.fhwa.dot.gov/>



FIGURE 9 - PEDESTRIAN LEVEL OF SERVICE SEGMENT ANALYSIS RESULTS

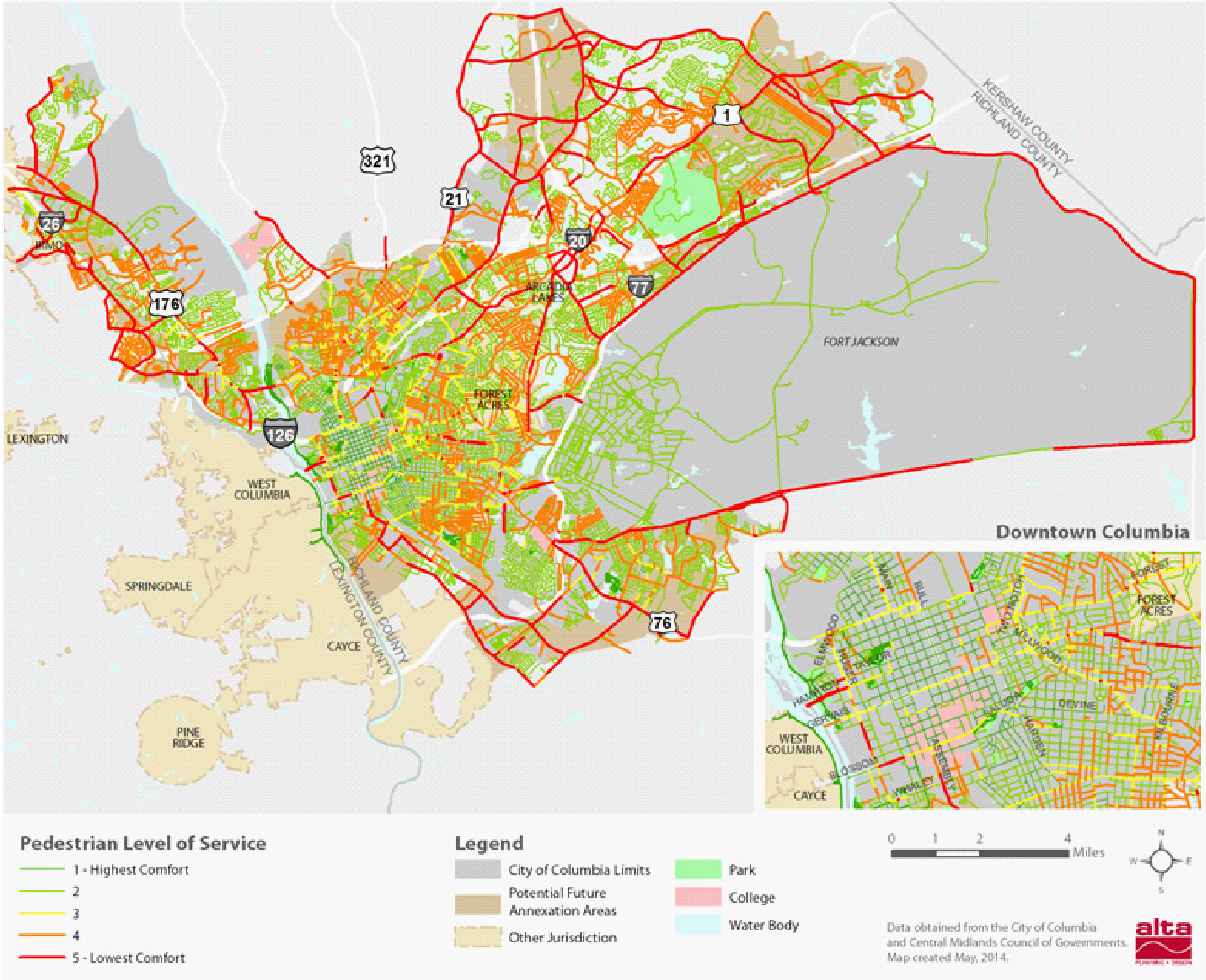
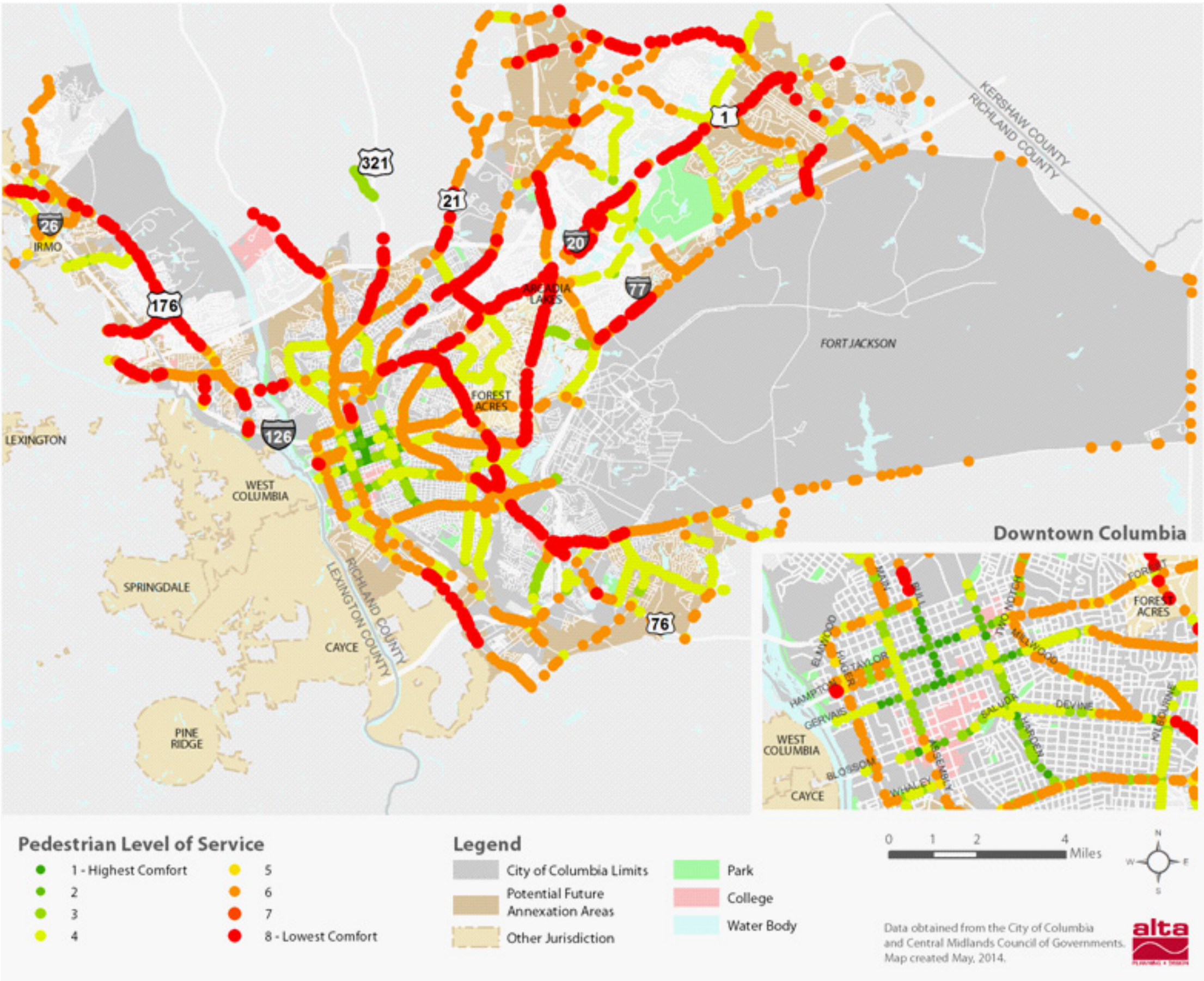




FIGURE 10 - PEDESTRIAN LEVEL OF SERVICE INTERSECTION ANALYSIS RESULTS





Bicycle Conditions - Level of Traffic Stress Analysis

INTRODUCTION TO LEVEL OF TRAFFIC STRESS

The methods used for the Level of Traffic Stress Analysis were adapted from the 2012 Mineta Transportation Institute (MTI) Report 11-19: Low-Stress Bicycling and Network Connectivity. The approach outlined in the MTI report uses roadway network data, including posted speed limit, the number of travel lanes, and the presence and character of bicycle lanes, as a proxy for bicyclist comfort level. Road segments are classified into one of four levels of traffic stress based on these factors. The lowest level of traffic stress, LTS 1, is assigned to roads that would be tolerable for most children to ride, and also to multi-use paths that are separated from motorized traffic; LTS 2 roads are those that could be comfortably ridden by the mainstream adult population; LTS 3 is the level assigned to roads that would be acceptable to current “enthused and confident” cyclists; and LTS 4 is assigned to segments that are only acceptable to “strong and fearless” bicyclists, who will tolerate riding on roadways with higher motorized traffic volumes and speeds. The definitions for each level of traffic stress are shown in the following table.

TABLE 26 - LEVEL OF TRAFFIC STRESS (LTS) DEFINITIONS. SOURCE: MINETA TRANSPORTATION INSTITUTE REPORT 11-19.

LTS 1	Presenting little traffic stress and demanding little attention from cyclists, and attractive enough for a relaxing bike ride. Suitable for almost all cyclists, including children trained to safely cross intersections. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where cyclists ride alongside a parking lane, they have ample operating space outside the zone into which car doors are opened. Intersections are easy to approach and cross.
LTS 2	Presenting little traffic stress and therefore suitable to most adult cyclists but demanding more attention than might be expected from children. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a well-confined traffic stream with adequate clearance from a parking lane, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where a bike lane lies between a through lane and a rightturn lane, it is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds. Crossings are not difficult for most adults
LTS 3	More traffic stress than LTS 2, yet markedly less than the stress of integrating with multilane traffic, and therefore welcome to many people currently riding bikes in American cities. Offering cyclists either an exclusive riding zone (lane) next to moderate-speed traffic or shared lanes on streets that are not multilane and have moderately low speed. Crossings may be longer or across higher-speed roads than allowed by LTS 2, but are still considered acceptably safe to most adult pedestrians.
LTS 4	A level of stress beyond LTS3.



LEVEL OF TRAFFIC STRESS PLUS
METHODOLOGY

The Level of Traffic Stress analysis completed for the City of Columbia builds on the MTI approach, expanding it to incorporate the impact on comfort of traffic volumes, the presence of traffic calming, and sharrows. The resulting categorization of each segment of Columbia’s road network is termed ‘Level of Traffic Stress Plus’, to highlight it’s divergence from the original model. Scoring in LTS Plus is based off of the four basic categories defined in the MTI report, but allows half points between each category to represent a more nuanced continuum of bicycle comfort for use in project prioritization. The scoring methodology

is summarized in the following table. At its core, the LTS Plus scoring decreases comfort (1 is the highest comfort level) as the number of lanes, posted speed limit, and traffic volumes increase. Traffic volumes reduce comfort more where bicyclists share the road with motorized vehicles, but comfort also decreases in bicycle lanes as traffic volumes next to those bicycle lanes increase. Shared lane markings are scored to have a limited impact on comfort, reducing scores to the equivalent of a 30 mph roadway where they are marked on a 35 mph roadway, but otherwise having no impact on the comfort of a shared street environment.

Unsignalized crossings increase stress for cyclists along otherwise low-stress routes. An intersection level of service analysis was completed to identify difficult crossings. Crossing comfort decreases as the number of lanes and posted speed increase. While median refuges can reduce the stress of an unsignalized crossing, refuges were not included in this analysis because of insufficient data.

TABLE 27 - SEGMENT SCORING MATRIX FOR BICYCLE LEVEL OF TRAFFIC STRESS. 1 = HIGHEST COMFORT LEVEL

Number of Travel Lanes	Traffic Volume (AADT)	Shared Street			Street with Sharrows		Street with Bike Lane		
					Speed Limit (MPH)				
		<= 25*	30	>= 35	All Other	35	<= 30	35	>= 40
2 Lanes (residential)	No data	1	2	3.5		2	1	3	3.5
2 - 3 lanes	<=3k	1.5	2.5	3.5		2.5	1.5	2.5	3.5
	3k - 10k	2	3	4		3	2	3	4
	10k - 20k	3	3.5	4		3.5	2.5	3.5	4
	>20k	4	4	4		4	3	4	4
4 - 5 Lanes	<=3k	2.5	3.5	3.5		3.5	2	2.5	3.5
	3k - 10k	3	4	4		4	3	3	4
	10k - 20k	3.5	4	4		4	3.5	3.5	4
	>20k	4	4	4		4	4	4	4
6+ Lanes	All volumes	4	4	4		4	4	4	4

*Bicycle lanes and/or on-street parking
**Scores also apply to 30 mph roadways with traffic calming

TABLE 28 - INTERSECTION SCORING MATRIX FOR BICYCLE LEVEL OF TRAFFIC STRESS. 1 = HIGHEST COMFORT LEVEL

Number of Travel Lanes	Posted Speed Limit		
	<= 25 mph**	30 - 35 mph	>= 40 mph
Up to 3 lanes	1	2	3
4 - 5 lanes	2	3	4
6+ lanes	4	4	4



BICYCLE LEVEL OF TRAFFIC STRESS (LTS) + ANALYSIS RESULTS

Segment Analysis

The results of the segment-based Level of Traffic Stress Plus Analysis are shown in Figure 11. Much of the network consists of disconnected clusters of low-stress (LTS 1 to 2) streets, shown in green and yellow. Individually, these islands of low-stress streets are comfortable to ride for most adults, but they are isolated from one another by larger roads with higher traffic speeds that disrupt bicycle mobility.

As an additional note, limited data on the roadways within Fort Jackson limit the accuracy of the analysis results on those roadways. Limited access highways were omitted from the analysis entirely.

Intersection Analysis

The results of the intersection-based Level of Traffic Stress Plus Analysis are shown in Figure 12. Many of the major roadways that act as barriers to pedestrians also hinder bicycle travel because of high speeds and lanes and long distances between signalized crossings.

Connectivity Analysis

While major roadways act as barriers at unsignalized crossings, signals provide a connection for cyclists to move between low-stress neighborhood roadways. Figure 13 displays connected clusters of roadways that can be travelled without using any link or crossing with a level of stress higher than 2. In central Columbia where the road network was built in a grid pattern, a large low-stress network is accessible. Outside of this central core, however, low—stress roads have been built without connectivity across major roadways, making travel between neighborhoods inaccessible to most adults. This display makes apparent the gaps in the bicycle network that could be targeted for improvements to create connected bicycling routes that are comfortable for the mainstream adult population. Along with improvements along high-stress corridors, safe crossing opportunities across those corridors will greatly increase bicycling mobility.



FIGURE 11 - BICYCLE LEVEL OF TRAFFIC STRESS SEGMENT ANALYSIS RESULTS

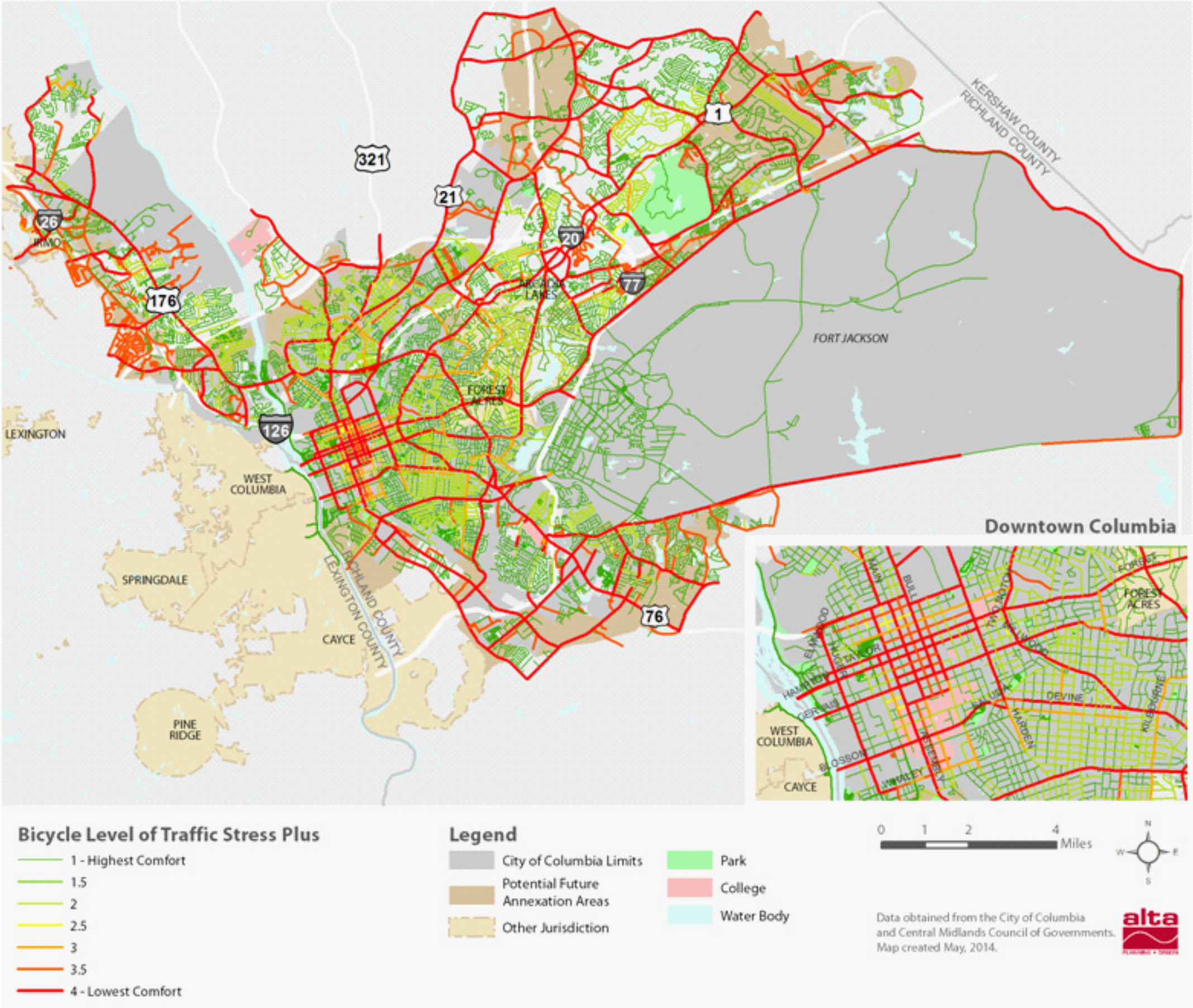




FIGURE 12 - BICYCLE LEVEL OF TRAFFIC STRESS INTERSECTION ANALYSIS RESULTS

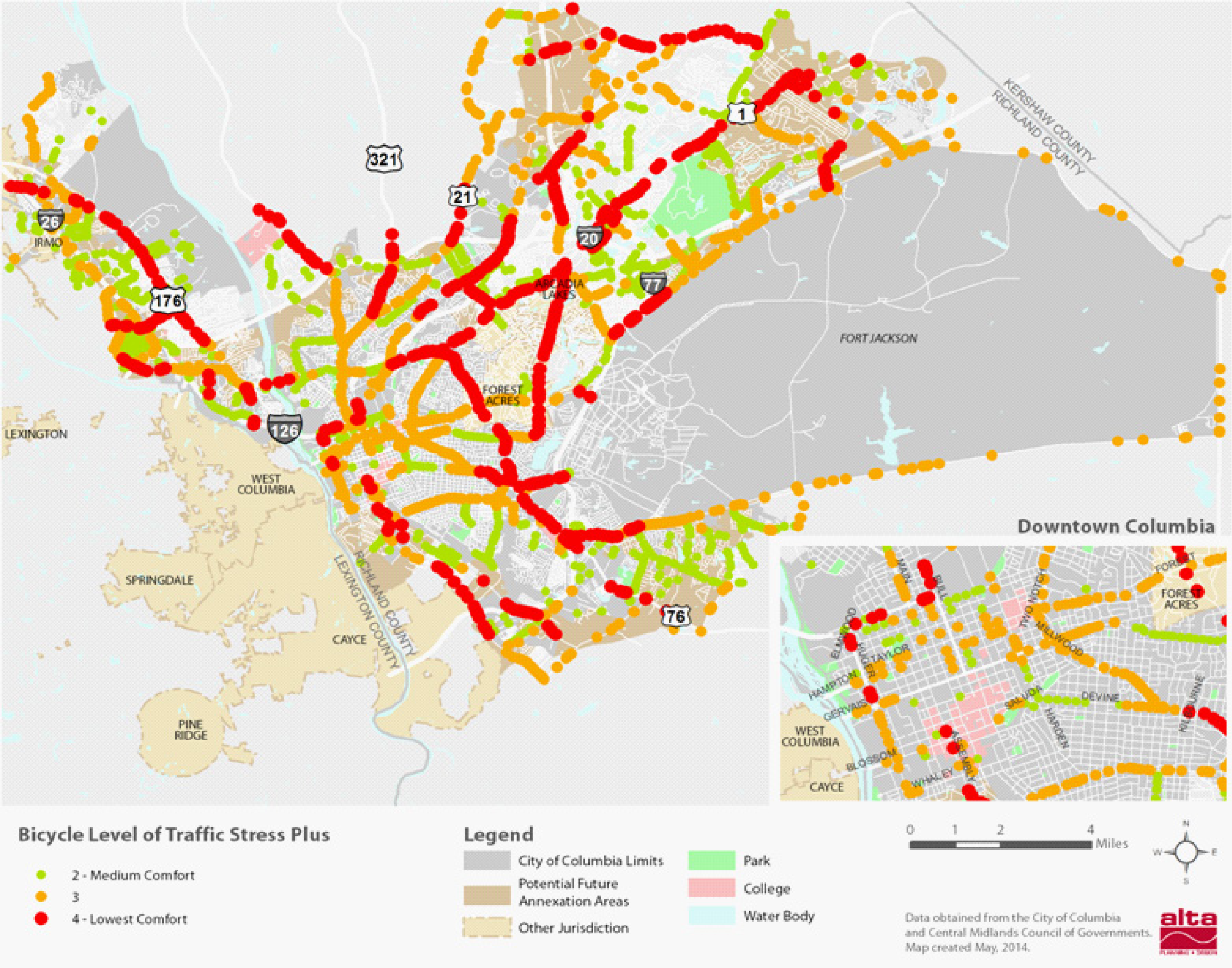
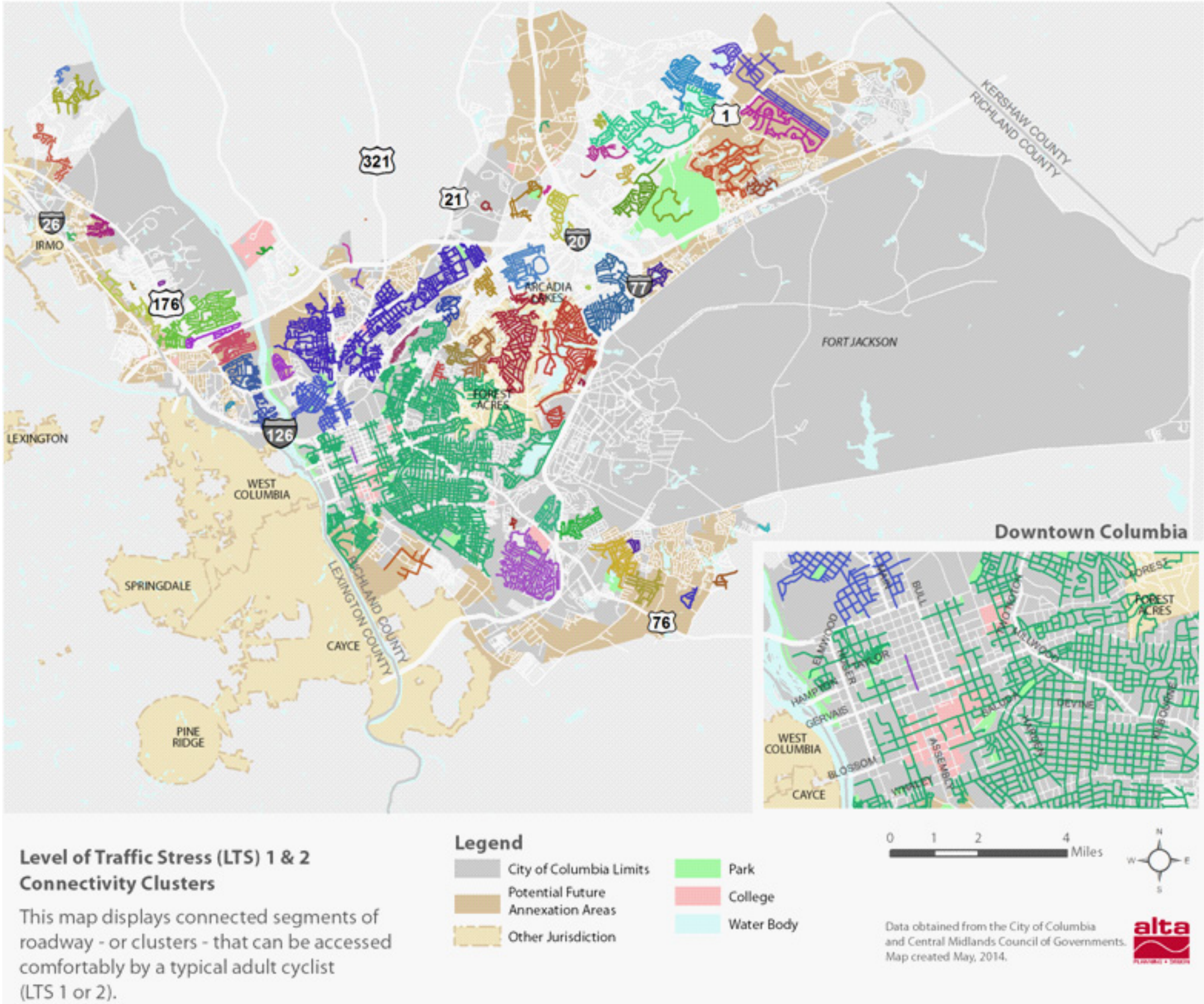




FIGURE 13 - BICYCLE LEVEL OF TRAFFIC STRESS 1& 2 CONNECTIVITY CLUSTERS





Conclusions

The pedestrian level of service analysis and bicycle level of stress analyses described in this memo provide a picture of the quality of infrastructure in the City of Columbia that serves bicyclists and pedestrians. In the next step of this planning process, demand for pedestrian and bicycle travel will be analyzed in order to identify areas of high demand and poor supply that should be prioritized for infrastructure improvements.

Appendix: Data Inputs

The following maps constitute the input data for the analysis.



FIGURE 14 - SPEED LIMITS AND TRAFFIC CALMING

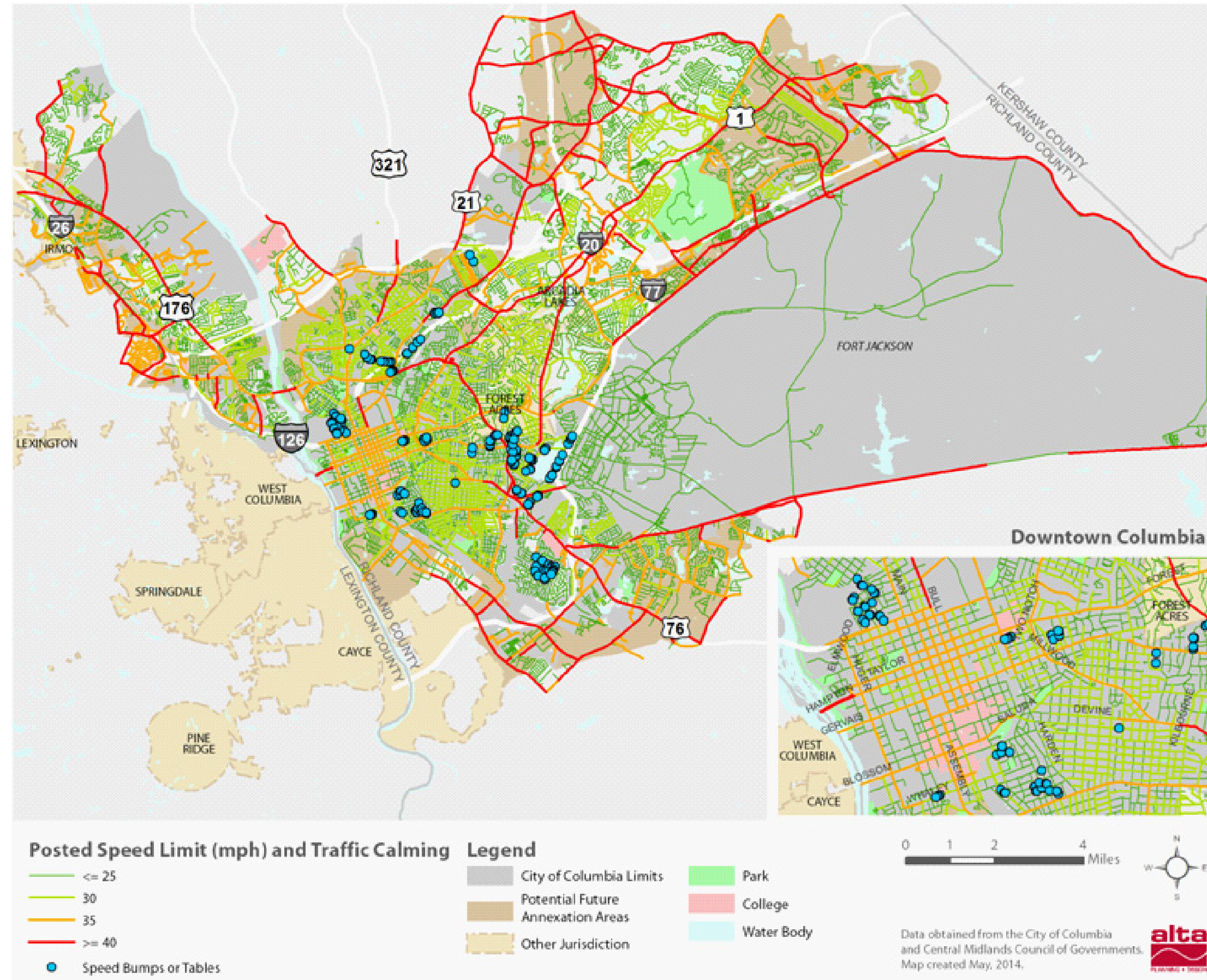




FIGURE 15 - NUMBER OF TRAVEL LANES

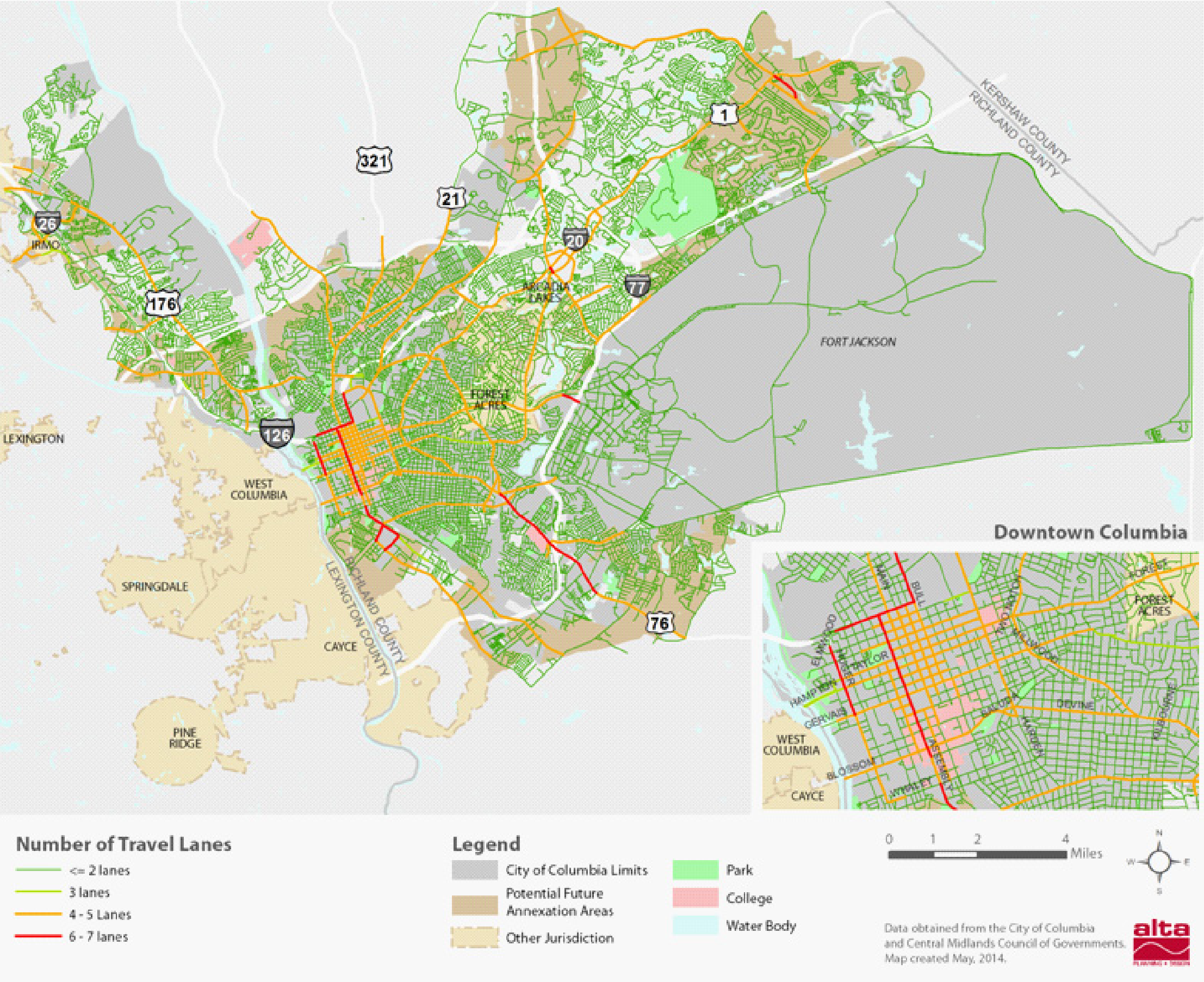




FIGURE 16 - TRAFFIC VOLUMES (AADT)

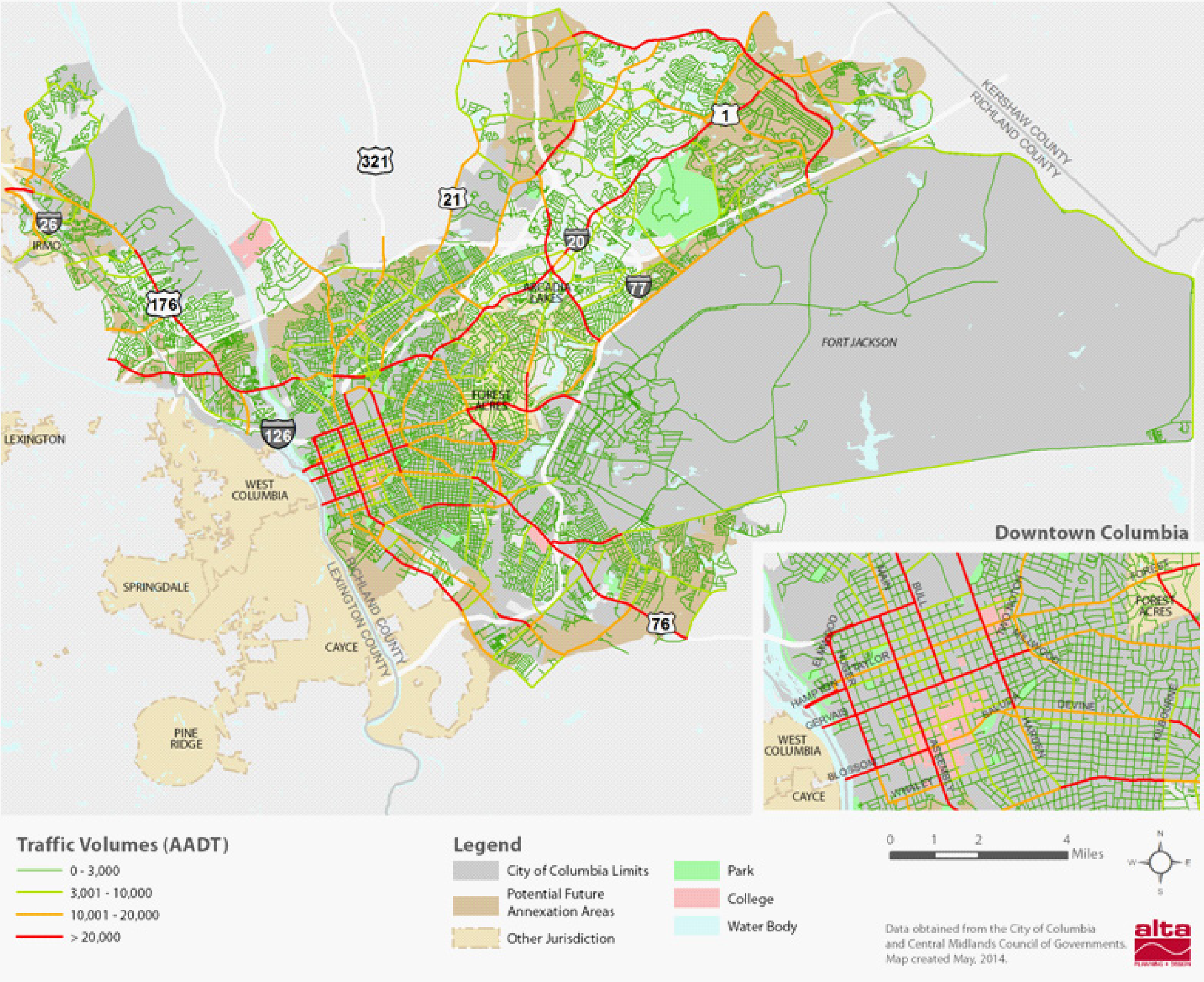




FIGURE 17 - PRESENCE OF SIDEWALKS

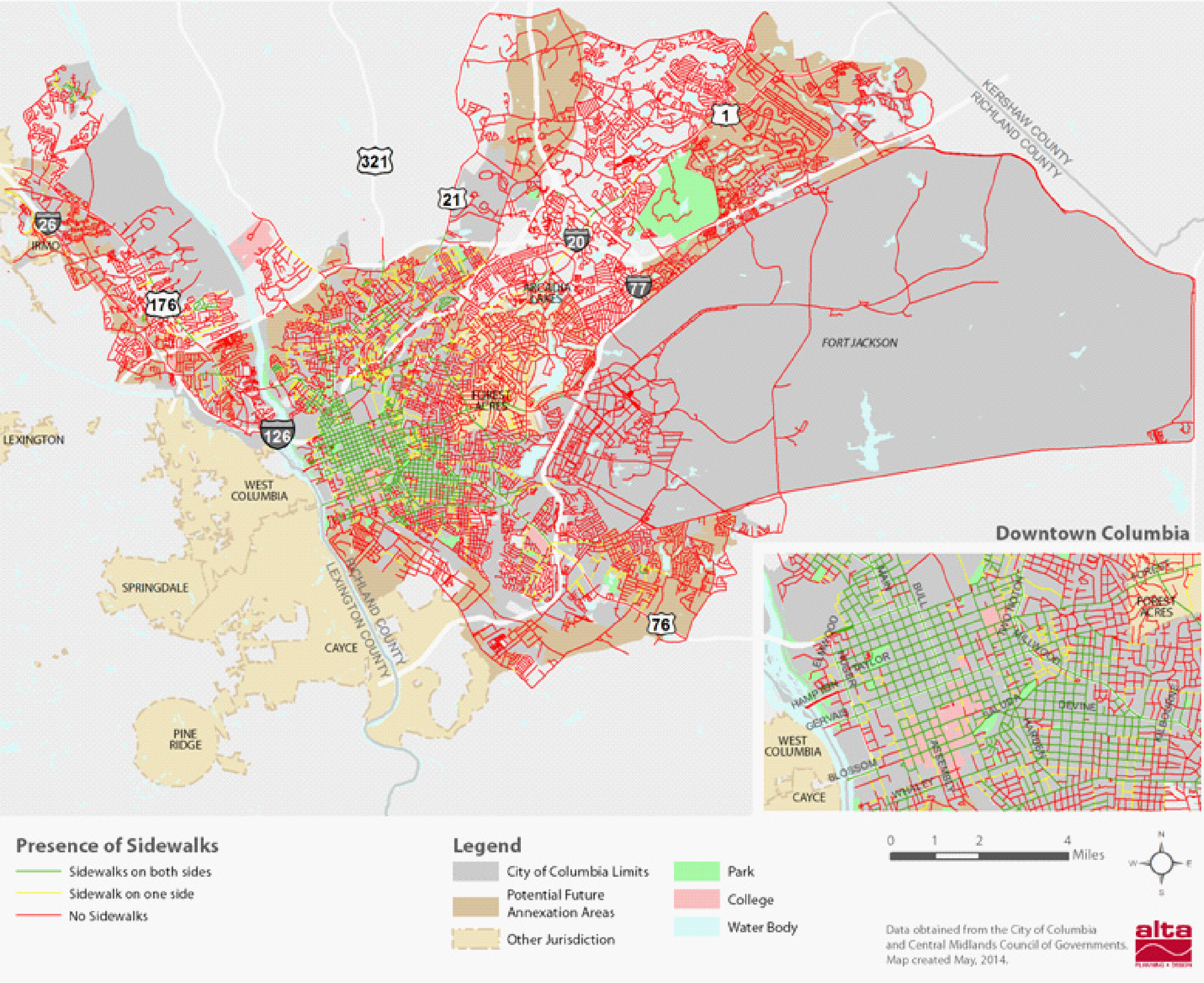




FIGURE 18 - BIKEWAYS AND ON-STREET PARKING

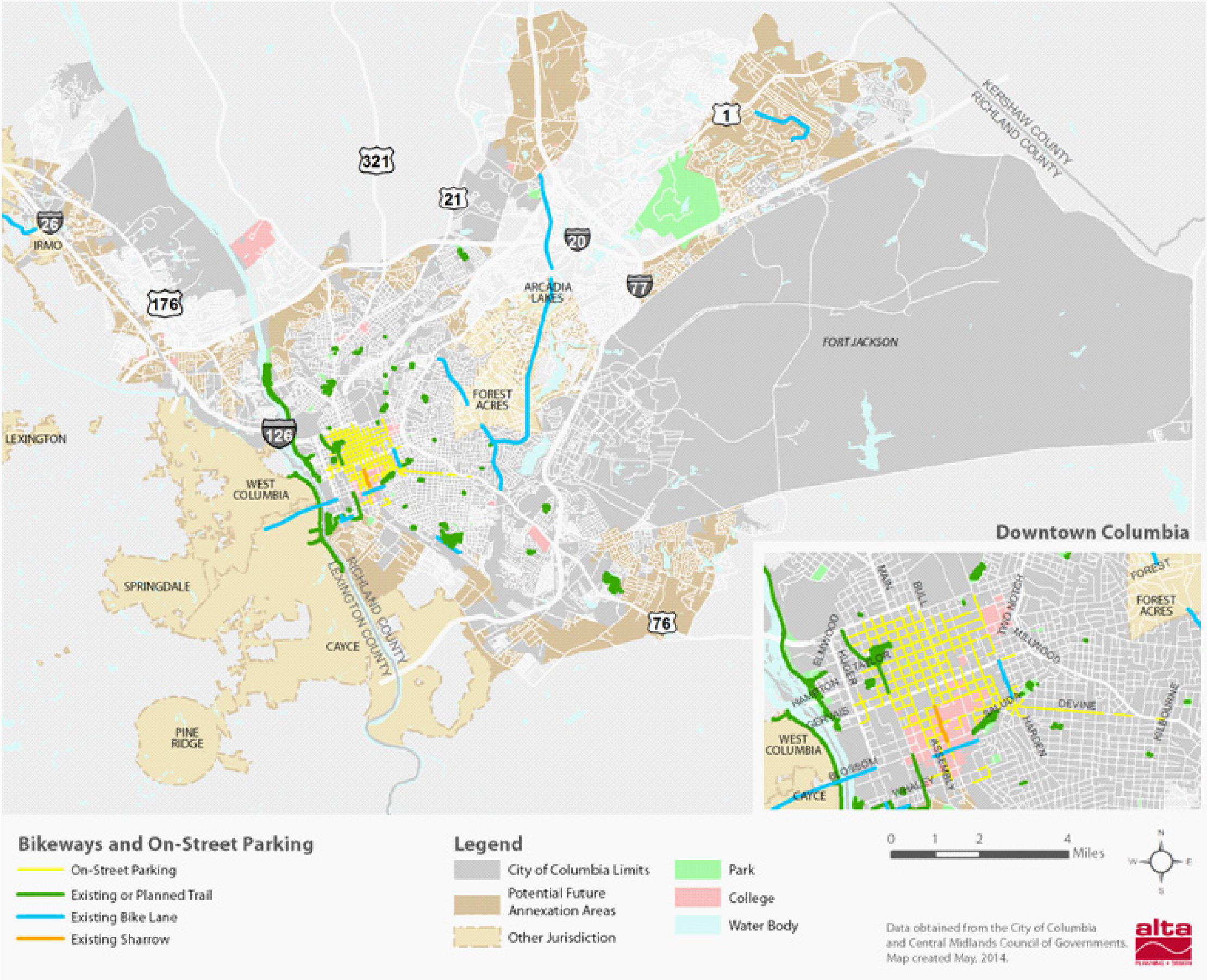




FIGURE 19 - CROSSWALKS AND CURB RAMPS

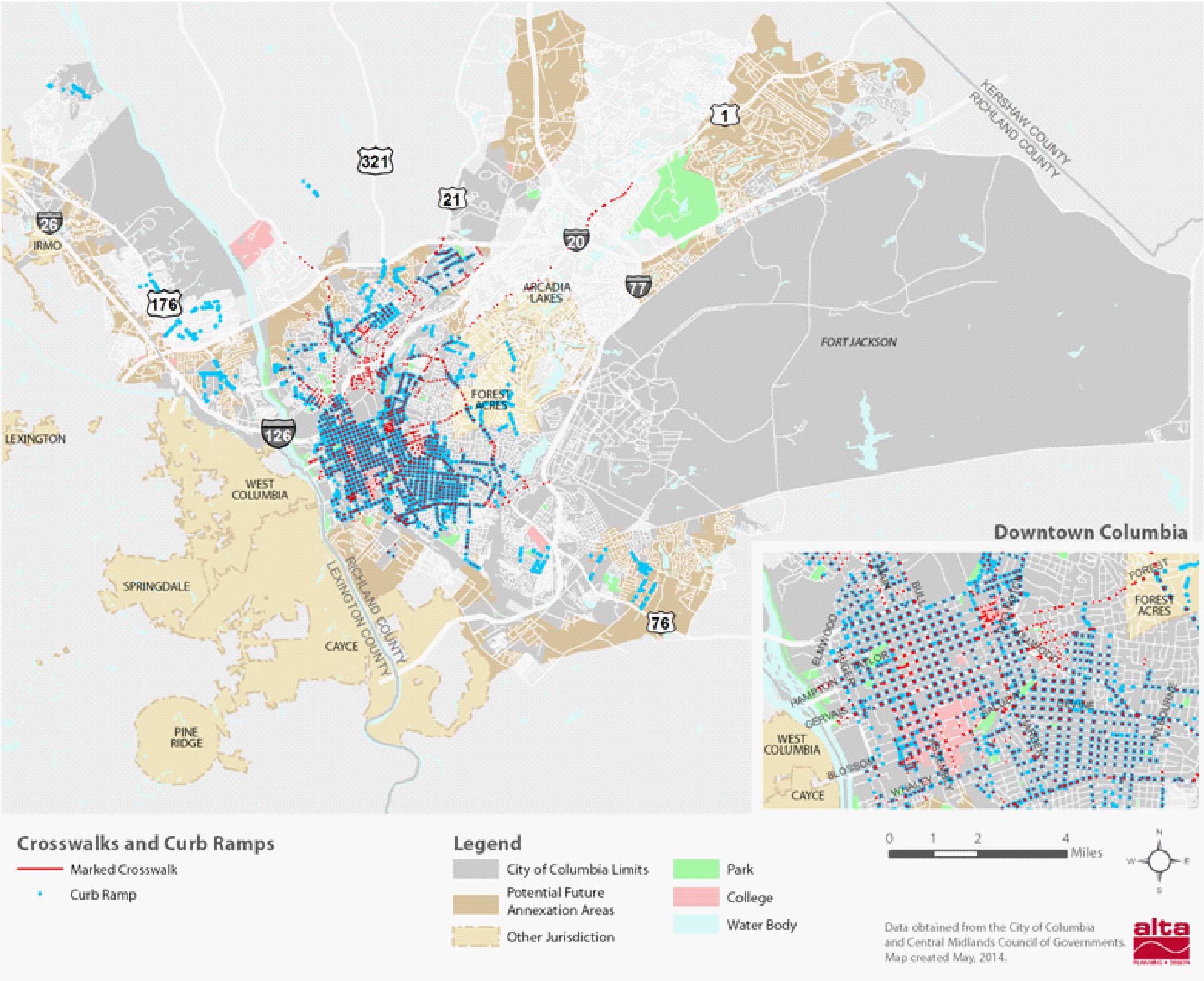
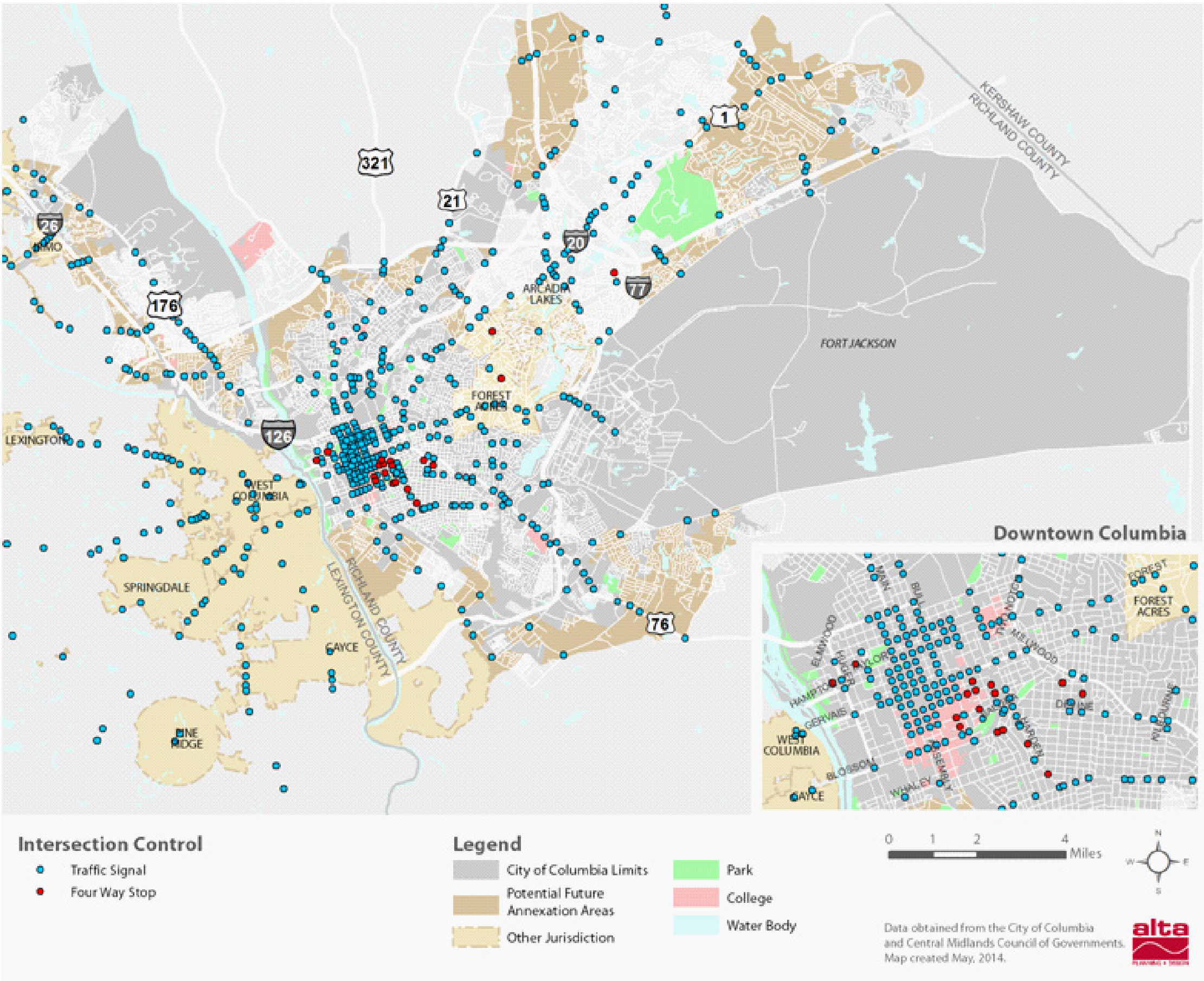




FIGURE 20 - INTERSECTION CONTROL





Safety Analysis

Overview

Safety for pedestrians and bicyclists is a priority outcome for this master plan. Columbia's recent history of pedestrian and bicycle collisions is an important consideration for the development of an improved bikeway and walkway network and new, effective education, enforcement, and evaluation programs. This is underscored by the fact that **South Carolina ranks 47th in the country for bicycle-friendliness¹ and is #4 on the list of the most dangerous states for pedestrians in the U.S.².**

The South Carolina Department of Public Safety provided collision data for the period of January 1, 2010, through May 9, 2014. SCDPS data is catalogued by county. All pedestrian and bicycle collisions within Richland County are analyzed in the following analysis.

For the period of January 1st to May 9th 2014, SCDPS data indicates a total of eight bicycle collisions and 28 pedestrian collisions.

Figure 21 to the right shows the total number of reported pedestrian-motor vehicle and bicycle-motor vehicle collisions in Richland County for each year from 2010 through 2013. This reflects a total of 162 reported bicycle collisions and 529 reported pedestrian collisions. For the period of January 1st to May 9th 2014, SCDPS data indicates a total of eight bicycle collisions and 28 pedestrian collisions.

To better understand the collision data, the table to the right provides a summary of bicycle and pedestrian collision data for a series of North Carolina cities with characteristics similar to Columbia.

The following sections present greater details on the yearly bicycle and pedestrian crash analysis for Richland County. These findings provide a basis for understanding the current safety conditions for bicyclists and pedestrians and priority locations for safety improvements.

FIGURE 21 - RICHLAND COUNTY TOTAL BICYCLE AND PEDESTRIAN COLLISIONS REPORTED (JAN. 2010 - DEC. 2013)

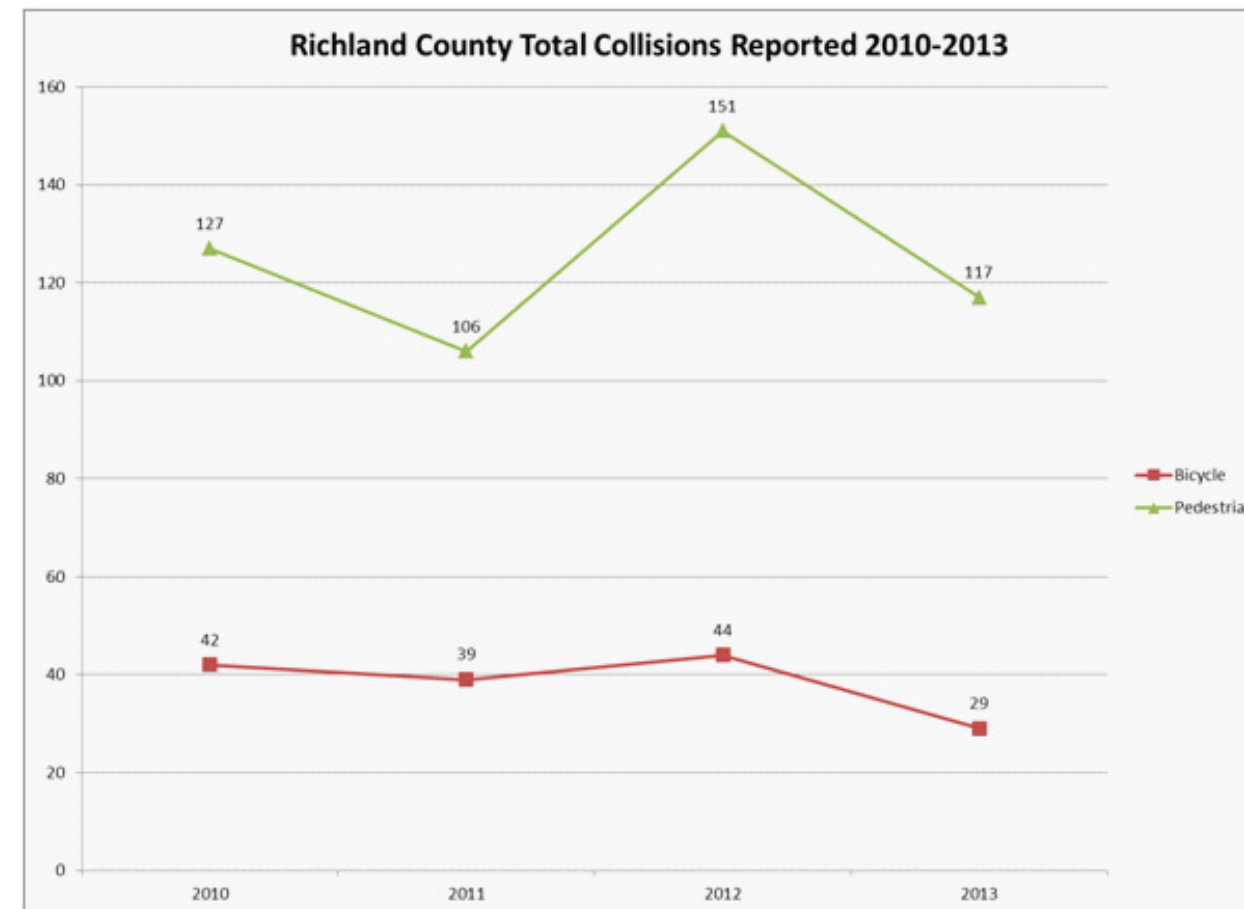


TABLE 29 - PEDESTRIAN AND BICYCLISTS COLLISION DATA

City	Population	Average Annual Pedestrian Collisions	Average Annual Bicycle Collision	University/College Presence
Columbia, SC	133,000	132	41	USC
Cary	136,278	29	19	N/a
Fayetteville	208,615	96	28	N/a
Durham	229,014	114	39	Duke
Winston-Salem	229,986	55	16	Wake Forest University
Greensboro	269,696	150	48	UNC-G and others
Raleigh	406,056	195	86	NC State

¹League of American Bicyclists. 2014. Bicycle Friendly State 2014 Ranking. Retrieved here: http://bikeleague.org/sites/default/files/2014_state_ranking_chart.pdf

²National Complete Streets Coalition. 2014. Dangerous by Design. Retrieved here: <http://www.smartgrowthamerica.org/documents/dangerous-by-design-2014/dangerous-by-design-2014.pdf>



Data Source Summary

Traffic collision data was analyzed for crashes within Richland County, South Carolina involving a pedestrian and motor vehicle or a bicyclist and motor vehicle between January 1, 2010 and May 9, 2014. All analyses are based on the available data. A few considerations should be noted when reviewing the results of this analysis:

- 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 \$1000 in total property damage. Crashes that do not meet these definitions are NOT included in the database.
- Second, due to the factors above and others, crash data typically under-reports the actual occurrence of crashes, especially those crashes that do not result in a serious injury. As such, specific locations identified in the crash analysis may not present all potentially unsafe areas for bicyclists and pedestrians. For future follow up studies, local knowledge from bicycle and pedestrian advocacy groups such as running and cycling clubs should be sought when possible to obtain additional information on unsafe environments. Detailed information on causes of crashes is also useful determining common types of collisions in a given area that may indicate a need for engineering improvements. However, inconsistent coding of the primary factors contributing to a collision may misrepresent this information.
- Finally, it should be noted that the data provided for this analysis does not contain certain data that can be

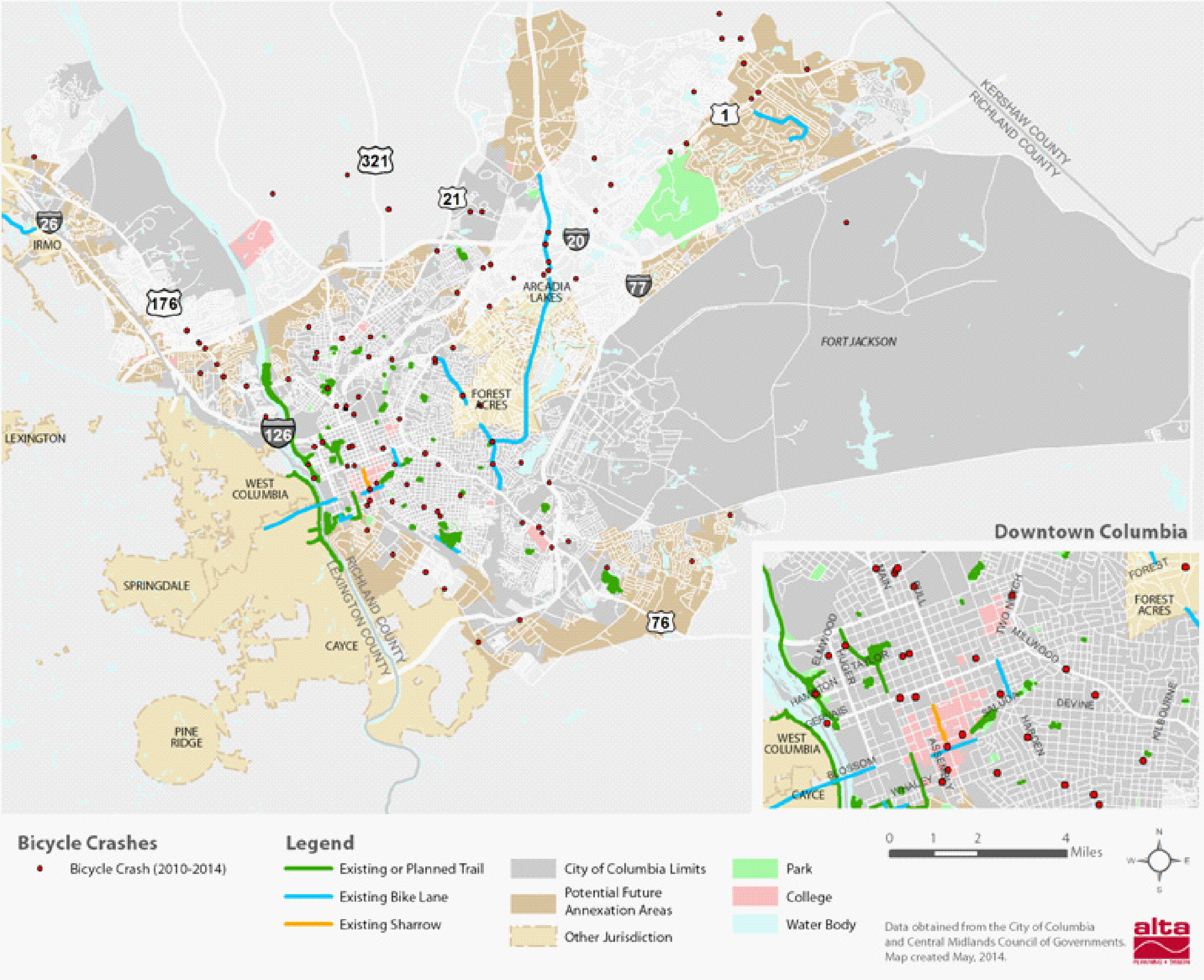
helpful in identifying recommendations for awareness programs and engineering improvements. Demographic data such as the age of crash victims can be useful in determining how education plays into potential causes of crashes. Younger bicyclists and pedestrians, in particular, are often less observant of safety practices such as looking left or right before crossing a roadway, to check for the presence of cars. As further reporting and analysis is done on bicycle and pedestrian crash data, data needs should be monitored to ensure that measures important within communities in the region are represented in crash data.

Geographic Distribution of Bicycle Crashes

Bicycle crashes are evenly distributed in Columbia and the surrounding areas (see Figure 22). The majority of crashes are along streets with no dedicated bikeway facility, however three occurred on the Beltline Boulevard bike lane, one on the Wheat Street bike lane, and four along the Trenholm Road bike lane (outside of the project study area). Collisions occur on arterials, collector roads, and neighborhood streets alike. Collisions occurred on both the Hampton Street and Gervais Street bridges across the Broad River. Broad River Road and Bluff Road bear the highest numbers of bicycle collisions.



FIGURE 22 - MAP OF BICYCLE CRASHES





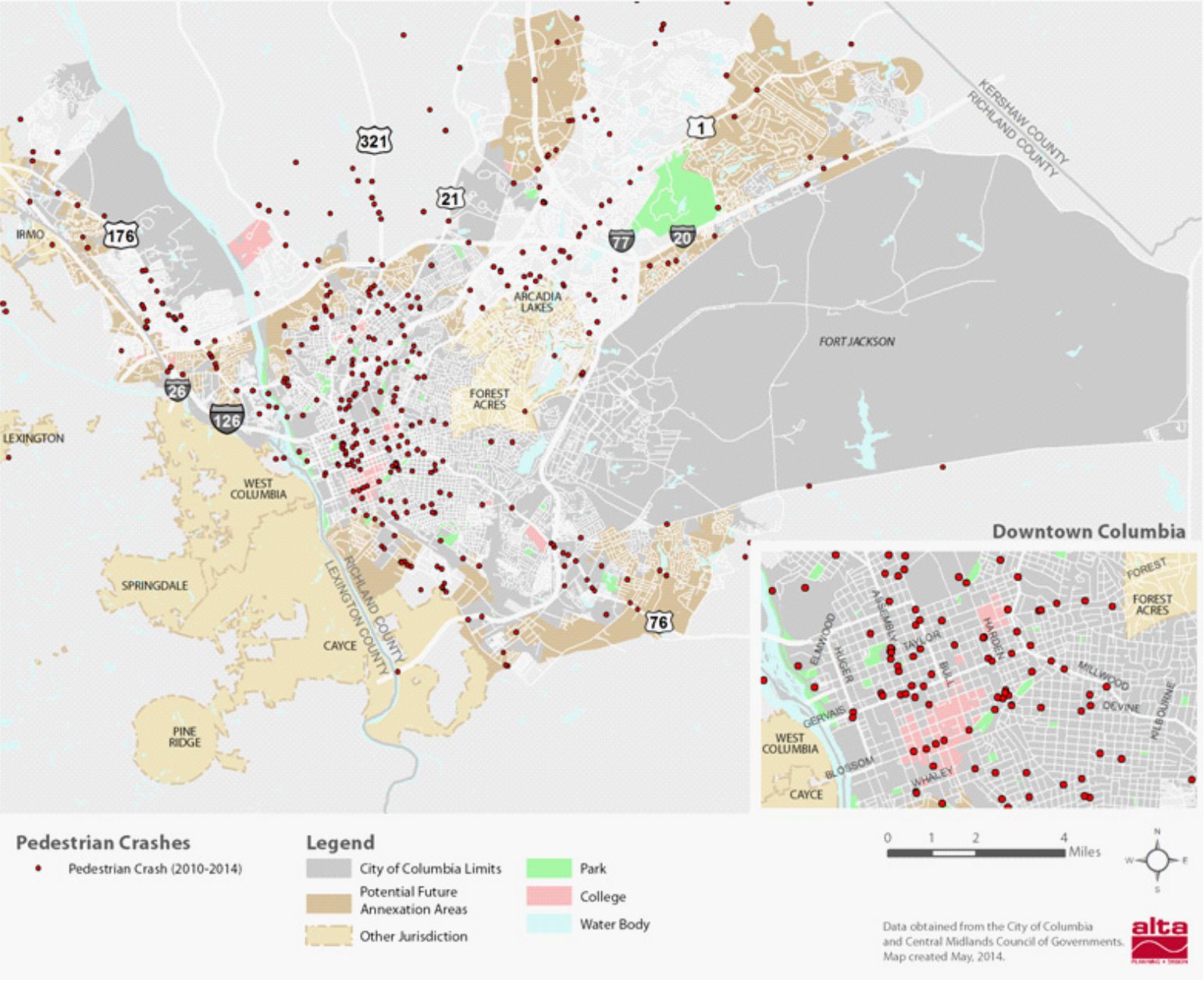
Geographic Distribution of Pedestrian Crashes

Like bicycle crashes, pedestrian crashes are relatively evenly distributed in Columbia and the surrounding areas (see Figure 23). The **highest concentration exists in the central Columbia area**, immediately west of Main/N. Main Street and east of US 1 and US 76. Additionally, several arterials present long stretches of high levels of pedestrian collisions and pedestrian collisions are clustered at several key intersections. **The table below shows the top intersections and corridors for pedestrian collisions in the study area.**

TABLE 30 - TOP PEDESTRIAN COLLISIONS

Top Intersections	Number of Collisions	Top Corridors	Number of Collisions
Bull & Whaley	3	BROAD RIVER RD	27
Forest & McDuffie	3	TWO NOTCH RD	17
Devine & Santee	3	BLUFF RD	12
Devine & Harden	3	GARNERS FERRY RD	11
Greenlawn & Garners Ferry	3	FARROW RD	9
		HARDEN ST	9
		BLOSSOM ST	8
		DEVINE ST	8
		MONTICELLO RD	7
		BULL ST	6

FIGURE 23 - MAP OF PEDESTRIAN CRASHES (2010-2014)

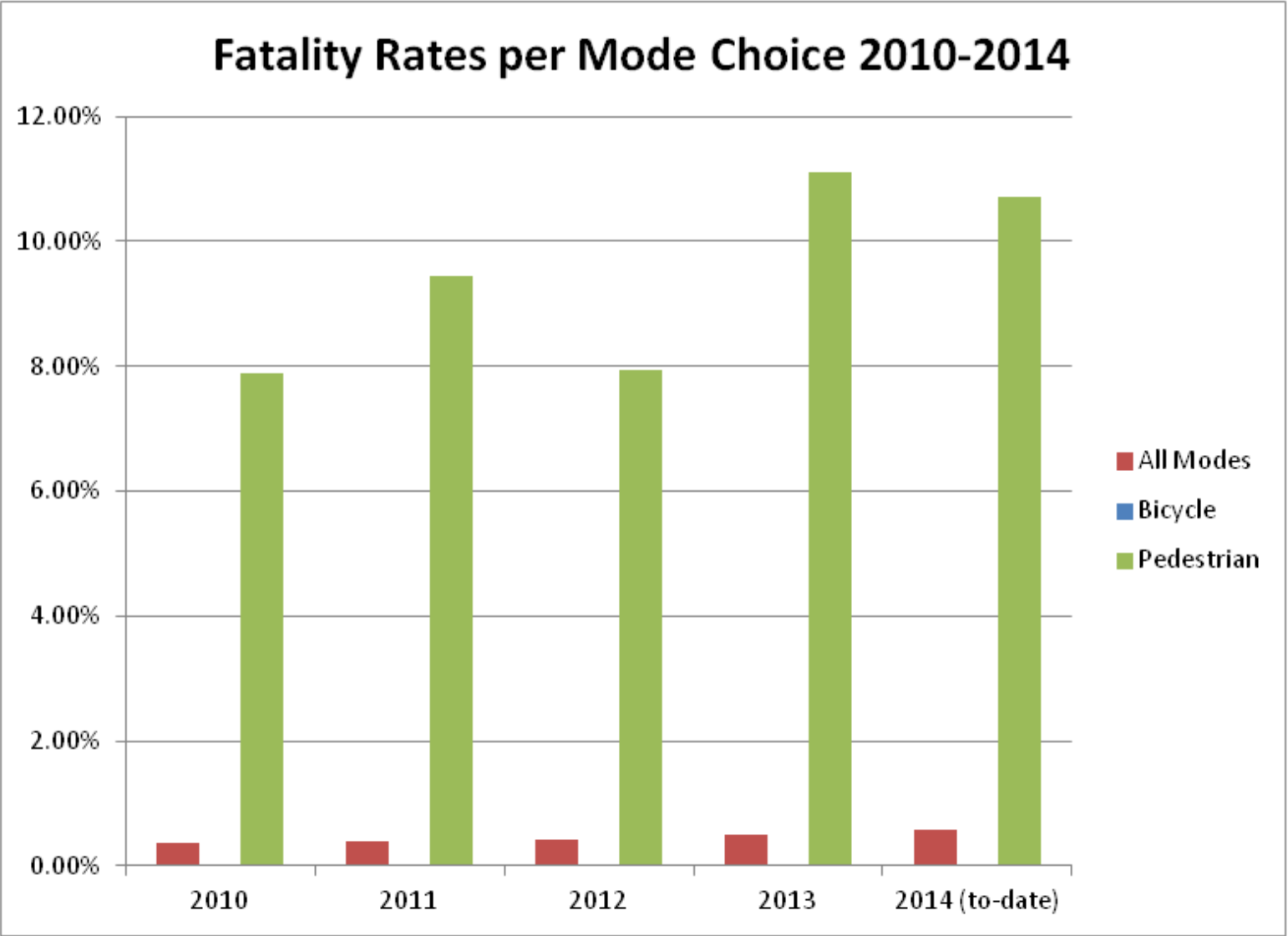




Collision Injuries and Fatalities

The following figure shows the percent of total collision fatalities attributable to each transportation mode. As shown, between 11.8% (in 2013) and up to 18.8% (in 2014 to-date) of reported collision fatalities in Richland County are pedestrian fatalities, with an annual average (excluding 2014) of 13.0%. No bicyclist fatalities are shown in this time period, however, the Columbia community has suffered the loss of several bicyclists over the last few years. The tragic deaths of 19 year old Jesse Gamble in 2008 and 45 year old Mandy Kennedy, a mother of two, in March of 2014 rattled the community. Each was commuting to/ from work at the time of their motor vehicle collision. The March 2014 fatality is not included in this data because the incident is still under investigation.

The following two sections assess the bicycle injuries and fatalities and pedestrian injuries and fatalities, respectively.

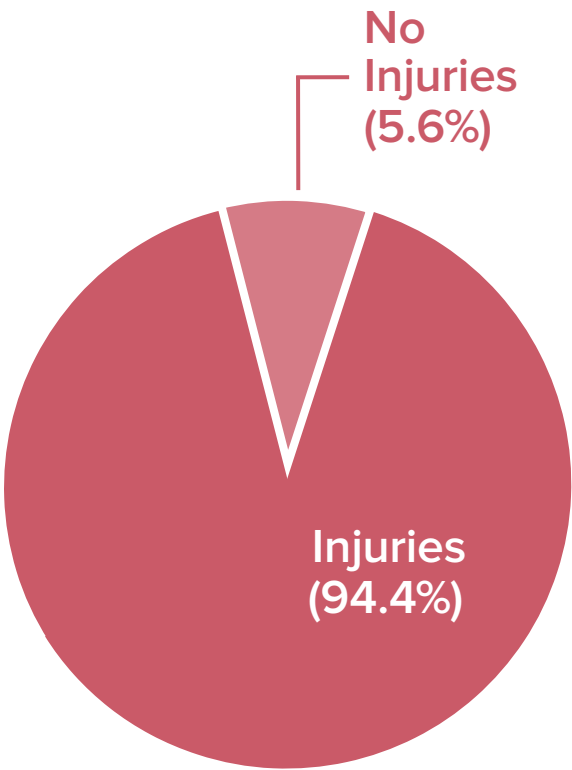




BICYCLE INJURIES AND FATALITIES

Figure 24 shows the ratio of bicyclist injuries and of fatalities to the total collisions reported in Richland County that involved a bicycle from 2010 through May 9, 2014. As shown, there have been no bicyclist fatalities as a result of reported collisions in Richland County over the time period. However, the majority of bicycle collisions (94.4%) result in an injury.

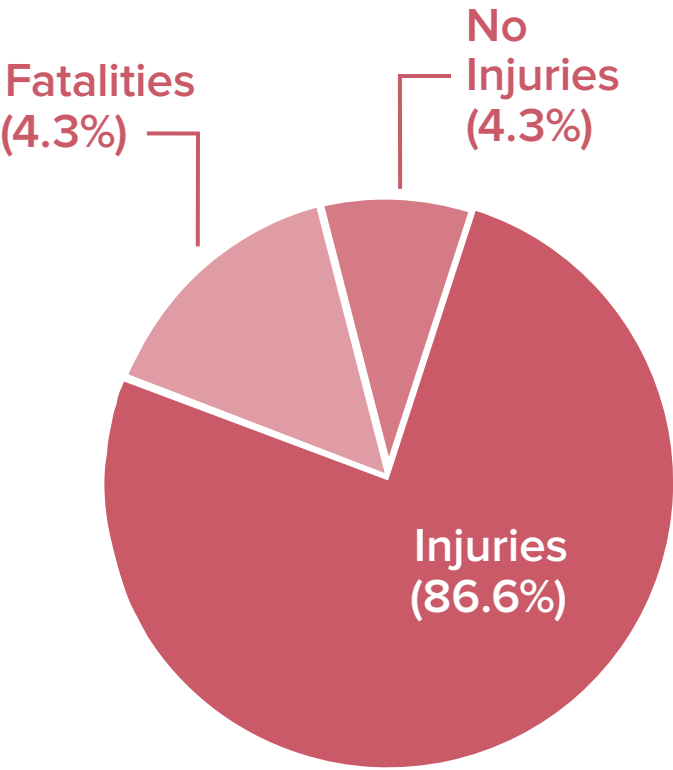
FIGURE 24 - RATIO OF BICYCLISTS INJURIES AND FATALITIES TO TOTAL COLLISIONS REPORTED (2010-2014)



PEDESTRIAN INJURIES AND FATALITIES

Figure 25 shows the ratio of pedestrian injuries and of fatalities to the total collisions reported in Richland County that involved a pedestrian during the data time period. As shown, 86.6% of the pedestrian collisions resulted in one or more injuries, and 9.1% resulted in a fatality. Only 4.3% of pedestrian collisions during the data time period did not result in an injury or fatality.

FIGURE 25 - RATIO OF PEDESTRIAN INJURIES AND FATALITIES TO TOTAL COLLISIONS REPORTED (2010-2014)





Collision Conditions

A total of 162 bicycle collisions and 529 pedestrian collisions were reported in Richland County from January 1, 2010 through May 9, 2014. Table 31 presents the characteristics of these collisions, such as the road surface conditions, lighting conditions, weather conditions, and where the collision occurred.

As shown in the table, most crashes for bicyclists and pedestrians occurred during dry road surface conditions (96% and 87%, respectively) and on clear days (89% and 83%, respectively). The majority of bicycle collisions occurred during daylight hours (70%), but **only 43% of pedestrian collisions occurred during daylight**. In addition, most collisions occurred on the roadway (89% for bicyclists and 87% for pedestrians).

TABLE 31 - RICHLAND COUNTY BICYCLE AND PEDESTRIAN COLLISION CHARACTERISTICS (2010-2014)

	Bicycle		Pedestrian	
	Total	% of Total	Total	% of Total
Total Collisions Reported	162	100%	529	100%
Road Surface Conditions				
- Wet	6	4%	65	12%
- Dry	155	96%	461	87%
Lighting Conditions				
- Daylight	114	70%	230	43%
- Dawn / Dusk	9	6%	29	5%
- Dark (Street Lamp Lit)	20	12%	121	23%
- Dark (Lighting Unspecified)	7	4%	53	10%
- Dark (Unlit)	12	7%	96	18%
Weather Conditions				
- Clear	144	89%	440	83%
- Cloudy	10	6%	38	7%
- Fog, Smog, Smoke	2	1%	3	1%
- Rain	4	2%	45	9%
- Snow	1	0.6%	2	0.4%
- Unknown	1	0.6%	1	0.2%
First Harmful Event Location				
- On Roadway	144	89%	458	87%
- Median / Shoulder	3	2%	18	3%
- Off Roadway	15	9%	45	9%
- Unknown	0	0%	8	2%



Collisions by Month and Time of Day

The following sections present the collisions per month and by time of day from 2010 through May 9, 2014. The data offers some indication as to the time of year and the hours that people bicycle and walk in Richland County. May and October held the highest number of bicycle collisions and October and November held the highest number of pedestrian collisions from 2010 through 2013³. Both bicycle and pedestrian collisions are concentrated in the late afternoon and evening hours, though there are crashes during the morning period as well.

It should be noted that there are collisions involving bicycles and pedestrians throughout the year, indicating that people in Richland County continue to cycle during the winter months. Similarly, collisions occur at all times of day, although the majority occur during daylight hours (between 6 am and 9 pm).

BICYCLE CRASHED BY MONTH AND TIME OF DAY

Figure 26 displays the bicycle collisions by month from 2010 through 2013. As shown, the most collisions occur in May and October with April and November close behind. The reported bicycle collisions decrease after May and build back up until the second peak in October. The higher numbers of collisions involving bicycles in the spring and fall months likely indicates that cycling is more prevalent during these good weather months.

Figure 27 presents the bicycle collisions by the time of day from 2010 through May 9, 2014. As shown, almost half of the bicycle collisions occur between 3 pm and 9 pm (47.5%), followed by an even distribution of collisions between the three-intervals from 6 am until 3 pm (13.6% during each three-hour interval).

³The 2014 data was excluded from the monthly analysis as it only extends through May 9, and would thus skew the data to more collisions in earlier months.

FIGURE 26 - BICYCLE COLLISIONS BY MONTH (2010-2013)

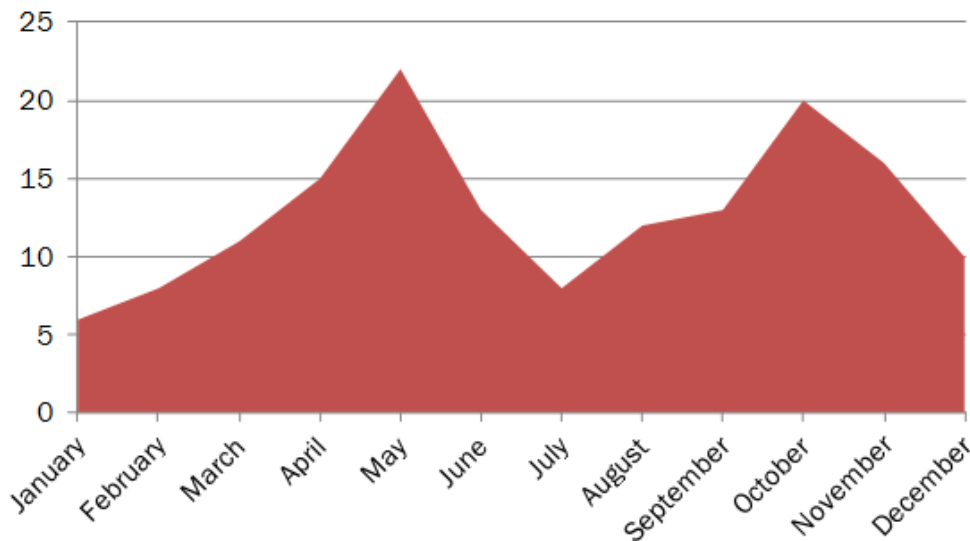
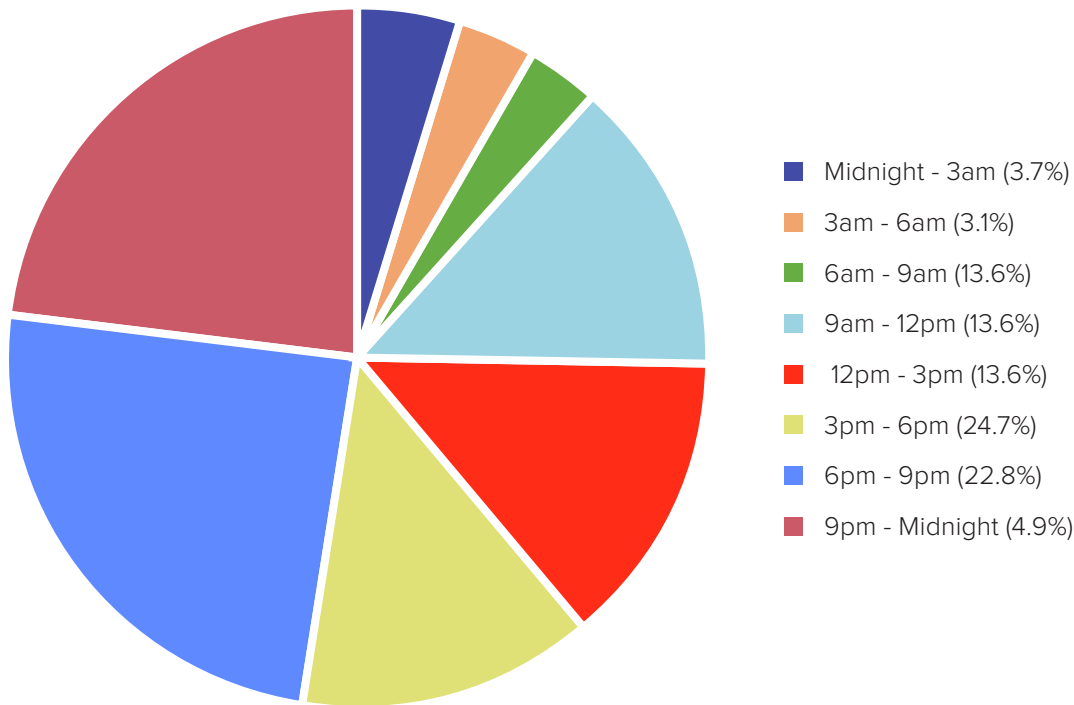


FIGURE 27 - BICYCLE COLLISIONS BY TIME OF DAY (2010-2014)





PEDESTRIAN CRASHES BY MONTH AND TIME OF DAY

Figure 28 displays the pedestrian collisions by month from 2010 through 2013. As shown, the most collisions occurred in November (67 instances). The reported pedestrian collisions increase during the fall months and are lowest in late spring and summer. Trends may reflect the fact that there is more daylight in spring and summer months.

The majority of pedestrian collisions occur during the evening hours from 6 pm to 9 pm (21.4%), followed closely by 9 pm to midnight (18.5%) and 3 pm to 6 pm (17.0%).

FIGURE 28 - PEDESTRIAN COLLISIONS BY MONTH (2010-2013)

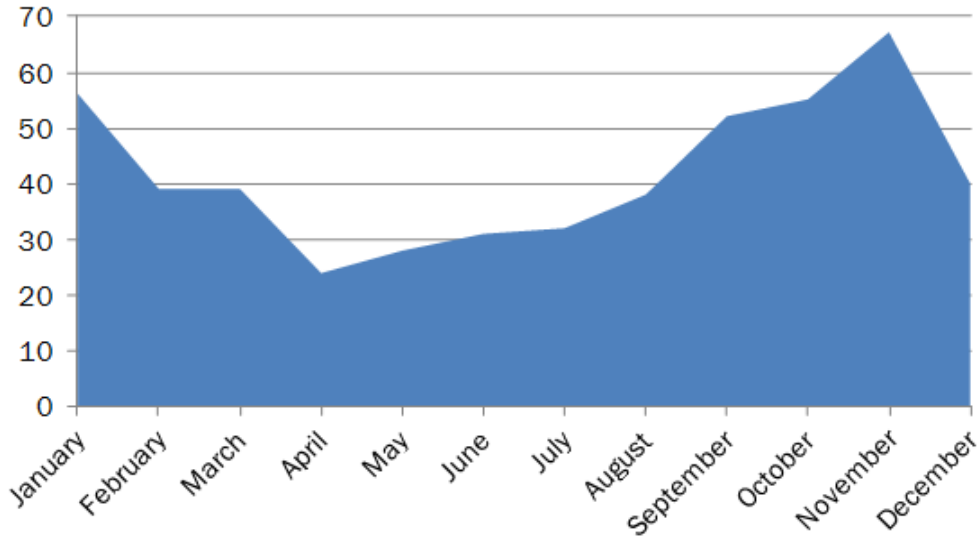
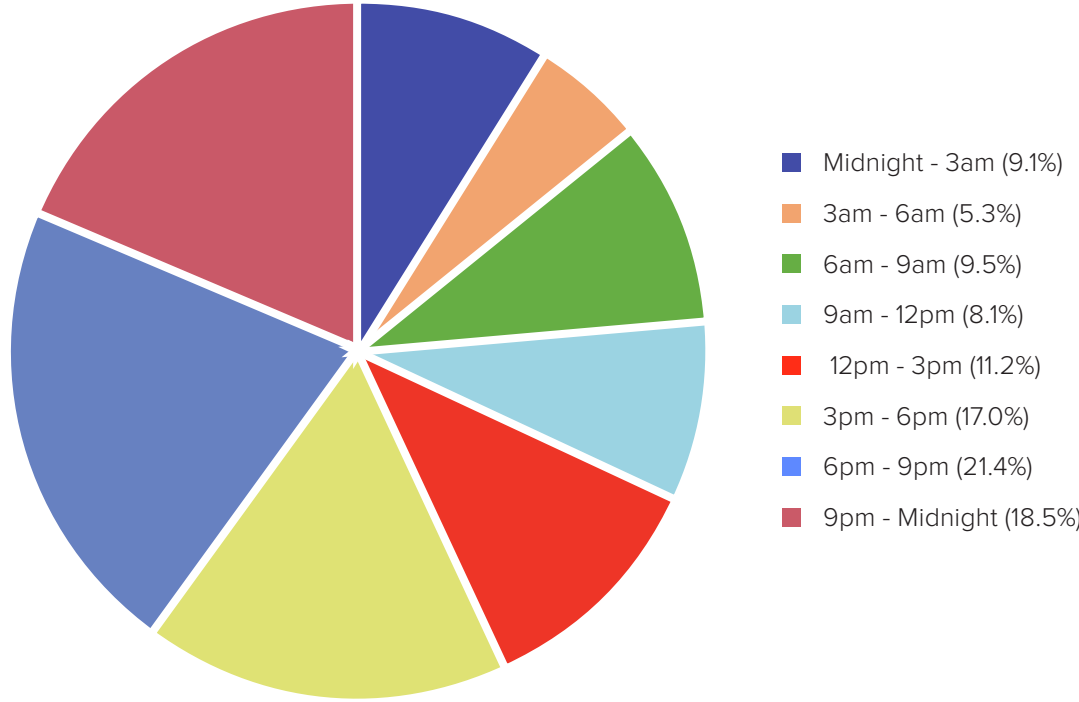


FIGURE 29 - PEDESTRIAN COLLISIONS BY TIME OF DAY (2010-2014)





Collisions by Contributing Factor

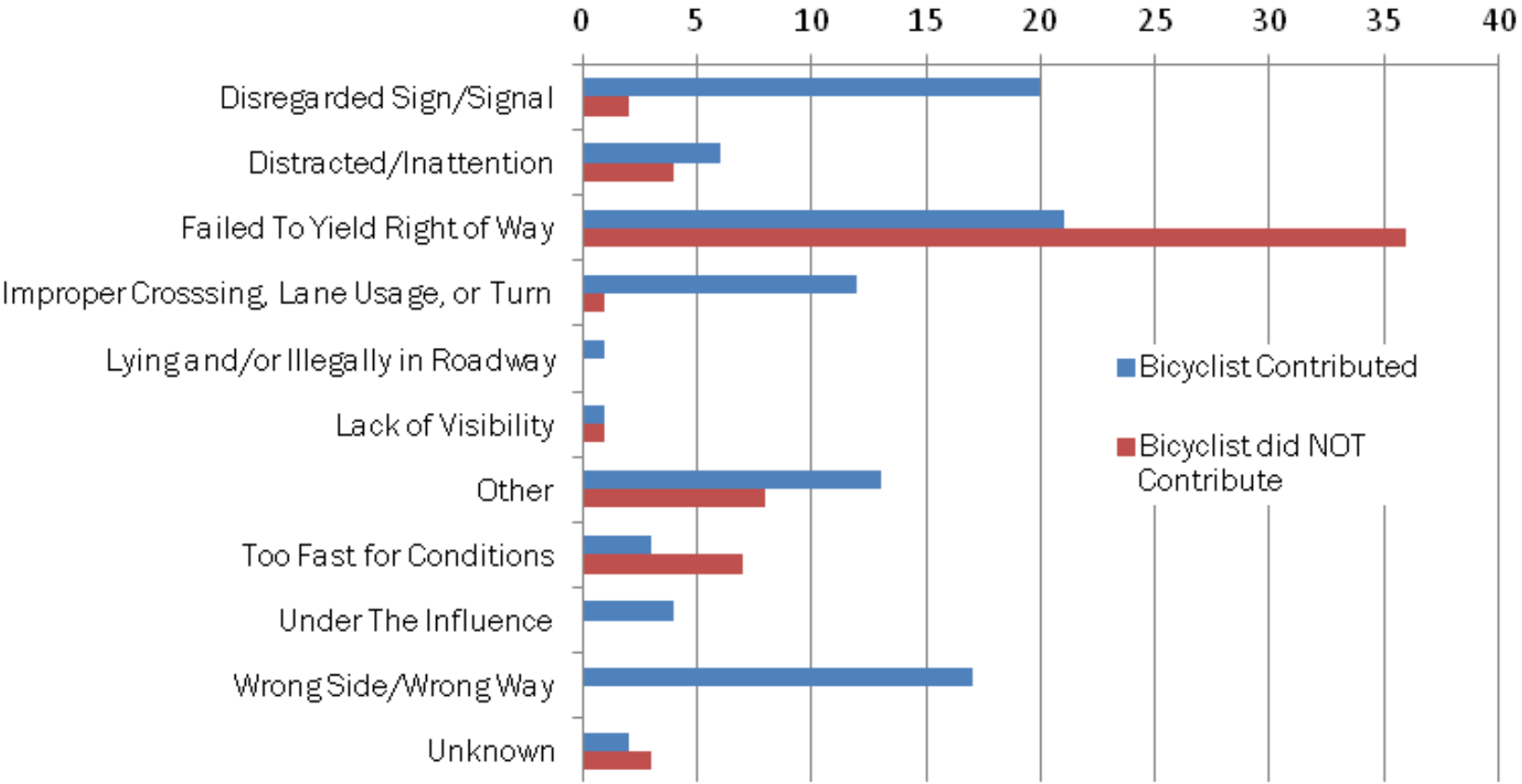
The available data also includes some information about the circumstances of the reported collisions. The following two sections assess the number of crashes for each category of primary factor contributing to the collision.

BICYCLE CONTRIBUTING FACTORS

The bicyclist was reported to be a contributor to the collision in 100 of the 162 incidents (61.7%). The top three primary factors for how the bicyclist contributed were failure to yield the right of way (21 collisions), disregarded a sign or signal (20 occasions), and riding in the wrong direction (17 instances). Conversely, in 36 reported bicycle collisions, the motorist failed to yield the right of way to the bicyclist, but the motor vehicle disregarded a sign or signal or was driving in the wrong direction in only two or zero instances, respectively. 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.

This data indicates several opportunities for creating targeted education and enforcement programs. For motor vehicle drivers, such programs should address failing to yield the right of way bicyclists and speeding. For bicyclists, such programs should address failing to follow traffic signs and signals, improper operations on the road, and riding on the wrong side (or the wrong way) of the road. Often, improved bicyclist infrastructure can serve as the most powerful and efficient means of teaching a cyclist how to properly navigate a roadway or intersection

FIGURE 30 - BICYCLE COLLISION CONTRIBUTING FACTORS (NUMBER OF COLLISIONS BY TYPE)



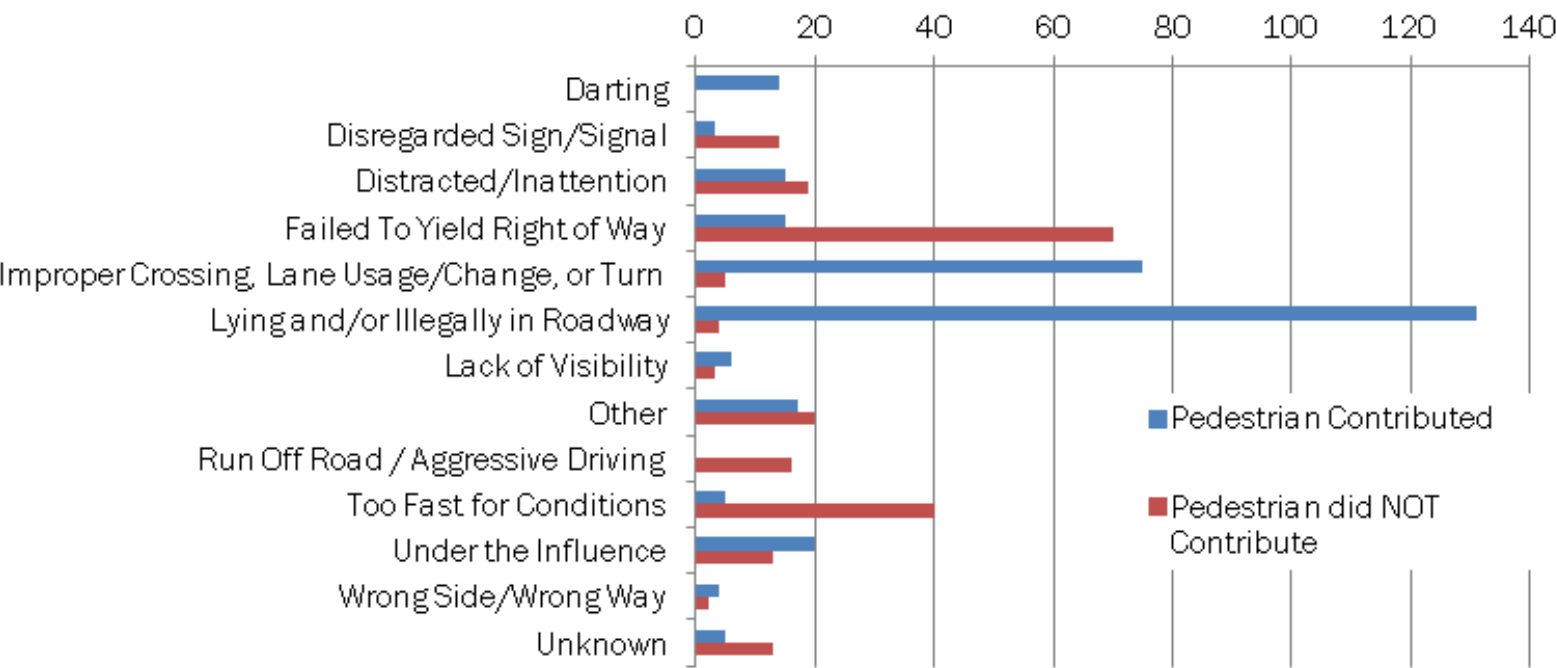


PEDESTRIAN CONTRIBUTING FACTORS

The pedestrian was reported to be a contributor to the collision in 310 of the 529 incidents (58.6%). **The top two primary factors for how the pedestrian contributed were illegally being in the roadway (131 collisions) and improper crossing, lane usage, or turn (75 instances).** It is important to note that a pedestrian may be identified as illegally within a roadway when they have been given no alternate safe place to walk, stand, or cross. This could include corridors with no sidewalks, a sidewalk on only one side of the road, long distances between intersections (for crossing), or bus stops with no designated waiting area.

The top two primary factors for collisions by motorists were failure to yield the right of way (70 collisions) and driving too fast for conditions (40 collisions). 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 31 - PEDESTRIAN COLLISION CONTRIBUTING FACTORS (NUMBER OF COLLISIONS BY TYPE)







APPENDIX F: INTERMODAL TRANSIT ANALYSIS

Introduction: Bicycle Access and Public Transportation

A major theme emerging from the Bike Walk Columbia Plan and the long-range vision for the Columbia area is that the region must develop a transportation system that creates and encourages the use of more travel choices, such as transit, biking, walking and ridesharing, and begin to reduce the degree of reliance on the single-occupant automobile for vehicle travel.

Quality of life is an important factor in the Columbia area. From the urban core of Columbia to the region's hills and lakes, the historical, cultural and recreational amenities are abundant. These amenities along with affordable housing, shopping centers, healthcare, and educational facilities draw people to the Midlands. The climate and geography of Columbia and the surrounding communities provide an opportunity for bicycling to truly be a transportation alternative to the single-occupant vehicle, when conveniently linked with the transit system via secure and plentiful bicycle parking at transfer stations and bicycle access onboard transit vehicles. The combination of bicycling and public transit offers many Columbia residents, workers, and visitors perhaps the best alternative to the flexibility and convenience of the single-occupant vehicle as a result of lower costs, reduced parking stress, and reduction in greenhouse gases.

Bicycling can be a convenient method of reaching a transit stop or transfer station. The bicycle offers the independence of the automobile and costs less than auto ownership, including paid parking and gas. On transit systems, such as The COMET, that allow bicycles onboard, the same bike can be used on the origin and destination ends of the trip. Workplace showers can allow longer distance commuters to bicycle to work, and arrive at their desks fresh and clean.

Well-designed, strategically located bicycle and pedestrian facilities can increase ridership on public transit by providing people with safe, pleasant access to these transit options. With geographically strategic investments in bicycle and pedestrian system improvements, together with the implementation of smart land use strategies and better education and incentive programs, many short auto trips could be shifted to walking, biking or transit trips to help reduce vehicles miles traveled (VMT) and emissions for a relatively low cost.

The following chapters provide an overview of the major transit providers in the Columbia area and a discussion of opportunities for future coordination among bicycle, pedestrian and transit access in the region.



Existing Transit Service

Public transportation empowers individuals to be independent, seek and retain employment, access medical care, and gain access to new opportunities. Nationally, the role of public transportation is evolving from the perspective of the stand-alone provider of services to the idea of public transportation developing partner alliances with other agencies and organizations. The result is improved mobility alternatives for customers for all transportation services. This evolutionary process has resulted in the recognition that while public transit remains an integral part of the overall transportation network, emphasis must be placed on the more inclusive perspective of partnerships.

Transportation providers in Columbia presently serve the mobility needs of the general public, including the elderly, persons with disabilities, low-income persons, commuters, students, and recreational users. Transportation providers include:

- The COMET, a public transit agency operated by the Central Midlands Regional Transit Authority (CMRTA)
- University of South Carolina Transportation Services, private student transportation
- The Santee Wateree Regional Transit Authority serving Elgin, Lugoff, Sumter, Hopkins, Camden, and Columbia
- Newberry Express from Newberry
- Intercity services, Greyhound Lines and Southeastern Stages, Megabus
- Private taxi, limousine, and shuttle providers

Even though the primary focus of this study is coordination between The COMET and USC Campus Shuttles, future facilities with other providers in the Columbia area should consider bicycle and pedestrian connections, as appropriate.



THE COMET (CMRTA)

The COMET provides fixed route and paratransit service in the Columbia urbanized area, including portions of Richland and Lexington Counties.

In July 2012, Richland County voted to place a penny-on-the-dollar tax referendum on the November 2012 ballot, with transit receiving 29 percent of each penny collected until the sunset of the tax: 22 years OR \$1.07 billion, whichever comes first. The penny tax referendum passed in the November 2012 election and, after several legal efforts to overturn the results, the South Carolina Supreme Court upheld the referendum results; thus, providing The COMET financial stability.

The tax cycle required that the new tax collections would not begin until May 1, 2013 and first disbursement would not occur until approximately November 2013—a full year after the election results.

In May 2014, The COMET added Sunday service for the first time since 2012, matching the level of service on Saturday for the best weekend service Columbia has ever had. In September 2014, The COMET launched 100 hours of additional service, a 25 percent increase, including:

- expanded hours on main line routes;
- increased frequencies on key routes;
- expanded Saturday service;
- the first ever USC-oriented route targeting student housing.

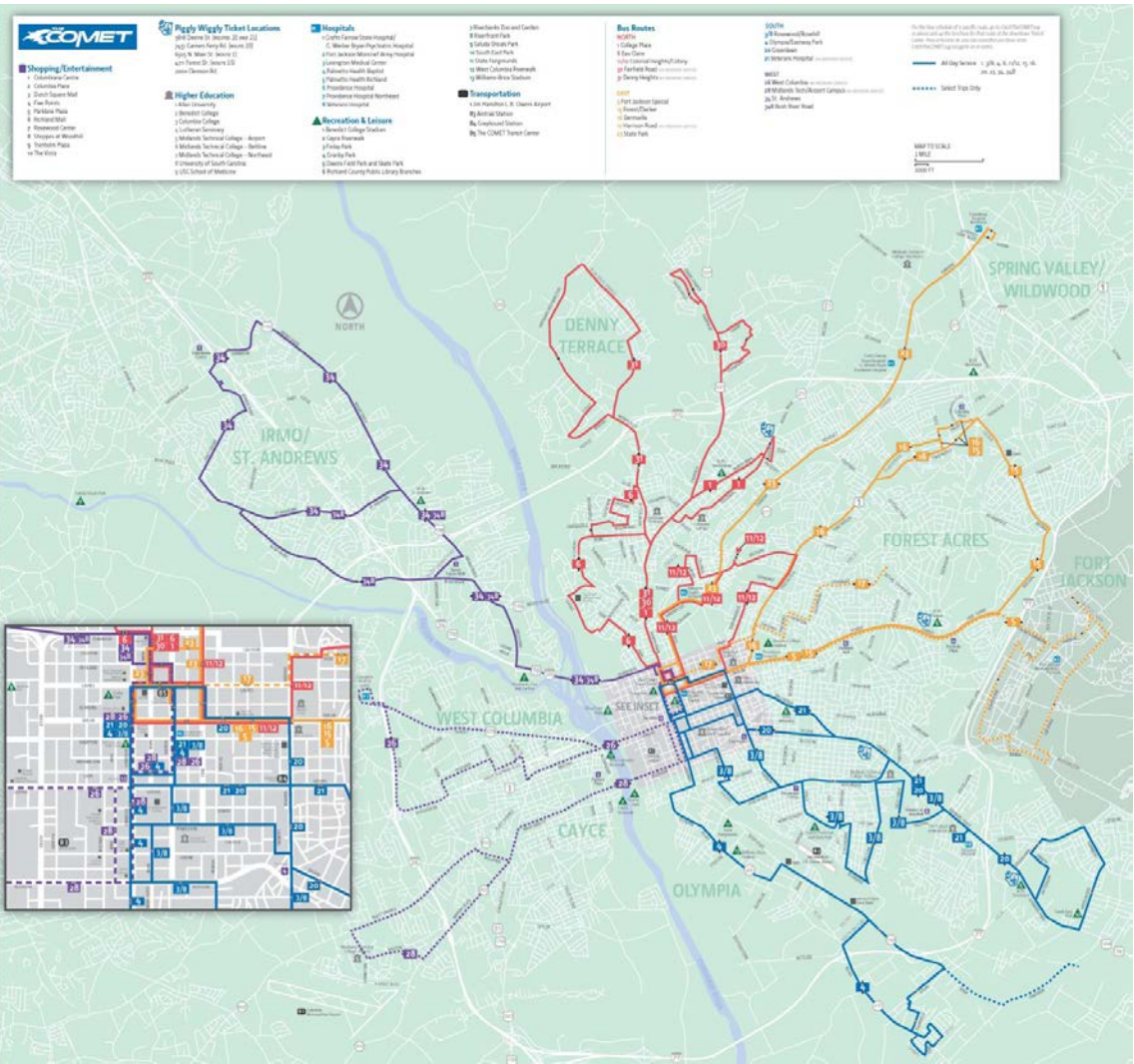
The COMET, previously known as CMRTA, re-branded from CMRTA for a variety of reasons; however, the main reason was the system demanded a name and image that reflected the identity of a bold, aggressive, forward-thinking transit system. It had to be vibrant, speak to the future and create loyalty to the system. It had to be cool. The new brand and color scheme has been the most talked-about aspect of transit for the past year. Much of The COMET's activity since summer 2013 has surrounded staffing, capital procurement, and system planning.

The COMET provides fixed route service within Richland County and portions of Lexington County. Much of this service is provided within the City of Columbia with operations reaching into the communities of Cayce, West Columbia, Forest Acres, Arcadia Lakes, Springdale, St. Andrews area, and Harbison area. The COMET routes that exist as of July 2014 are shown in Figure 32. Service is provided from 5:30am to 11:00pm, Monday through Friday, and 7:30 am – 9:30 pm on Saturdays and Sundays

with service every 60 minutes. In August 2014, The COMET implemented additional transit service, the Orbit, which is an internal circulation of transit routes that provides approximately 15-30 minute headways for the downtown Columbia area, near the USC Campus. Additional service will be implemented in 2015 to complete the full rollout of the Orbit.

The COMET also operates two other types of service: ADA demand-response (DART) and open-access demand response (Flex) service.

FIGURE 32 - THE COMET SERVICE





DART:

The ADA demand response paratransit service follows the service days and times of the fixed route system. Demand response must be prescheduled the day before and has a no denial policy, using trip negotiation and scheduling to accommodate trip requests. To qualify for DART service, applicants must be unable to independently access and/or use The COMET fixed route system. If an individual resides within ¾-mile of the fixed route service, but does not have an accessible path, such as a sidewalk or wheelchair ramps at an intersection, then the person is eligible for this type of service. Those who wish to use the DART system can be certified as eligible by completing an application and following the short eligibility review process.

Flex:

The open-access service is a newly created flexible service that operates like the ADA service; however, any passenger can ride the vehicle and ALL origins and destinations must be within the service zone, which includes the end-of-the-line points for three fixed routes. This service is designed to connect low-density areas to fixed route buses, especially higher frequency main line routes. The first Flex Zone began in February 2014 and will be expanded to a larger service area. There is no dedicated vehicle to this route, as the passengers are fit into the DART manifest and delivered to the route destinations by DART drivers. This minimizes overall costs and allows for the same staff to answer and schedule telephone-based calls. The COMET also operates a “Re-Flex” route, which is a hybrid deviated fixed route—it has a series of scheduled fixed route trips, but then is available to perform demand-response service like a classic flexible service.

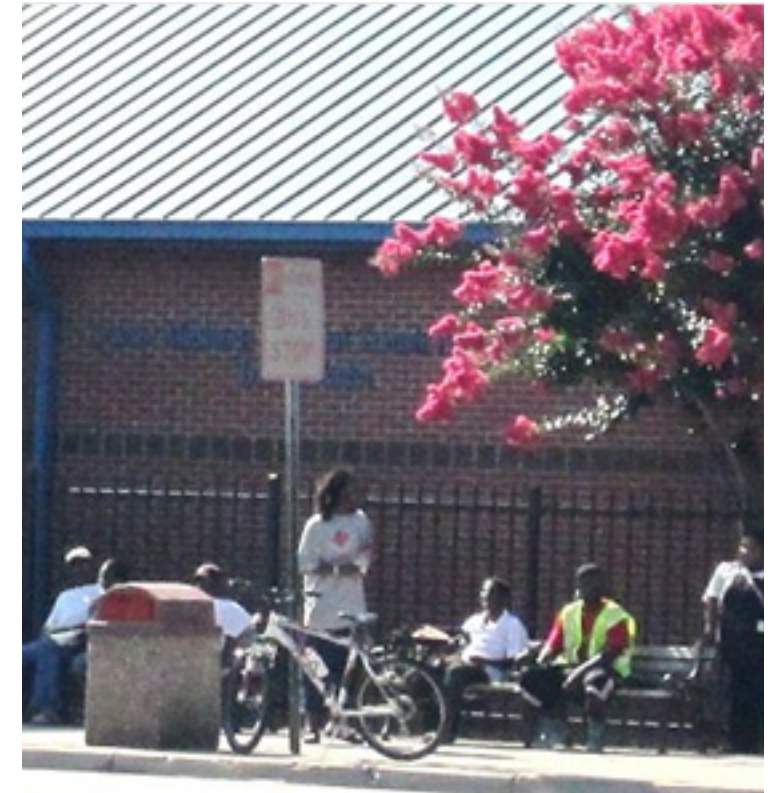
System:

The COMET base fare is \$1.50. In FY 2012, The COMET provided just under 2M passenger trips, with approximately 145,000 revenue vehicle hours. The COMET has approximately 45 peak vehicles in operation for fixed route and paratransit services each weekday. In FY2012, the annual operating budget for both services was approximately \$12M.

The COMET receives FTA 5307 revenue funds, which have a requirement of at least one percent of the funding apportioned to The COMET must be used for transit enhancement activities, such as historic preservation, landscaping, public art, pedestrian access, bicycle access, and enhanced access for persons with disabilities. This Columbia Bike Walk Plan provides an opportunity for The COMET to use the findings as a priority for these funds, as appropriate to other needs identified within specific transit plans.

Within Columbia, the Downtown Transit Center is the primary transfer point for The COMET routes. The Santee Wateree RTA also provides transit service into the Columbia area via two routes. The stops for the routes include the Downtown Transit Center and the following other locations listed below. Any future roadway or transit improvement projects should consider bicycle and pedestrian facilities and connections at these sites.

- Richland Memorial Hospital
- Bull/Confederate, DHEC/DSS
- Sumter/Hampton, Palmetto Health
- Sumter/State House, State House
- Sumter/Pendleton
- Pendleton/Assembly, DNR
- Assembly/Gervais
- Assembly/Washington
- Assembly/Blanding





CAROLINA SHUTTLE (UNIVERSITY OF SOUTH CAROLINA, CAMPUS TRANSPORTATION)

The Carolina Shuttle is operated by the University of South Carolina Vehicle Management and Parking Services, within the Division of Administration and Finance. The campus shuttle operates six routes Monday through Friday, 7:30 am to 5:45 pm. The Evening Shuttle operates from 5:30pm to 12:30am. The system operates during the Fall and Spring semesters, with limited operation during the summer, reading days, and holidays. The Carolina Shuttle does not run on a set schedule. Buses arrive at designated stops approximately every 15 minutes.

The Carolina Shuttle is free to all USC students, faculty, and staff. Shuttle and parking maps are available at Parking Services, the Askus information desk at the Russell House, and at Vehicle Management. Commuting students are encouraged to park in lots located at the Coliseum, Bates Area, and 1600 Hampton, then ride the Shuttle to central campus. Approximately 35,000 students attend USC during the fall and spring semester. As USC continues to improve facilities and connections across campus, these primary stop locations should consider adequate bicycle, pedestrian, and transit facility needs.

The Campus Shuttle has an operating budget of approximately \$1.5M annually. USC has 30 buses in its fleet. While school is in session, 15 peak vehicles are in operation, while 6 vehicles operate during the summer session. Annual ridership for the USC Shuttle service is approximately 212,000 trips, which averages approximately 1,100 trips per day. The cost per student is \$24.25 per semester for the Shuttle bus pass.

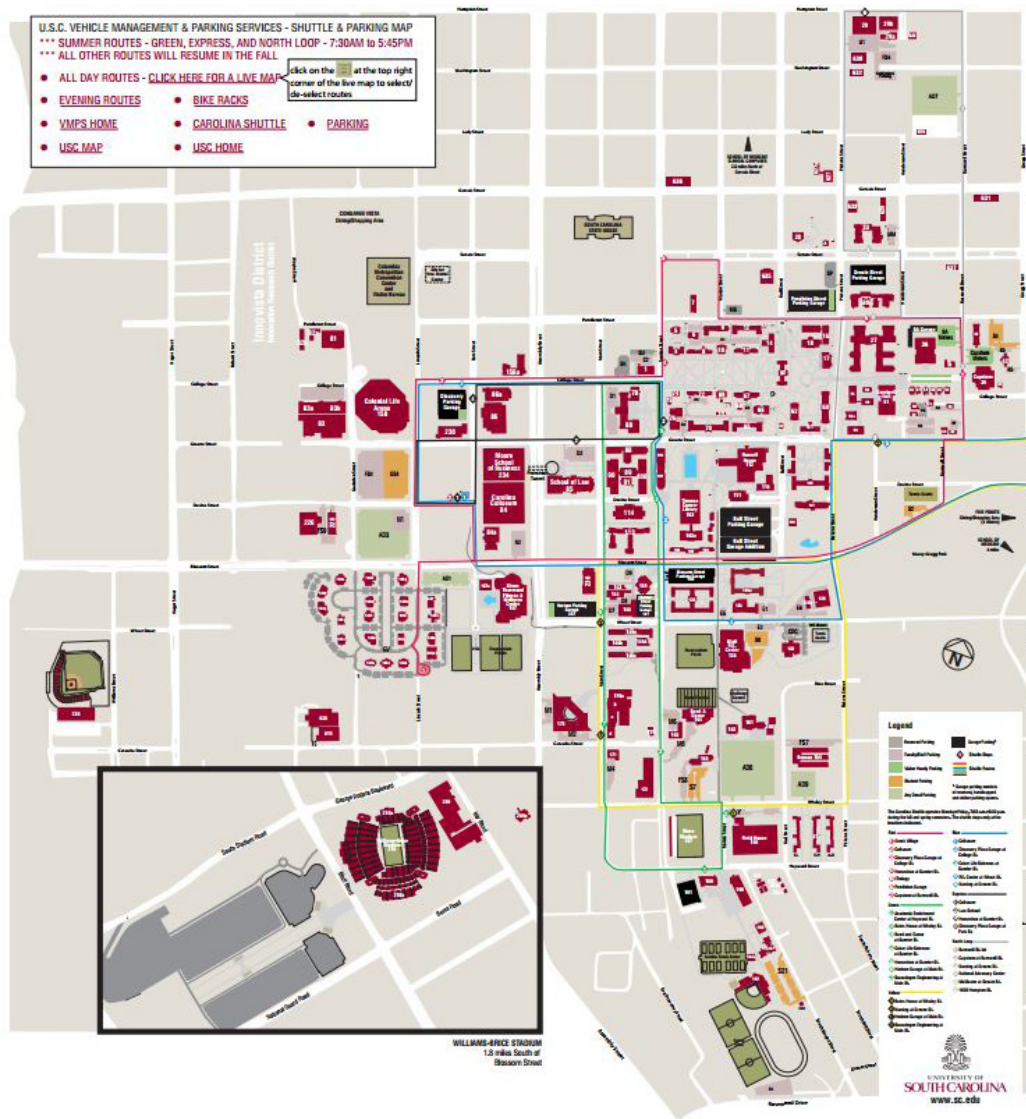
The USC Shuttle currently uses the NextBus software to display current and live information where the bus is located on the six routes. An example for the Blue Route is: <http://www.nextbus.com/googleMap/?a=usc&r=blue>. USC Shuttle

management has a goal to advance technology for the Shuttle service, which includes:

- Scheduling and dispatch software to improve route efficiencies
- Fuel management system that would upgrade the existing GasBoy software that has been in place for many years

- Maintenance software, compatible with the Fuel Management and the Scheduling software to ensure efficient tracking of required operational and maintenance data

All USC Shuttle vehicles are wheelchair accessible.





INTERCITY SERVICES

Bus:

South Carolina is served by two (2) Class A intercity bus carriers, Greyhound Bus Lines and Southeastern Stages. The city of Columbia and Fort Jackson are stops for both carriers. The intercity bus stop is located at 2015 Gervais Street, near Laurens Street, in downtown Columbia and at Fort Jackson. The downtown bus station should have adequate pedestrian amenities, along with accessible pathways to and from the facility.

Intercity Rail:

Intercity rail transportation, particularly high speed rail service, has a greater potential than intercity bus to significantly impact how South Carolina residents and visitors travel between cities in the future, due to the reduced travel times, level of comfort, and direct service. One key to integration of intercity bus service is to connect patrons to high-speed rail service, which extends the reach of the high speed rail corridor.

Although there is not a funded national program for the actual construction of high-speed rail passenger corridors, the United States Department of Transportation (USDOT) has designated a network of corridors for the development of high-speed rail service in this country. These corridors are generally focused on regional trips that could be competitive with commercial air service from a schedule standpoint. To date, only small amounts of Federal funding have been provided, adequate only for studies. South Carolina is a member of the Southeast High Speed Rail Coalition, along with its neighbors, North Carolina, Georgia, Florida and Virginia. Two corridors that pass through South Carolina have been adopted as part of the Southeast High Speed Rail Coalition plan. These corridors were added to the Southeast Corridor network designated by the USDOT as future high-speed rail passenger routes.

The provision of a high-speed rail station in Columbia with connections to/from other urban activity centers via rail or bus would be very important for access to and from the Central Midlands region. Although not categorized as intercity passenger rail, the Central Midlands Council of Governments has analyzed at a preliminary level the feasibility and viability of regional commuter rail in several corridors, extending from Columbia to Camden, Newberry and Batesburg-Leesville. The COG also studied the possibility of a connecting rail service to high-speed rail via either Spartanburg or Charlotte.

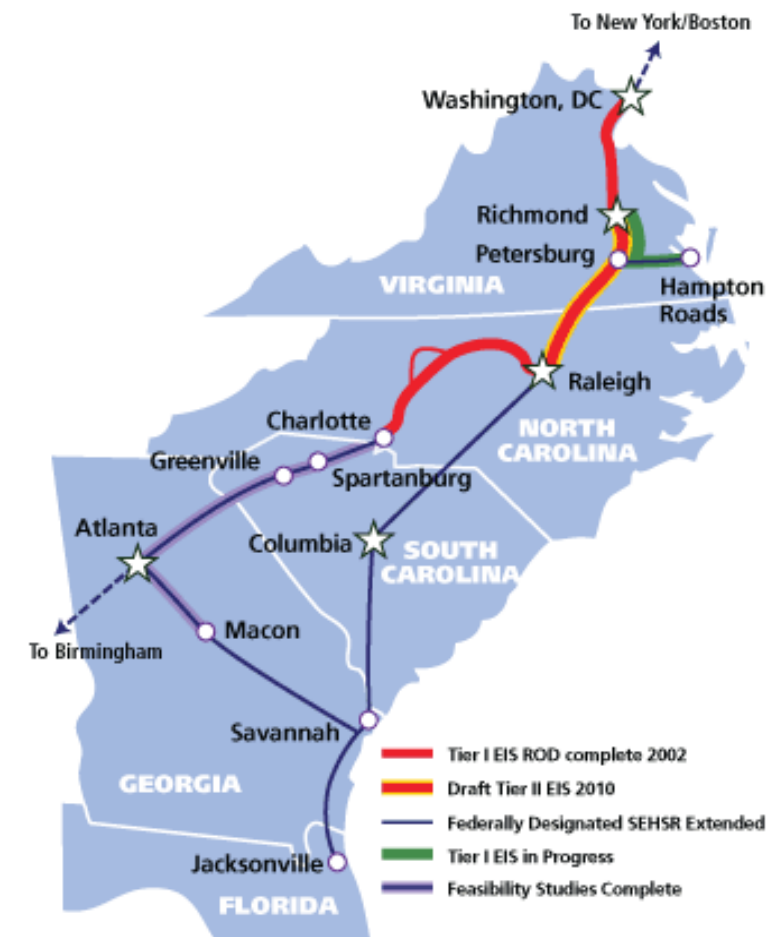
<http://www.sehsr.org/history.html>

As the possibility of high-speed rail becomes a reality for the Midlands, appropriate planning of transit route connections, bicycle and pedestrian facilities should be incorporated into the process.

Passenger Rail: Amtrak

The Amtrak passenger rail station is located at 850 Pulaski Street, near College Street, southeast of the downtown area. The Silver Star provides service through Columbia, from New York City, Tampa to Miami, Florida. In 2013, the Columbia station recorded 36,349 boardings and alightings, the third busiest in South Carolina, behind Charleston, and Florence.

The Amtrak station should continue to incorporate bicycle, pedestrian, and transit facilities into future improvements.





COORDINATION OF TRANSIT SERVICES

Over the past 10 years, there has been a strong national emphasis for livable communities that provide a range of transportation choices available to all residents within the community, including transit, walking, and bicycling. The above transit services within Columbia and surrounding areas offer transportation options to residents. Building upon these existing systems is a goal for many agencies in the area.

The state of coordination among the transit providers is present, but limited within the community.

- The COMET has bicycle racks on all buses, which has been a priority for the agency for several years. New buses ordered by The COMET buses will have racks for three bikes.
- USC does not have bike racks on buses, but does have many bicycle racks located on campus to accommodate student and faculty bike riders. Future buses should include bicycle racks on the front of the vehicles to accommodate the high usage of bicycles on campus. USC should continue to provide bicycle racks around campus to accommodate the bicycle mode share.
- The COMET, in coordination with USC, began in August 2014 the Garnet route, which provides service every 20 minutes from the student complexes on Bluff Road to the USC campus. Currently the apartment complexes on Bluff Road provide small shuttle vans for USC students to/from campus. Over the next year, The COMET and USC will continue to work together for future funding of this route.
- The COMET began in August 2014 more frequent service in the core downtown from the Downtown Transit Center to the USC campus. The goal of the reconfiguration of routes is to provide convenient and

frequent service to downtown employees, students, and staff.

- Local government agencies involved in the High Speed Rail initiatives continue to recognize the necessary link between bus and rail services for the future.
- The COMET has approximately 900 bus stops located across Columbia. One goal of the agency is to have accessibility at all bus stops. This goal will improve accessibility to pedestrian facilities within the community.





Bicycle and Pedestrian Access to Transit in Columbia

Every transit trip begins with a walking or bicycling trip. Transit users must find one way or another to reach their transit stop and to complete the final leg of their journey to their destination (often referred to as the “last mile”). Transit is a critical link in a truly multi-modal network and through providing safe and convenient pedestrian and bicycling access to transit, Columbia can increase safety, accessibility, and attractiveness of all of these modes.

BICYCLE ACCESSIBILITY

High activity transit routes that are linked with existing bicycle facilities and priority corridors for bicycling improvements present the greatest opportunity for encouraging bike-and-bus multi-modal trips. Through the existing conditions analysis of this planning process, the project team identified the following downtown areas as target areas for creating and improving bicycling access to transit:

- USC campus area
- Assembly Street
- Taylor, between Benedict College and Finlay Park

Other areas for priority improvements of bicycling access to The COMET transit services include:

- East: Leesburg Road at Semmes Road
- South: Shop Road and Bluff Road at S. Beltline Blvd
- North: River Drive, east of the Broad River
- North: Columbia College at N. Main and Fairfield Roads
- Northeast: Farrow Road near Wilson Blvd
- Northwest: Broad River Road at Lake Murray Blvd

Providing bicycle parking and on-bus bicycle storage are critical improvements that must occur for bike-and-bus multi-modal trips to be feasible for the average transit user. Bicycle parking needs and recommendations are discussed in section 4 of this chapter and in the Bicycle Parking Plan of this Master Plan. A summary of bike-on-bus needs is included below:

- Bike racks are available on the front of all The COMET buses and bicycles are also allowed onboard. Each month, The COMET has approximately 200 bikes loaded on the bus bike racks. Route 101, Route 15, and Route 16 have the highest use of bicycle rack usage, as reported in March 2014. The Downtown Transit Station does not have existing facilities for bicycle parking; therefore, passengers will secure bicycles on sign posts or along the fence for safety.
- The Carolina Shuttle (USC) fleet currently does not have mounted bicycle racks on buses. All future procured buses should include bicycle racks on the buses. Many bicycle racks and benches are available to USC faculty and students across the campus. Future facility improvements should continue to coordinate bicycle racks and major USC Shuttle bus stops.

Both The COMET and the Carolina Shuttle should invest in 3-mount bicycle racks on buses to meet current demand and to ensure that bike-and-bus multi-modal trips are a consistent and reliable option for transit users. This is identified as a goal within The COMET’s current planning efforts and would positively impact bicycle access to the entire system.

ADA AND PEDESTRIAN ACCESSIBILITY

A number of factors impact pedestrian - and in particular ADA - accessibility to the transit network. The following statistics provide a snapshot of accessibility needs throughout The COMET system, based on The COMET’s most up-to-date field-collected data:

Boarding & Alighting Areas: A total of 121 stops, or 14 percent of all stops, need a boarding and alighting (b&a) area. B & A is a basic provision for accessing transit. It not only provides a safe area for waiting away from traffic, but is also a federal mandate for ensuring ADA accessibility of transit. According to the U.S. Access Board, the following dimensions define an accessible B & A area (note that compliance with dimensions is required to the extent construction specifications are within a public entity’s control):

810.2.2 Dimensions. Bus boarding and alighting areas shall provide a clear length of 96 inches (2440 mm), measured perpendicular to the curb or vehicle roadway edge, and a clear width of 60 inches (1525 mm), measured parallel to the vehicle roadway. Public entities shall ensure that the construction of bus boarding and alighting areas comply with 810.2.2, to the extent the construction specifications are within their control.

Sidewalk Access: 583 existing transit stops have sidewalk access. This equates to approximately 34 percent of transit stops having no sidewalk access. Transit users walking to a transit stop without a sidewalk are often relegated to a drainage ditch or walking within the roadway travel lane. The safety of disabled transit users is further comprised.

Shelters & Benches: Only 25 of The COMET transit stops, or 2.8 percent, have a shelter. Approximately 10 percent, or 86, of The COMET’s transit stops have benches.

Lighting: A total 385 of The COMET transit stops, or 44 percent, have sufficient lighting (either through street lights of adjacent building lighting). A nearly equivalent number of stops, 43 percent, have no lighting.



EXTERNAL FACTORS FOR CONSIDERATION

Lexington County is the neighbor to the west of Richland County and despite having a substantial population, it has limited transit service. Mainly rural and suburban with no urban core, it has a growing retail corridor along the confluence of two main highways that provides the majority of economic investment, mainly in the way of retail stores and service economy jobs. New industrial parks have opened and attracted major employers such as Amazon.com and Nephron Pharmaceuticals. As Lexington County grows, new opportunities for transportation, especially public transit may become more critical.

Lexington County is a primary growth opportunity for The COMET, as it may have ample demand for a future park-and-ride facility into the metro core of the City and has tremendous opportunity to grow rural transportation services.

Both Richland and Lexington counties have extensive rural areas; The COMET’s ability to deliver low-cost and highly flexible transportation services in these areas will be of critical importance over the next five years. The COMET has already deployed pilot flex zones in one rural area and will implement a new flex/fixed route combination in another area, establishing distinct service models that can be used across the Midlands region.

The City straddles the two counties, with only a very small portion of the City in Lexington County.

As the capital city of South Carolina and home to the University of South Carolina, Columbia’s primary employers are: health care providers, financial and legal services, economic development, government employers, and education and research facilities. Columbia has repositioned itself as a cultural community over the past five years, working to revitalize its downtown and attract new development. A substantial number of residential developments are underway in the downtown core, which will be supported by new USC housing complexes. The new influx of residents will increase downtown employment and retail and spur increased density for the

downtown area. Millennial-age residents are gravitating to downtown due the low cost of living, proximity to campus and growing availability of downtown activities.

The COMET’s goal for the next 3 years focuses on suburban zones, creating circulators in development areas to move people within defined service areas and connecting to high-capacity corridors. Over the next three years, The COMET will identify park and ride services, which provide an opportunity for bicycle and pedestrian trail coordination.

Transit enhancements are a major emphasis for The COMET and for USC Shuttle services, which includes benches, shelters, trash cans, 3-position bicycle racks on buses, schedule racks throughout the community, transit technology (trackers and fare payment), on-board security systems and general information. USC is currently conducting its Phase 1 Transportation Master Plan that will incorporate the multiple modes of transportation on and off campus.

An additional focus for The COMET is existing Downtown Transit Center, which is leased from the City for a nominal rate. The Transit Center is outfitted with a contractor-staffed information/pass sales desk, public restrooms, a climate controlled waiting area with seating, digital announcement & information boards for customers, and real-time trip arrival information. The Transit Center is one of the key challenge areas for The COMET. It is currently a social gathering place for a variety of non-transit activities.

The Transit Center is also a challenge operationally, as it lacks on-street boarding and alighting space. The facility is on a corner property, surrounded by businesses, parking lots and driveways, making it impossible to load more than a few buses at a single time. As the system grows, The COMET is looking for other sites to accommodate the service. Until a permanent large-scale facility is constructed, this will be the primary transit hub for downtown. The COMET has already begun a transit

center location study, partnering with the Central Midland Council of Governments (CMCOG) to conduct an analysis of the downtown core. Step one is identifying the transit service corridors, followed by identifying all attainable property within that area. Second is identifying, from among those properties, all locations that can support a multi-modal center. Third is feasibility analysis: conducting stakeholder meetings and receiving input from neighboring businesses. Finally, a list of prioritized properties, in order of attainability based on support from neighboring businesses and price, will be presented to move forward. The study shall also look at potential park-and-ride locations, as well as satellite transfer points in suburban transit-friendly areas. Each of these sites will consider bicycle and pedestrian access for Columbia residents.





Multimodal Best Practices and Policies

An initial step for developing the transportation network in Columbia for all modes is to have policies in place to support development decisions in the future. Current research also provides best practices used across the country for bicycle and pedestrian access to transit facilities. One such study is the Improvement to Transit access for Cyclists and Pedestrians, Toolkit of Non-Motorized Infrastructure Best Practices, February 2012. The study identifies the following recommendations:

- **Shelter:** Providing a shelter at all transit stops and stations allows commuters protection from sun and from inclement weather. Shelters should be established outside of the pedestrian walking zone and with sufficient room for bus wheelchair lifts to load and unload passengers. If there is not adequate space to install a dedicated shelter, there should be awnings or overhangings on the surrounding buildings for commuters to stand beneath.
- **Seating:** Benches or seats should be provided at all transit stops and stations for commuters to rest while waiting for the bus or train. Elderly and disabled passengers often have difficulty standing for long periods. Seating should be installed within close proximity of transit stops and stations and under the provided shelter if feasible.
- **Wayfinding Signage:** Wayfinding signage at transit stops and stations helps users navigate the area and locate amenities, such as bicycle storage areas and passenger loading zones. Providing passengers with this information improves access to transit by removing barriers of potential users.
- **Bicycle Storage:** Providing bicycle storage at transit stops and stations allows commuters to combine their trips with greater convenience. Short-term bicycle racks are appropriate for bus stops where storage space in the public right-of-way is limited. Long-term storage facilities, such as lockers or enclosed storage rooms, should be provided at train stations in addition to bicycle racks for commuters that require all-day storage. Both

short- and long-term parking facilities should be located near loading zones and, when possible, in view of station attendants. Racks cost approximately \$200 per rack and lockers cost approximately \$2000-\$3000 per locker to install.

The following provide examples of effective policies supporting coordination of transit, bicycle and pedestrian modes.

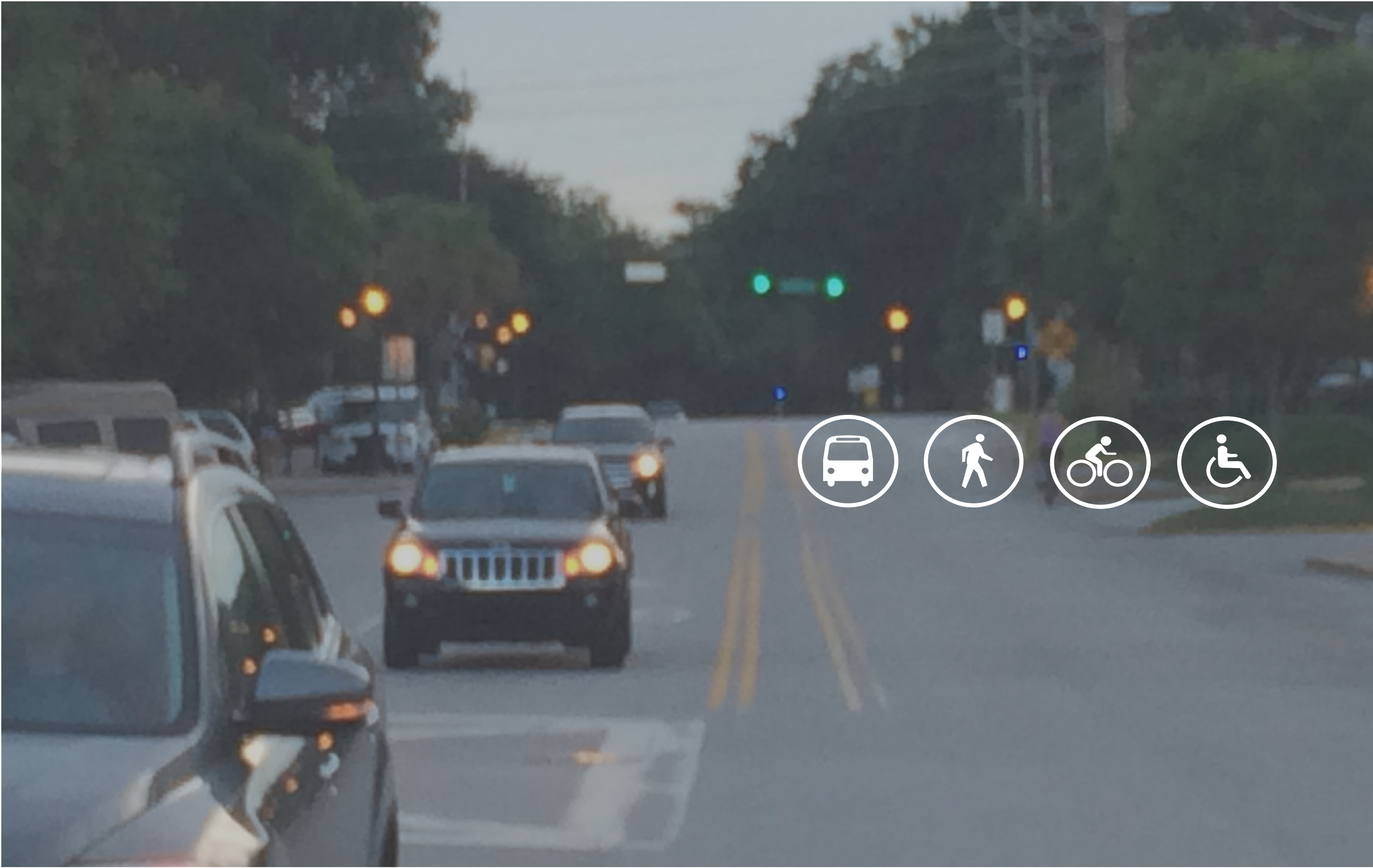
- Promote convenient intermodal connections between all elements of the Columbia transportation network, including a transit system that incorporates easy bike and ped access.
- Promote transportation improvements that support the redevelopment of lower-density, auto-dominated arterials to become more pedestrian and transit compatible urban transportation corridors.
- Promote the development of local street patterns and pedestrian routes that provide access to transit services within convenient walking distance of homes, jobs, schools, stores, and other activity areas.
- Develop a coordinated network of facilities for pedestrians and bicycles which provides effective local mobility, accessibility to transit services and connections to and between centers.
- Support opportunities to redevelop the road system as multimodal public facilities which accommodate the needs of pedestrians, bicycles, transit, automobiles, and trucks.
- Provide opportunities for creation of town centers in urban areas that: (1) serve as focal points for neighborhoods and major activity areas; (2) include a mix of land uses, such as pedestrian-oriented commercial, transit stops, recreation and housing; and (3) encourage transit use, biking and walking through design and land use density.
- Support the transformation of low-density auto-oriented transportation corridors to higher-density mixed-use urban transportation corridors when redevelopment would not

detract from centers or compact communities. Corridors that offer potential include those that are located near significant concentrations of residences or employment, and have the potential to support frequent transit service and increased pedestrian activity. Encourage the redevelopment of these arterials through:

- Addition of transit facilities, pedestrian-oriented retail, offices, housing, and public amenities,
- Building design and placement, street improvements, parking standards, and other measures that encourage pedestrian and transit travel, and
- Provision of pedestrian and bicycle connections between transportation corridors and nearby neighborhoods.

As the Midlands region continues to grow over the next decade, providing a viable transportation network for all modes becomes critical. The data included in this report provide guidance for policy and decision makers to improve transportation for all modes, including bicycle, transit and pedestrian connections.







APPENDIX G: BIKE SPACE ANALYSIS

Introduction

A critical component of the bikeway network analysis was the use of Alta Planning + Design’s ‘BikeSpace’ model. BikeSpace is an analysis tool that excels at quickly identifying corridors with the greatest potential for striping dedicated bicycle facilities. It does not make recommendations for non-delineated 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 challenging. The decision to narrow or eliminate a travel lane, or remove on-street parking will need to be carefully weighed against the benefits of adding bike lanes. The City of Columbia will need identify the impacts of altering the roadway’s existing condition and, as with any roadway retrofit, conduct careful field analyses and detailed 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 street characteristics vary by jurisdiction. For the purposes of the model, acceptable minimum roadway dimensions were based on local practices and set at the following:

- Travel lane width: 11 feet
- Right turn lane width: 10 feet
- Left or Center Turn Lane width: 10 feet
- Parking lane width: 7 feet
- Bike lane minimum width: 5 feet
- Buffered bike lane minimum width: 7 feet
- 1-way cycletrack minimum width: 9 feet
- 2-way cycletrack minimum width: 10 feet
- Threshold ADT for 5 or 4 to 3 lane road diet: 18,000 ADT



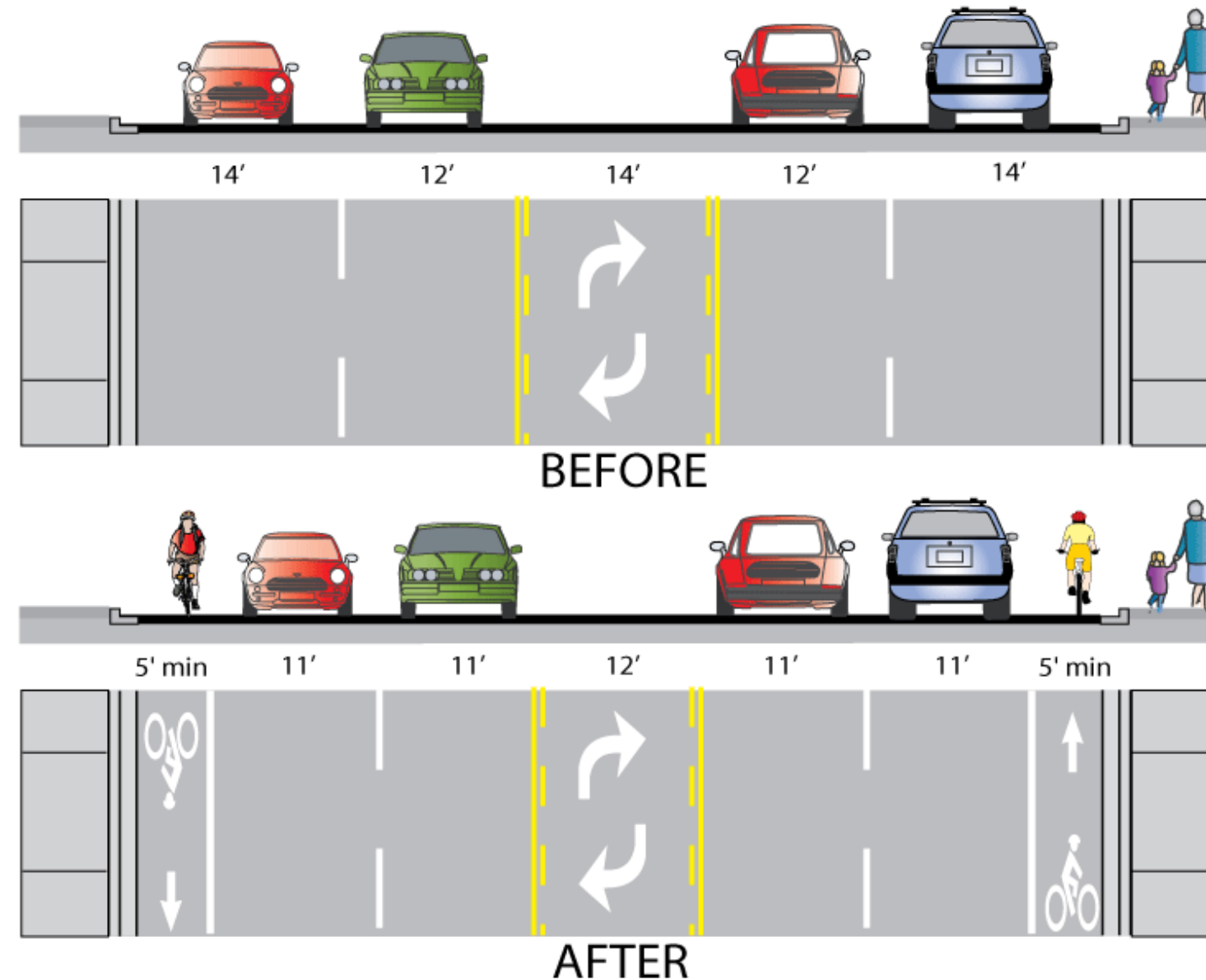
BikeSpace Outcomes

Analysis corridors were those corridors where delineated on-street bicycle facilities (bicycle lanes, buffered bike lanes, and cycle tracks) had been recommended as a part of this planning effort. BikeSpace results were used to help determine the near-term feasibility of proposed improvements and were incorporated into project prioritization.

In many instances the BikeSpace model recommends multiple implementation strategies 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 Within 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.

Reconfigure Travel Lanes and/or Parking Lanes – In this option, bike lanes can be added by simply adjusting wide travel lanes or parking lanes within the established minimums presented above. No reduction to the number of travel lanes or available parking is needed.



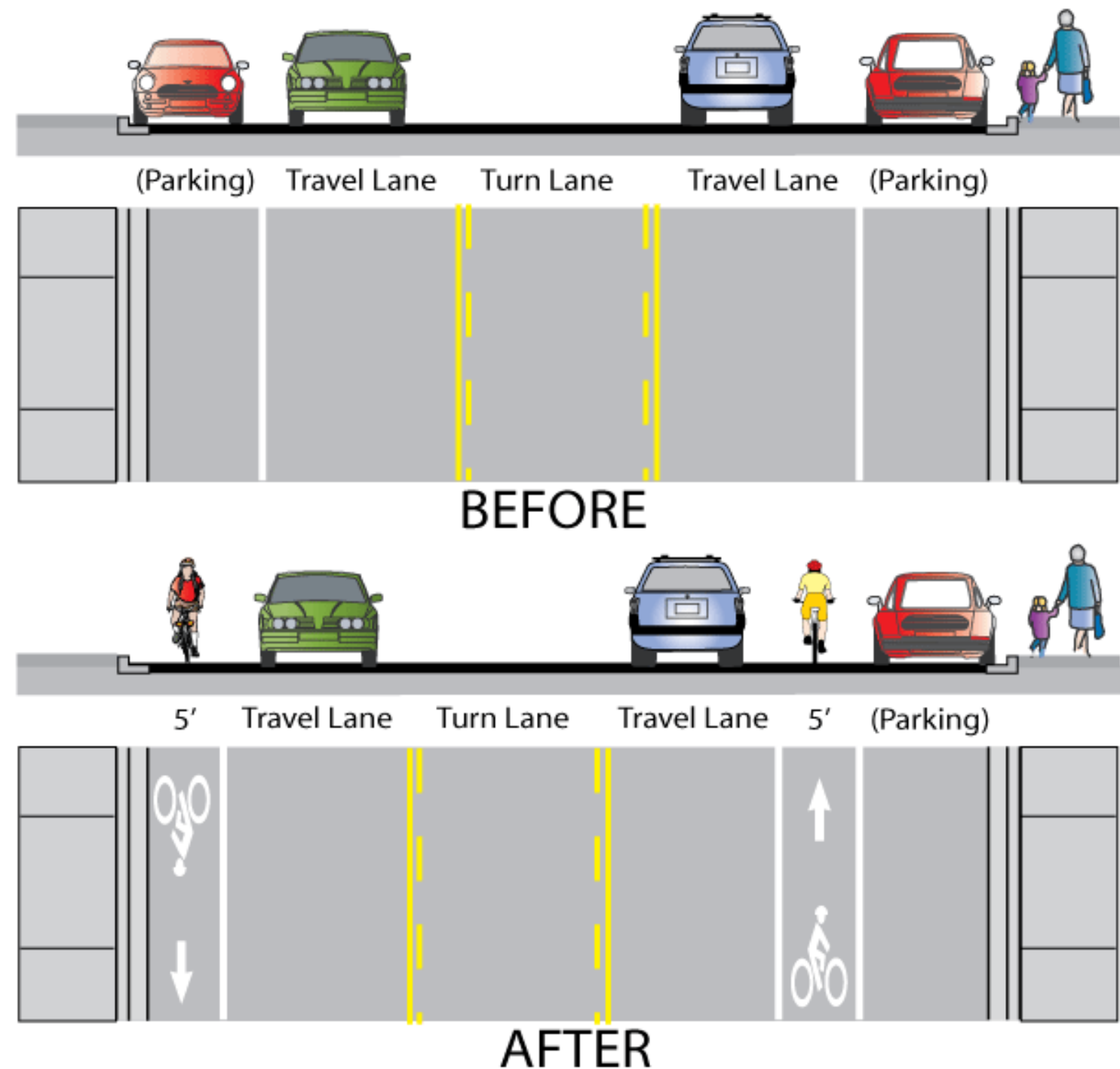


Candidate for '5 to 3' or '4 to 3' Road Diet – In this option, a reconfiguration of the existing travel lanes may be necessary. In areas with two travel lanes in either direction, it may make sense to remove two travel lanes and use the spare roadway width to stripe a center turn lane and two 5' bike lanes. On roads with two travel lanes in each direction and a center turn lane, it may make sense to remove two travel lanes and use the spare roadway width to stripe buffered bike lanes or a cycle-track (either one-way or two-way). This treatment may not be appropriate on roads with high ADT.

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 – 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.





General Outcomes

The project team incorporated the BikeSpace analysis into the recommended bikeway network GIS files provided to the City and utilized this information in prioritizing the recommended bicycle network. This information can also be utilized to help determine an implementation strategy for individual projects, although detailed studies and engineering judgment should always be used in project development. The following table explains how to interpret the BikeSpace data within the recommendations GIS file attribute table. As discussed previously, the table presents all potential implementation strategies. However, these are ranked in terms of ease of implementation from easiest/least expensive to most difficult/most expensive. Therefore it is recommended that the implementation strategy that appears first in the list be the most highly considered.

TABLE 32 - BIKESPACE GIS ATTRIBUTE LEGEND

GIS Attribute Heading	Attribute Name	Potential Values	Notes
Width_BL	Is there sufficient width to add bike lanes?	0 = no, 1 = yes	
Need_BL	Need bike lanes based on volume?	0 = no, 1 = yes	
Restr_Ex_Ln	Restripe existing outside lanes and add bike lanes	0 = no, 1 = yes	Most preferred implementation strategy (least cost/easiest to implement)
Reconfig_Wdth	Reconfigure lane or parking widths and add bike lanes	0 = no, 1 = yes	
Rd_Dt_Can	Candidate for Road Diet	0 = no, 1 = yes	Road diets are generally 4 or 5 lane roads reduced to 3 lanes
No_Lns_Rem	Number of lanes remaining after road diet	value = number of lanes	
Rem_Park	Bike lane implementation would require removal of parking lanes	0 = no, 1 = yes	
Add_Wdth	Bike lanes will not fit within the existing roadway. Add additional roadway width and stripe bike lanes.	0 = no, 1 =yes	Least preferred implementation strategy (most cost/most difficult to implement)

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EVERY TRANSIT-USER IS A PEDESTRIAN AND/OR BICYCLIST

Pedestrian and bicycle access to transit stops is critical to the safety and convenience of transit users in Columbia. Share your thoughts on how to create more transit stops in Columbia that provide safe and comfortable access for pedestrians and bicyclists.



A LACK OF SIDEWALKS, ADA-ACCESSIBLE FEATURES, OR OTHER KEY ELEMENTS OF A CONVENIENT, AND OVERALL



TRANSIT STOPS/ROUTES IN NEED OF BETTER AND BICYCLE ACCESS?

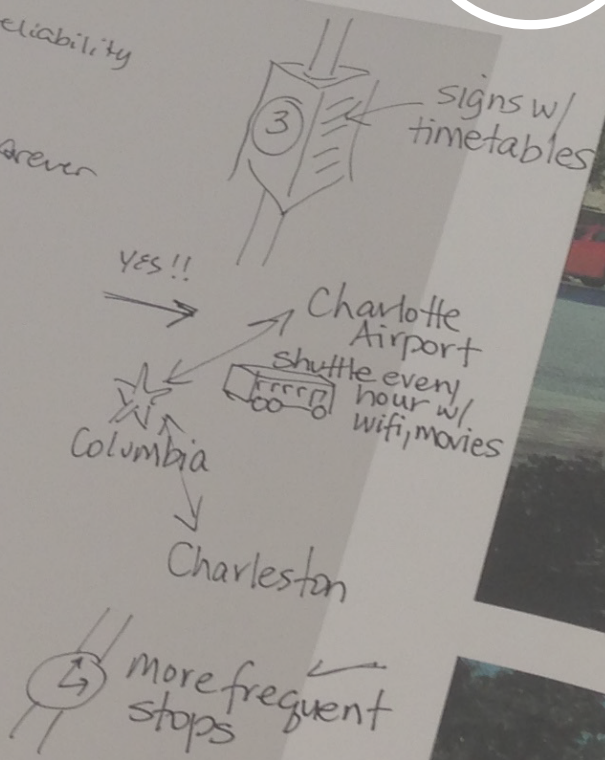
WHAT WOULD MAKE TRANSIT IN COLUMBIA MORE CONVENIENT AND PRACTICAL FOR YOU?



BICYCLE RACKS ON BUSES, W/ FEATURES ARE CRITICAL TO BE PRACTICAL, AND INVITING C

...of downtown residential?
...to connect our urban core. These
...lines. Our urban core streets should
...red/bike/intersections
...unsafe. Can't create
...t. Fix it, please!

Cheaper non-stop buses to Charlotte & Charleston
Better communication of bus/shuttle times & ensure reliability
Bus shelters
More frequent stops.
Buses that come more frequently so you don't wait forever for the next bus.
Shade - @Stops and sidewalks to stops
Many stops don't feel safe -- sketchy areas
Smart streets - sidewalks + protected bike lanes
neighborhood connections to Greenway + major East West North South bike routes
Timeliness! #8 is always late
Enforcing existing laws w/regard to sharing the road.
FREQUENT SCHEDULES FOR THE MALLS!
Routes/Stop West of Assembly St.
More frequent than hourly.





APPENDIX H: POTENTIAL IMPLEMENTATION FUNDING SOURCES

Introduction

This report outlines sources of funding for pedestrian and bicycle projects in Columbia, SC. When considering possible funding sources for the Columbia pedestrian and bicycle network, it is important to consider that not all construction activities will be accomplished with a single funding source. Pedestrian and bicycle funding is administered at all levels of government, federal, state, local and through private sources. The following sections identify potential matching and major funding sources, and the criteria for pedestrian and bicycle projects and programs.

The Implementation Chapter of this Plan provides further guidance regarding the recommended structure for Columbia County's community-driven efforts to generate volunteer investment and secure local private and public sector funds for implementation.

Federal Funding Sources

Federal funding is typically directed through state agencies to local governments either in the form of grants or direct appropriations, independent from state budgets. Federal funding typically requires a local match of 20%, although there are sometimes exceptions, such as the recent American Recovery and Reinvestment Act stimulus funds, which did not require a match.

The following is a list of possible Federal funding sources that could be used to support construction of many pedestrian and bicycle improvements. Most of these are competitive, and involve the completion of extensive applications with clear documentation of the project need, costs, and benefits. It should be noted that the FHWA encourages the construction of pedestrian and bicycle facilities as an incidental element of larger ongoing projects. Examples include providing paved shoulders on new and reconstructed roads, or building sidewalks, on-street bikeways, trails and marked crosswalks as part of new highways.

The FHWA has recently put together a table that outlines pedestrian and bicycle funding opportunities by improvement type within the US Department of Transportation, Federal Transit Administration and Federal Highway Funding that is helpful as a reference supplement to this chapter: http://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm

MOVING AHEAD FOR PROGRESS IN THE TWENTY-FIRST CENTURY (MAP-21)

The largest source of federal funding for bicyclists and pedestrians is the US DOT's Federal-Aid Highway Program, which Congress has reauthorized roughly every six years since the passage of the Federal-Aid Road Act of 1916. The latest act, Moving Ahead for Progress in the Twenty-First Century (MAP-21) was enacted in July 2012 as Public Law 112-141. The Act replaces the Safe, Accountable, Flexible, Efficient

Transportation Equity Act – a Legacy for Users (SAFETEA-LU), which was valid from August 2005 - June 2012.

MAP-21 authorizes funding for federal surface transportation programs including highways and transit for the 27 month period between July 2012 and September 2014. It is not possible to guarantee the continued availability of any listed MAP-21 programs, or to predict their future funding levels or policy guidance. Nevertheless, many of these programs have been included in some form since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, and thus may continue to provide capital for active transportation projects and programs.

In South Carolina, federal monies are administered through the South Carolina Department of Transportation (SCDOT) and Metropolitan Planning Organizations (MPOs). Most, but not all, of these programs are oriented toward transportation versus recreation, with an emphasis on reducing auto trips and providing inter-modal connections. Federal funding is intended for capital improvements and safety and education programs, and projects must relate to the surface transportation system.

There are a number of programs identified within MAP-21 that are applicable to pedestrian and bicycle projects. These programs are discussed below.

More information: <http://www.fhwa.dot.gov/map21/summaryinfo.cfm>



TRANSPORTATION ALTERNATIVES

Transportation Alternatives (TA) is a new funding source under MAP-21 that consolidates three formerly separate programs under SAFETEA-LU: Transportation Enhancements (TE), Safe Routes to School (SR2S), and the Recreational Trails Program (RTP). These funds may be used for a variety of pedestrian, bicycle, and streetscape projects including sidewalks, bikeways, multi-use paths, and rail-trails. TA funds may also be used for selected education and encouragement programming such as Safe Routes to School, despite the fact that TA does not provide a guaranteed set-aside for this activity as SAFETEA-LU did. South Carolina’s Governor did not opt–out of the Recreational Trails Program funds, ensuring that dedicated funds for recreational trails continue to be provided as a subset of TA. MAP-21 provides \$85 million nationally for the RTP.

Complete eligibilities for TA include:

1. Transportation Alternatives as defined by Section 1103 (a) (29). This category includes the construction, planning, and design of a range of pedestrian and bicycle infrastructure including “on–road and off–road trail facilities for pedestrians, bicyclists, and other active forms of transportation, including sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety–related infrastructure, and transportation projects to achieve compliance with the Americans with Disabilities Act of 1990.” Infrastructure projects and systems that provide “Safe Routes for Non-Drivers” is a new eligible activity.

For the complete list of eligible activities, visit: http://www.fhwa.dot.gov/environment/transportation_enhancements/legislation/map21.cfm

2. Recreational Trails. TA funds may be used to develop and maintain recreational trails and trail-related facilities for both active and motorized recreational trail uses. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use,

and other active and motorized uses. These funds are available for both paved and unpaved trails, but may not be used to improve roads for general passenger vehicle use or to provide shoulders or sidewalks along roads.

Recreational Trails Program funds 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 or easements of 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)

Under MAP-21, dedicated funding for the RTP continues at FY 2009 levels – roughly \$85 million annually. South Carolina will receive \$1,211,220 in RTP funds per year through FY2014. Grant applications are typically due in April of 2013. More info on administration of the Recreational Trails Program in South Carolina can be found through the following site: <http://www.scprt.com/our-partners/grants/trails.aspx>

3. Safe Routes to School. The purpose of the Safe Routes to Schools eligibility is to promote safe, healthy alternatives to riding the bus or being driven to school. All projects must be within two miles of primary or middle schools (K-8).

Eligible projects may include:

- **Engineering improvements.** These physical improvements are designed to reduce potential pedestrian and bicycle 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 projects include sidewalk improvements, traffic calming/speed reduction, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street pedestrian and bicycle 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.

In South Carolina, SRTS projects utilizing the remaining SAFETEA-LU funding require no matching funds by the local implementing agency. However, all SRTS projects moving forward that utilize MAP-21 TA funding require a 20% monetary match.

4. Planning, designing, or constructing roadways within the right-of-way of former Interstate routes or divided highways.

At the time of writing, detailed guidance from the Federal Highway Administration on this new eligible activity was not available.



Average annual funds available through TA over the life of MAP-21 equal \$814 million nationally, which is based on a 2% set-aside of total MAP-21 authorizations. TA apportionments for 2013 and 2014 were slightly around 2.8 million for urbanized areas with populations more than 200,000 people. It is likely that 2015 funding will be substantially less due to a smaller overall apportionment of MAP-21 funding (<http://www.fhwa.dot.gov/MAP21/funding.cfm>). State DOTs may elect to transfer up to 50% of TA funds to other highway programs, so the amount listed above represents the maximum potential funding.

TA funds are typically allocated through the planning districts. Columbia's funding would come through the MPO. TA funds require a 20 percent local match and must be administered by either SCDOT or a qualified Local Public Agency (LPA).

SURFACE TRANSPORTATION PROGRAM (GUIDESHARE)

The Surface Transportation Program (STP) provides states with flexible funds which may be used for a variety of highway, road, bridge, and transit projects. A wide variety of pedestrian and bicycle improvements are eligible, including on-street bicycle facilities, off-street trails, sidewalks, crosswalks, pedestrian and bicycle signals, parking, and other ancillary facilities. Modification of sidewalks to comply with the requirements of the Americans with Disabilities Act (ADA) is also an eligible activity. Unlike most highway projects, STP-funded pedestrian and bicycle facilities may be located on local and collector roads which are not part of the Federal-aid Highway System. Fifty percent of each state's STP funds are suballocated geographically by population. These funds are funneled through SCDOT to the MPOs in the state. The remaining 50% may be spent in any area of the state. In South Carolina, STP is known as Guides share.

In 2014 the total amount of estimated Guides share funding for COATS is \$10,483,916. Total STP funding in 2015 is projected to be 35% less than 2014 levels statewide, so COATS's allocation will likely drop as well. It should also be noted that these numbers are far behind projected Guides share funding estimates in the 2009 COATS Long Range Transportation Plan (which estimates \$13,860,000 in 2014 and \$15,523,200 in 2015).

SOUTH CAROLINA C FUNDS

South Carolina has a long-established program that provides funding to counties to administer projects on state and local roads. Funding for this program comes from a portion of State fuel tax revenues. Up to 75% of these funds may be used for projects on local-jurisdiction roadways, with the remainder being utilized on State-jurisdiction roadways. Bikeway and sidewalk improvements as a part of repaving or reconstruction are eligible project types. In FY 2014-2015, Richland County received \$3,355,300 for C-fund projects.

More information on the C-fund program can be found here:
<http://www.scdot.org/doing/cprogram.aspx>

HIGHWAY SAFETY IMPROVEMENT PROGRAM

MAP-21 doubles the amount of funding available through the Highway Safety Improvement Program (HSIP) relative to SAFETEA-LU. HSIP provides \$2.4 billion nationally for projects and programs that help communities achieve significant reductions in traffic fatalities and serious injuries on all public roads, bikeways, and walkways. Infrastructure and non-infrastructure projects are eligible for HSIP funds. Pedestrian and bicycle safety improvements, enforcement activities, traffic calming projects, and crossing treatments for active transportation users in school zones are examples of eligible projects. All HSIP projects must be consistent with the state's Strategic Highway Safety Plan.

Pedestrian and Bicycle strategies identified in the 2014 Draft SHSP include engineering bike lanes, sidewalks and shared-use paths, especially where supported by crash data, educational programs and targeted enforcement.

Last updated in 2007, the SCDOT SHSP is located here: http://www.scdot.org/inside/pdfs/Multimodal/Road_Map.pdf

CONGESTION MITIGATION/AIR QUALITY PROGRAM

The Congestion Mitigation/Air Quality Improvement Program (CMAQ) provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter which reduce transportation related emissions. States with no nonattainment areas such as South Carolina may use their CMAQ funds for any CMAQ or STP eligible project. These federal dollars can be used to build pedestrian and bicycle facilities that reduce travel by automobile. Purely recreational facilities generally are not eligible.



PARTNERSHIP FOR SUSTAINABLE COMMUNITIES

The Partnership for Sustainable Communities is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The partnership aims to “improve access to affordable housing, more transportation options, and lower transportation costs while protecting the environment in communities nationwide.” It is based on five Livability Principles, one of which explicitly addresses the need for pedestrian and bicycle infrastructure (“Provide more transportation choices: Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation’s dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health”).

It is not a formal agency with a regular annual grant program. Nevertheless, it is an important effort that has already led to some new grant opportunities (including the TIGER grants). Columbia should track Partnership communications and be prepared to respond proactively to announcements of new grant programs.

More information: <http://www.epa.gov/smartgrowth/partnership/>

RIVERS, TRAILS, AND CONSERVATION ASSISTANCE PROGRAM

The Rivers, Trails, and Conservation Assistance Program (RTCA) is a National Parks Service (NPS) program providing technical assistance via direct NPS staff involvement to establish and restore greenways, rivers, trails, watersheds and open space. The program only provides planning assistance. Projects are prioritized for assistance based on criteria including 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. This program may benefit trail development in Columbia and the region indirectly through technical assistance, particularly for community organizations, but is not be considered a future capital funding source.

More information: <http://www.nps.gov/orgs/rtca/apply.htm>

COMMUNITY DEVELOPMENT BLOCK GRANTS

The Community Development Block Grants (CDBG) program provides money for streetscape revitalization. Federal CDBG grantees may “use Community Development Block Grants funds for activities that include (but are not limited to): acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, community and senior citizen centers and recreational facilities; paying for planning and administrative expenses, such as costs related to developing a consolidated plan and managing Community Development Block Grants funds; provide public services for youths, seniors, or the disabled; and initiatives such as neighborhood watch programs.”

Trails and greenway projects that enhance accessibility are the best fit for this funding source. CDBG funds could also be used to write an ADA Transition Plans. Columbia currently regularly receives CDBG funds annually for local disbursement – 2014 award amounts totaled \$950,277.

More information: www.hud.gov/cdbg

COMMUNITY TRANSFORMATION GRANTS

Community Transformation Grants administered through the Center for Disease Control support community–level efforts to reduce chronic diseases such as heart disease, cancer, stroke, and diabetes. Active transportation infrastructure and programs that promote healthy lifestyles are a good fit for this program, particularly if the benefits of such improvements accrue to population groups experiencing the greatest burden of chronic disease.

In past years, SCDHEC has received over \$4.5 M annually in grant money from this program and has used it to fund internal position and has administered it to various programs across the state such as Eat Smart Move More!

More info: <http://www.cdc.gov/communitytransformation/>

LAND AND WATER CONSERVATION FUND (LWCF)

The Land and Water Conservation Fund (LWCF) provides grants for planning and acquiring outdoor recreation areas and facilities, including trails. Funds can be used for right–of–way acquisition and construction. The program is administered by the South Carolina Department of Parks, Recreation & Tourism as a grant program. Any Trails and Greenways Plan projects located in future parks could benefit from planning and land acquisition funding through the LWCF. Trail corridor acquisition can be funded with LWCF grants as well. This program requires a 50-50 match – applications are due in the spring.

More information: <http://www.scprt.com/our-partners/grants/lwcf.aspx>

FEDERAL LANDS ACCESS PROGRAM (FLAP)

FLAP is a grant program initiated by the MAP-21 transportation bill that provides funding specifically for access on or to federal lands – this includes bicycle and pedestrian improvements. In Columbia, this could be specifically for projects that connect to Congaree Swamp National Monument Wilderness.

Unless reauthorized, the funding for this program will expire with MAP-21, for more information on this program, refer to the following website: <http://www.efl.fhwa.dot.gov/programs/federal-lands-access.aspx>

EPA GREEN INFRASTRUCTURE GRANT SOURCES

The City of Columbia had a Consent Decree Order and resulting settlement with the EPA in 2013 as a result of sanitary sewer overflow and effluent limit exceedances (<http://www2.epa.gov/enforcement/columbia-south-carolina-clean-water-act-settlement>). As a result of the Order and Settlement, Columbia must assess and rehabilitate its server system within 12 years at a total estimated cost of \$750 million. This projected work presents opportunities for the City to address



some of its pedestrian and bicycle-infrastructure deficiencies in conjunction with both “green” roadway projects and sanitary sewer system improvements.

The EPA offers a number of grant resources that serve to improve clean water in communities such as the EPA Clean Water State Revolving Fund, EPA Clean Water Act Nonpoint Source Grant and EPA Community Action for a Renewed Environment (CARE) Grants. More information on these, and other funding sources can be found through the EPA’s website:

http://water.epa.gov/infrastructure/greeninfrastructure/gi_funding.cfm

NEW FREEDOM INITIATIVE

MAP-21 continues this initiative under Section 5310 – Enhanced Mobility of Seniors and Individuals with Disabilities. Section 5310 provides capital and operating costs to provide transportation services and facility improvements that exceed those required by the Americans with Disabilities Act. Examples of pedestrian/accessibility projects funded in other communities through the New Freedom Initiative include installing Accessible Pedestrian Signals (APS), enhancing transit stops to improve accessibility, and establishing a mobility coordinator position. In 2013 and 2014, over \$250 M dollars were available nationwide through this grant program, 60% of this available to urbanized areas with populations over 200,000. Funds granted through this program require a 20% local match.

More information: <http://www.hhs.gov/newfreedom/>

PILOT TRANSIT-ORIENTED DEVELOPMENT PLANNING

MAP-21 establishes a new pilot program to promote planning for Transit-Oriented Development (TOD). This program provides \$10 M a year nationally for TOD planning and awards grants on a competitive basis. Planning programs can include efforts that facilitate “multimodal connectivity and accessibility” and “increase access to transit hubs for pedestrian and bicycle traffic.”

OTHER FEDERAL TRANSIT ADMINISTRATION FUNDING SOURCES FOR PEDESTRIAN INFRASTRUCTURE, BICYCLING INFRASTRUCTURE AND BIKE SHARE.

Most FTA funding can be used to fund pedestrian and bicycle projects “that enhance or are related to public transportation facilities.”

According to the FTA, an FTA grantee may use any of the following programs under Title 49, Chapter 53, of the United States Code to fund capital projects for pedestrian and bicycle access to a public transportation facility:

- Section 5307 Urbanized Area Formula Program;
- Section 5309 New Starts and Small Starts Major Capital Investment Programs;
- Section 5309 Fixed Guideway Modernization Program;
- Section 5309 Bus and Bus Facilities Discretionary Program;
- Section 5310 Elderly Individuals and Individuals with Disabilities Formula Program;
- Section 5311 Non-Urbanized Area Formula Program;
- Section 5311 Public Transportation on Indian Reservations;
- Section 5316 Job Access & Reverse Commute Formula Program;
- Section 5317 New Freedom Program; and,
- Section 5320 Paul S. Sarbanes Alternative Transportation in Parks and Public Lands.

ADDITIONAL FEDERAL FUNDING

The landscape of federal funding opportunities for pedestrian and bicycle programs and projects is always changing. A number of Federal agencies, including the Bureau of Land Management, the Department of Health and Human Services, the Department of Energy, and the Environmental Protection Agency have offered grant programs amenable to pedestrian and bicycle planning and implementation, and may do so again in the future.

For up-to-date information about grant programs through all federal agencies, see: <http://www.grants.gov/>

CENTER FOR DISEASE CONTROL GRANT OPPORTUNITIES

The CDC provides funding opportunities for several different organization and jurisdiction types that can potentially support pedestrian and bicycle infrastructure, planning or other support programs. An overview of these different programs and funding cycles can be found here: (<http://www.cdc.gov/chronicdisease/features/funding-opportunity-announcements.htm>, <http://www.cdc.gov/chronicdisease/about/2014-foa-awards.htm#stateLocal>).

As an example of a project type, the YMCA of Greater Cleveland was awarded close to \$1M in funding in 2014 to administer funding of a citywide protected bikeway plan and transportation-related Health Impact Assessments, among other projects.



State Funding Sources

The following is a list of possible State funding sources that could be used to support construction of many pedestrian and bicycle improvements in Columbia County.

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. SCTIB funded development of the Palmetto Parkway in Aiken County, which included development of a roughly five mile multi-use trail within the parkway’s right of way.

More information: <http://sctib.sc.gov/Pages/default.aspx>

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION – CAPITAL PROJECTS

Columbia County should work closely with SCDOT to include pedestrian and bicycle improvements as part of major projects. The two groups should cooperate on a regular basis to identify opportunities for implementation of the Columbia Pedestrian and Bicycle master Plan.

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION – MAINTENANCE PROGRAM

The South Carolina Department of Transportation carries out a number of road resurfacing maintenance projects annually. There may be opportunities for road restriping to be completed as part of regular roadway maintenance. This will require coordination between the City of Columbia, the SCDOT District Traffic Engineer and the local maintenance office to ensure that the pavement marking design is appropriate and safe for cyclists and drivers.

SOUTH CAROLINA PARKS AND RECREATION DEVELOPMENT FUND (PARD)

The PARD grant program is a state funded non–competitive reimbursable grant program for eligible local governments or special purposes district entities within each county which provide recreational opportunities. The fund requires a 20% cash or in-kind match. The following bullets highlight characteristics of the grant program.

- Monthly grant cycle
- Non–competitive program available to eligible local governmental entities within each county area for development of new public recreation facilities or enhancement/renovations to existing facilities.
- Projects need endorsement of majority weighted vote factor of County Legislative Delegation Members.
- This is an 80-20 match program
- Application Deadline is the 10th of each month

PARD funding is allocated on a county-by-county basis and comes from a portion of the State’s bingo revenues. In 2013, insufficient revenue was generated to fund the PARD program. Richland County has failed to generate sufficient bingo revenue to fund the program in the past several years, but this could change in the future.

More information: <http://www.scprt.com/our-partners/grants/pard.aspx>.

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. 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 specific State plans.

More information: <http://www.scdot.org/inside/stip.aspx>



Local Government Funding Sources

Local funding sources that would support bike facility project construction will most likely be limited but should be explored to support Columbia County active transportation projects.

METROPOLITAN PLANNING ORGANIZATION

Metropolitan Planning Organizations (MPOs) are federally required regional transportation planning organizations. MPOs are responsible for planning and prioritizing all federally funded transportation improvements within an urbanized area.

The Columbia Area Transportation Study (COATS) is the Metropolitan Planning Organization (MPO) for the City and surrounding urban areas (<http://www.centralmidlands.org>). MPOs are a partnership between local and state government that makes decisions about transportation planning in urbanized areas and meets planning requirements established by federally authorizing legislation for transportation funding. COATS works cooperatively with SCDOT to develop transportation plans, travel models, transit plans, and pedestrian and bicycle plans. COATS works with the state on funding issues for transportation improvements, project planning issues, and other issues such as environmental and air quality concerns. COATS also works with local governments to coordinate land use and transportation planning.

MPOs maintain a long-range transportation plan (LRTP) and develop a transportation improvement program (TIP) to develop a fiscally constrained program based on the long-range transportation plan and designed to serve the region's goals while using spending, regulating, operating, management, and financial tools. This Plan recommends that the City and its partners continue to work closely with COATS to ensure pedestrian, bikeways and transit improvement projects recommended in this Plan are listed in the TIP.

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 incorporate recommendations for bicycle or pedestrian improvements in order to reduce additional costs. More information on the City of Columbia budget and General Fund can be found here:

<http://www.columbiasc.net/budget-office/current-prior-budgets>

LOCAL BOND MEASURES

Local bond measures, or levies, are usually general obligation bonds for specific projects. Bond measures are typically limited by time based on the debt load of the local government or the project under focus. Funding from bond measures can be used for engineering, design and construction of trails, greenways, and pedestrian and bicycle facilities. A bond issued in Denver, Colorado funded \$5 million for trail development and also funded the City's bike planner for several years. In 2012, voters in Austin, Texas approved a \$143 million bond measure to fund a variety of mobility and active transportation projects. A project paid for with a bond measure will need to be repaid through a designated revenue stream such as parking revenues or other user feeds.

STORMWATER UTILITY FEES

Stormwater charges are typically based on an estimate of the amount of impervious surface on a user's property. Impervious surfaces (such as rooftops and paved areas) increase both the amount and rate of stormwater runoff compared to natural conditions. Such surfaces cause runoff that directly or indirectly discharges into public storm drainage facilities and creates a need for stormwater management services. Thus, users with more impervious surface are charged more for stormwater service than users with less impervious surface.

The rates, fees, and charges collected for stormwater management services may not exceed the costs incurred to provide these services. The costs that may be recovered through the stormwater rates, fees, and charges includes any costs necessary to assure that all aspects of stormwater quality and quantity are managed in accordance with federal and state laws, regulations, and rules. Open space may be purchased with stormwater fees, if the property in question is used to mitigate floodwater or filter pollutants.

SYSTEM DEVELOPMENT CHARGES/ DEVELOPER IMPACT FEES

System Development Charges (SDCs), also known as Developer Impact Fees, represent another potential local funding source. SDCs are 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- or off-site pedestrian improvements that will encourage residents to walk (or use transit, if available) rather than drive. In-lieu parking fees may be used to help construct new or improved pedestrian facilities. Establishing a clear nexus or connection between the impact fee and the project's impacts is critical in avoiding a potential lawsuit.

STREET USER FEES

Many cities administer street user fees through residents' monthly water or other utility bills. The revenue generated by the fee can be used for operations and maintenance of the street system, and priorities would be established by the Public Works Department. Revenue from this fund can be used to maintain on-street pedestrian and bicycle facilities, including routine sweeping of bicycle lanes and other designated bicycle routes.

IN LIEU OF FEES

Developers often dedicate open space or greenways in exchange for waiving fees associated with park and open space allocation requirements in respect to proposed development. These types of requirements are presented within local municipal codes and ordinances.



UTILITY LEASE REVENUE

A method to generate revenues from land leased to utilities for locating utility infrastructure on municipally owned parcels. This can improve capital budgets and support financial interest in property that would not otherwise create revenue for the government.

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. Based on South Carolina’s Municipal Improvements Act of 1999, LIDs can include a Municipal Improvement District (MID), a County Public Works Improvement District (CPWID) or a Residential Improvement District (RID).

Several cities have successfully used LID funds to make improvements on residential streets and for large scale arterial projects. LIDs formed to finance commercial street development can be “full cost,” in which the property assessments are entirely borne by the property owners.

BUSINESS IMPROVEMENT AREA OR DISTRICT (BIA OR BID)

Trail development and 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, including as wider sidewalks, landscaping and ADA compliance.

SALES TAX

Local governments that choose to exercise a local option sales tax use the tax revenues to provide funding for a wide variety of projects and activities. Columbia has included pedestrian and bicycle projects as part of the county-wide one-cent sales tax addendum. In 2012, Richland County voters passed a 1% sales addendum to fund \$1.07 billion in transportation improvements county-wide over the following 22 years. \$81 M of this revenue will go towards sidewalks, bike lanes and greenways. This should prove to be a huge boon to walking and bicycling in the region in the coming years.

More Information: <http://www.richlandonline.com/Government/TransportationPenny.aspx>

PROPERTY TAX

Property taxes generally support a significant portion of a local government’s activities. However, the revenues from property taxes can also be used to pay debt service on general obligation bonds issued to finance open space system acquisitions. Because of limits imposed on tax rates, use of property taxes to fund open space could limit the county’s or a municipality’s ability to raise funds for other activities. Property taxes can provide a steady stream of financing while broadly distributing the tax burden. In other parts of the country, this mechanism has been popular with voters as long as the increase is restricted to parks and open space. It should be noted that other public agencies compete vigorously for these funds, and taxpayers are generally concerned about high property tax rates.

EXCISE TAXES

Excise taxes are taxes on specific goods and services. These taxes require special legislation and the use of the funds generated through the tax are limited to specific uses. Examples include lodging, food, and beverage taxes that generate funds for promotion of tourism, and the gas tax that generates revenues for transportation-related activities.

TAX INCREMENT FINANCING (TIF)

Tax Increment Financing 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 trail) is constructed, surrounding property values generally increase and encourage surrounding development or redevelopment. The increased tax revenues are then dedicated to support the debt created by the original public improvement project. More information on the legal requirements for TIF for Redevelopment Projects can be found here:

<http://www.scstatehouse.gov/code/t31c006.php>



Private Sector Funding Sources

Many communities have solicited greenway funding assistance from private foundations and other conservation-minded benefactors. Below are several examples of private funding opportunities available.

BIKES BELONG GRANT PROGRAM

The Bikes Belong Coalition of bicycle suppliers and retailers has awarded \$1.2 million and leveraged an additional \$470 million since its inception in 1999. The program funds corridor improvements, mountain bike trails, BMX parks, trails, and park access. It is funded by the Bikes Belong Employee Pro Purchase Program.

More information: <http://www.bikesbelong.org/grants/>

THE ROBERT WOOD JOHNSON FOUNDATION

The Robert Wood Johnson Foundation was established as a national philanthropy in 1972 and today it is the largest U.S. foundation devoted to improving the health and health care of all Americans. Grant making is concentrated in four areas:

- To assure that all Americans have access to basic health care at a reasonable cost
- To improve care and support for people with chronic health conditions
- To promote healthy communities and lifestyles
- To reduce the personal, social and economic harm caused by substance abuse: tobacco, alcohol, and illicit drugs

More information: <http://www.rwjf.org/applications/>

BANK OF AMERICA CHARITABLE FOUNDATION, INC.

The Bank of America Charitable Foundation is one of the largest in the nation. The primary grants program is called Neighborhood Excellence, which seeks to identify critical issues in local communities. Another program that applies to greenways is the Community Development Programs, and specifically the Program Related Investments. This program targets low and moderate income communities and serves to encourage entrepreneurial business development.

More information: <http://www.bankofamerica.com/foundation>

THE WALMART FOUNDATION

The Walmart Foundation offers a Local, State, and National Giving Program. The Local Giving Program awards grants of \$250 to \$5,000 through local Walmart and Sam's Club Stores. Application opportunities are announced annually in February with a final deadline for applications in December. The State Giving Program provides grants of \$25,000 to \$250,000 to 501c3 nonprofits working within one of five focus areas: Hunger Relief & Nutrition, Education, Environmental Sustainability, Women's Economic Empowerment, or Workforce Development. The program has two application cycles per year: January through March and June through August. The Walmart Foundation's National Giving Program awards grants of \$250,000 and more, but does not accept unsolicited applications.

More information: <http://foundation.walmart.com/apply-for-grants>

DUKE ENERGY FOUNDATION

Funded by Duke Energy shareholders, this non-profit organization makes charitable grants to selected non-profits or governmental subdivisions. Each annual grant must have:

- An internal Duke Energy business "sponsor"
- A clear business reason for making the contribution

The grant program has three focus areas: Environment and Energy Efficiency, Economic Development, and Community Vitality. Related to this project, the Foundation would support programs that support conservation, training and research around environmental and energy efficiency initiatives.

More information: <http://www.duke-energy.com/community/foundation.asp>

THE KODAK AMERICAN GREENWAYS PROGRAM

The Conservation Fund's American Greenways Program has teamed with the Eastman Kodak Corporation and the National Geographic Society to award small grants (\$250 to \$2,000) to stimulate the planning, design and development of greenways. These grants can be used for activities such as mapping, conducting ecological assessments, surveying land, holding conferences, developing brochures, producing interpretive displays, incorporating land trusts, and building trails. Grants cannot be used for academic research, institutional support, lobbying or political activities.

More information: <http://www.conservationfund.org>



NATIONAL TRAILS FUND

American Hiking Society created the National Trails Fund in 1998, the only privately supported national grants program providing funding to grassroots organizations working toward establishing, protecting and maintaining foot trails in America. 73 million people enjoy foot trails annually, yet many of our favorite trails need major repairs due to a \$200 million backlog of badly needed maintenance. National Trails Fund grants help give local organizations the resources they need to secure access, volunteers, tools and materials to protect America’s cherished public trails. To date, American Hiking has granted more than \$240,000 to 56 different trail projects across the U.S. for land acquisition, constituency building campaigns, and traditional trail work projects. Awards range from \$500 to \$10,000 per project.

Projects the American Hiking Society will consider include:

- Securing trail lands, including acquisition of trails and trail corridors, and the costs associated with acquiring conservation easements.
- Building and maintaining trails which will result in visible and substantial ease of access, improved hiker safety, and/or avoidance of environmental damage.
- Constituency building surrounding specific trail projects - including volunteer recruitment and support.

More information: <http://www.americanhiking.org/alliance/fund.html>

THE CONSERVATION ALLIANCE

The Conservation Alliance is a non-profit organization of outdoor businesses whose collective annual membership dues support grassroots citizen-action groups and their efforts to protect wild and natural areas. One hundred percent of its member companies’ dues go directly to diverse, local community groups across the nation—groups like Southern Utah Wilderness Alliance, Alliance for the Wild Rockies, The Greater Yellowstone Coalition, the South Yuba River Citizens’ League, RESTORE: The North Woods and the Sinkyone Wilderness Council (a Native American-owned/operated wilderness park). For these groups, who seek to protect the last great wild lands and waterways from resource extraction and commercial development, the Alliance’s grants are substantial in size (about \$35,000 each), and have often made the difference between success and defeat. Since its inception in 1989, The Conservation Alliance has contributed \$4,775,059 to grassroots environmental groups across the nation, and its member companies are proud of the results: To date the groups funded have saved over 34 million acres of wild lands and 14 dams have been either prevented or removed-all through grassroots community efforts.

The Conservation Alliance is a unique funding source for grassroots environmental groups. It is the only environmental grant maker whose funds come from a potent yet largely untapped constituency for protection of ecosystems – the active transportation outdoor recreation industry and its customers. This industry has great incentive to protect the places in which people use the clothing, hiking boots, tents and backpacks it sells. The industry is also uniquely positioned to educate outdoor enthusiasts about threats to wild places, and engage them to take action. Finally, when it comes to decision—makers, especially those in the Forest Service, National Park Service, and Bureau of Land Management, this industry has clout - an important tool that small advocacy groups can wield.

The Conservation Alliance Funding Criteria: The Project should be focused primarily on direct citizen action to protect and enhance our natural resources for recreation. The Alliance does not look for mainstream education or scientific research projects, but rather for

active campaigns. All projects should be quantifiable, with specific goals, objectives and action plans and should include a measure for evaluating success. The project should have a good chance for closure or significant measurable results over a fairly short term (one to two years). Funding emphasis may not be on general operating expenses or staff payroll.

More information: <http://www.conservationalliance.com/index.m>

NATIONAL FISH AND WILDLIFE FOUNDATION (NFWF)

The National Fish and Wildlife Foundation (NFWF) is a private, nonprofit, tax-exempt organization chartered by Congress in 1984. The National Fish and Wildlife Foundation sustains, restores, and enhances the Nation’s fish, wildlife, plants and habitats. Through leadership conservation investments with public and private partners, the Foundation is dedicated to achieving maximum conservation impact by developing and applying best practices and innovative methods for measurable outcomes.

The Foundation awards matching grants under its Keystone Initiatives to achieve measurable outcomes in the conservation of fish, wildlife, plants and the habitats on which they depend. Awards are made on a competitive basis to eligible grant recipients, including federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Project proposals are received on a year-round, revolving basis with two decision cycles per year. Grants generally range from \$50,000-\$300,000 and typically require a minimum 2:1 non-federal match.

Funding priorities include bird, fish, marine/coastal, and wildlife and habitat conservation. Other projects that are considered include controlling invasive species, enhancing delivery of ecosystem services in agricultural systems, minimizing the impact on wildlife of emerging energy sources, and developing future conservation leaders and professionals.

More information: <http://www.nfwf.org/AM/Template.cfm?Section=Grants>



THE TRUST FOR PUBLIC LAND

Land conservation is central to the mission of the Trust for Public Land (TPL). Founded in 1972, the Trust for Public Land is the only national nonprofit working exclusively to protect land for human enjoyment and wellbeing. TPL helps conserve land for recreation and spiritual nourishment and to improve the health and quality of life of American communities. Also, TPL is the leading organization helping agencies and communities identify and create funds for conservation from federal, state, local, and philanthropic sources.

Since 1996, TPL has helped states and communities craft and pass over 382 successful ballot measures, generating \$34 billion in new conservation-related funding.

More information: <http://www.tpl.org/what-we-do/services/conservation-finance/>

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 re-duce 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 \$90,000 and \$275,000.

More information: <http://www.epa.gov/care/>

LOCAL TRAIL SPONSORS

A sponsorship program for trail amenities allows smaller donations to be received from both individuals and businesses. Cash donations could be placed into a trust fund to be accessed for certain construction or acquisition projects associated with the greenways and open space system. Some recognition of the donors is appropriate and can be accomplished through the placement of a plaque, the naming of a trail segment, and/or special recognition at an opening ceremony. Types of gifts other than cash could include donations of services, equipment, labor, or reduced costs for supplies.

CORPORATE DONATIONS

Corporate donations are often received in the form of liquid investments (i.e. cash, stock, bonds) and in the form of land. 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. Municipalities typically create funds to facilitate and simplify a transaction from a corporation's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented. Such donations can improve capital budgets and/or projects.

Other Sources

VOLUNTEER WORK AND PUBLIC-PRIVATE PARTNERSHIPS

Individual volunteers from the community can be brought together with groups of volunteers from church groups, civic groups, scout troops and environmental groups to work on greenway development on special community workdays. Volunteers can also be used for fundraising, maintenance, and programming needs. 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.

PRIVATE INDIVIDUAL DONATIONS

Private individual donations can come in the form of liquid investments (i.e. cash, stock, bonds) or land. Municipalities typically create funds to facilitate and simplify a transaction from an individual's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented. Such donations can improve capital budgets and/or projects.

FUNDRAISING / CAMPAIGN DRIVES

Organizations and individuals can participate in a fundraiser or a campaign drive. It is essential to market the purpose of a fundraiser to rally support and financial backing. Oftentimes fundraising satisfies the need for public awareness, public education, and financial support.



LAND TRUST ACQUISITION AND DONATION

Land trusts are held by a third party other than the primary holder and the beneficiaries. This land is oftentimes held in a corporation for facilitating the transfer between two parties. For conservation purposes, land is often held in a land trust and received through a land trust. A land trust typically has a specific purpose such as conservation and is used so land will be preserved as the primary holder had originally intended.

ADOPT-A-TRAIL PROGRAM

A challenge grant program with local businesses may be a good source of local funding, where corporations ‘adopt’ a 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 pedestrian and bicycle facilities.

Residents and other community members are excellent resources for garnering support and enthusiasm for a trail, and Columbia County 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.

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APPENDIX I: WALK BIKE COLUMBIA!

PEDESTRIAN, BICYCLE, AND COMPLETE STREETS DESIGN GUIDELINES





CONTENTS

Introduction 5

PEDESTRIAN FACILITIES 6

Design Needs of Pedestrians 7

Design Needs of Wheelchair Users 8

Design Needs of Runners 8

Sidewalks..... 9

Zones In The Sidewalk Corridor 10

Sidewalk Widths..... 10

Sidewalk Obstructions And Driveway Ramps..... 10

Pedestrian Amenities 11

Accessible Bus Stop Design 11

Pedestrians At Intersections..... 12

Marked Crosswalks 13

Median Refuge Islands 13

Minimizing Curb Radii 14

Curb Extensions 14

Advanced Yield Line or Stop Bar..... 15

Parking Control 15

ADA Compliant Curb Ramps..... 16

Pedestrians at Railroad Grade Crossings 16

Crossings Beacons and Signals For Pedestrians..... 17

Accommodating Pedestrians at Signalized Crossings..... 18

Active Warning Beacons (RRFB) 18

Hybrid Warning Beacon (HAWK) For Mid-Block Crossing..... 19

Route Users To Signalized Crossings 19

SHARED USE PATHS AND OFF-STREET FACILITIES 20

General Design Practice..... 21

Greenways In River And Utility Corridors 21

Greenways In Abandoned Rail Corridors..... 22

Greenways In Active Rail Corridors 22

Local Neighborhood Accessways..... 23

Shared Use Paths Along Roadways..... 23

Path/Roadway Crossing Types..... 24

Marked/Unsignalized Crossings 25

Full Traffic Signal Crossings..... 25

Undercrossings 26

Overcrossings 26

BICYCLE FACILITIES 27

Design Needs of Bicyclists..... 28

Bicycle Facility Selection Guidelines..... 29

Facility Classification 30

Facility Continua 30

Shared Roadways 31

Signed Shared Roadways 32

Marked Shared Roadways..... 32

Bicycle Boulevards 33

Advisory Bike Lane..... 33



Separated Bikeways34

Shoulder Bikeways35

Conventional Bike Lane35

Bike Lane Adjacent To On-Street Parking36

Bikeways And Diagonal Parking36

Left Side Bike Lane37

Contra Flow Bike Lane37

Buffered Bike Lane38

Uphill Bicycle Climbing Lane38

Protected Bike Lanes39

Cycle Track Separation And Placement40

One-Way Cycle Tracks40

Two Way Cycle Tracks41

Driveways And Minor Street Crossings41

Major Street Crossings.....42

Bicycle Transit Bypass.....42

Bikeways At Intersections.....43

Bike Box.....44

Bike Lanes at Right Turn Only Lanes.....44

Colored Bike Lanes In Conflict Areas.....45

Combined Bike Lane/Turn Lane.....45

Intersection Crossing Markings.....46

Two-Stage Turn Box.....46

Bicyclists at Single Lane Roundabouts47

Bike Lanes at High Speed Interchanges.....47

Bike/Ped Facilities at Diverging Diamond Interchanges.....48

Bikeways at Railroad Grade Crossings48

Crossing Beacons And Signals for Bicycles49

Active Warning Beacons50

Hybrid Warning Beacon (HAWK) for Bicycle Route Crossing.....50

Bicycle Detection and Actuation51

Bicycle Signal Heads.....51

Retrofitting Streets To Add Bikeways.....52

Roadway Widening.....53

Lane Narrowing53

Lane Reconfiguration54

Parking Reduction.....54

Transit & Bicycle Wayfinding.....55

Transit Wayfinding55

Bikeway Wayfinding Sign Types56

Bikeway Wayfinding Sign Placement56

Bicycle Support Facilities57

Bicycle Racks58

On-Street Bicycle Corral58

Bicycle Lockers59

Secure Parking Area (SPA)59

Bicycle Parking at Transit60

Bike Share Station Placement60

Bikeway Maintenance61

Sweeping.....62

Signage62

Roadway Surface62

Pavement Overlays.....62

Drainage Grates63

Gutter To Pavement Transition63

Landscaping.....63

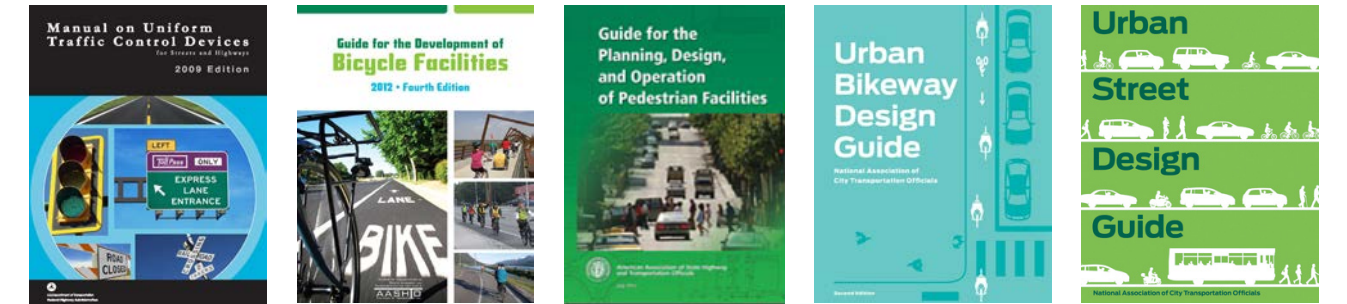
Maintenance Management Plan63



INTRODUCTION

This technical handbook is intended to assist the City of Columbia in the selection and design of pedestrian, bicycle, transit facilities. The following sections pull together best practices by facility type from public agencies and municipalities nationwide. Within the design sections, treatments are covered within a single sheet tabular format relaying important design information and discussion, example photos, schematics (if applicable), and existing summary guidance from current or upcoming draft standards. Existing standards are referenced throughout and should be the first source of information when seeking to implement any of the treatments featured here.

National Standards



The Federal Highway Administration’s **Manual on Uniform Traffic Control Devices** (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.

The National Committee on Traffic Control Devices (NCTCD) has submitted draft language for consideration in future editions of the MUTCD to include contemporary bicycle facilities. Guidance for these treatments are evolving, and practitioners should reference future editions of national guidance to understand current best practice.

To further clarify the MUTCD, the FHWA created a table of contemporary bicycle facilities that lists various bicycle-related signs, markings, signals, and other treatments and identifies their official status (e.g., can be implemented, currently experimental). See **Bicycle Facilities and the Manual on Uniform Traffic Control Devices**.¹

Bikeway treatments not explicitly covered by the MUTCD are often subject to experiments, interpretations and official rulings by the FHWA. The **MUTCD Official Rulings** is a resource that allows website visitors to obtain information about these supplementary materials. Copies of various documents (such as incoming request letters, response letters from the FHWA, progress reports, and final reports) are available on this website.²

American Association of State Highway and Transportation Officials (AASHTO) **Guide for the Development of Bicycle Facilities**, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities. The standards and guidelines presented by AASHTO provide basic information, such as minimum sidewalk widths, bicycle lane dimensions, detailed striping requirements and recommended signage and pavement markings.

The National Association of City Transportation Officials’ (NACTO³) **Urban Bikeway Design Guide** and **Urban Streets Design Guide** is the newest publication of nationally recognized street design guidelines, and offers guidance on the current state of the practice designs. The NACTO Urban Bikeway Design Guide is based on current practices in the best cycling cities in the world. The intent of the guide is to offer substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right of way present unique challenges. All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the US.

Offering similar guidance for pedestrian design, the 2004 AASHTO **Guide for the Planning, Design and Operation of Pedestrian Facilities** provides comprehensive guidance on planning and designing for people on foot.

Some of these treatments are not directly referenced in the current versions of the AASHTO Guide or the MUTCD, although many of the elements of these treatments are found within these documents. In all cases, engineering judgment is recommended to ensure that the application makes sense for the context of each treatment, given the many complexities of urban

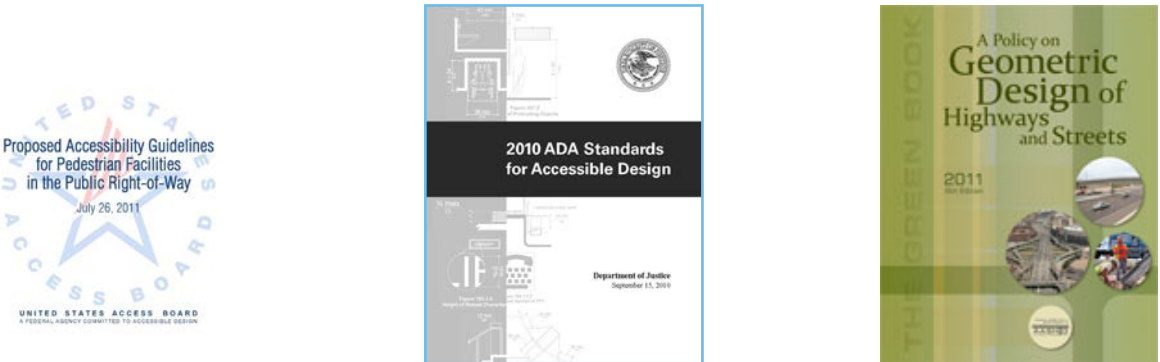
1 *Bicycle Facilities and the Manual on Uniform Traffic Control Devices*. (2011). FHWA. http://www.fhwa.dot.gov/environment/bikeped/mutcd_bike.htm
2 *MUTCD Official Rulings*. FHWA. <http://mutcd.fhwa.dot.gov/orsearch.asp>
3 <http://nacto.org/>

Local Standards



The South Carolina Department of Transportation has published a variety of additional resources for designing bicycle and pedestrian facilities. These include the SCDOT Highway Design Manual, SCDOT Traffic Calming Design Guidelines, SCDOT Traffic Signal Design Guidelines and SCDOT Access and Roadside Management Standards. In recent years, SCDOT has also issued several Traffic Engineering Guidelines, and Engineering Directive Memorandums for such treatments as pedestrian hybrid beacons, shared lane markings, rumble strips and other complete streets treatments.

Additional US Federal Guidelines



Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle and pedestrian facility project. The United States Access Board’s proposed **Public Rights-of-Way Accessibility Guidelines**¹ (PROWAG) and the **2010 ADA Standards for Accessible Design**² (2010 Standards) contain standards and guidance for the construction of accessible facilities. This includes requirements for sidewalk curb ramps, slope requirements, and pedestrian railings along stairs.

The 2011 AASHTO: **A Policy on Geometric Design of Highways and Streets** commonly referred to as the “Green Book,” contains the current design research and practices for highway and street geometric design.

1 <http://www.access-board.gov/prowag/>
2 http://www.ada.gov/2010ADAstandards_index.htm

**PEDESTRIAN FACILITIES SHOULD
CONSIDER A WIDE RANGE OF
PHYSICAL CHARACTERISTICS, AND
ACCOMMODATE THE NEEDS AND
ABILITIES OF ALL PEDESTRIANS**

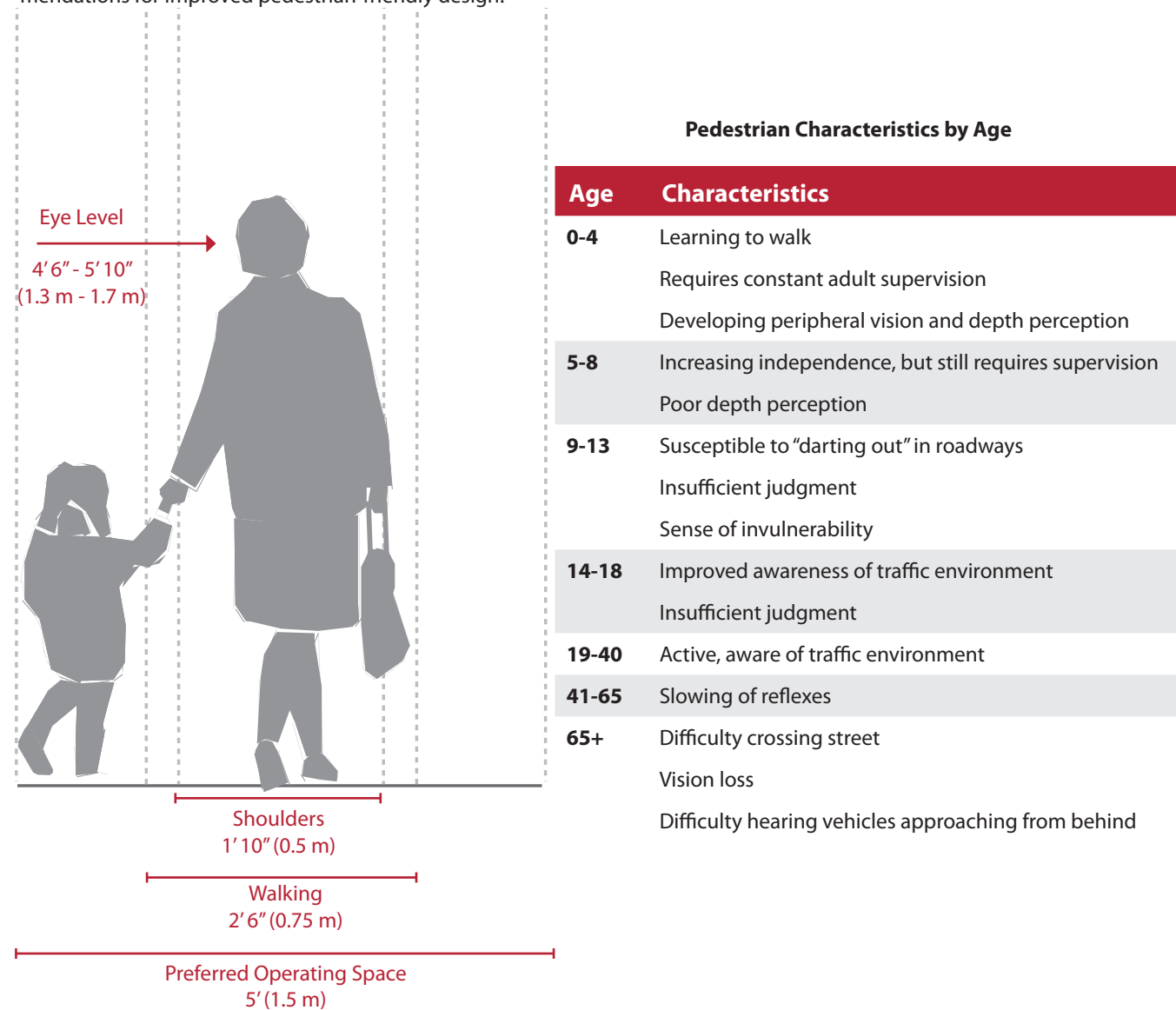


Types of Pedestrians

Pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians’ physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing. The table below summarizes common pedestrian characteristics for various age groups.

The MUTCD recommends a normal walking speed of 3.5 feet per second when calculating the pedestrian clearance interval at traffic signals. The walking speed can drop to 3 feet per second for areas with older populations and persons with mobility impairments. While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

The table below summarizes common physical and cognitive impairments, how they affect personal mobility, and recommendations for improved pedestrian-friendly design.



Source: AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, Exhibit 2-1. 2004.

Disabled Pedestrian Design Considerations

Impairment	Effect on Mobility	Design Solution
Wheelchair and Scooter Users	Difficulty propelling over uneven or soft surfaces.	Firm, stable surfaces and structures, including ramps or beveled edges.
	Cross-slopes cause wheelchairs to veer downhill.	Cross-slopes of less than two percent.
	Require wider path of travel.	Sufficient width and maneuvering space.
Walking Aid Users	Difficulty negotiating steep grades and cross slopes; decreased stability.	Smooth, non-slippery travel surface.
	Slower walking speed and reduced endurance; reduced ability to react.	Longer pedestrian signal cycles, shorter crossing distances, median refuges, and street furniture.
Hearing Impairment	Less able to detect oncoming hazards at locations with limited sight lines (e.g. driveways, angled intersections, channelized right turn lanes) and complex intersections.	Longer pedestrian signal cycles, clear sight distances, highly visible pedestrian signals and markings.
Vision Impairment	Limited perception of path ahead and obstacles; reliance on memory; reliance on non-visual indicators (e.g. sound and texture).	Accessible text (larger print and raised text), accessible pedestrian signals (APS), guide strips and detectable warning surfaces, safety barriers, and lighting.
Cognitive Impairment	Varies greatly. Can affect ability to perceive, recognize, understand, interpret, and respond to information.	Signs with pictures, universal symbols, and colors, rather than text.



DESIGN NEEDS OF WHEELCHAIR USERS

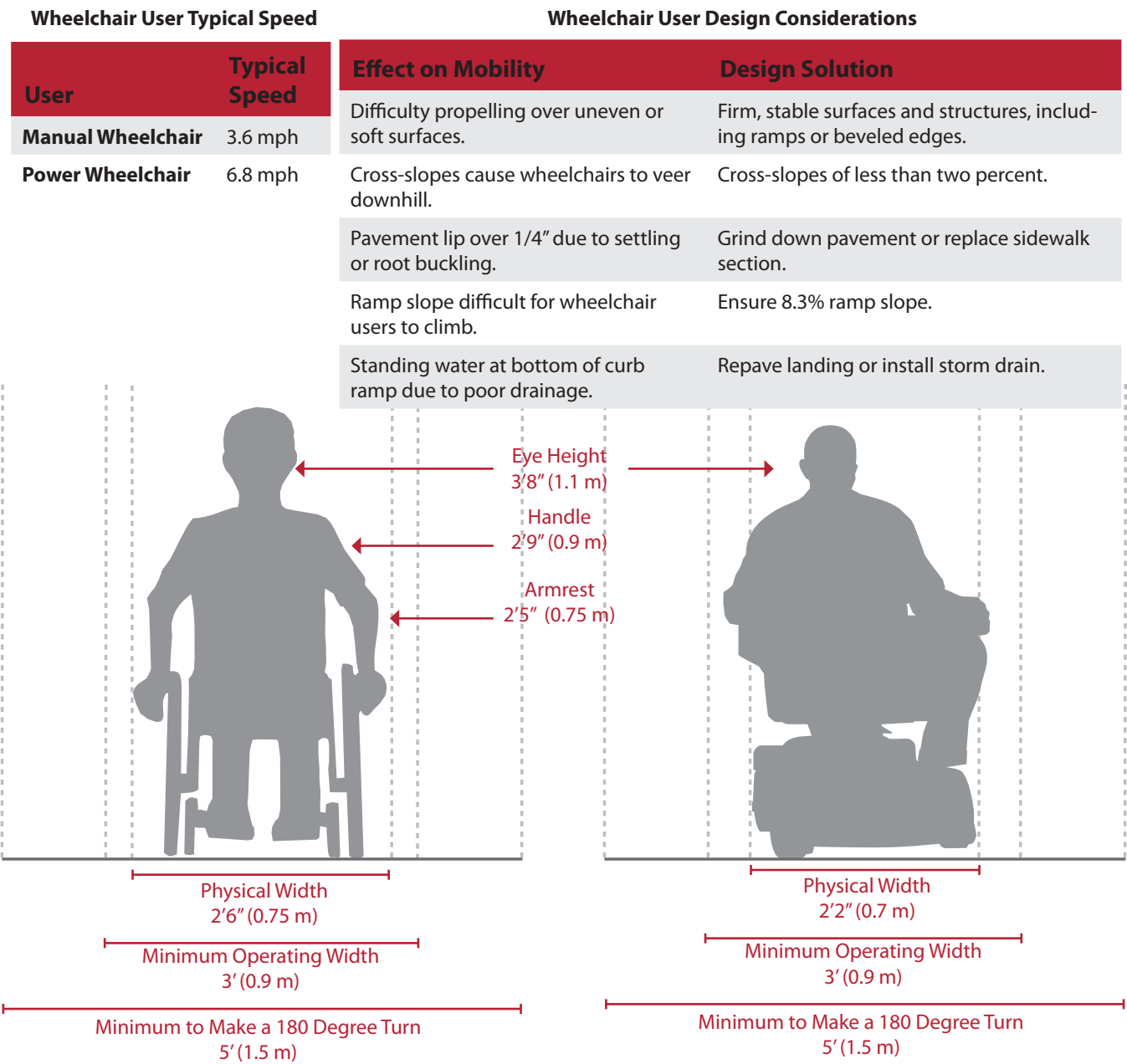
As the American population ages, the number of people using mobility assistive devices (such as manual wheelchairs, powered wheelchairs) increases.

Manual wheelchairs are self-propelled devices. Users propel themselves using push rims attached to the rear wheels. Braking is done through resisting wheel movement with the hands or arm. Alternatively, a second individual can control the wheelchair using handles attached to the back of the chair.

Power wheelchairs use battery power to move the wheelchair. The size and weight of power wheelchairs limit their ability to negotiate obstacles without a ramp.

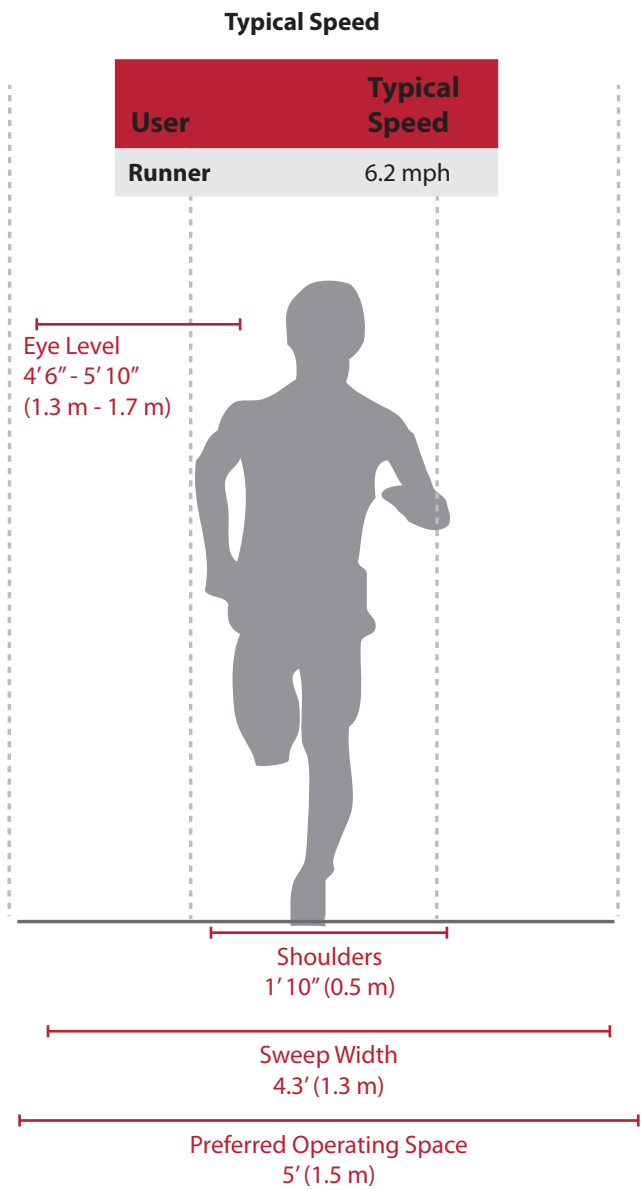
Maneuvering around a turn requires additional space for wheelchair devices. Providing adequate space for 180 degree turns at appropriate locations is an important element for accessible design.

ADA inadequacies should be inventoried in an ADA transition plan and addressed in a systematic fashion.



DESIGN NEEDS OF RUNNERS

Running is an important recreation and fitness activity commonly performed on shared use paths. Many runners prefer softer surfaces (such as rubber, bare earth or crushed rock) to reduce impact. Runners can change their speed and direction frequently. If high volumes are expected, controlled interaction or separation of different types of users should be considered.



Source: FHWA. *Characteristics of Emerging Road and Trail Users and Their Safety*. 2004.
USDOJ. *2010 ADA Standards for Accessible Design*. 2010.

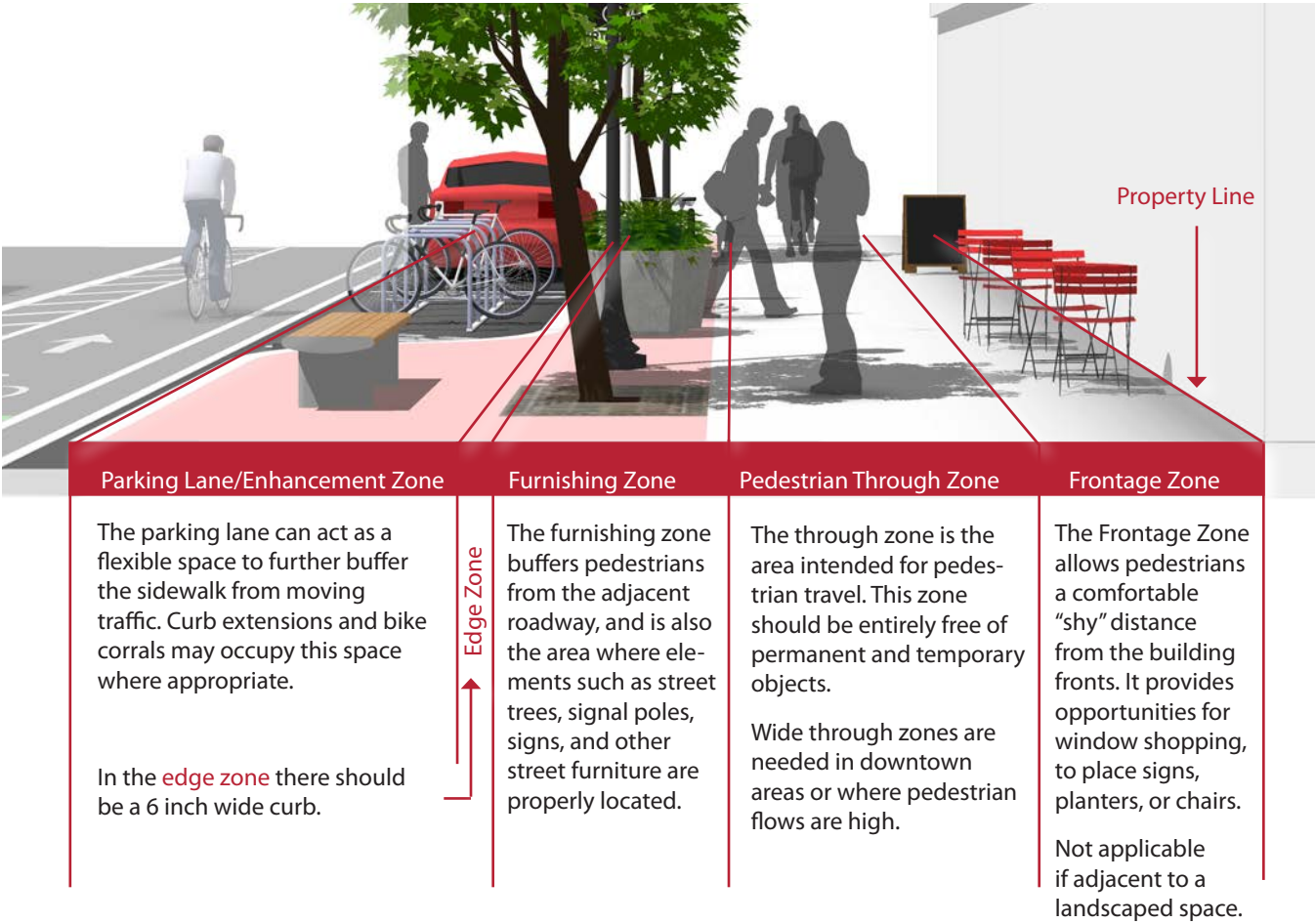
SIDEWALKS



ZONES IN THE SIDEWALK CORRIDOR

Description

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. A variety of considerations are important in sidewalk design. Providing adequate and accessible facilities can lead to increased numbers of people walking, improved safety, and the creation of social space.



Discussion

Sidewalks should be more than areas to travel; they should provide places for people to interact. There should be places for standing, visiting, and sitting. Sidewalks should contribute to the character of neighborhoods and business districts, strengthen their identity, and be an area where adults and children can safely participate in public life.

Additional References and Guidelines

USDOJ. *ADA Standards for Accessible Design*. 2010.
United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
NACTO. *Urban Street Design Guide*. 2013.
SCDOT. *Highway Design Manual*. 2003.

Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped space. Colored, patterned, or stamped concrete can add distinctive visual appeal.



SIDEWALK WIDTHS

Description

The width and design of sidewalks will vary depending on street context, functional classification, and pedestrian demand. Below are preferred widths of each sidewalk zone according to general street type. Standardizing sidewalk guidelines for different areas of the city, dependent on the above listed factors, ensures a minimum level of quality for all sidewalks.

Guidance

Sidewalk width should be determined based on desired user comfort. While a 3 foot wide through zone may accommodate a single person walking, it is inadequate for two people to walk side-by-side or comfortably pass other users. Designers should strive for sidewalk conditions that allow for side-by-side walking and comfortable passing.



Street Classification	Parking Lane/Enhancement Zone	Furnishing Zone	Pedestrian Through Zone	Frontage Zone	Total
Local Streets	Varies	2 - 8 feet	4 - 6 feet	N/A	6 - 14 feet
Commercial/Downtown Areas	Varies	4 - 8 feet	6 - 12 feet	2.5 - 10 feet	11 - 30 feet
Arterials and Collectors	Varies	2 - 8 feet	4 - 8 feet	2.5 - 5 feet	8 -21 feet

Seating for outdoor dining is most common and functional in furnishing zones of 6 ft, although narrower configurations are possible.

Six feet enables two pedestrians (including wheelchair users) to walk side-by-side, or to pass each other comfortably

Discussion

It is important to provide adequate width along a sidewalk corridor. Two people should be able to walk side-by-side and pass a third comfortably. In areas of high demand, sidewalks should contain adequate width to accommodate the high volumes and different walking speeds of pedestrians. The Americans with Disabilities Act requires a 4 foot clear width in the pedestrian zone plus 5 foot passing areas every 200 feet.

Additional References and Guidelines

USDOJ. *ADA Standards for Accessible Design*. 2010.
United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
NACTO. *Urban Street Design Guide*. 2013.
SCDOT. *Highway Design Manual*. 2003.

Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped boulevard. Surfaces must be firm, stable, and slip resistant.

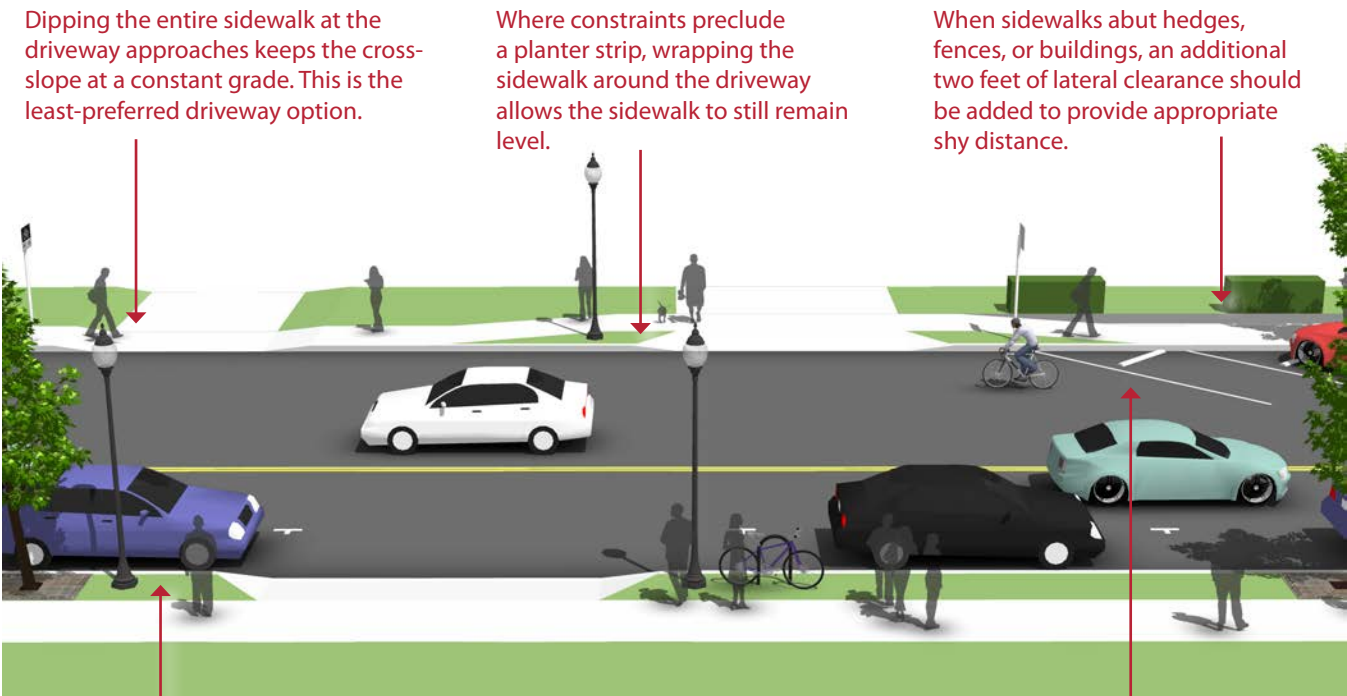
SIDEWALK OBSTRUCTIONS AND DRIVEWAY RAMPS

Description

Obstructions to pedestrian travel in the sidewalk corridor typically include driveway ramps, curb ramps, sign posts, utility and signal poles, mailboxes, fire hydrants and street furniture.

Guidance

Reducing the number of accesses reduces the need for special provisions. This strategy should be pursued first. Obstructions should be placed between the sidewalk and the roadway to create a buffer for increased pedestrian comfort.



Planter strips allow sidewalks to remain level, with the driveway grade change occurring within the planter strip.

When sidewalks abut angled on-street parking, wheel stops should be used to prevent vehicles from overhanging in the sidewalk.

Discussion

Driveways are a common sidewalk obstruction, especially for wheelchair users. When constraints only allow curb-tight sidewalks, dipping the entire sidewalk at the driveway approaches keeps the cross-slope at a constant grade. However, this may be uncomfortable for pedestrians and could create drainage problems behind the sidewalk.

Additional References and Guidelines

USDOJ. *ADA Standards for Accessible Design*. 2010.
United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

SCDOT. *Highway Design Manual*. 2003.

Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped space. Surfaces must be firm, stable, and slip resistant.



PEDESTRIAN AMENITIES

Description

A variety of streetscape elements can define the pedestrian realm, offer protection from moving vehicles, and enhance the walking experience. Key features are presented below.

Street Trees

In addition to their aesthetic and environmental value, street trees can slow traffic and improve safety for pedestrians. Trees add visual interest to streets and narrow the street's visual corridor, which may cause drivers to slow down. It is important that trees do not block light or the vision triangle.

Street Furniture

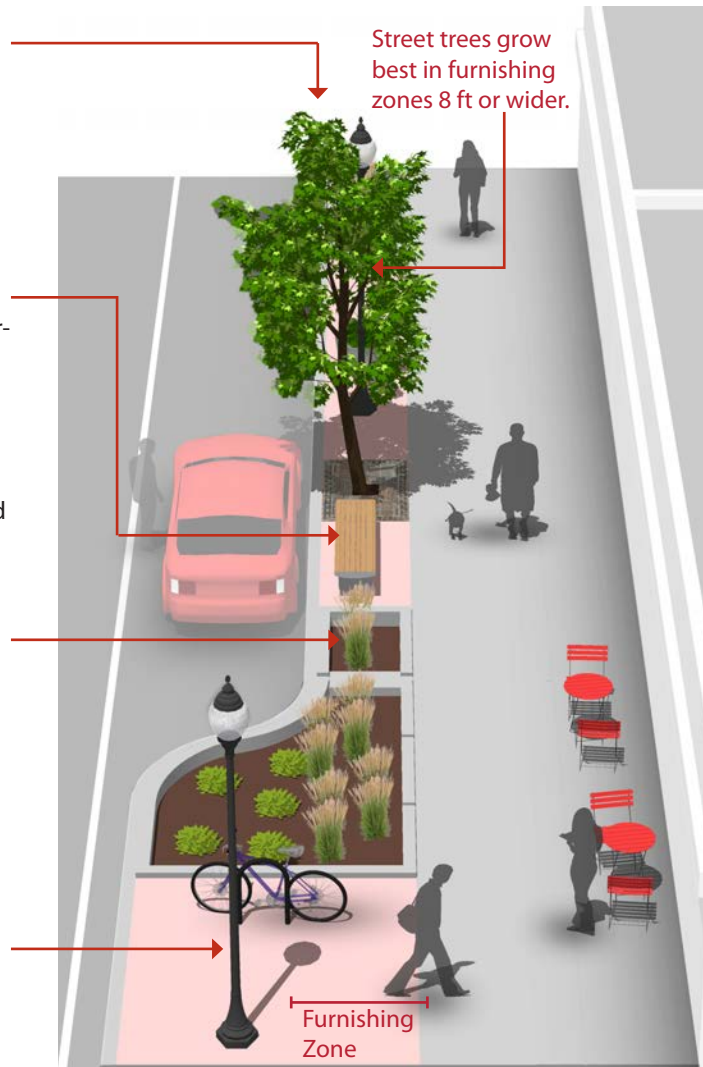
Providing benches at key rest areas and viewpoints encourages people of all ages to use the walkways by ensuring that they have a place to rest along the way. Benches should be 20" tall to accommodate elderly pedestrians comfortably. Benches can be simple (e.g., wood slats) or more ornate (e.g., stone, wrought iron, concrete). If alongside a parking zone, street furniture should be placed to minimize interference with passenger loading.

Green Features

Green stormwater strategies may include bioretention swales, rain gardens, tree box filters, and pervious pavements (pervious concrete, asphalt and pavers). Bioswales are natural landscape elements that manage water runoff from a paved surface. Plants in the swale trap pollutants and silt from entering a river system.

Lighting

Pedestrian scale lighting improves visibility for both pedestrians and motorists - particularly at intersections. Pedestrian scale lighting can provide a vertical buffer between the sidewalk and the street, defining pedestrian areas.



Discussion

Additional pedestrian amenities such as banners, public art, special paving, along with historical elements and cultural references, promote a sense of place. Public activities should be encouraged and commercial activities such as dining, vending and advertising may be permitted when they do not interfere with safety and accessibility.

Pedestrian amenities should be placed in the furnishing zone on a sidewalk corridor. See Zones in the Sidewalk Corridor for a discussion of the functional parts of a sidewalk. Signs, meters, tree wells should go between parking spaces.

Additional References and Guidelines

United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Establishing and caring for your young street trees is essential to their health. Green features may require routine maintenance, including sediment and trash removal, and clearing curb openings and overflow drains.

ACCESSIBLE BUS STOP DESIGN

Description

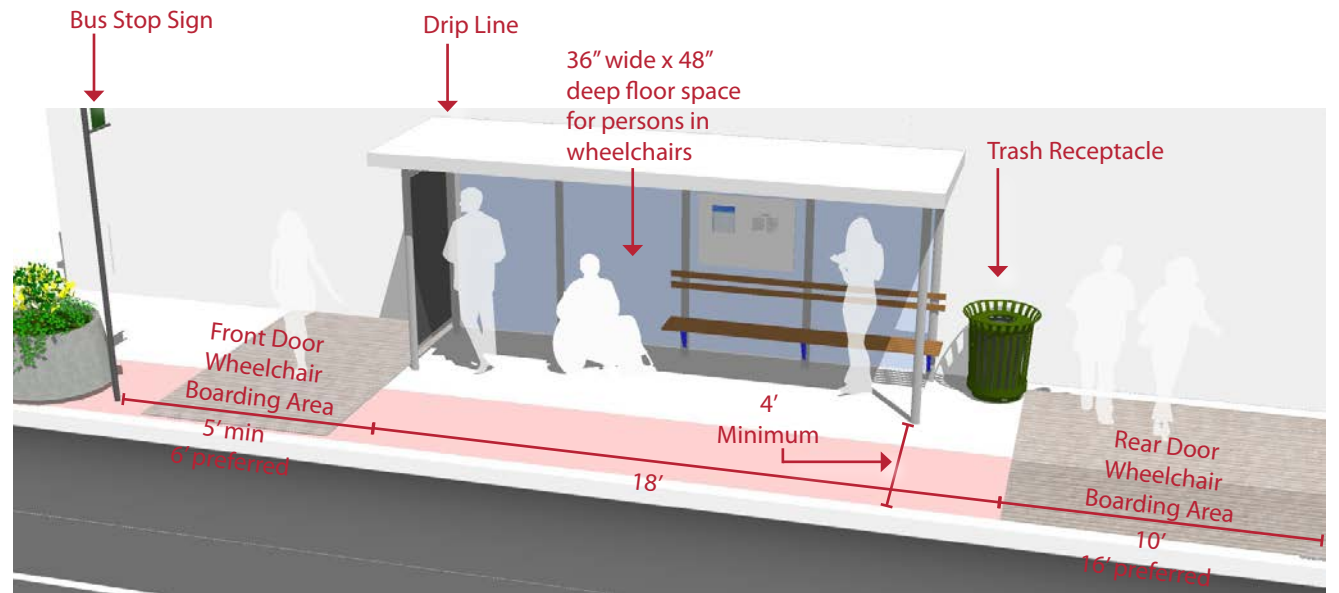
Bus stops should be connected to a continuous sidewalk and be located with adequate right of way to provide amenities such as shelters, benches and bike racks for users. The bus stop should offer direct pedestrian connectivity to adjacent destinations. Bus stops should be placed in a conspicuous, well-lit location to improve safety and reduce vandalism.

Bus stops should be designed to accommodate all users through the Americans with Disabilities Act accessibility requirements.

Guidance

Successful stop design provides good pedestrian traffic flow and thoughtful placement of amenities while meeting ADA accessibility requirements.

- Site fixtures should be placed at the back of the site, allowing for pedestrian flow adjacent to the street.
- A 5' minimum clear area should be maintained between any site fixtures and the street.
- The boarding and alighting areas should also be kept clear of obstacles. This includes benches, trash receptacles, trees, utility poles, newsracks, etc.
- The space for front door boarding and alighting should be a minimum of 5' wide (6' preferred) and the space for each of the rear doors should be a minimum of 10' wide (16' preferred).



Discussion

Far-side bus stops have been shown to offer advantages for pedestrians and motorists – by improving visibility of pedestrians at crosswalks and not disrupting motor vehicle turning movements. For bus stops located at intersections, far-side bus stops should be utilized wherever possible.

Additional References and Guidelines

USDOJ. *ADA Standards for Accessible Design*. 2010.
United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

Materials and Maintenance

Regularly inspect transit stops and keep clear of debris and trash.

PEDESTRIANS AT INTERSECTIONS





MARKED CROSSWALKS

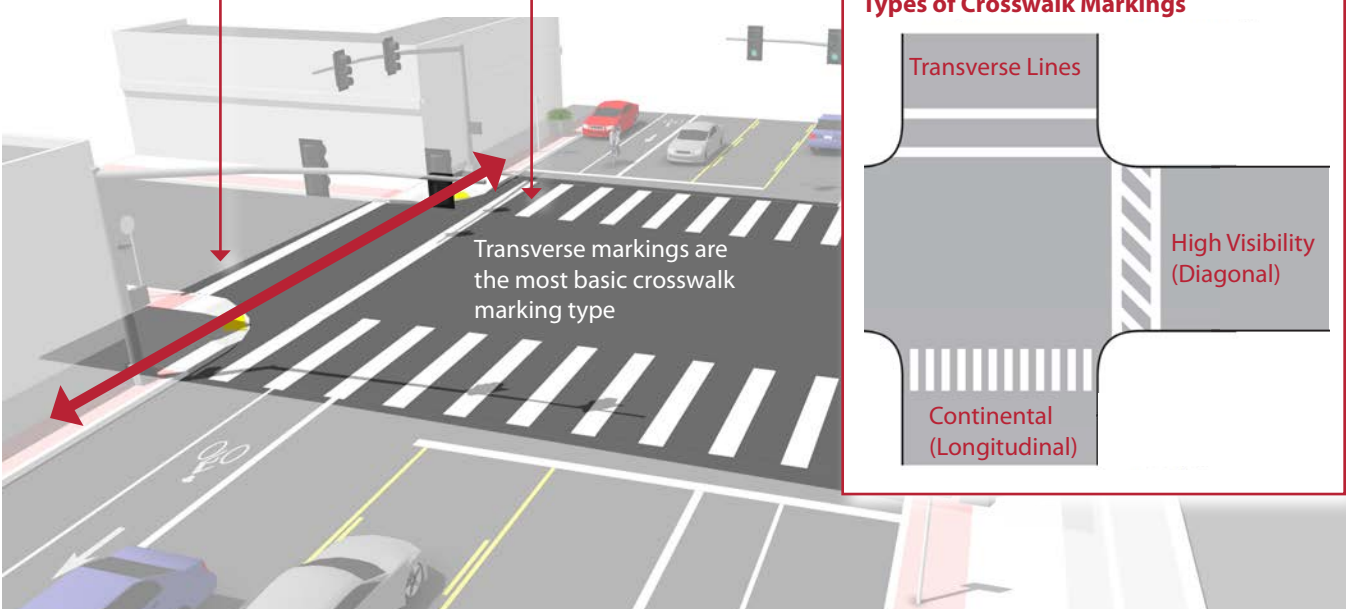
Description

A marked crosswalk signals to motorists that they must stop for pedestrians and encourages pedestrians to cross at designated locations. Installing crosswalks alone will not necessarily make crossings safer especially on multi-lane roadways.

At mid-block locations, crosswalks can be marked where there is a demand for crossing and there are no nearby marked crosswalks.

The crosswalk should be located to align as closely as possible with the through pedestrian zone of the sidewalk corridor

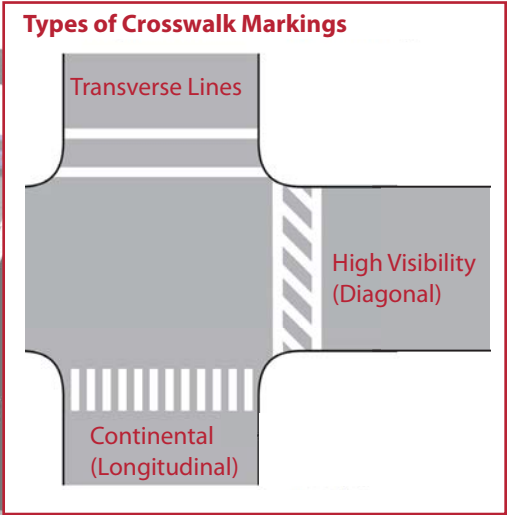
Continental markings provide additional visibility



Guidance

At signalized intersections, all crosswalks should be marked. At un-signalized intersections, crosswalks may be marked under the following conditions:

- At a complex intersection, to orient pedestrians in finding their way across.
- At an offset intersection, to show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.



Discussion

Continental crosswalk markings should be used at crossings with high pedestrian use or where vulnerable pedestrians are expected, including: school crossings, across arterial streets for pedestrian-only signals, at mid-block crosswalks, and at intersections where there is expected high pedestrian use and the crossing is not controlled by signals or stop signs.

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices*. (3B.18). 2009.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
FHWA. *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations*. 2005.
FHWA. *Crosswalk Marking Field Visibility Study*. 2010.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Thermoplastic markings offer increased durability than conventional paint.

MEDIAN REFUGE ISLANDS

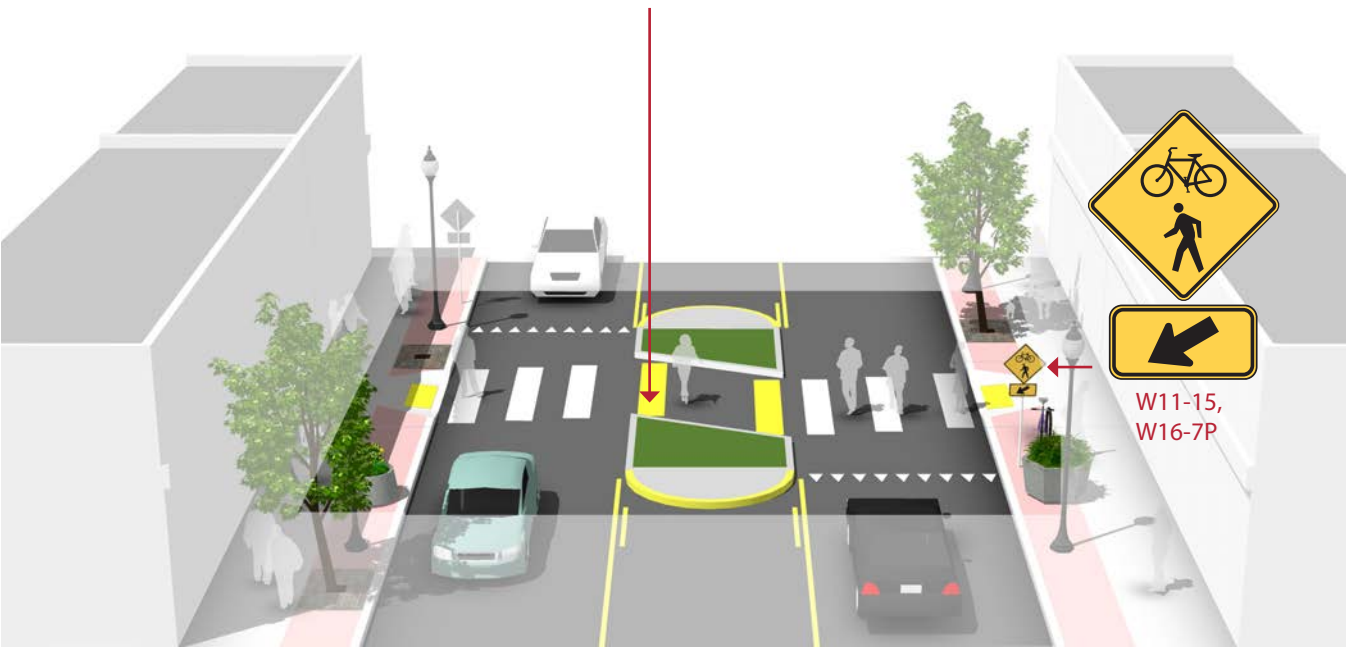
Description

Median refuge islands are located at the mid-point of a marked crossing and help improve pedestrian safety by allowing pedestrians to cross one direction of traffic at a time. Refuge islands minimize pedestrian exposure by shortening crossing distance and increasing the number of available gaps for crossing.

Guidance

- Can be applied on any roadway with a left turn center lane or median that is at least 6' wide.
- Appropriate at signalized or unsignalized crosswalks
- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least 6' wide between travel lanes (to accommodate bikes with trailers and wheelchair users) and at least 20' long.
- On streets with speeds higher than 25 mph there should also be double centerline marking, reflectors, and "KEEP RIGHT" signage.

Cut through median islands are preferred over curb ramps, to better accommodate bicyclists.



Discussion

If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 1 ft 6 in.

On multi-lane roadways, consider configuration with active warning beacons for improved yielding compliance.

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
NACTO. *Urban Bikeway Design Guide*. 2012.
NACTO. *Urban Street Design Guide*. 2013.
SCDOT. *Traffic Calming Guidelines*. 2006.

Materials and Maintenance

Refuge islands may collect road debris and may require somewhat frequent maintenance. Refuge islands should be visible to snow plow crews and should be kept free of snow berms that block access.



MINIMIZING CURB RADII

Description

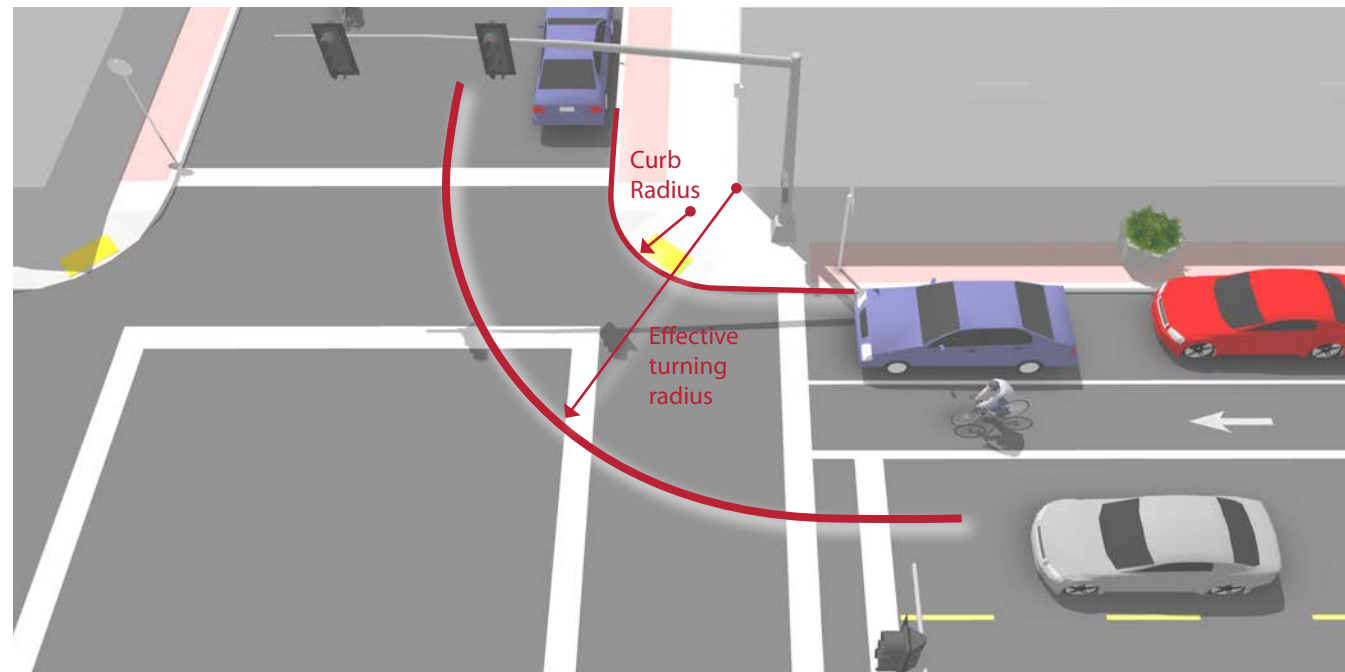
The size of a curb's radius can have a significant impact on pedestrian comfort and safety. A smaller curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crossing distance and requires vehicles to slow more on the intersection approach. During the design phase, the chosen radius should be the smallest possible for the circumstances.

Guidance

- The radius may be as small as 3 ft where there are no turning movements, or 5 ft where there are turning movements, adequate street width, and a larger effective turning radius created by parking or bike lanes.

The designer should differentiate between two types of vehicles:

- The Design Vehicle: the frequent user that should be able to make a turn at the intersection with ease.
- The Intersection Check Vehicle, the infrequent user that must be able to accomplish the turn, but may involve occupying adjacent or opposing lanes temporarily during the maneuver.



Discussion

Several factors govern the choice of curb radius in any given location. These include the desired pedestrian area of the corner, traffic turning movements, street classifications, design vehicle turning radius, intersection geometry, and whether there is parking or a bike lane (or both) between the travel lane and the curb.

Additional References and Guidelines

AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
AASHTO. *A Policy on Geometric Design of Highways and Streets*. 2004.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Improperly designed curb radii at corners may be subject to damage by large trucks.

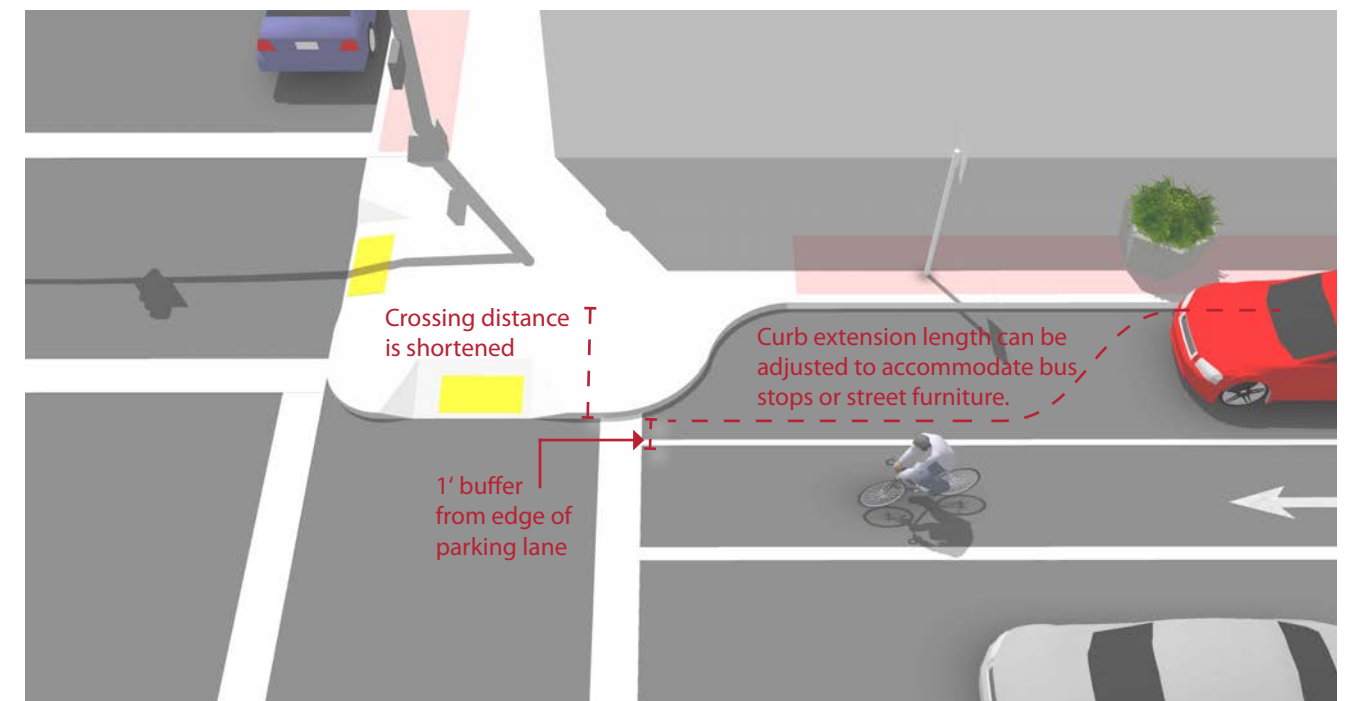
CURB EXTENSIONS

Description

Curb extensions minimize pedestrian exposure during crossing by shortening crossing distance and giving pedestrians a better chance to see and be seen before committing to crossing. They are appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb.

Guidance

- In most cases, the curb extensions should be designed to transition between the extended curb and the running curb in the shortest practicable distance.
- For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 ft and the two radii should be balanced to be nearly equal.
- Curb extensions should terminate one foot short of the parking lane to maximize bicyclist safety.



Discussion

If there is no parking lane, adding curb extensions may be a problem for bicycle travel and truck or bus turning movements.

Additional References and Guidelines

AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
AASHTO. *A Policy on Geometric Design of Highways and Streets*. 2004.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Planted curb extensions may be designed as a bioswale, a vegetated system for stormwater management.



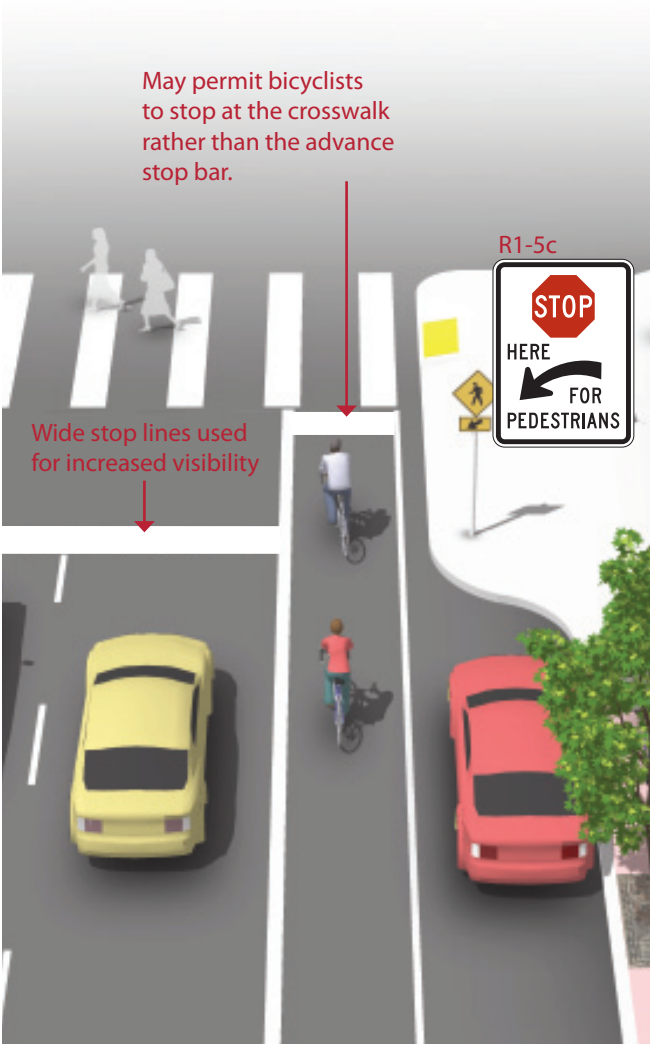
ADVANCED YIELD LINE OR STOP BAR

Description

Advance stop bars and yield lines increase pedestrian comfort and safety by stopping motor vehicles well in advance of marked crosswalks, allowing vehicle operators a better line of sight of pedestrians and giving inner lane motor vehicle traffic time to stop for pedestrians.

Guidance

- On streets with at least two travel lanes in each direction.
- Prior to a marked crosswalk
- In one or both directions of motor vehicle travel
- Recommended 15-50 feet or more in advance of the crosswalk
- A “Stop Here for Pedestrians” sign should accompany the advance stop bar



Discussion

If a bicycle lane is present, mark the advance stop bar or yield line to permit bicyclists to stop at the crosswalk ahead of the stop bar.

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

PARKING CONTROL

Description

Parking control involves restricting or reducing on-street parking near intersections or other locations with high pedestrian activity, such as bus stops, driveways, bridge or tunnel entrances, and school zones. Locating parking away from the intersection improves motorist’s visibility on the approach to the intersection and crosswalk. Improved sight lines at intersections reduces conflicts between motorists and pedestrians.

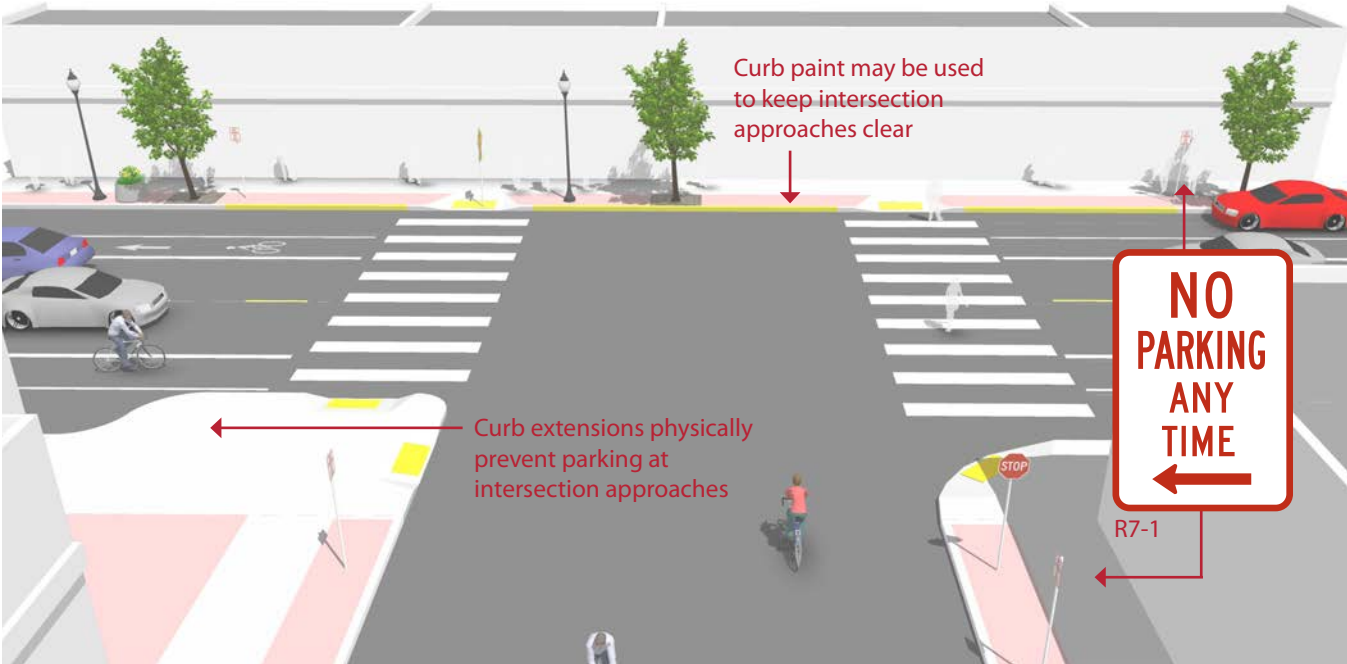
Guidance

Curb extensions, NO PARKING signage, or curb paint can be used to keep the approach to intersections clear of parked vehicles.

At “T” and offset intersections, where the boundaries of the intersection may not be obvious, this prohibition should be made clear with signage.

Parking should not be allowed within any type of intersection adjacent to schools, school crosswalks, and parks. This includes “T” and offset intersections.

SCDOT Access and Roadside Management Standards recommend a minimum 20 foot clearance from signalized intersections, 30 feet from stop-controlled intersections, and 50 feet from railway or highway crossings.



Discussion

In areas where there is high parking demand parking compact vehicles may be allowed within “T” or offset intersections and on either side of the crosswalk. At these locations, signs will be placed to prohibit parking within the designated crosswalk areas, and additional enforcement should be provided, particularly when the treatment is new.

Additional References and Guidelines

AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
AASHTO. *A Policy on Geometric Design of Highways and Streets*. 2004.
SCDOT. *Access and Roadside Management Standards*. 2012.

Materials and Maintenance

Signage and striping require routine maintenance.



ADA COMPLIANT CURB RAMPS

Description

Curb ramps are the design elements that allow all users to make the transition from the street to the sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners. Properly designed curb ramps ensure that the sidewalk is accessible from the roadway. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access.

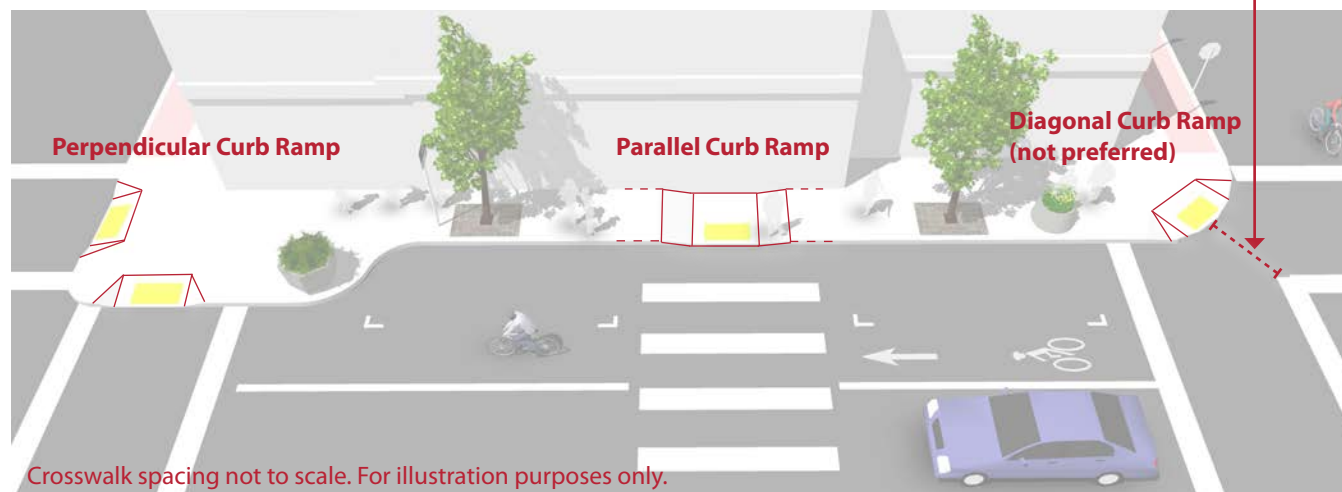
Although diagonal curb ramps might save money, they create potential safety and mobility problems for pedestrians, including reduced maneuverability and increased interaction with turning vehicles, particularly in areas with high traffic volumes. Diagonal curb ramp configurations are the least preferred of all options.

Guidance

- The landing at the top of a ramp shall be at least 4 feet long and at least the same width as the ramp itself.
- The ramp shall slope no more than 1:12, with a maximum cross slope of 2.0%.
- If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway.
- If the ramp lands on a dropped landing within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 5'-0" long and at least as wide as the ramp, although a width of 5'-0" is preferred.

Curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles. Three configurations are illustrated below.

Diagonal ramps shall include a clear space of at least 48" within the crosswalk for user maneuverability



Discussion

The edge of an ADA compliant curb ramp may be marked with a tactile warning device (also known as truncated domes) to alert people with visual impairments to changes in the pedestrian environment. Contrast between the raised tactile device and the surrounding infrastructure is important so that the change is readily evident. These devices are most effective when adjacent to smooth pavement so the difference is easily detected. The devices should provide color contrast so partially sighted people can see them.

Additional References and Guidelines

United States Access Board. *Accessibility Guidelines for Buildings and Facilities*. 2002.
United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
USDOJ. *ADA Standards for Accessible Design*. 2010.
SCDOT. *Highway Design Manual*. 2003.

Materials and Maintenance

It is critical that the interface between a curb ramp and the street be maintained adequately. Asphalt street sections can develop potholes at the foot of the ramp, which can catch the front wheels of a wheelchair.

PEDESTRIANS AT RAILROAD GRADE CROSSINGS

Description

Locations where sidewalks must cross railroad tracks are problematic for pedestrians, particularly for those with mobility or vision impairments.

Wheelchair and scooter casters can easily get caught in the flangeway gap, and slippery surfaces, degraded rough materials, or elevated track height can cause tripping hazards for all pedestrians.

Angled track crossings also limit sight triangles, impacting the ability to see oncoming trains.

Guidance

- Bells or other audible warning devices may be included in the flashing-light signal assembly to provide additional warning for pedestrians and bicyclists.
- Pedestrians need clear communication and warning to know that they may encounter a train and when a train is coming. Provide clear definition of where the safest place to cross is.
- The crossing should be as close as practical to perpendicular with tracks. Ensure clear lines of sign and good visibility so that pedestrians can see approaching trains
- The crossing must be level and flush with the top of the rail at the outer edge and between the rails.
- Flangeway gaps should not exceed 2.5 in (3.0 in for tracks that carry freight.)

Barriers and swing arm gates may be appropriate to channelize pedestrian crossings.

Pedestrian automatic gate arms or manually operated swing gates may help control pedestrian movements.

Concrete or rubber is the best material for pedestrian railroad crossings.



Discussion

Crossing design and implementation is a collaboration between the railroad company and highway agency. The railroad company is responsible for the crossbucks, flashing lights and gate mechanisms, and the highway agency is responsible for advance warning markings and signs. Warning devices should be recommended for each specific situation by a qualified engineer based on various factors including train frequency and speed, path and trail usage and sight distances.

Additional References and Guidelines

AASHTO. *Planning, Design, and Operation of Ped. Facilities*. 2004.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *Railroad-Highway Grade Crossing Handbook*. 2007.
TRB. *TCRP 17: Integration of Light Rail Transit into City Streets*. 1996.
Rails-to-Trails Conservancy. *Rails-with-Trails: A Preliminary Assessment of Safety and Grade Crossings*. 2005.

Materials and Maintenance

Surfaces must be firm, stable, and slip resistant. Concrete or rubber are the preferred materials for use at railroad crossings. Rubber may become slippery when wet and degrade over time. (AASHTO 2012)

CROSSINGS BEACONS AND SIGNALS FOR PEDESTRIANS





ACCOMMODATING PEDESTRIANS AT SIGNALIZED CROSSINGS

Description

Pedestrian Signal Head

Pedestrian signal indicators demonstrate to pedestrians when to cross at a signalized crosswalk. All traffic signals should be equipped with pedestrian signal indications except where pedestrian crossing is prohibited by signage. An Accessible Pedestrian Signal (APS) using audible and/or vibrotactile indication should be provided for pedestrians upon detection/actuation.

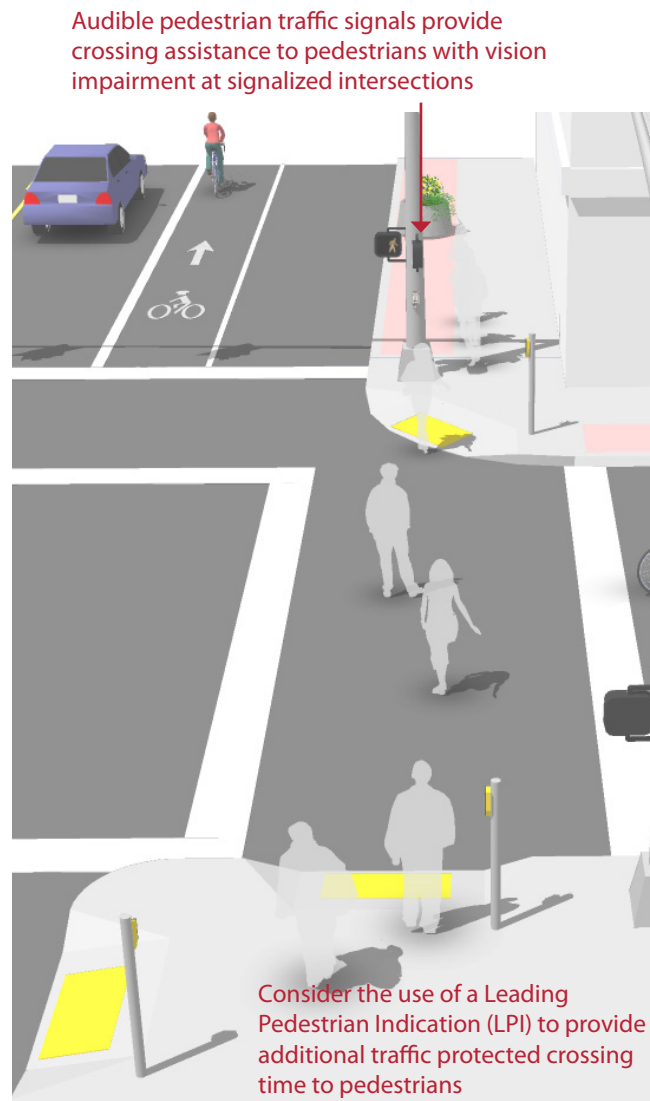
Countdown pedestrian signals are particularly valuable for pedestrians, as they indicate whether a pedestrian has time to cross the street before the signal phase ends. Countdown signals should be used at all signalized intersections.

Signal Timing

Providing adequate pedestrian crossing time is a critical element of the walking environment at signalized intersections. The MUTCD recommends traffic signal timing to assume a pedestrian walking speed of 4' per second, meaning that the length of a signal phase with parallel pedestrian movements should provide sufficient time for a pedestrian to safely cross the adjacent street.

At crossings where older pedestrians or pedestrians with disabilities are expected, crossing speeds as low as 3' per second may be assumed. Special pedestrian phases can be used to provide greater visibility or more crossing time for pedestrians at certain intersections.

In busy pedestrian areas such as downtowns, the pedestrian signal indication should be built into each signal phase, eliminating the requirement for a pedestrian to actuate the signal by pushing a button.



Discussion

When push buttons are used, they should be located so that someone in a wheelchair can reach the button from a level area of the sidewalk without deviating significantly from the natural line of travel into the crosswalk, and marked (for example, with arrows) so that it is clear which signal is affected.

In new construction, APS should be installed wherever pedestrian signals are installed. New accessible signals should be prioritized where insufficient acoustic information exists — at all times — to permit safe crossing at a particular intersection or crosswalk. See <http://www.apsguide.org/> for more information.

Additional References and Guidelines

United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public-Right-of-Way (PROWAG)*. 2011.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

It is important to repair or replace traffic control equipment before it fails. Consider semi-annual inspections of controller and signal equipment, intersection hardware, and loop detectors.

ACTIVE WARNING BEACONS (RRFB)

Description

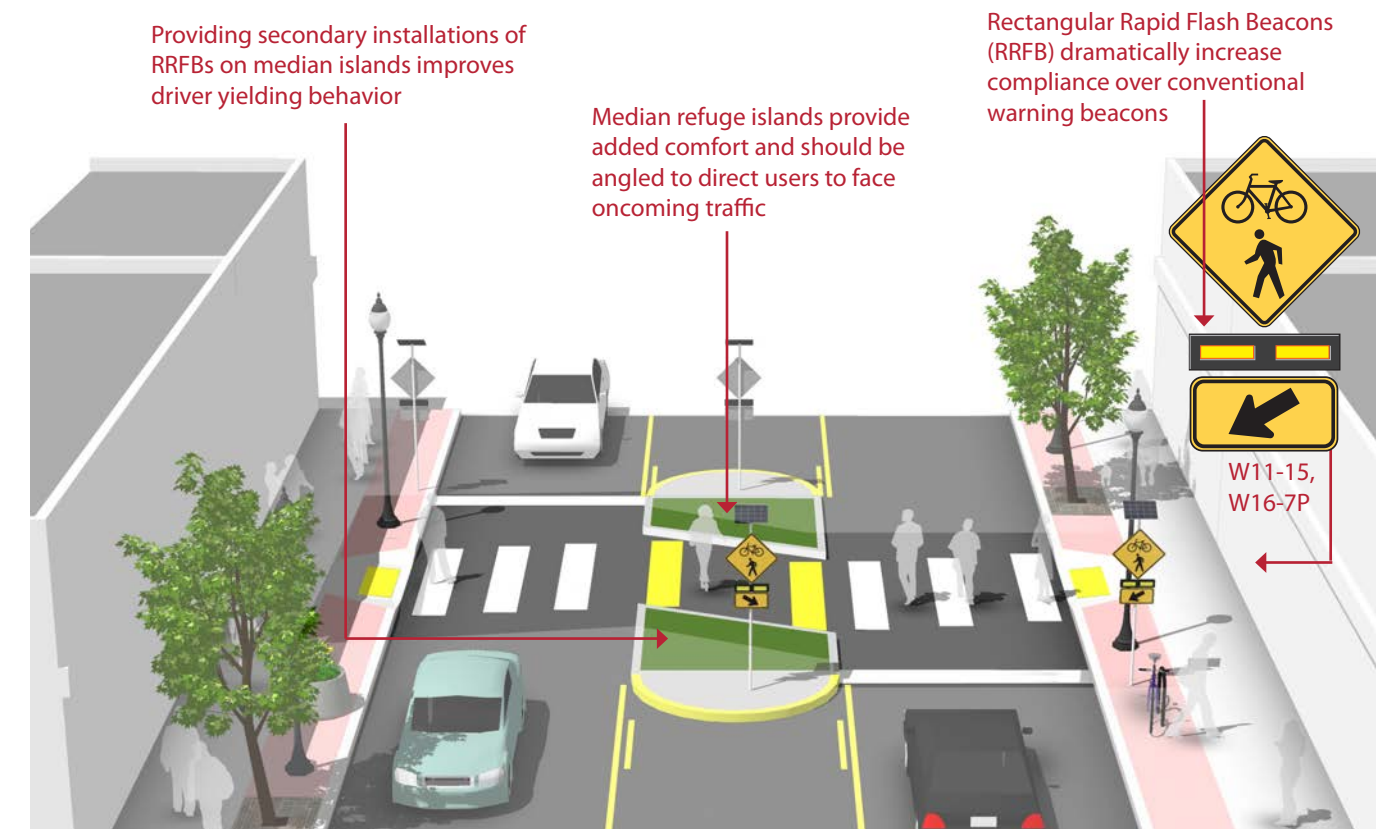
Enhanced marked crossings are unsignalized crossings with additional treatments designed to increase motor vehicle yielding compliance on multi-lane or high volume roadways.

These enhancements include pathway user or sensor actuated warning beacons, Rectangular Rapid Flash Beacons (RRFB) shown below, or in-roadway warning lights.

Guidance

Guidance for marked/unsignalized crossings applies.

- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.
- Warning beacons shall initiate operation based on user actuation and shall cease operation at a pre-determined time after the user actuation or, with passive detection, after the user clears the crosswalk.



Discussion

Rectangular rapid flash beacons show the most increased compliance of all the warning beacon enhancement options.

A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88%. Additional studies of long term installations show little to no decrease in yielding behavior over time.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)*. 2008.
SCDOT. *Traffic Engineering Guideline TG-33: Rectangular Rapid Flash Beacons*.

Materials and Maintenance

Locate markings out of wheel tread when possible to minimize wear and maintenance costs. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.



HYBRID WARNING BEACON (HAWK) FOR MID-BLOCK CROSSING

Description

Pedestrian hybrid beacons provide a high level of comfort for crossing users through the use of a red-signal indication to stop conflicting motor vehicle traffic.

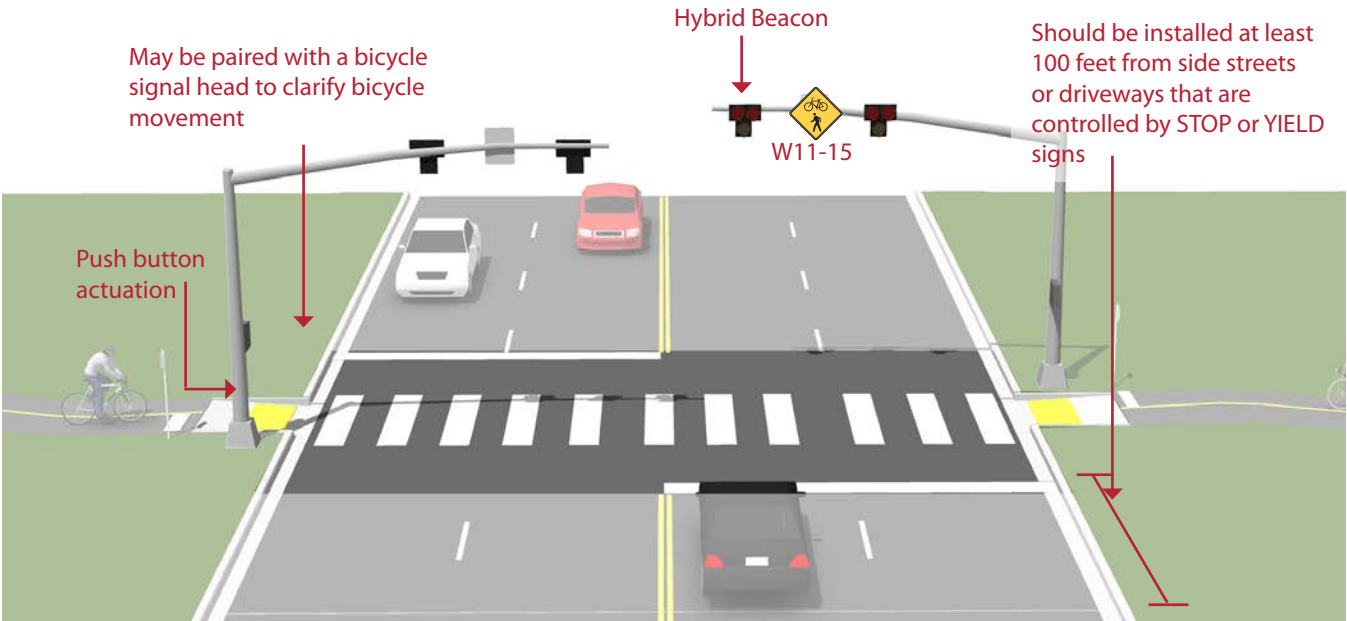
Hybrid beacon installation faces only cross motor vehicle traffic, stays dark when inactive, and uses a unique ‘wig-wag’ signal phase to indicate activation. Vehicles have the option to proceed after stopping during the final flashing red phase, which can reduce motor vehicle delay when compared to a full signal installation.

Guidance

Hybrid beacons (illustrated here) may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable path crossings.

FHWA does not allow bicycle signals to be used with Hybrid beacons, though some cities have done so successfully.

To maximize safety when used for bicycle crossings, the flashing ‘wig-wag’ phase should be very short and occur after the pedestrian signal head has changed to a solid “DON’T WALK” indication as bicyclists can enter an intersection quickly.



Discussion

Shared use path signals are normally activated by push buttons but may also be triggered by embedded loop, infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.

Additional References and Guidelines

SCDOT. *Traffic Guideline TG-26: Pedestrian Hybrid Beacon Guideline*.
FHWA. *Pedestrian Hybrid Beacon Guide - Recommendations and Case Study*. 2014.
NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Hybrid beacons are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

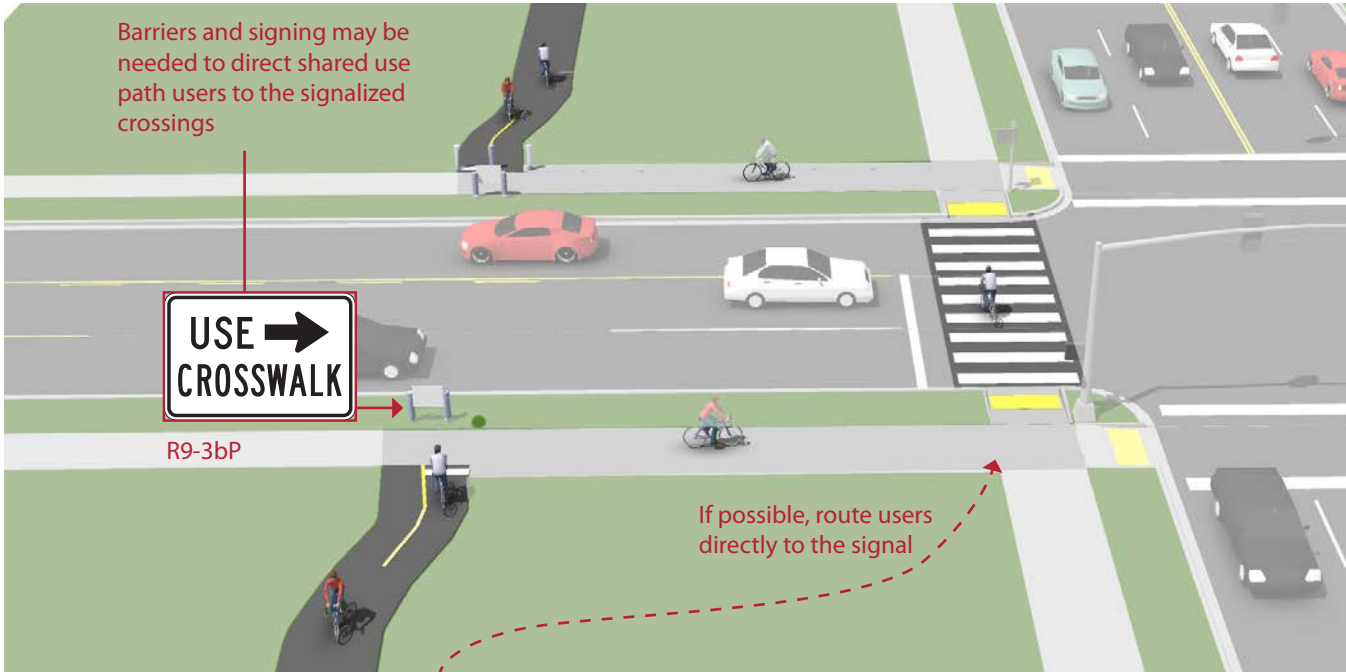
ROUTE USERS TO SIGNALIZED CROSSINGS

Description

Path crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal. For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.

Guidance

Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal.



Discussion

In the US, the minimum distance a marked crossing can be from an existing signalized intersection varies from approximately 250 to 660 feet. Engineering judgement and the context of the location should be taken into account when choosing the appropriate allowable setback. Pedestrians are particularly sensitive to out of direction travel and undesired mid-block crossing may become prevalent if the distance is too great.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

Materials and Maintenance

If a sidewalk is used for crossing access, it should be kept clear of snow and debris and the surface should be level for wheeled users.

**SHARED USE PATHS ARE
SEPARATED FROM TRAFFIC AND
PROVIDE A COMFORTABLE AND
DESIRABLE TRANSPORTATION
AND RECREATIONAL FACILITY
FOR USERS OF ALL SKILL
LEVELS**





GENERAL DESIGN PRACTICE

Description

Shared use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.

Guidance

Width

- 10 feet is recommended in most situations and will be adequate for most usage levels.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use.
- In constrained conditions for short distances, 8 foot width may be acceptable.

Lateral Clearance

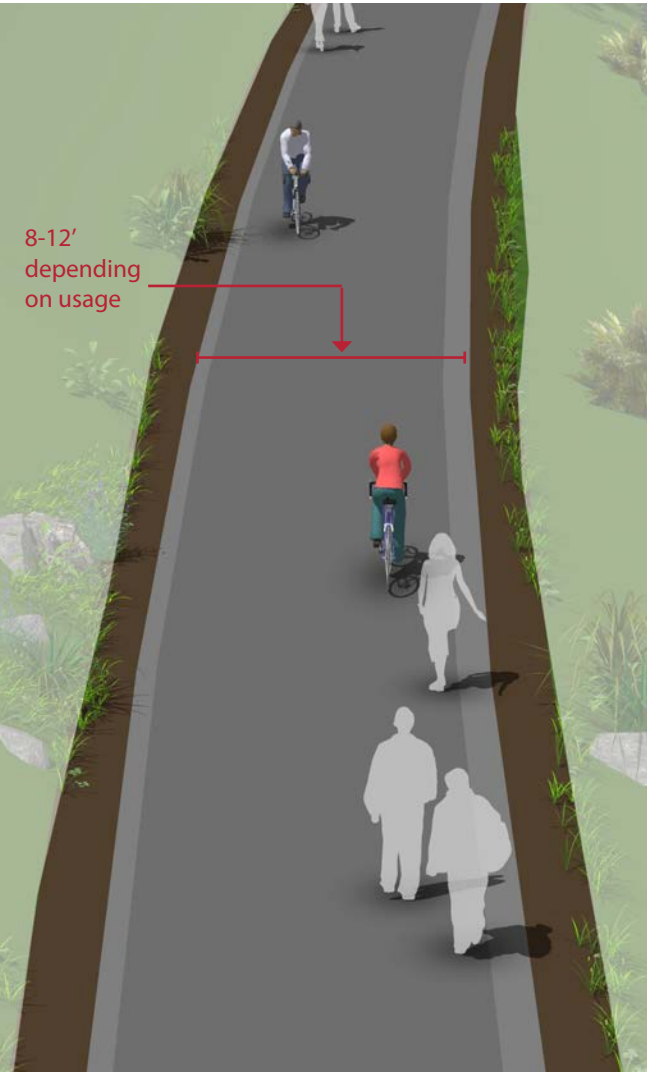
- A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.



GREENWAYS IN RIVER AND UTILITY CORRIDORS

Description

Utility and waterway corridors often offer excellent shared use path development and bikeway gap closure opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Guidance

Shared use paths in utility corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

Access Points

Any access point to the path should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles.

Path Closure

Public access to the shared use path may be prohibited during the following events:

- Canal/flood control channel or other utility maintenance activities
- Inclement weather or the prediction of storm conditions



Discussion

Terminate 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.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development*. 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

Discussion

Similar to railroads, public access to flood control channels or canals may be undesirable. Hazardous materials, deep water or swift current, steep, slippery slopes, and debris all may constitute risks for public access. Appropriate fencing may be desired to keep path users within the designated travel way. Creative design of fencing is encouraged to make the path facility feel welcoming to the user.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development*. 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.



GREENWAYS IN ABANDONED RAIL CORRIDORS

Description

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.

In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

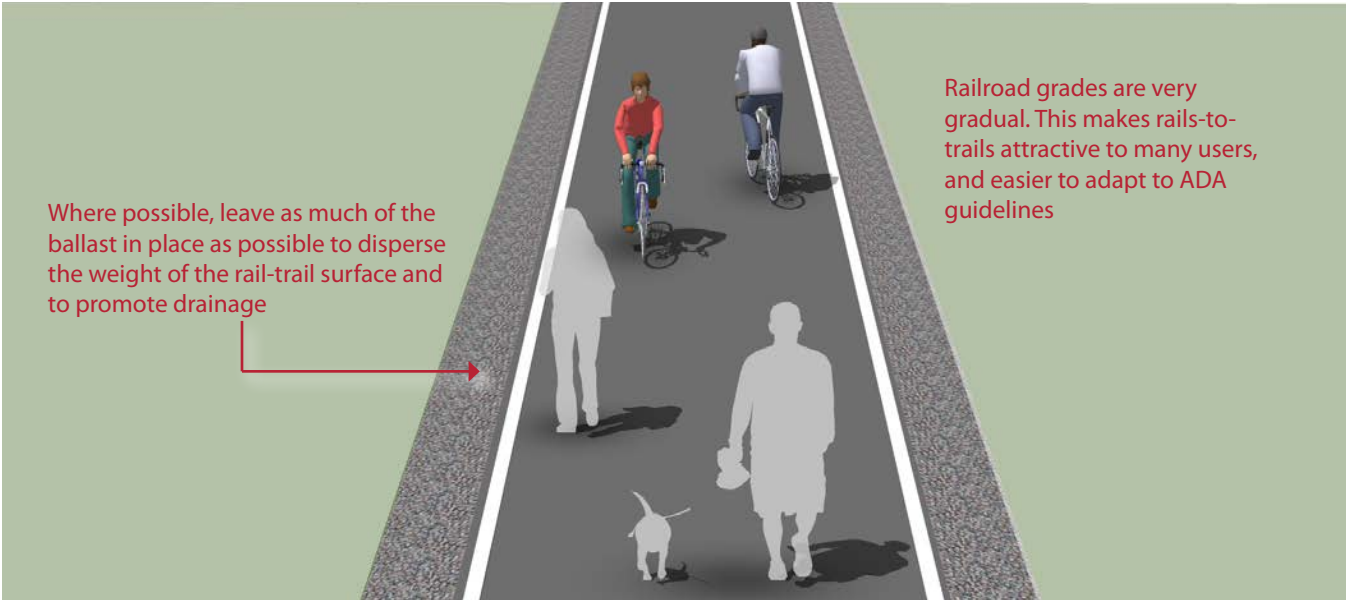
The railroad may form an agreement with any person, public or private, who would like to use the banked rail line as a trail or linear park until it is again needed for rail use. Municipalities should acquire abandoned rail rights-of-way whenever possible to preserve the opportunity for trail development.

Guidance

Shared use paths in abandoned rail corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

In full conversions of abandoned rail corridors, the sub-base, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

If converting a rail bed adjacent to an active rail line, see Shared Use Paths in Active Rail Corridors.



GREENWAYS IN ACTIVE RAIL CORRIDORS

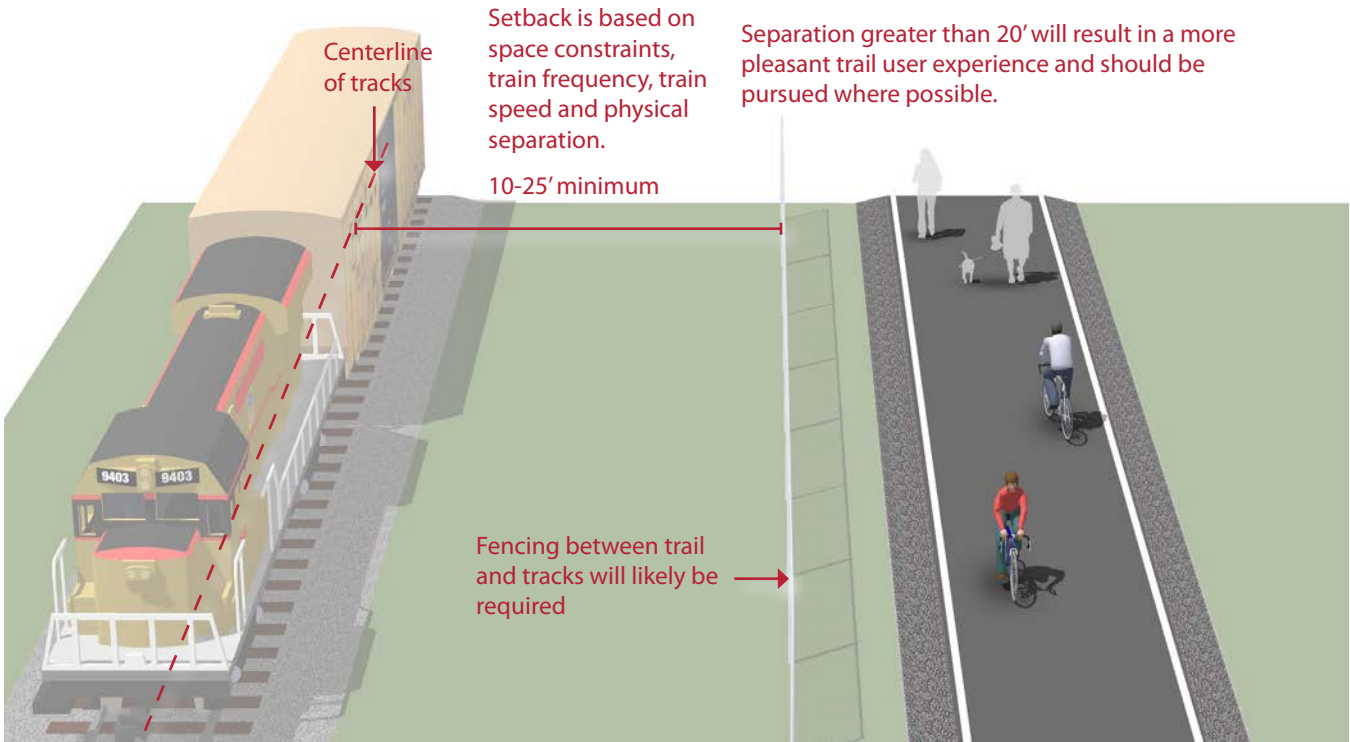
Description

Rails-with-Trails projects typically consist of paths adjacent to active railroads. It should be noted that some constraints could impact the feasibility of rail-with-trail projects. In some cases, space needs to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/trespassing, and numerous crossings may affect a project's feasibility.

Guidance

Shared use paths in utility corridors should meet or exceed general design standards. If additional width allows, wider paths, and landscaping are desirable.

If required, fencing should be a minimum of 5 feet in height with higher fencing than usual next to sensitive areas such as switching yards. Setbacks from the active rail line will vary depending on the speed and frequency of trains, and available right-of-way.



Discussion

It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum path widths, but often lack preferred shoulder and lateral clearance widths.

Rail-to-trails can involve many challenges including the acquisition of the right of way, cleanup and removal of toxic substances, and rehabilitation of tunnels, trestles and culverts. A structural engineer should evaluate existing railroad bridges for structural integrity to ensure they are capable of carrying the appropriate design loads.

Discussion

Railroads may require fencing with rail-with-trail projects. Concerns with trespassing and security can vary with the volume and speed of train traffic on the adjacent rail line and the setting of the shared use path, i.e. whether the section of track is in an urban or rural setting.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
Flink, C. *Greenways: A Guide To Planning Design And Development*. 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *Rails-with-Trails: Lessons Learned*. 2002.

Materials and Maintenance

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LOCAL NEIGHBORHOOD ACCESSWAYS

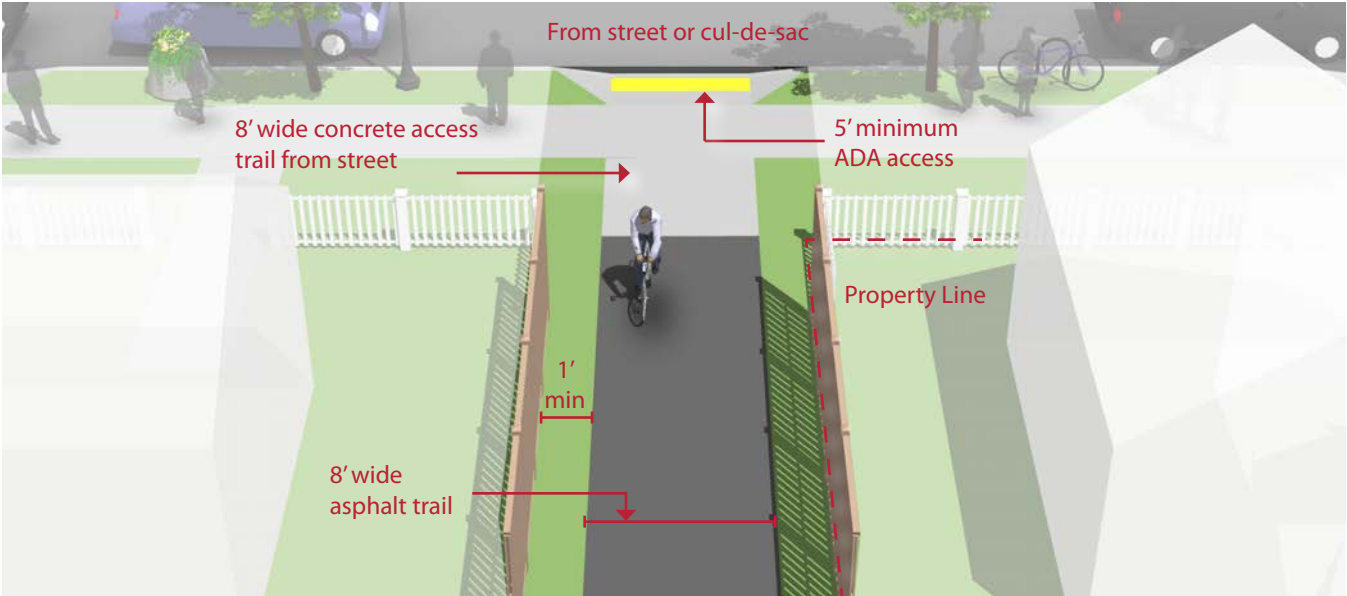
Description

Neighborhood accessways provide residential areas with direct bicycle and pedestrian access to parks, trails, greenspaces, and other recreational areas. They most often serve as small trail connections to and from the larger trail network, typically having their own rights-of-way and easements.

Additionally, these smaller trails can be used to provide bicycle and pedestrian connections between dead-end streets, cul-de-sacs, and access to nearby destinations not provided by the street network.

Guidance

- Neighborhood accessways should remain open to the public.
- Trail pavement shall be at least 8’ wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8’ wide only when necessary to protect large mature native trees over 18” in caliper, wetlands or other ecologically sensitive areas.
- Access trails should slightly meander whenever possible.



Discussion

Neighborhood accessways should be designed into new subdivisions at every opportunity and should be required by City/County subdivision regulations.

For existing subdivisions, Neighborhood and homeowner association groups are encouraged to identify locations where such connects would be desirable. Nearby residents and adjacent property owners should be invited to provide landscape design input.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *Federal Highway Administration University Course on Bicycle and Pedestrian Transportation. Lesson 19: Greenways and Shared Use Paths*. 2006.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

SHARED USE PATHS ALONG ROADWAYS

Description

Shared Use Paths along roadways, also called Sidepaths, are a type of path that run adjacent to a street.

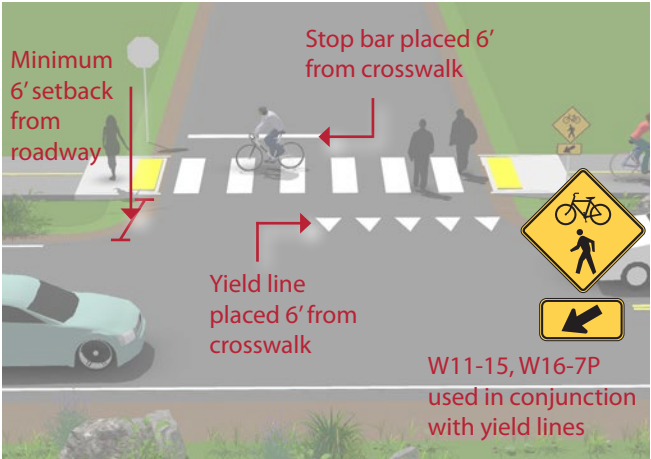
Because of operational concerns it is generally preferable to place paths within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available.

Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path.

The AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings.

In general, there are two approaches to crossings: adjacent crossings and setback crossings, illustrated below.

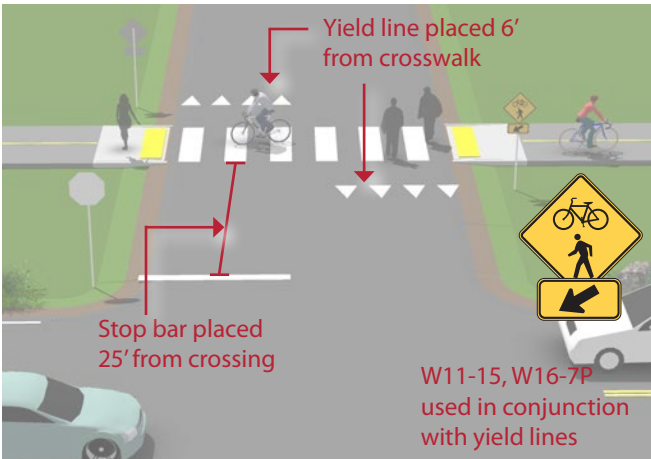
Adjacent Crossing - A separation of 6 feet emphasizes the conspicuity of riders at the approach to the crossing.



Guidance

- Guidance for sidepaths should follow that for general design practises of shared use paths.
- A high number of driveway crossings and intersections create potential conflicts with turning traffic. Consider alternatives to sidepaths on streets with a high frequency of intersections or heavily used driveways.
- Where a sidepath terminates special consideration should be given to transitions so as not to encourage unsafe wrong-way riding by bicyclists.
- Crossing design should emphasize visibility of users and clarity of expected yielding behavior. Crossings may be STOP or YIELD controlled depending on sight lines and bicycle motor vehicle volumes and speeds.

Setback Crossing - A set back of 25 feet separates the path crossing from merging/turning movements that may be competing for a driver's attention.



Discussion

The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodation such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.

To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
NACTO. *Urban Bikeway Design Guide*. See entry on Raised Cycle Tracks. 2012.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

PATH/ROADWAY CROSSING TYPES



MARKED/UNSIGNALIZED CROSSINGS

Description

A marked/unsignalized crossing typically consists of a marked crossing area, signage and other markings to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

When space is available, using a median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.

See Active Warning Beacons (RRFB) and Hybrid Warning Beacons (HAWK) for more information on enhanced bicycle and pedestrian crossing treatments at unsignalized crossings locations.

Guidance

Maximum traffic volumes

- ≤9,000-12,000 Average Daily Traffic (ADT) volume
- Up to 15,000 ADT on two-lane roads, preferably with a median
- Up to 12,000 ADT on four-lane roads with median

Maximum travel speed

- 35 MPH

Minimum line of sight

- 25 MPH zone: 155 feet
- 35 MPH zone: 250 feet
- 45 MPH zone: 360 feet



Discussion

Unsignalized crossings of multi-lane arterials over 15,000 ADT may be possible with features such as sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons or in-pavement flashers, and excellent sight distance. For more information see the discussion of active warning beacons.

On roadways with low to moderate traffic volumes (<12,000 ADT) and a need to control traffic speeds, a raised crosswalk may be the most appropriate crossing design to improve pedestrian visibility and safety.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Locate markings out of wheel tread when possible to minimize wear and maintenance costs.

FULL TRAFFIC SIGNAL CROSSINGS

Description

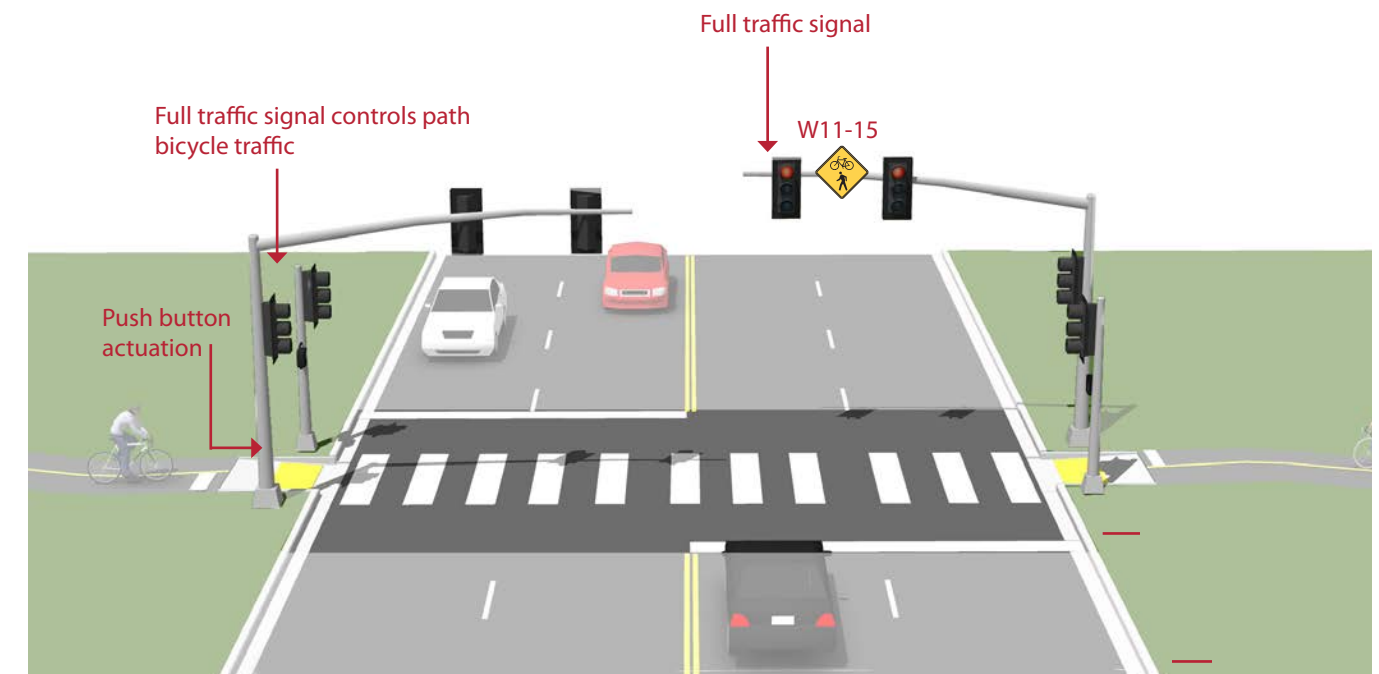
Signalized crossings provide the most protection for crossing path users through the use of a red-signal indication to stop conflicting motor vehicle traffic.

A full traffic signal installation treats the path crossing as a conventional 4-way intersection and provides standard red-yellow-green traffic signal heads for all legs of the intersection.

Guidance

Full traffic signal installations must meet MUTCD pedestrian, school or modified warrants. Additional guidance for signalized crossings:

- Located more than 300 feet from an existing signalized intersection
- Roadway travel speeds of 40 MPH and above
- Roadway ADT exceeds 15,000 vehicles



Discussion

Shared use path signals are normally activated by push buttons but may also be triggered by embedded loop, infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.

Additional References and Guidelines

FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Traffic signals require routine maintenance. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.



UNDERCROSSINGS

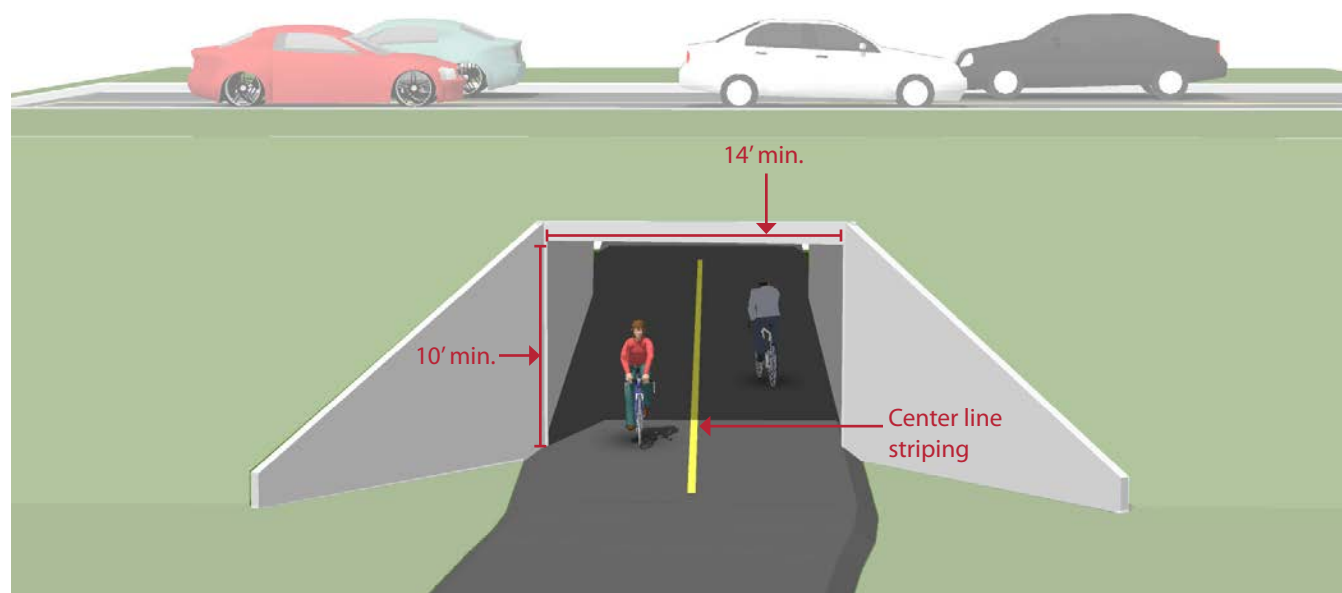
Description

Bicycle/pedestrian undercrossings provide critical non-motorized system links by joining areas separated by barriers such as railroads and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.

Guidance

- 14 foot minimum width, greater widths preferred for lengths over 60 feet.
- 10 foot minimum height.
- The undercrossing should have a centerline stripe even if the rest of the path does not have one.
- Lighting should be considered during the design process for any undercrossing with high anticipated use or in culverts and tunnels.



Discussion

Safety is a major concern with undercrossings. Shared use path users may be temporarily out of sight from public view and may experience poor visibility themselves. To mitigate safety concerns, an undercrossing should be designed to be spacious, well-lit, equipped with emergency call boxes at each end and completely visible for its entire length from end to end.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

Materials and Maintenance

14 foot width allows for maintenance vehicle access.

Potential problems include conflicts with utilities, drainage, flood control and vandalism.

OVERCROSSINGS

Description

Bicycle/pedestrian overcrossings provide critical non-motorized system links by joining areas separated by barriers such as deep canyons, waterways or major transportation corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.

Overcrossings require a minimum of 17 feet of vertical clearance to the roadway below versus a minimum elevation differential of around 12 feet for an undercrossing. This results in potentially greater elevation differences and much longer ramps for bicycles and pedestrians to negotiate.

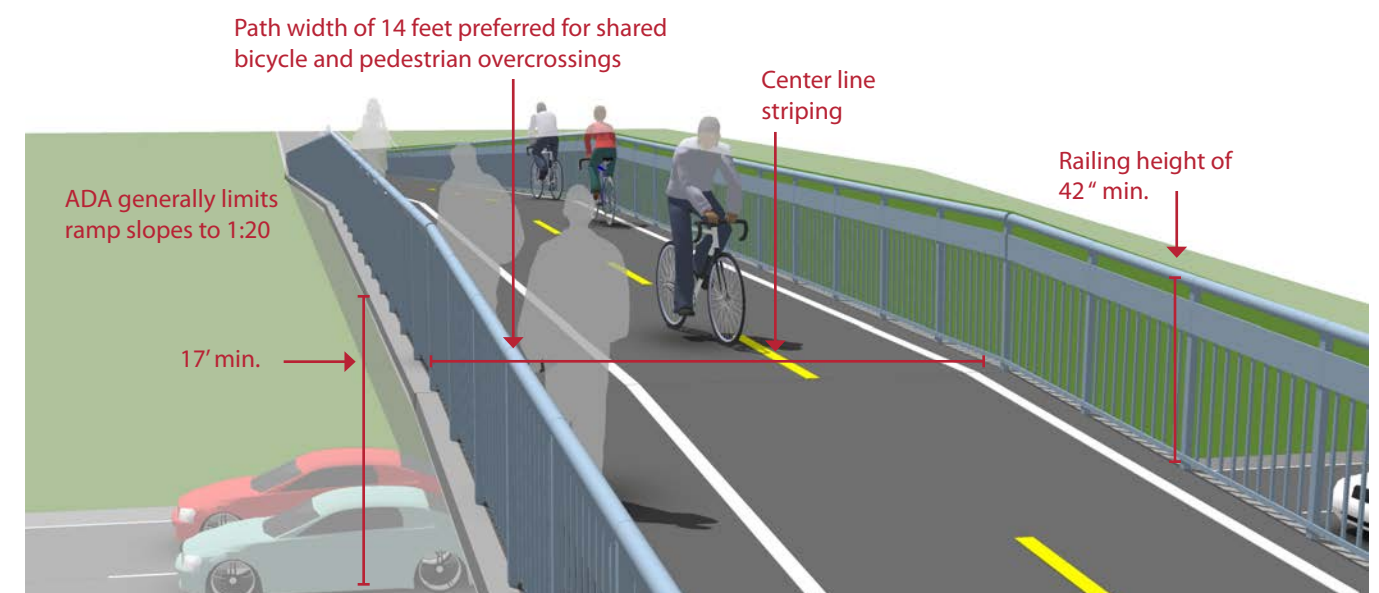
Guidance

8 foot minimum width, 14 feet preferred. If overcrossing has any scenic vistas additional width should be provided to allow for stopping. A separate 5 foot pedestrian area may be provided for facilities with high bicycle and pedestrian use.

10 foot headroom on overcrossing; clearance below will vary depending on feature being crossed.

Roadway:	17 feet
Freeway:	18.5 feet
Heavy Rail Line:	23 feet

The overcrossing should have a centerline stripe even if the rest of the path does not have one.



Discussion

Overcrossings for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet.

Overcrossings pose potential concerns about visual impact and functional appeal, as well as space requirements necessary to meet ADA guidelines for slope.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004.

Materials and Maintenance

Potential issues with vandalism.

Overcrossings can be more difficult to clear of snow than undercrossings.

**THE UNIQUE CHARACTER
AND NEEDS OF
BICYCLING RELATING
TO ROADWAY SAFETY
REQUIRE QUALITY
FACILITIES THAT
MINIMIZE RISK.**





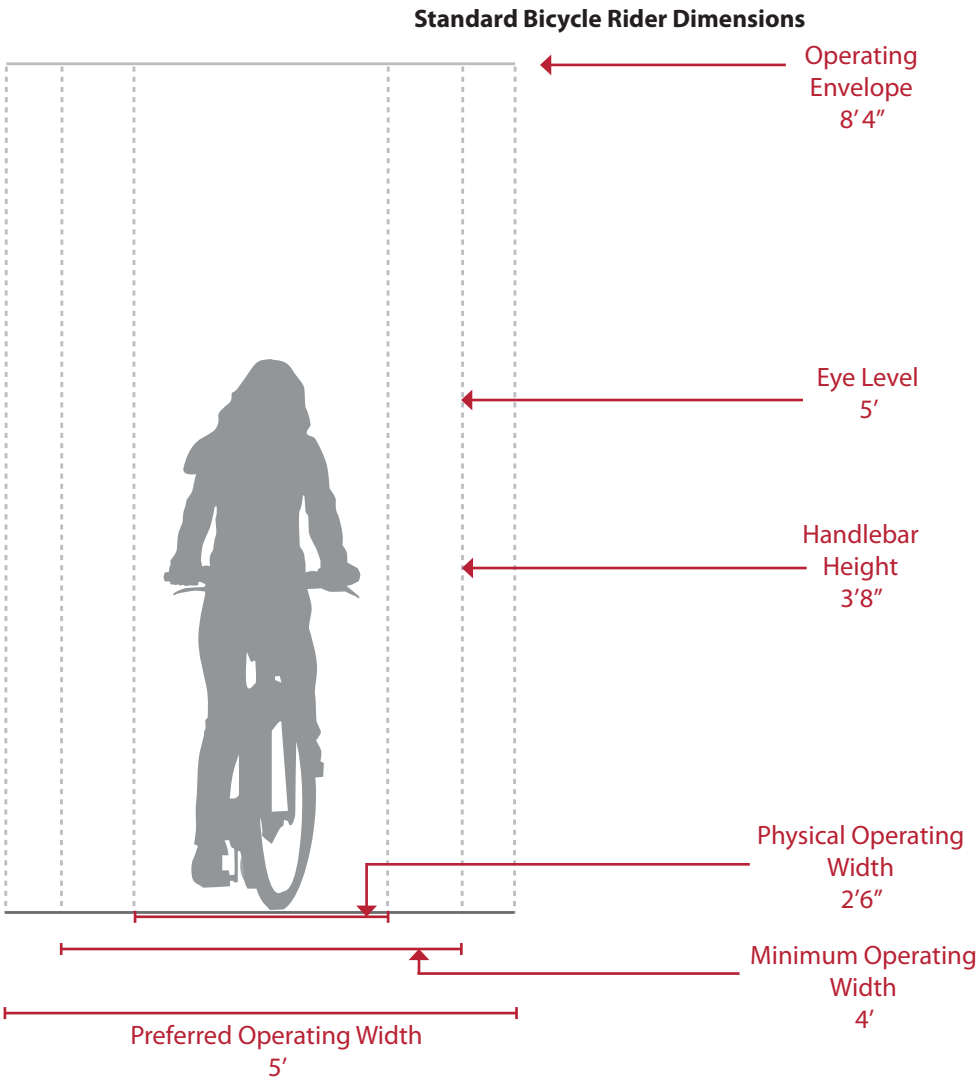
DESIGN NEEDS OF BICYCLISTS

The purpose of this section 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 affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile’s structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

Bicycle as a Design Vehicle

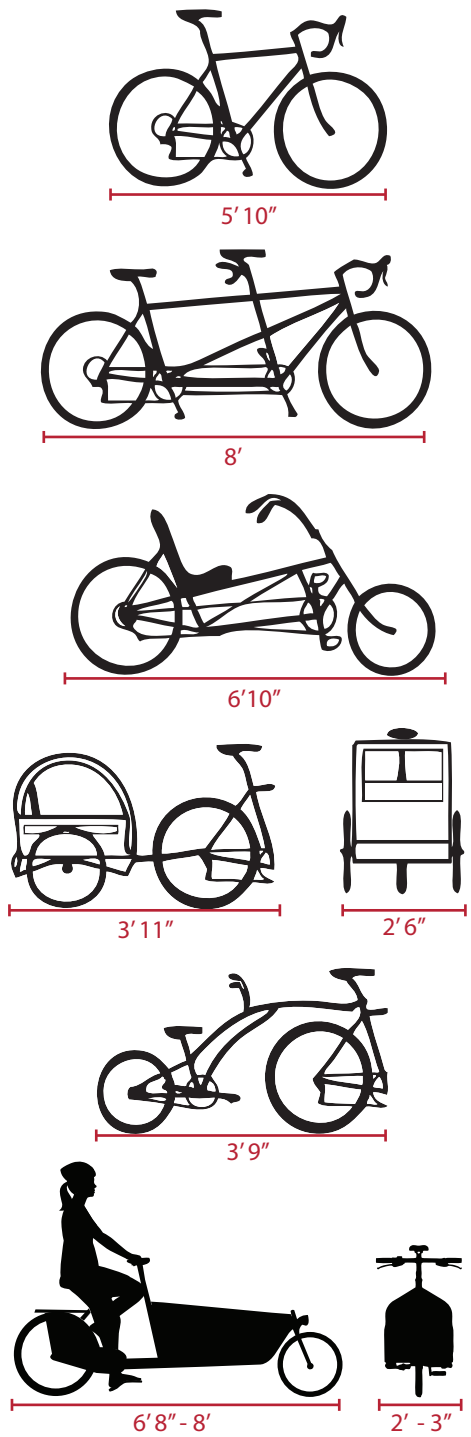
Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

The figure below illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet may be minimally acceptable.



Source: AASHTO Guide for the Development of Bicycle Facilities, 4th Edition. 2012.

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure and table below summarize the typical dimensions for bicycle types.



Bicycle as Design Vehicle - Typical Dimensions

Source: AASHTO Guide for the Development of Bicycle Facilities, 4th Edition *AASHTO does not provide typical dimensions for tricycles.

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
Recumbent Bicyclist	Vertical clearance to obstructions (tunnel height, lighting, etc)	10 ft
	Approximate center of gravity	2 ft 9 in - 3 ft 4 in
	Physical length	8 ft
Tandem Bicyclist	Eye height	3 ft 10 in
	Physical length	8 ft
Bicyclist with child trailer	Physical length	10 ft
	Physical width	2 ft 6 in

Bicycle as Design Vehicle - 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

*Tandem bicycles and bicyclists with trailers have typical speeds equal to or less than upright adult bicyclists.

Design Speed Expectations

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths. The table to the right provides typical bicyclist speeds for a variety of conditions.

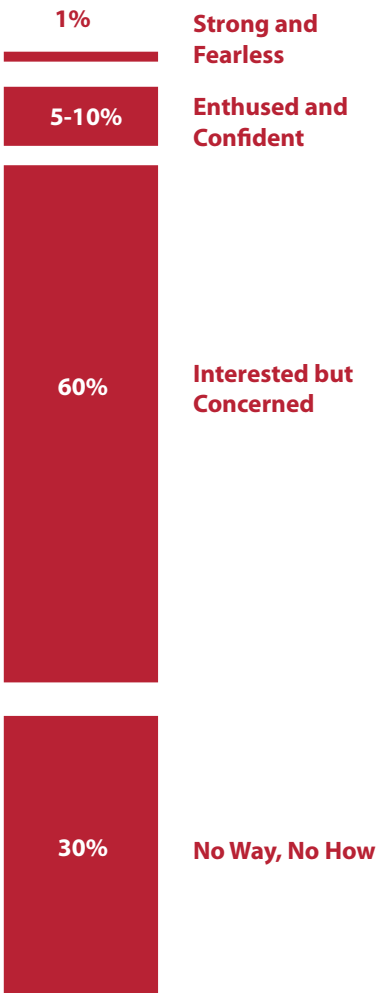


Types of Bicyclists

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people.

The bicycle planning and engineering professions currently use several systems to classify the population which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. The current AASHTO Guide to the Development of Bicycle Facilities encourages designers to identify their rider type based on the trip purpose (Recreational vs Transportation) and on the level of comfort and skill of the rider (Causal vs Experienced). A more detailed framework for understanding of the US population's relationship to transportation focused bicycling is illustrated in the figure below. Developed by planners in Portland, OR¹ and supported by research², this classification provides the following alternative categories to address varying attitudes towards bicycling in the US:

- **Strong and Fearless** (approximately 1% of population) – Characterized by bicyclists that will typically ride anywhere 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 shared use paths.
- **Enthusied and Confident** (5-10% of population) - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared use paths 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 such as commuters, recreationalists, racers and utilitarian bicyclists.
- **Interested but Concerned** (approximately 60% of population) – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or shared use paths under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become “Enthusied & Confident” with encouragement, education and experience.
- **No Way, No How** (approximately 30% of population) – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



Typical Distribution of Bicyclist Types

BICYCLE FACILITY SELECTION GUIDELINES

The specific bicycle facility type that should be provided depends on the surrounding environment (e.g. auto speed and volume, topography, and adjacent land use) and expected bicyclist needs (e.g. bicyclists commuting on a highway versus students riding to school on residential streets).



Facility Selection Guidelines

There are no 'hard and fast' rules for determining the most appropriate type of bicycle facility for a particular location – roadway speeds, volumes, right-of-way width, presence of parking, adjacent land uses, and expected bicycle user types are all critical elements of this decision. Studies find that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds. Additionally, most bicyclists prefer facilities separated from motor vehicle traffic or located on local roads with low motor vehicle traffic speeds and volumes. Because off-street pathways are physically separated from the roadway, they are perceived as safe and attractive routes for bicyclists who prefer to avoid motor vehicle traffic. Consistent use of treatments and application of bikeway facilities allow users to anticipate whether they would feel comfortable riding on a particular facility, and plan their trips accordingly. This section provides guidance on various factors that affect the type of facilities that should be provided.



¹ Roger Geller, City of Portland Bureau of Transportation. *Four Types of Cyclists*. <http://www.portlandonline.com/transportation/index.cfm?a=237507>. 2009.

² Dill, J., McNeil, N. *Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential*. 2012.



FACILITY CLASSIFICATION

Description

Consistent with bicycle facility classifications throughout the nation, these Bicycle Facility Design Guidelines identify the following classes of facilities by degree of separation from motor vehicle traffic.

Shared roadways are bikeways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. The most basic type of bikeway is a signed shared roadway. This facility provides continuity with other bicycle facilities (usually bike lanes), or designates preferred routes through high-demand corridors.



Shared roadways may also be designated by pavement markings, signage and other treatments including directional signage, traffic diverters, chicanes, chokers and /or other traffic calming devices to reduce vehicle speeds or volumes. Such treatments often are associated with Neighborhood Greenways.



Separated Bikeways, such as bike lanes, use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movements by both bicyclists and motorists.



Cycle Tracks are exclusive bike facilities that combine the user experience of a separated path with the on-street infrastructure of conventional bike lanes.



Shared Use Paths are facilities separated from roadways for use by bicyclists and pedestrians.



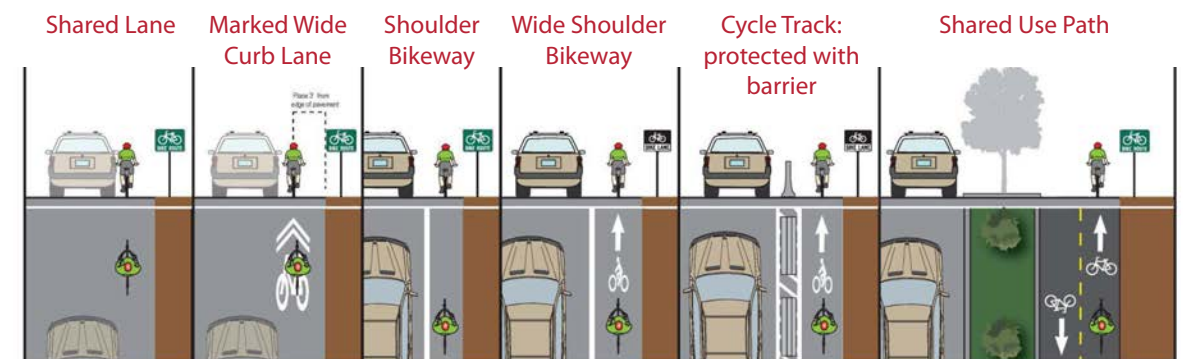
FACILITY CONTINUA

The following continua illustrate the range of bicycle facilities applicable to various roadway environments, based on the roadway type and desired degree of separation. Engineering judgment, traffic studies, previous municipal planning efforts, community input and local context should be used to refine criteria when developing bicycle facility recommendations for a particular street. In some corridors, it may be desirable to construct facilities to a higher level of treatment than those recommended in relevant planning documents in order to enhance user safety and comfort. In other cases, existing and/or future motor vehicle speeds and volumes may not justify the recommended level of separation, and a less intensive treatment may be acceptable.

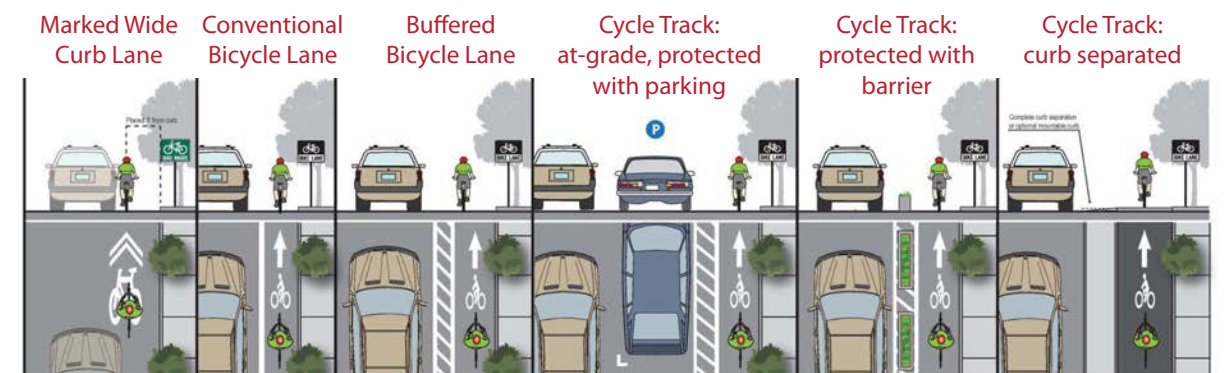
Least Protected

Most Protected

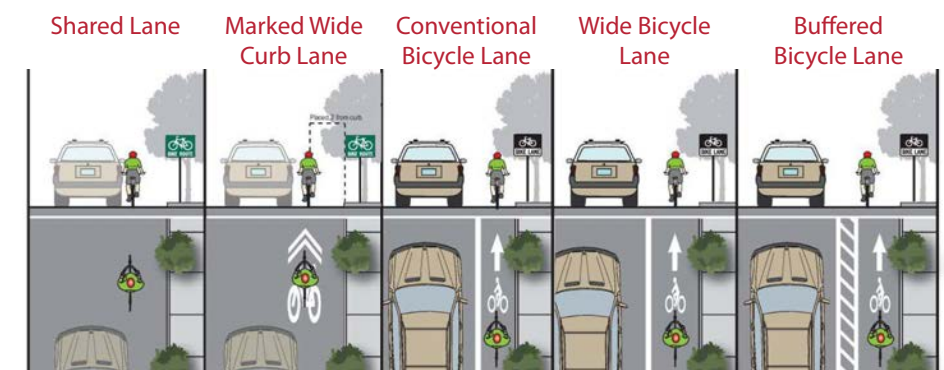
Arterial/Highway Bikeway Continuum (without curb and gutter)



Arterial/Highway Bikeway Continuum (with curb and gutter)



Collector Bikeway Continuum



SHARED ROADWAYS





SIGNED SHARED ROADWAYS

Description

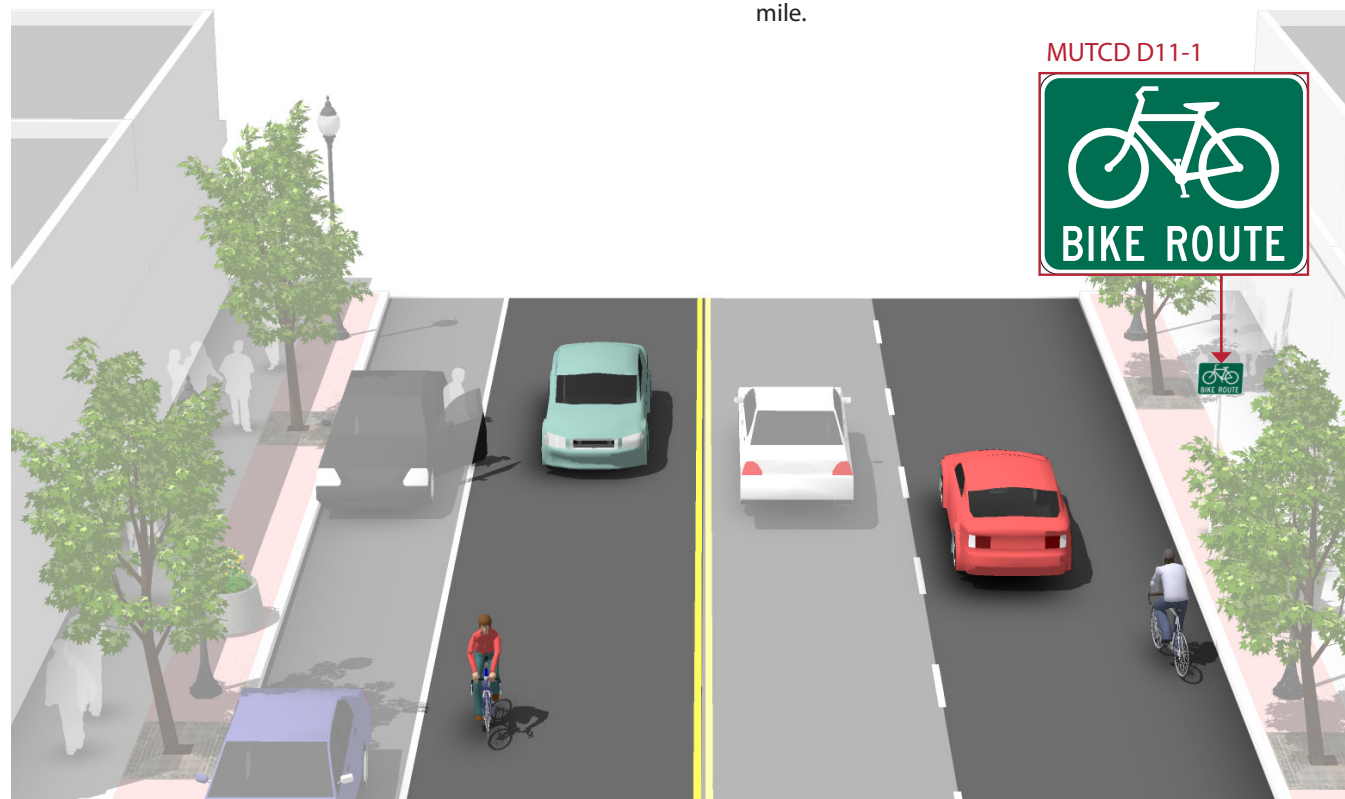
Signed shared roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Guidance

Lane width varies depending on roadway configuration.

Bike route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.



Discussion

Signed Shared Roadways serve either to provide continuity with other bicycle facilities (usually bike lanes) or to designate preferred routes through high-demand corridors.

This configuration differs from a neighborhood greenway due to a lack of traffic calming, wayfinding, pavement markings and other enhancements designed to provide a higher level of comfort for a broad spectrum of users.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs, and will need periodic replacement due to wear.

MARKED SHARED ROADWAYS

Description

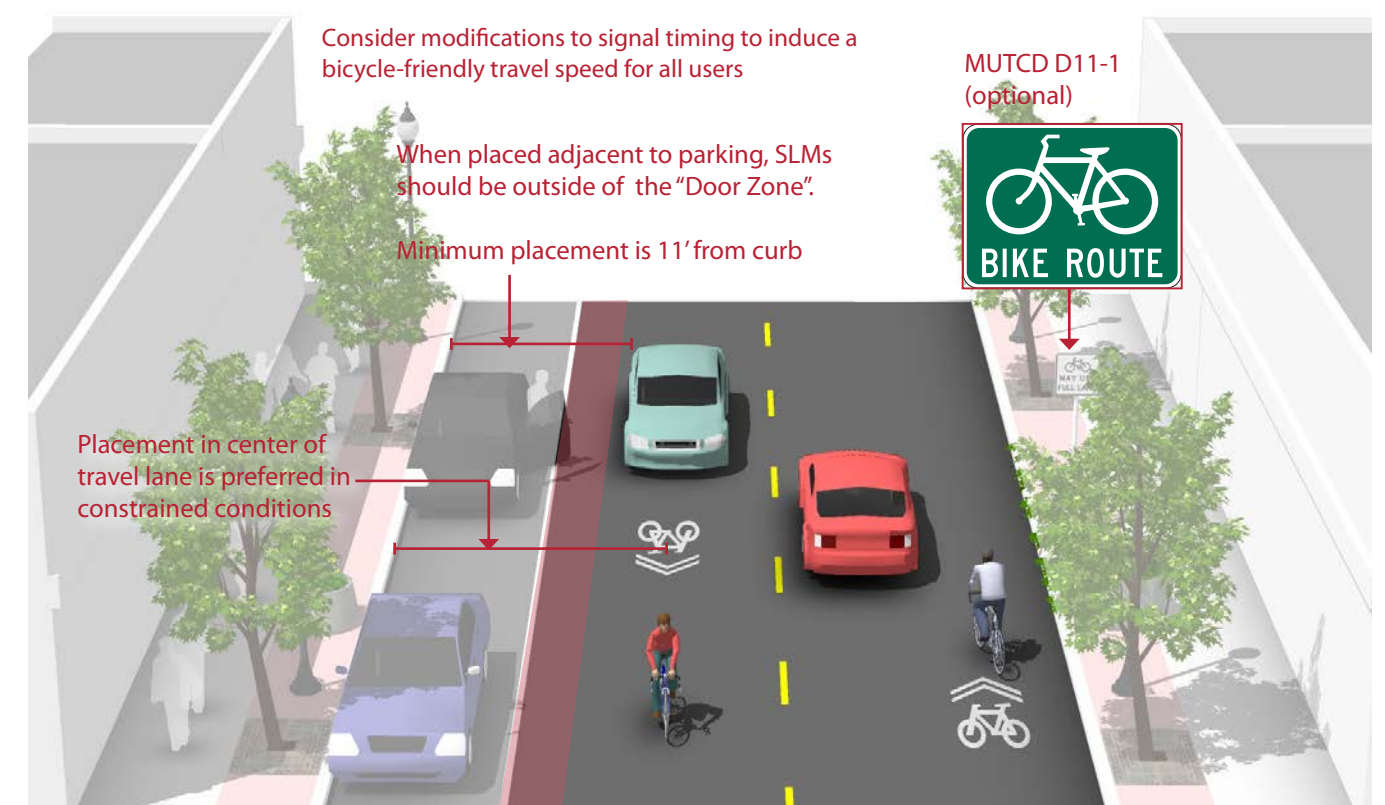
A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed in the middle of the lane. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.

In all conditions, SLMs should be placed outside of the door zone of parked cars.

Guidance

- May be used on streets with a speed limit of 35 mph or under. Lower than 30 mph speed limit preferred.
- In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



Discussion

If collector or arterial, this should not be a substitute for dedicated bicycle facilities if space is available.

Bike Lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space. SLMs shall not be used on shoulders, in designated bike lanes, or to designate bicycle detection at signalized intersections. (MUTCD 9C.07)

Additional References and Guidelines

SCDOT. *TG-24: Use of Shared Lane Marking Symbols*.
AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Placing SLMs between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.



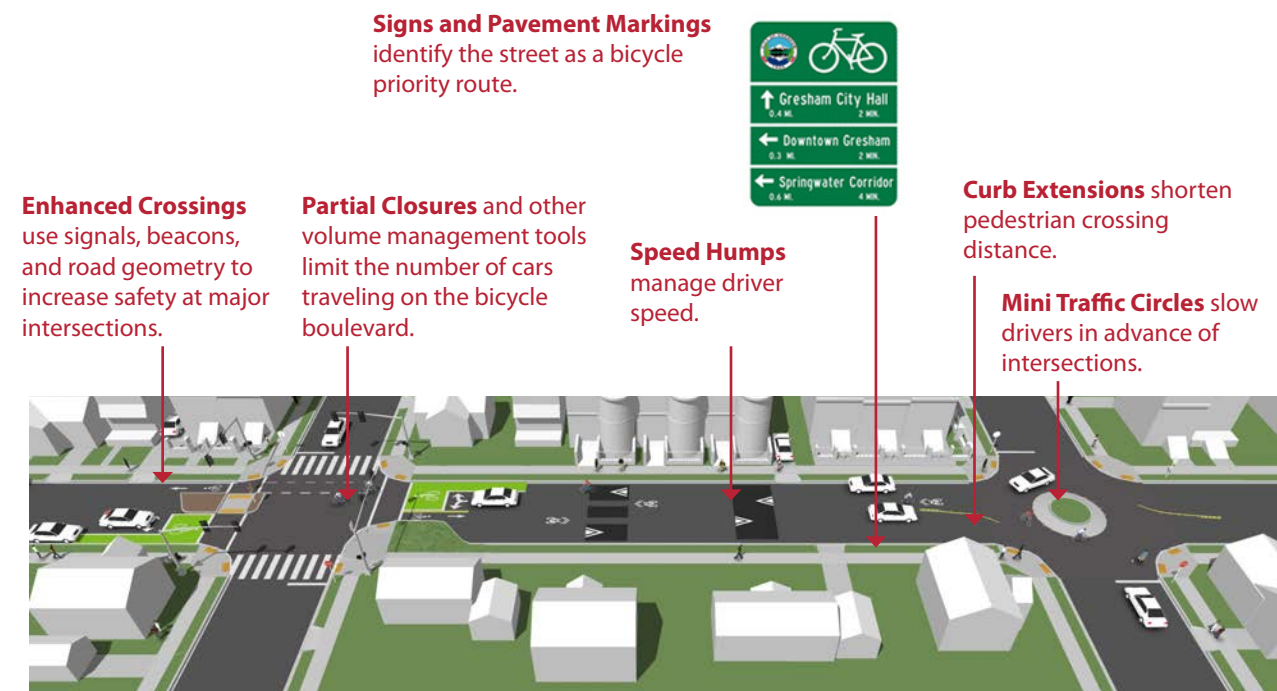
BICYCLE BOULEVARDS

Description

Bicycle boulevards are low-volume, low-speed streets modified to enhance bicyclist comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic.

Guidance

- Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.
- Bicycle boulevards should have a maximum posted speed of 25 mph. Use traffic calming to maintain an 85th percentile speed below 22 mph.
- Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Target motor vehicle volumes range from 1,000 to 3,000 vehicles per day.
- Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.



Discussion

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis.

Additional References and Guidelines

Alta Planning + Design and IBPI. *Bicycle Boulevard Planning and Design Handbook*. 2009.
BikeSafe. *Bicycle countermeasure selection system*.
Ewing, Reid. *Traffic Calming: State of the Practice*. 1999.
Ewing, Reid and Brown, Steven. *U.S. Traffic Calming Manual*. 2009.

Materials and Maintenance

Vegetation should be regularly trimmed to maintain visibility and attractiveness.

ADVISORY BIKE LANE

Description

Advisory bike lanes are bicycle priority areas delineated by dotted white lines, separated from a narrow automobile travel area. The automobile zone should be configured narrowly enough so that two cars cannot pass each other in both directions without crossing the advisory lane line.

Motorists may only enter the bicycle zone when no bicycles are present. Motorists must overtake with caution due to potential oncoming traffic.

Guidance

- Advisory bike lanes can be used on roadways where the following conditions exist:
- Motor vehicle traffic is <4000 motor vehicles per day (<2000 preferred).
 - Advisory bike lane width of 5 to 7 ft.
 - Minimum 2-way motor vehicle travel lane width of 13-18 feet.
 - No centerline on roadway.



Discussion

Most appropriate when roadways are straight with few bends, inclines or sightline obstructions. Consider the use of colored pavement within the bicycle priority area to discourage unnecessary encroachment by motorists or parked vehicles. This treatment requires a request to experiment to be implemented on roadways funded with federal transportation dollars.

Additional References and Guidelines

City of Minneapolis. Request To Experiment. July 2010.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

SEPARATED BIKEWAYS





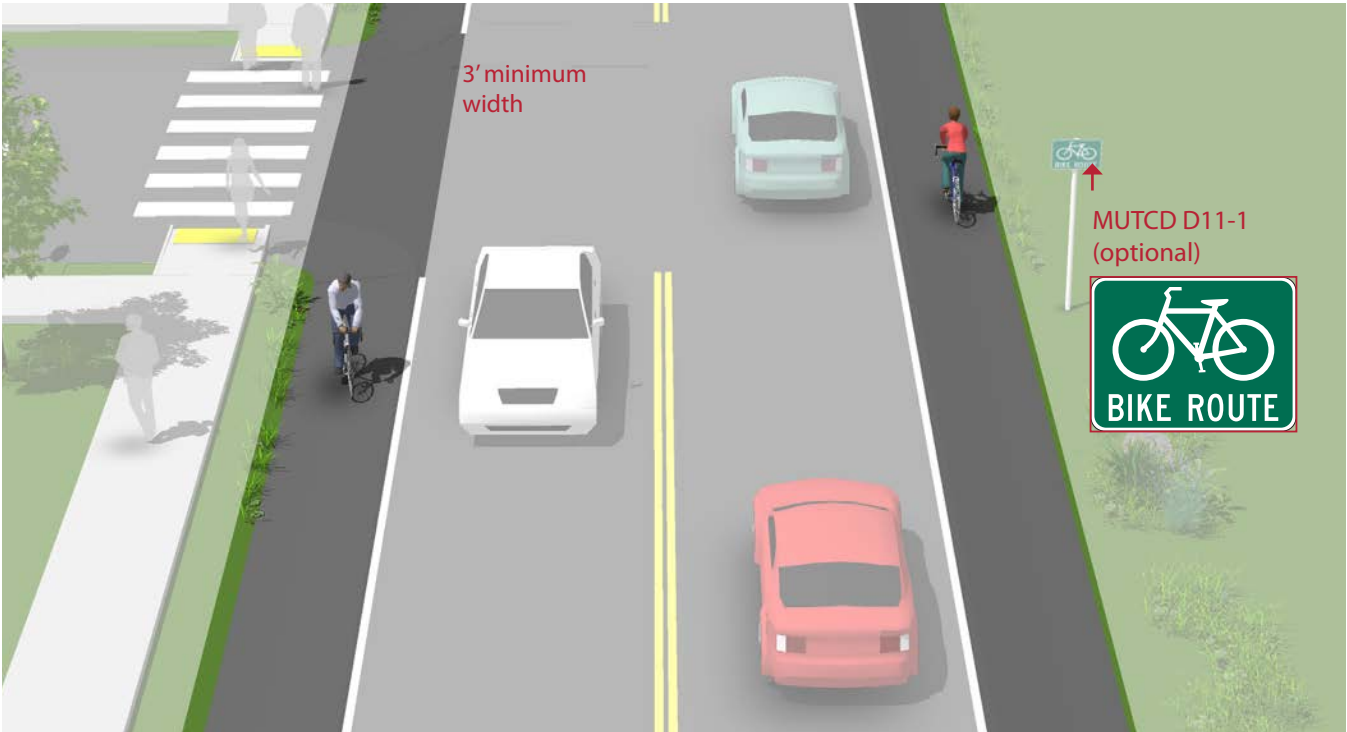
SHOULDER BIKEWAYS

Description

Typically found in less-dense areas, shoulder bikeways are paved roadways with striped shoulders (4'+) wide enough for bicycle travel. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary treatment, with full bike lanes planned for construction when the roadway is widened or completed with curb and gutter. This type of treatment is not typical in urban areas and should only be used where constraints exist.

Guidance

- If 4 feet or more is available for bicycle travel, the full bike lane treatment of signs, legends, and an 8" bike lane line would be provided.
- If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.
 - Rumble strips are not recommended on shoulders used by bicyclists unless there is a minimum 4 foot clear path. 12 foot gaps every 40-60 feet should be provided to allow access as needed.



CONVENTIONAL BIKE LANE

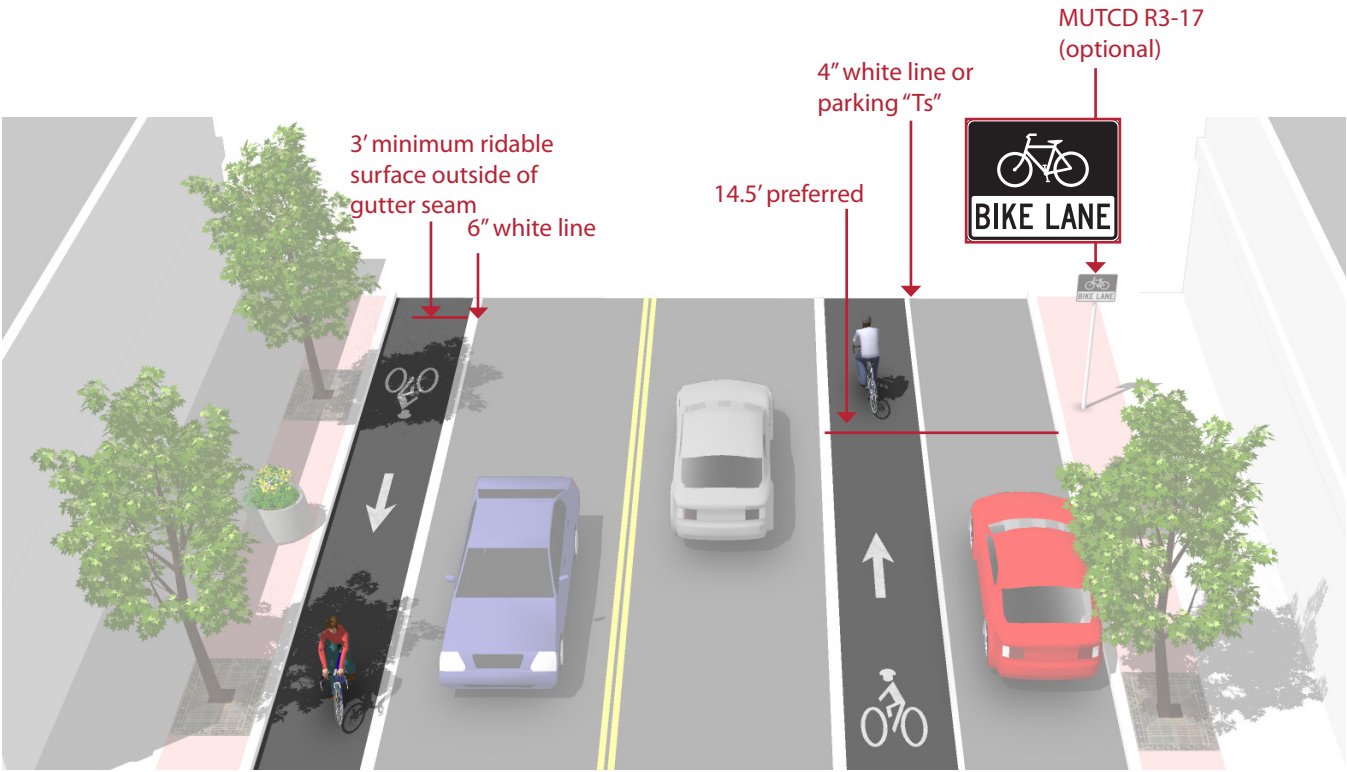
Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

Guidance

- 4 foot minimum when no curb and gutter is present.
- 5 foot minimum when adjacent to curb and gutter or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.
- 14.5 foot preferred from curb face to edge of bike lane. (12 foot minimum).
- 7 foot maximum width for use adjacent to arterials with high travel speeds. Greater widths may encourage motor vehicle use of bike lane.



Discussion

A wide outside lane may be sufficient accommodation for bicyclists on streets with insufficient width for bike lanes but which do have space available to provide a wider (14'-16') outside travel lane. Consider configuring as a marked shared roadway in these locations.

Additional References and Guidelines

SCDOT. EDM 53: Installation of Rumble Strips.
AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Shoulder bikeways should be cleared of snow through routine snow removal operations.

Discussion

Wider bicycle lanes are desirable in certain situations such as on higher speed arterials (45 mph+) where use of a wider bicycle lane would increase separation between passing vehicles and bicyclists. Appropriate signing and stenciling is important with wide bicycle lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane. Consider buffered bike lanes when further separation is desired.

Additional References and Guidelines

SCDOT. EDM 22: Considerations for Bicycle Facilities.
AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
NACTO. Urban Bikeway Design Guide. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.



BIKE LANE ADJACENT TO ON-STREET PARKING

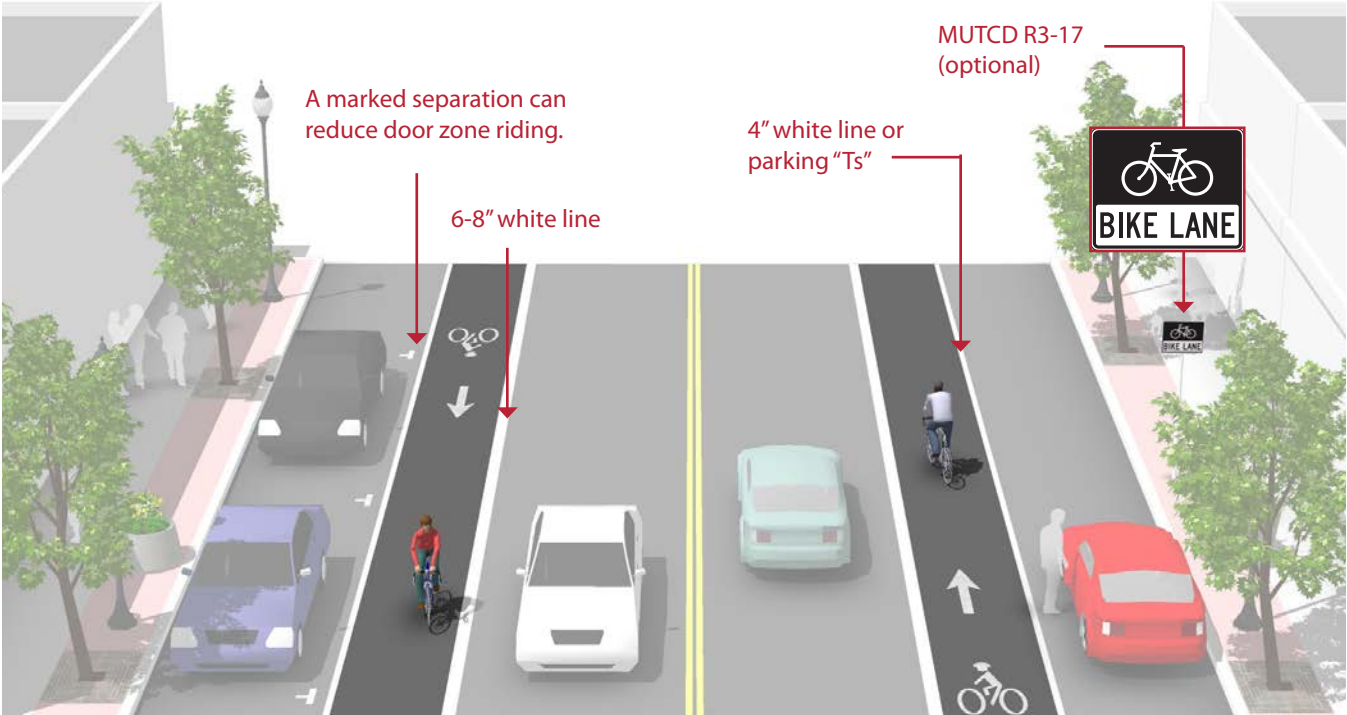
Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

Guidance

- 12 foot minimum from curb face to edge of bike lane.
- 14.5 foot preferred from curb face to edge of bike lane.
- 7 foot maximum for marked width of bike lane. Greater widths may encourage vehicle loading in bike lane. Configure as buffered bicycle lanes when a wider facility is desired.



Discussion

Bike lanes adjacent to on-street parallel parking require special treatment in order to avoid crashes caused by an open vehicle door. The bike lane should have sufficient width to allow bicyclists to stay out of the door zone while not encroaching into the adjacent vehicular lane. Parking stall markings, such as parking "Ts" and double white lines create a parking side buffer that encourages bicyclists to ride farther away from the door zone.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

BIKEWAYS AND DIAGONAL PARKING

Description

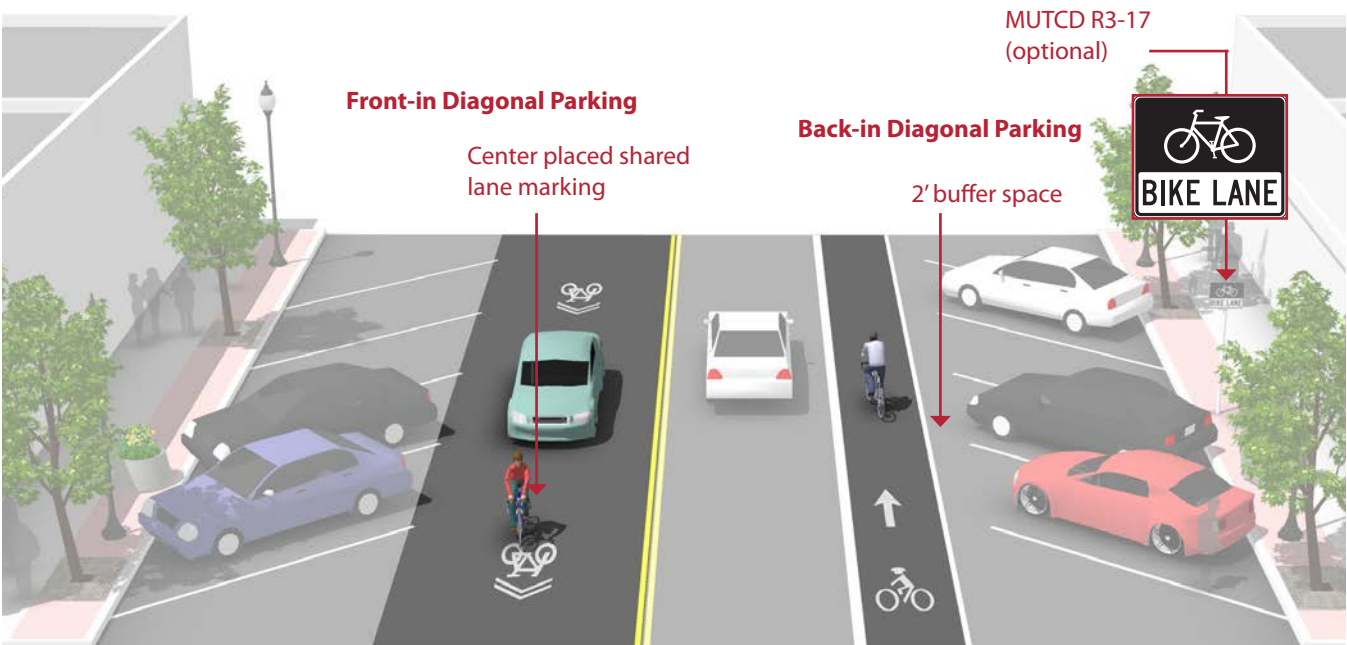
In certain areas with high parking demand such as urban commercial areas, diagonal parking can be used to increase parking supply.

Back-in diagonal parking improves sight distances between drivers and bicyclists when compared to conventional head-in diagonal parking. Back-in parking is best paired with a dedicated bicycle lane.

Conventional front-in diagonal parking is not compatible or recommended with the provision of bike lanes, as drivers backing out of conventional diagonal parking have limited visibility of approaching bicyclists. Under these conditions, shared lane markings should be used to guide bicyclists away from reversing automobiles.

Guidance

- Front-in Diagonal Parking
- Shared lane markings are the preferred facility with front-in diagonal parking
- Back-in Diagonal Parking
- 5 foot minimum marked width of bike lane
 - Parking bays are sufficiently long to accommodate most vehicles (so vehicles do not block bike lane)



Discussion

Back-in diagonal parking provides other benefits including loading and unloading of the trunk at the curb rather than in the street, passengers (including children) are directed by open doors towards the curb and there is no door conflict with bicyclists. While there may be a learning curve for some drivers, back-in diagonal parking is typically an easier maneuver than conventional parallel parking.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.



LEFT SIDE BIKE LANE

Description

Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets.

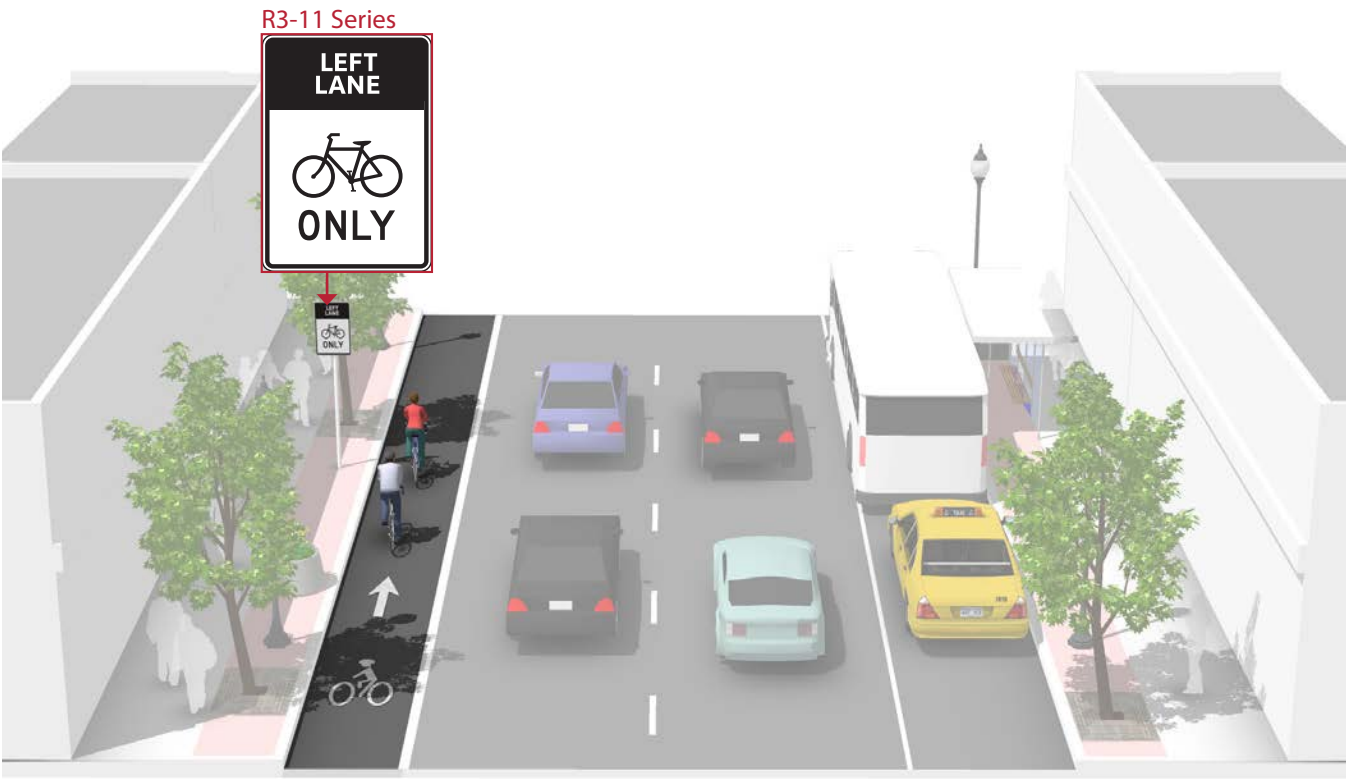
Left-side bike lanes offer advantages on streets with heavy delivery or transit use, frequent parking turnover on the right side or other potential conflicts that could be associated with right-side bicycle lanes.

Guidance

Follow guidance for conventional bike lanes.

Signage should accompany left-side bicycle lanes to clarify proper use by bicyclists to reduce wrong-way riding.

Bicycle through lanes should be provided to the right of vehicle left turn pockets to reduce conflicts at intersections.



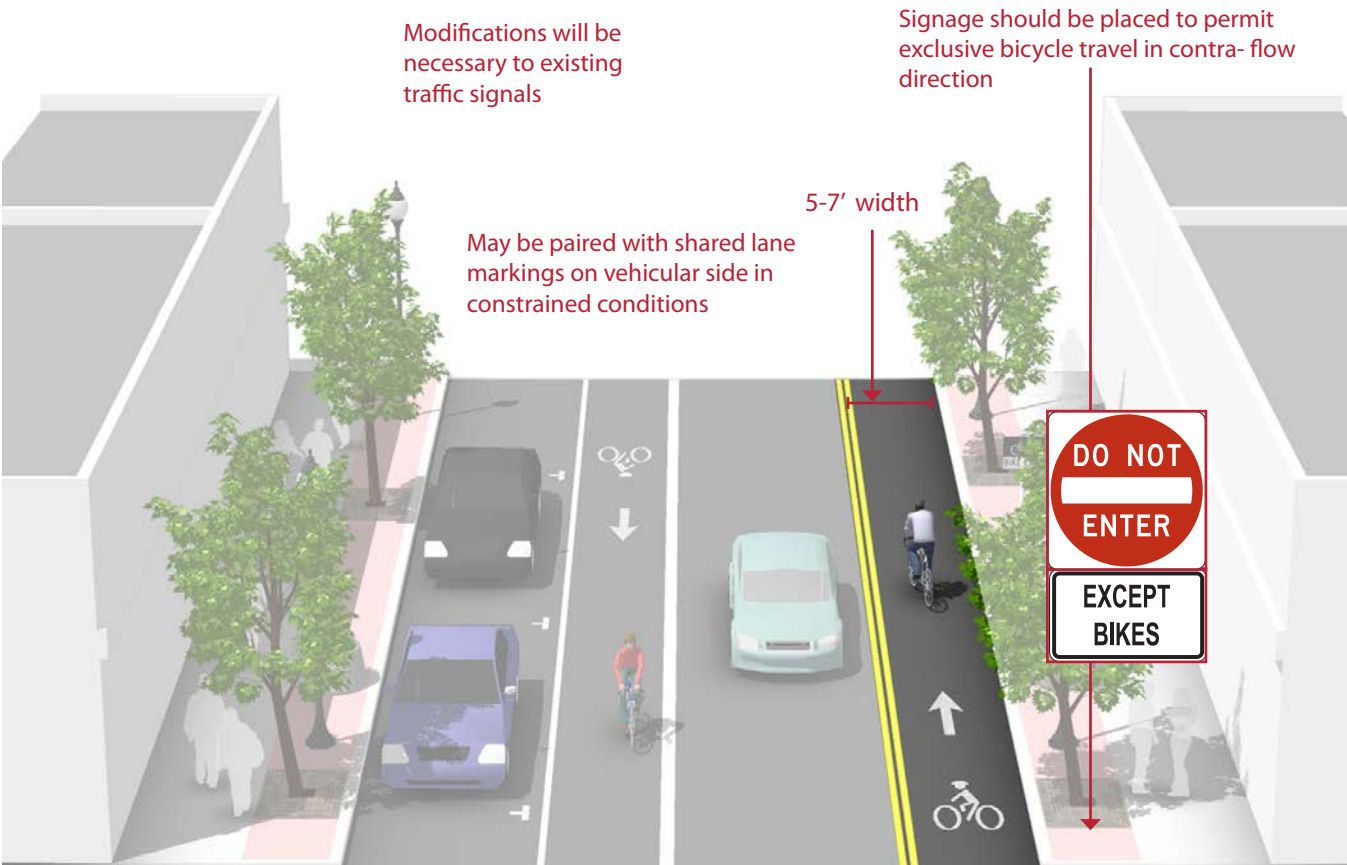
CONTRA FLOW BIKE LANE

Description

Contra-flow bike lanes provide bidirectional bicycle access on a roadway that is one-way for motor vehicle traffic. This treatment can provide direct access and connectivity for bicyclists and reducing travel distances. Contra-flow bike lanes can also be used to convert two-way motor vehicle traffic to one-way to reduce traffic volumes where desired.

Guidance

- The contra-flow bike lane should be 5-7 feet wide and marked with a solid double yellow line and appropriate signage. Bike lane markings should be clearly visible to ensure that the contra-flow lane is exclusively for bicycles. Coloration should be considered in the bike lane.
- Signage specifically allowing bicycles at the entrance of the contra flow lane is recommended.



Discussion

Intersection treatments such as bike boxes and bike signals should be considered to assist in the transition from left-side bike lanes to right-side bike lanes.

Discussion

Because of the opposing direction of travel, contra-flow bike lanes increase the speed differential between bicyclists and motor vehicles in the adjacent travel lane. If space permits consider a buffered bike lane or cycle track configuration to provide additional separation.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.



BUFFERED BIKE LANE

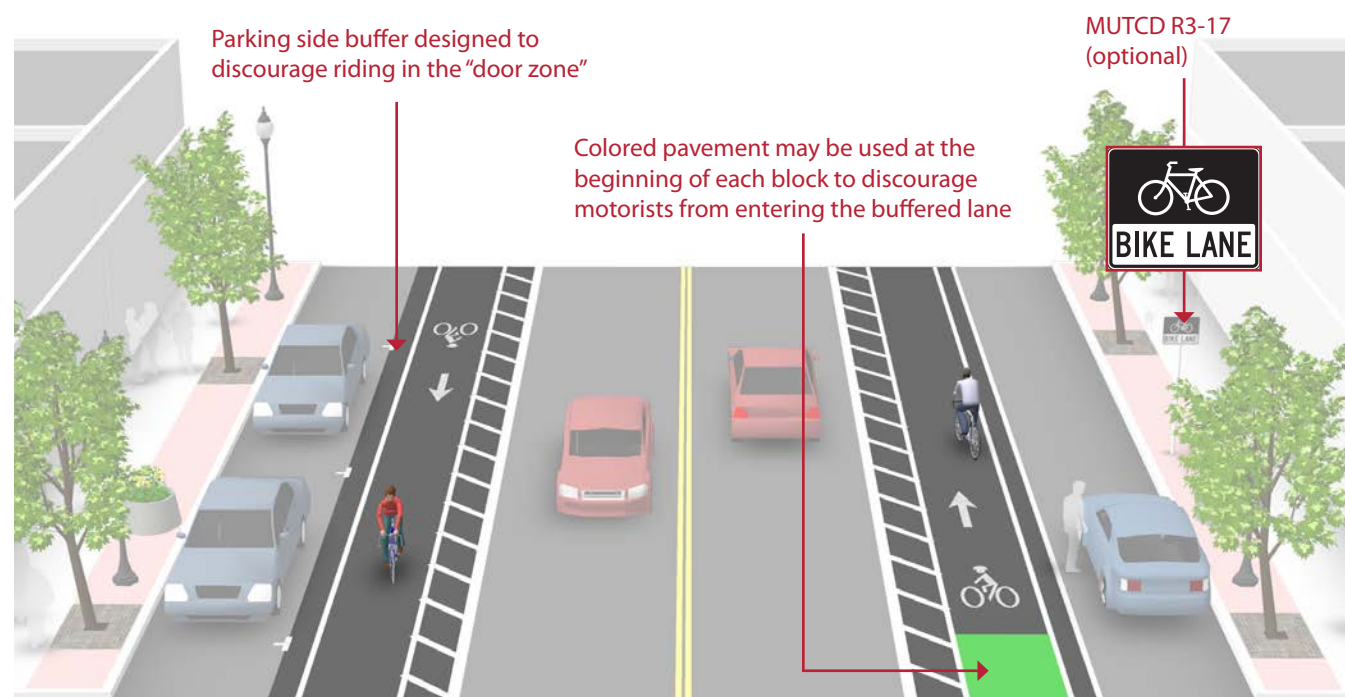
Description

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes follow general guidance for buffered preferential vehicle lanes as per MUTCD guidelines (section 3D-01).

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane and/or parked cars. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Guidance

- The minimum bicycle travel area (not including buffer) is 5 feet wide.
- Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching. For clarity at driveways or minor street crossings, consider a dotted line for the inside buffer boundary where cars are expected to cross.
- Buffered bike lanes can buffer the travel lane only, or parking lane only depending on available space and the objectives of the design.



Discussion

Frequency of right turns by motor vehicles at major intersections should determine whether continuous or truncated buffer striping should be used approaching the intersection. Commonly configured as a buffer between the bicycle lane and motor vehicle travel lane, a parking side buffer may also be provided to help bicyclists avoid the 'door zone' of parked cars.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. (3D-01). 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

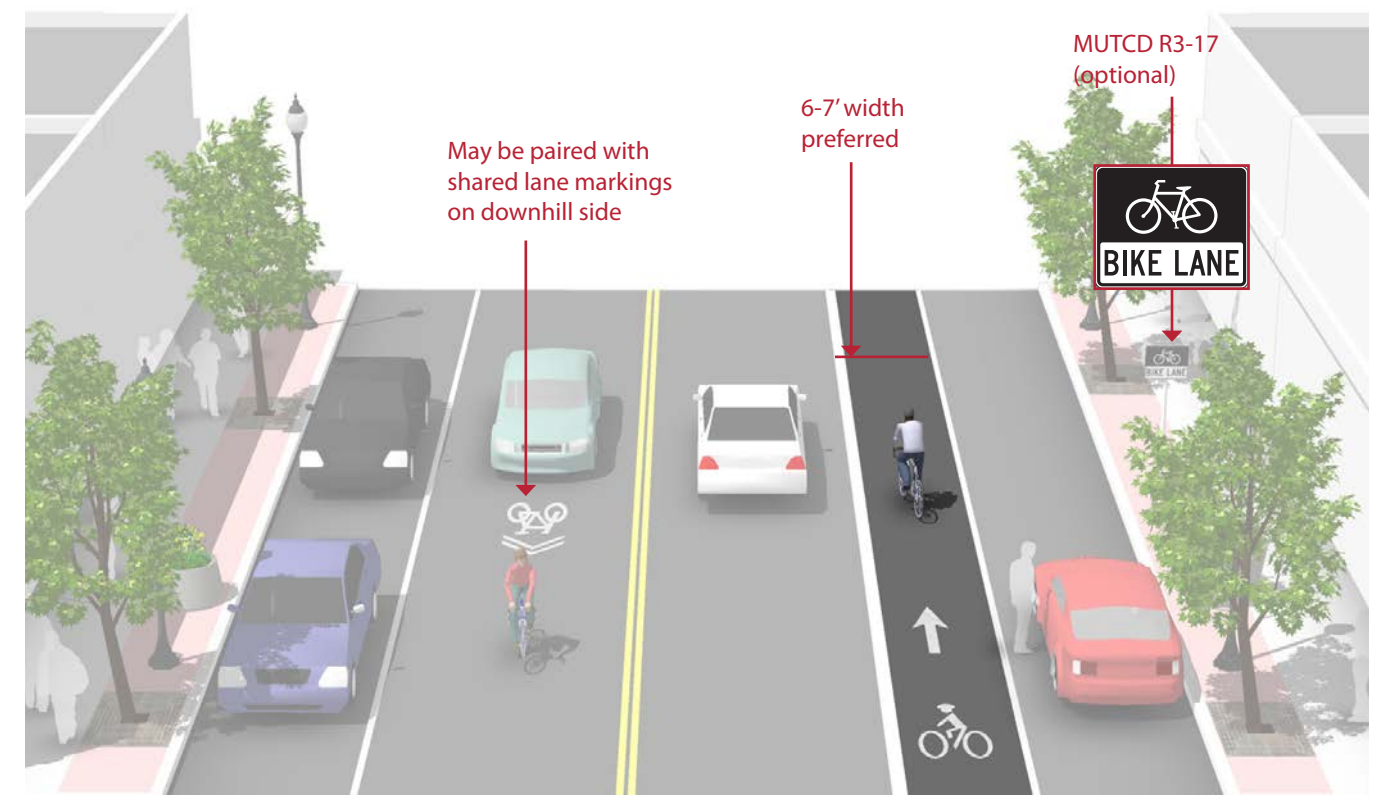
UPHILL BICYCLE CLIMBING LANE

Description

Uphill bike lanes (also known as "climbing lanes") enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes.

Guidance

- Uphill bike lanes should be 6-7 feet wide (wider lanes are preferred because extra maneuvering room on steep grades can benefit bicyclists).
- Can be combined with shared lane markings for downhill bicyclists who can more closely match prevailing traffic speeds.



Discussion

This treatment is typically found on retrofit projects as newly constructed roads should provide adequate space for bicycle lanes in both directions of travel. Accommodating an uphill bicycle lane often includes delineating on-street parking (if provided), narrowing travel lanes and/or shifting the centerline if necessary.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

PROTECTED BIKE LANES





CYCLE TRACK SEPARATION AND PLACEMENT

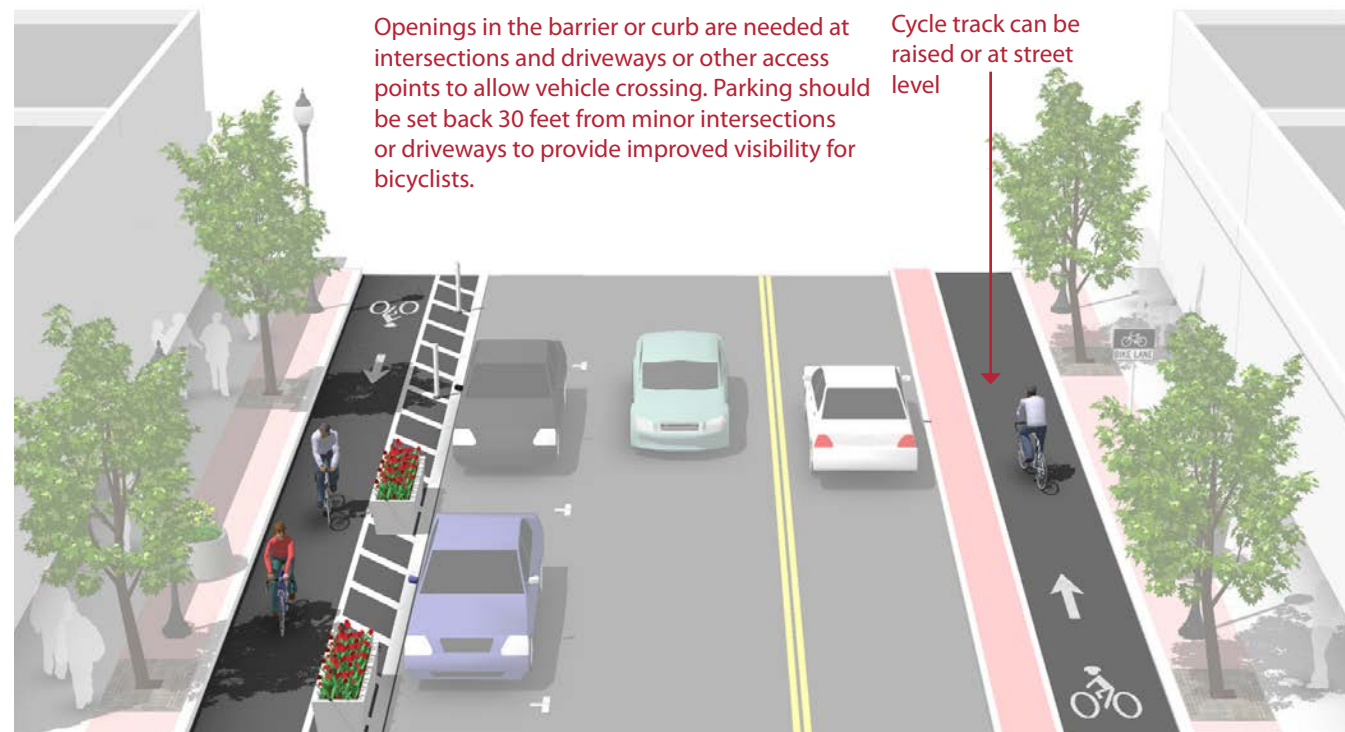
Description

Protection is provided through physical barriers and can include bollards, parking, a planter strip, an extruded curb, or on-street parking. Cycle tracks using these protection elements typically share the same elevation as adjacent travel lanes.

Raised cycle tracks may be at the level of the adjacent sidewalk or set at an intermediate level between the roadway and sidewalk to separate the cycle track from the pedestrian area.

Guidance

- Cycle tracks should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles. Cycle tracks located on one-way streets have fewer potential conflict areas than those on two-way streets.
- In situations where on-street parking is allowed, cycle tracks shall be located between the parking lane and the sidewalk (in contrast to bike lanes).



Discussion

Sidewalks or other pedestrian facilities should not be narrowed to accommodate the cycle track as pedestrians will likely walk on the cycle track if sidewalk capacity is reduced. Visual and physical cues (e.g., pavement markings & signage) should be used to make it clear where bicyclists and pedestrians should be travelling. If possible, separate the cycle track and pedestrian zone with a furnishing zone.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.

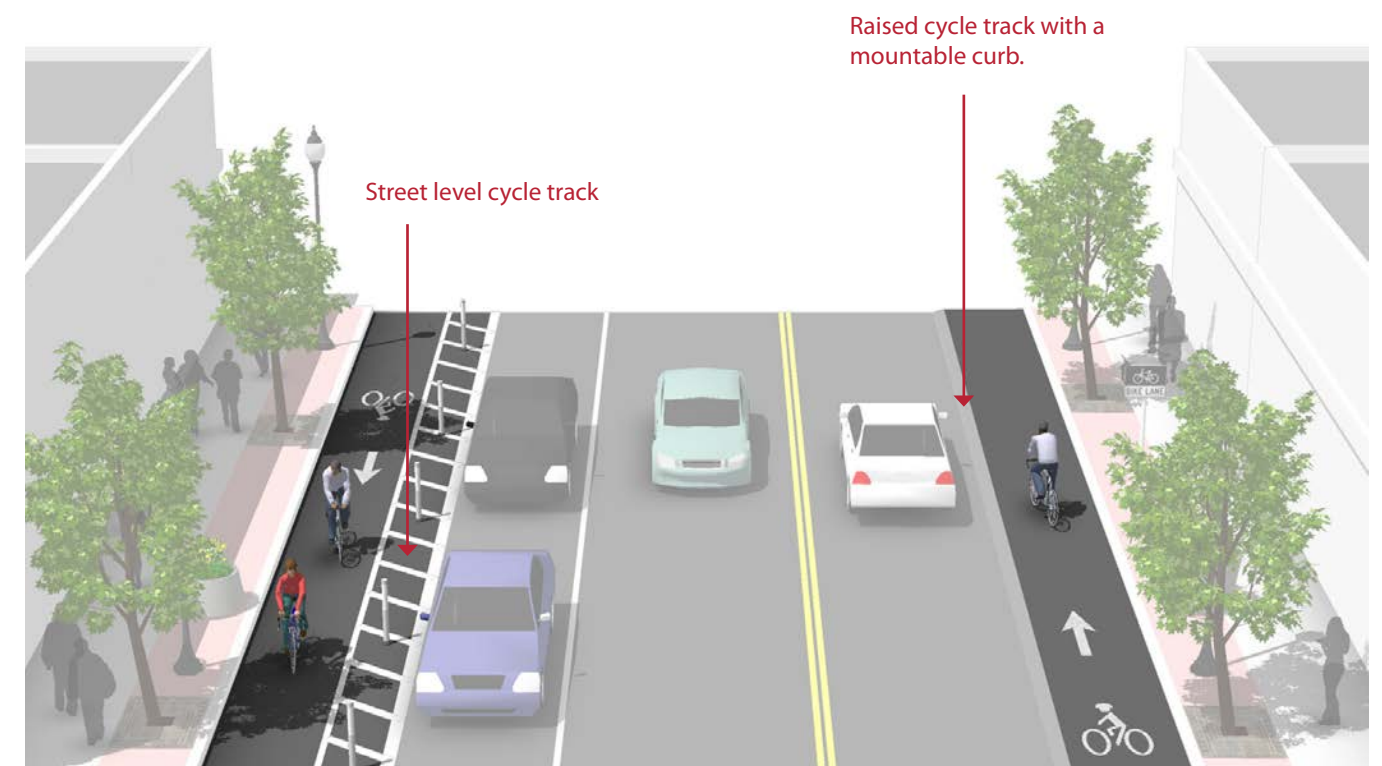
ONE-WAY CYCLE TRACKS

Description

One-way cycle tracks are physically separated from motor traffic and distinct from the sidewalk. Cycle tracks are either raised or at street level and use a variety of elements for physical protection from passing traffic.

Guidance

- 7 foot recommended minimum to allow passing.
- 5 foot minimum width in constrained locations.
- When placed adjacent to parking, the parking buffer should be three feet wide to allow for passenger loading and to prevent door collisions.
- When placed adjacent to a travel lane, one-way raised cycle tracks may be configured with a mountable curb to allow entry and exit from the bicycle lane for passing other bicyclists or to access vehicular turn lanes.



Discussion

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions. Driveways and minor street crossings are unique challenges to cycle track design. Parking should be prohibited within 30 feet of the intersection to improve visibility. Color, yield markings and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the cycle track has priority over entering and exiting traffic. If configured as a raised cycle track, the crossing should be raised so that the sidewalk and cycle track maintain their elevation through the crossing.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.



TWO-WAY CYCLE TRACKS

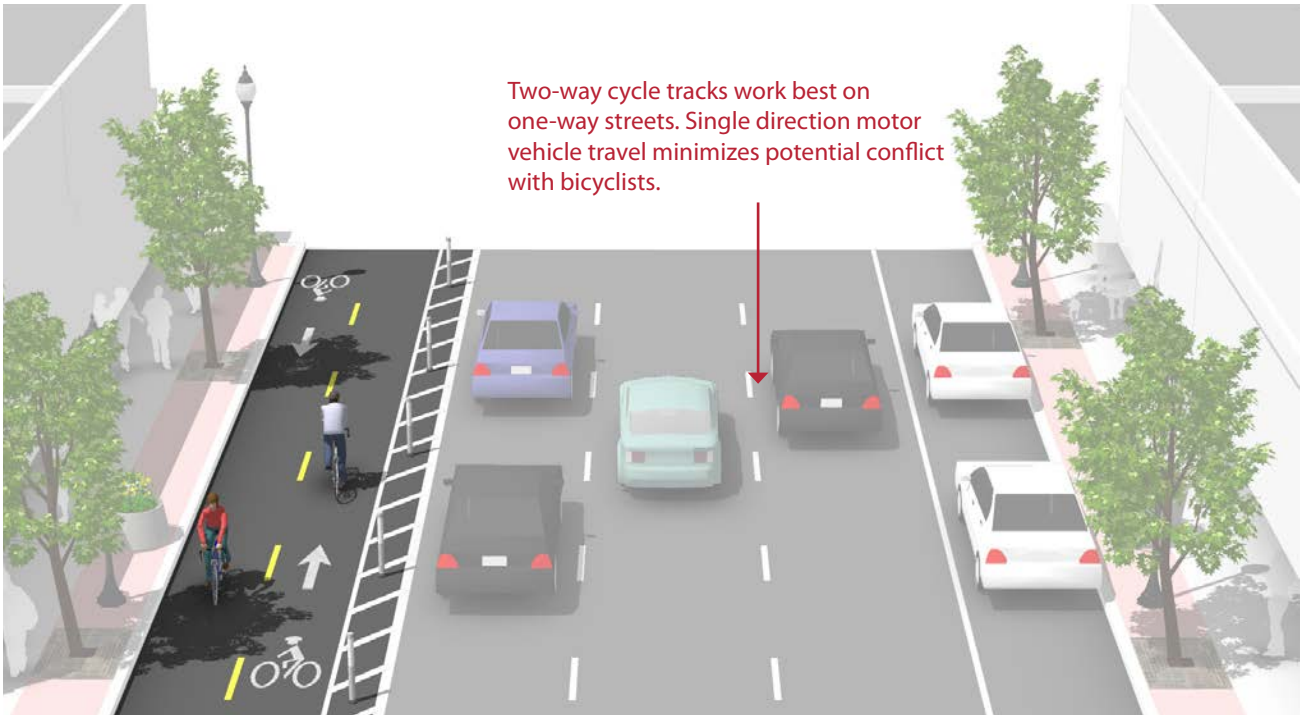
Description

Two-way cycle tracks are physically separated cycle tracks that allow bicycle movement in both directions on one side of the road. Two-way cycle tracks share some of the same design characteristics as one-way cycle tracks, but may require additional considerations at driveway and side-street crossings.

A two-way cycle track may be configured as a protected cycle track at street level with a parking lane or other barrier between the cycle track and the motor vehicle travel lane and/or as a raised cycle track to provide vertical separation from the adjacent motor vehicle lane.

Guidance

- 12 foot recommended minimum for two-way facility
- 8 foot minimum in constrained locations
- When placed adjacent to parking, the parking buffer should be three feet wide to allow for passenger loading and to prevent door collisions.



Discussion

Cycle tracks will require careful assessment of intersection traffic operation, including traffic signal control, to ensure safe and efficient travel is maintained. Turning movements should be guided by separated signals for bicycles and conflicting motor vehicles. Transitions into and out of two-way cycle tracks should be simple and easy to use to deter bicyclists from continuing to ride against the flow of traffic.

At driveways and minor intersections, bicyclists riding against roadway traffic in two-way cycle tracks may surprise pedestrians and drivers not expecting bidirectional travel. Appropriate signage is recommended.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
ITE. *Separated Bikeways*. 2013.

Materials and Maintenance

In cities with winter climates barrier, separated and raised cycle tracks may require special equipment for snow removal.

DRIVEWAYS AND MINOR STREET CROSSINGS

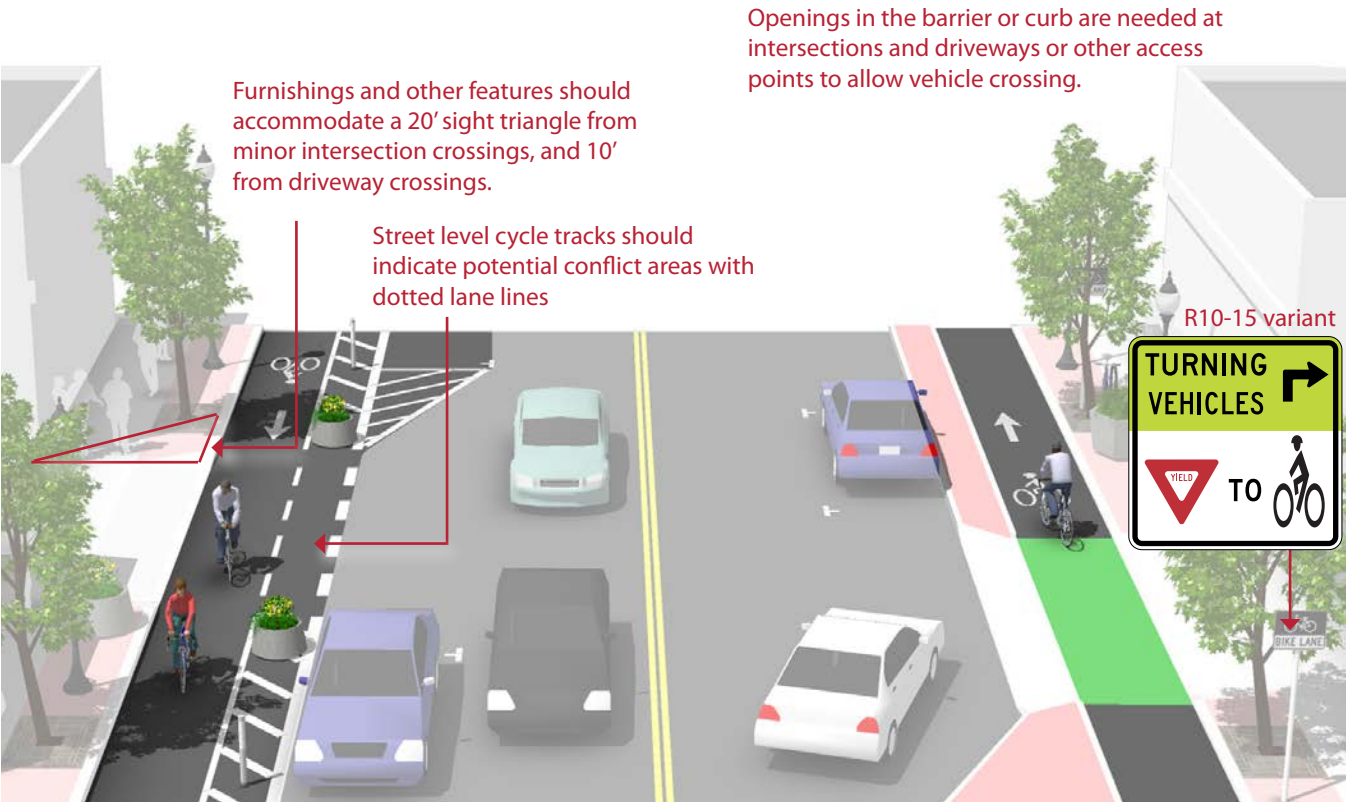
Description

The added separation provided by cycle tracks creates additional considerations at intersections that should be addressed.

At driveways and crossings of minor streets a smaller fraction of automobiles will cross the cycle track. Bicyclists should not be expected to stop at these minor intersections if the major street does not stop.

Guidance

- If raised, maintain the height of the cycle track through the crossing, requiring automobiles to cross over.
- Remove parking 30 feet prior the intersection.
- Use colored pavement markings and/or shared lane markings through the conflict area.
- Place warning signage to identify the crossing.



Discussion

At these locations, bicyclist visibility is important, as a buffer of parked cars or vegetation can reduce the visibility of a bicyclist traveling in the cycle track. Markings and signage should be present that make it easy to understand where bicyclists and pedestrians should be travelling. Access management should be used to reduce the number of crossings of driveways on a cycle track. Driveway consolidations and restrictions on motorized traffic movements reduce the potential for conflict.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.



MAJOR STREET CROSSINGS

Description

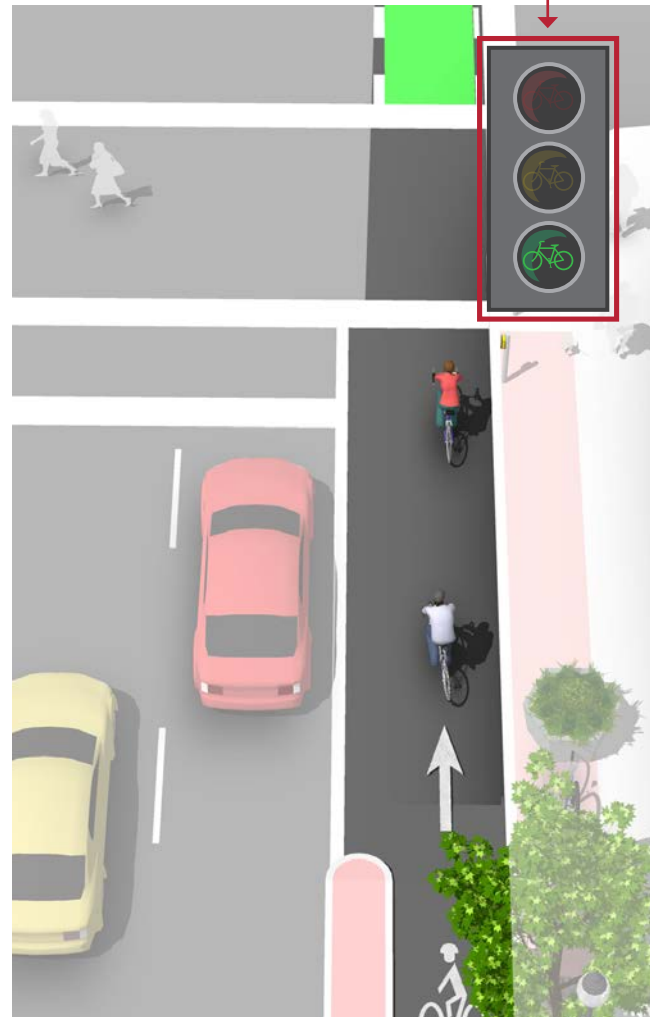
Cycle tracks approaching major intersections must minimize and mitigate potential conflicts and provide connections to intersecting facility types.

Cycle track crossings of signalized intersections can also be accomplished through the use of a bicycle signal phase which reduces conflicts with motor vehicles by separating bicycle movements from any conflicting motor vehicle movements.

Guidance

- Drop cycle track buffer and transition to bike lane 16' in advance of the intersection.
- Remove parking 16' -50' in advance of the buffer termination.
- Use a bike box or advanced stop line treatment to place bicyclists in front of traffic.
- Use colored pavement markings through the conflict area.
- Provide for left-turning movements with two-stage turn boxes.
- Consider using a protected phase bicycle signal to isolate conflicts between bicyclists and motor vehicle traffic.
- In constrained conditions with right turn only lanes, consider transitioning to a shared bike lane/turn lane.

Demand-only bicycle signals can be implemented to reduce vehicle delay and to prevent an empty signal phase from regularly occurring.



Discussion

Signalization utilizing a bicycle signal head can also be set to provide cycle track users a green phase in advance of vehicle phases. The length of the signal phase will depend on the width of the intersection.

The same conflicts exist at non-signalized intersections. Warning signs, special markings and the removal of on-street parking in advance of the intersection can raise visibility and awareness of bicyclists.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.

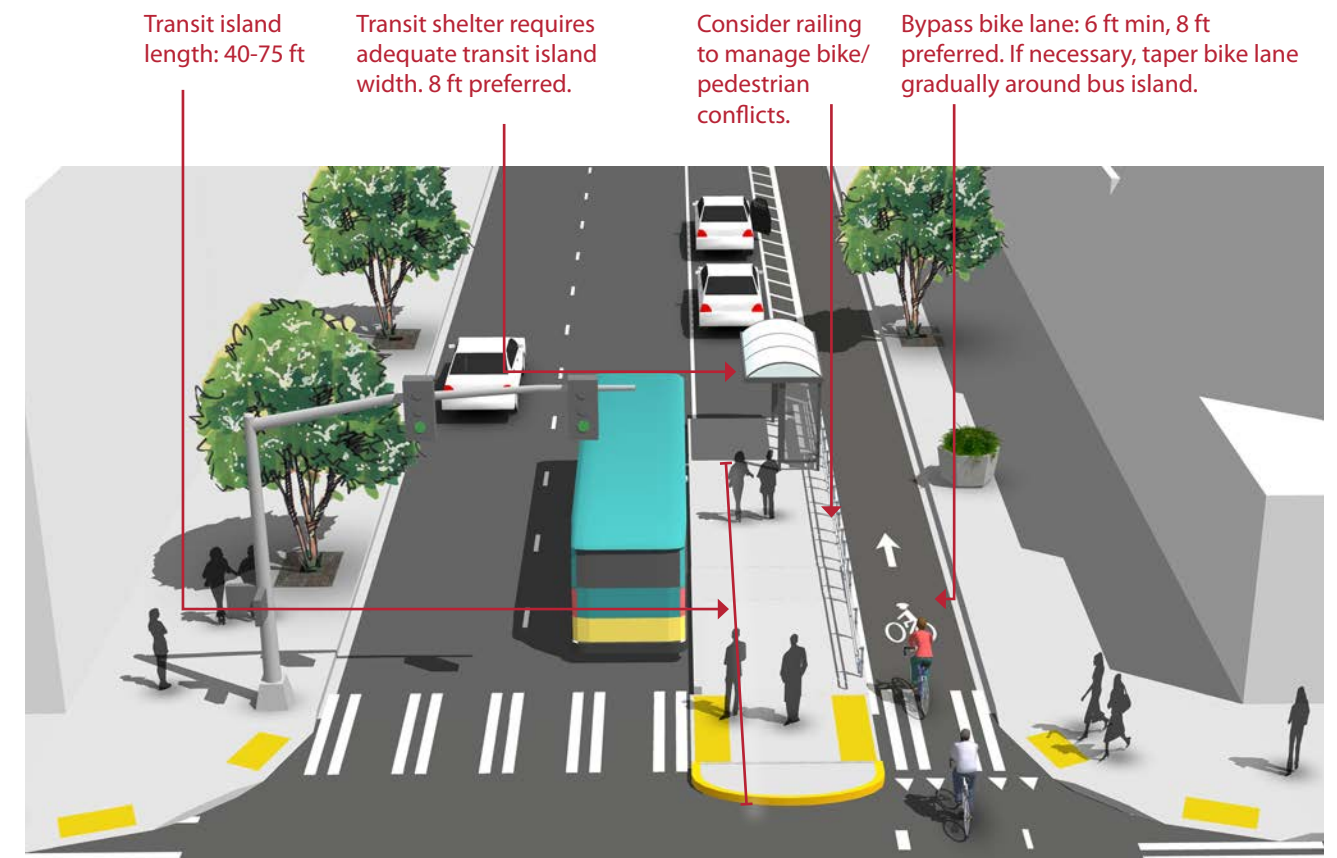
BICYCLE TRANSIT BYPASS

Description

The bicycle lane transit bypass is a channelized lane for bicycles designed to allow bicyclists to pass stopped buses, and prevent conflicts with buses pulling to the curb. This is particularly helpful on corridors with high volumes of transit vehicles and bicyclists, where "leapfrogging" may occur.

Guidance

- Appropriate in areas with high volumes of buses and bicyclists.
- 6 foot minimum width bypass lane.
- Transit island should be wide enough to hold all waiting transit riders.



Discussion

Ensure an adequate width bicycle lane where the bypass lane rejoins the roadway so that bicyclists do not encroach into adjacent lanes.

Conflicts with pedestrians may be increased over conventional bus stop designs. Consider railings to direct pedestrians to a single location where they may cross to the sidewalk.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

The channelized bicycle lane may require additional sweeping to maintain free of debris.

BIKEWAYS AT INTERSECTIONS





BIKE BOX

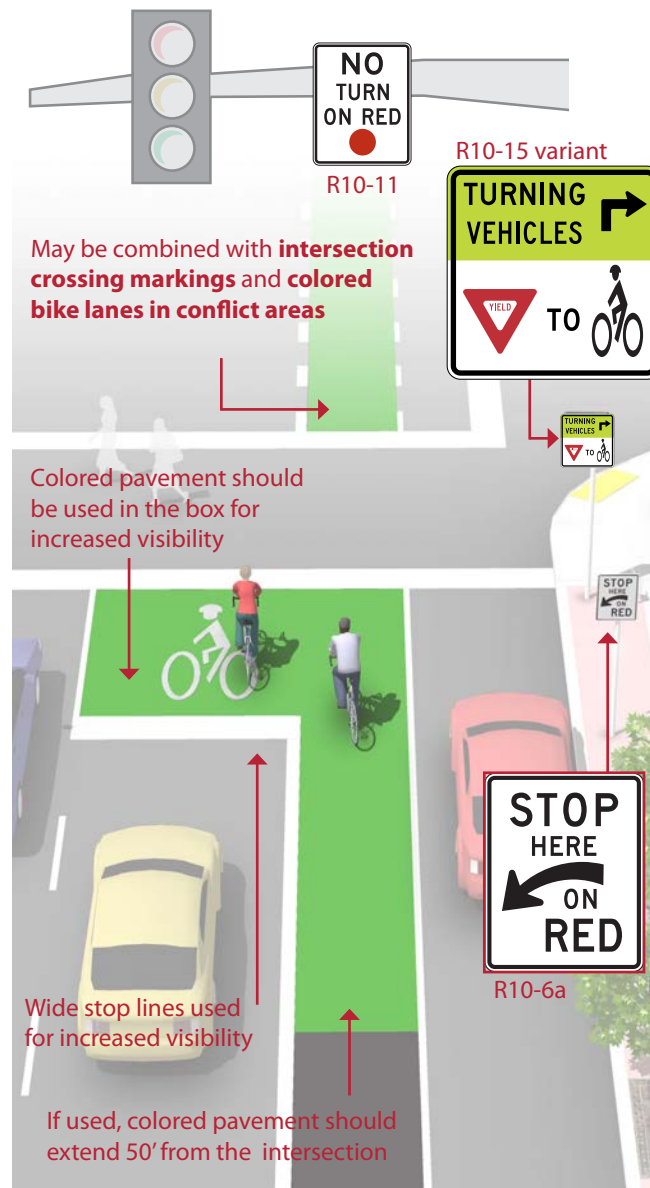
Description

A bike box is a designated area located at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible space to get in front of queuing motorized traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box.

At locations with downhill grades or high speed bicycle travel, intersections will require additional safety measures to prevent conflicts between bicyclists proceeding straight and motorists turning right. Potential enhancements include designing the intersection to include a separate right turn lane, prohibiting all vehicle right turns, and/or providing an exclusive signal phase for bicycles.

Guidance

- 14' minimum depth
- A "No Turn on Red" (MUTCD R10-11) sign shall be installed overhead to prevent vehicles from entering the Bike Box.
- A "Stop Here on Red" sign should be post-mounted at the stop line to reinforce observance of the stop line.
- A "Yield to Bikes" sign should be post-mounted in advance of and in conjunction with an egress lane to reinforce that bicyclists have the right-of-way going through the intersection.
- An ingress lane should be used to provide access to the box.
- A supplemental "Wait Here" legend can be provided in advance of the stop bar to increase clarity to motorists.



Discussion

Bike boxes are considered experimental by the FHWA. Bike boxes should be placed only at signalized intersections, and right turns on red shall be prohibited for motor vehicles. Bike boxes should be used in locations that have a large volume of bicyclists and are best utilized in central areas where traffic is usually moving more slowly. Prohibiting right turns on red improves safety for bicyclists yet does not significantly impede motor vehicle travel.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10. 2011.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

BIKE LANES AT RIGHT TURN ONLY LANES

Description

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to use a shared bike lane/turn lane.

The design (right) illustrates a bike lane pocket, with signage indicating that motorists should yield to bicyclists through the conflict area.

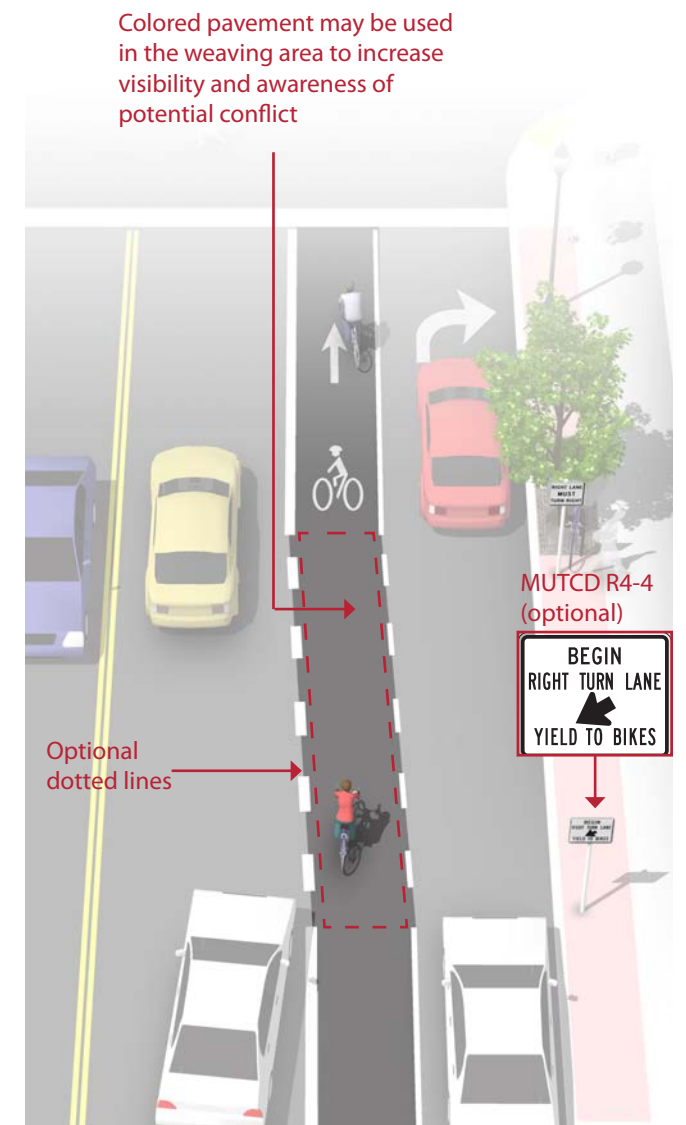
Guidance

At auxiliary right turn only lanes (add lane):

- Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.
- Use signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using colored conflict areas to promote visibility of the mixing zone.

Where a through lane becomes a right turn only lane:

- Do not define a dotted line merging path for bicyclists.
- Drop the bicycle lane in advance of the merge area.
- Use shared lane markings to indicate shared use of the lane in the merging zone.



Discussion

For other potential approaches to providing accommodations for bicyclists at intersections with turn lanes, please see guidance on shared bike lane/turn lane, bicycle signals, and colored bike facilities.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.



COLORED BIKE LANES IN CONFLICT AREAS

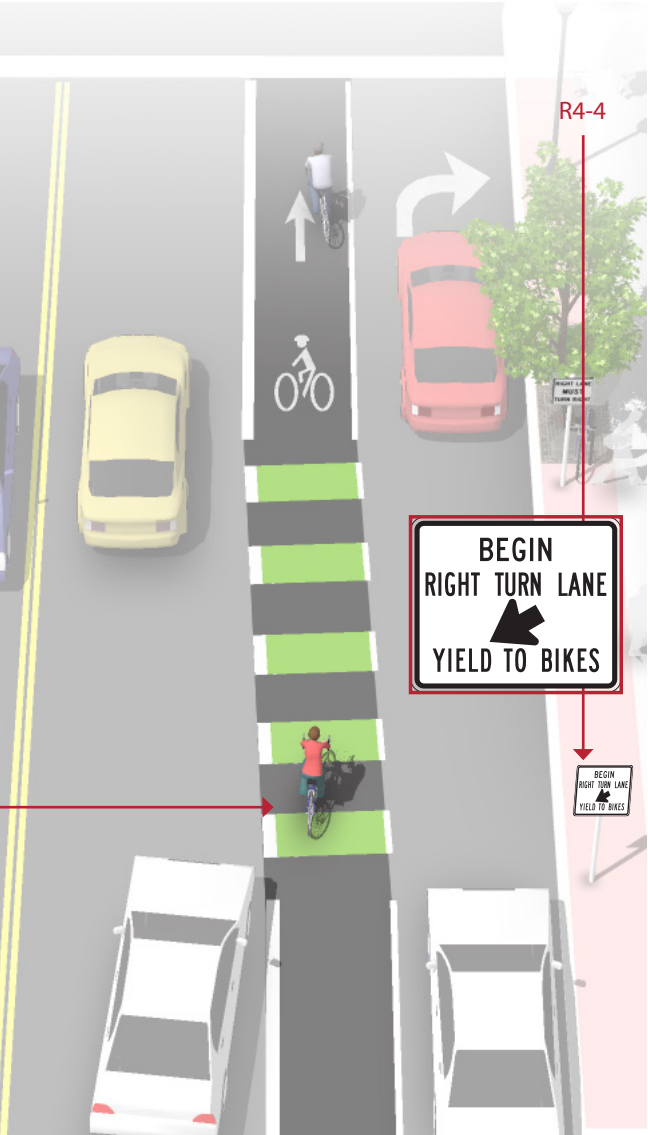
Description

Colored pavement within a bicycle lane increases the visibility of the facility and reinforces priority of bicyclists in conflict areas.

Guidance

- Green colored pavement was given interim approval by the Federal Highways Administration in March 2011. See interim approval for specific colored pavement standards.
- The colored surface should be skid resistant and retro-reflective.
- A “Yield to Bikes” sign should be used at intersections or driveway crossings to reinforce that bicyclists have the right-of-way in colored bike lane areas.

Normal white dotted edge lines should define colored space



Discussion

Evaluations performed in Portland, OR, St. Petersburg, FL and Austin, TX found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement when compared with an uncolored treatment.

Additional References and Guidelines

FHWA. Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10. 2011.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

COMBINED BIKE LANE/TURN LANE

Description

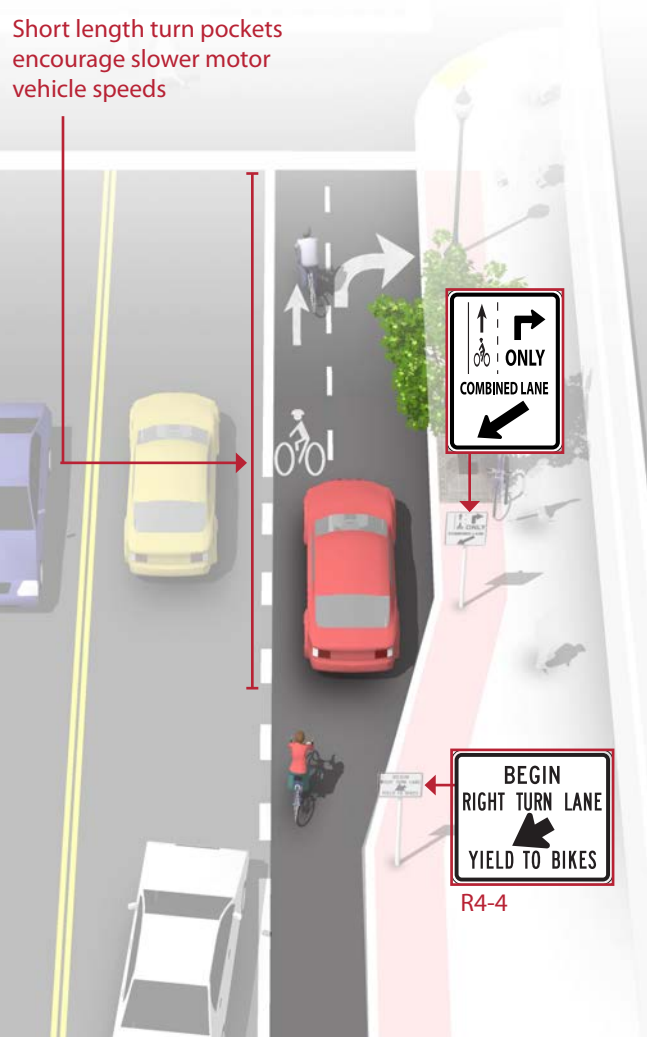
The combined bike lane/turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dotted line delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

This treatment is recommended at intersections lacking sufficient space to accommodate both a standard through bike lane and right turn lane.

Guidance

- Maximum shared turn lane width is 13 feet; narrower is preferable.
- Bike Lane pocket should have a minimum width of 4 feet with 5 feet preferred.
- A dotted 4 inch line and bicycle lane marking should be used to clarify bicyclist positioning within the combined lane, without excluding cars from the suggested bicycle area.
- A “Right Turn Only” sign with an “Except Bicycles” plaque may be needed to make it legal for through bicyclists to use a right turn lane.

Short length turn pockets encourage slower motor vehicle speeds



Discussion

Case studies cited by the Pedestrian and Bicycle Information Center indicate that this treatment works best on streets with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less). May not be appropriate for high-speed arterials or intersections with long right turn lanes. May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Locate markings out of tire tread to minimize wear. Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority.



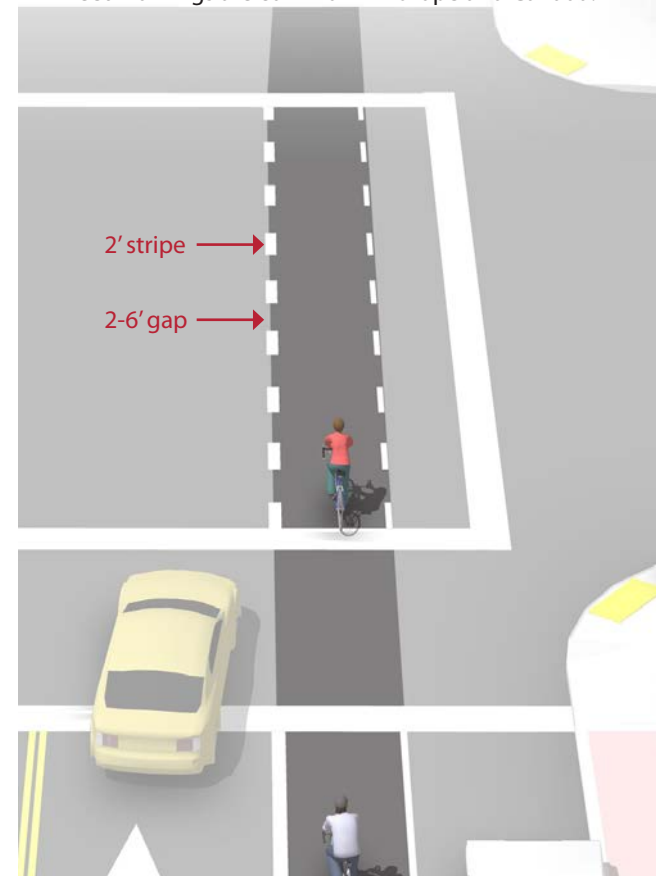
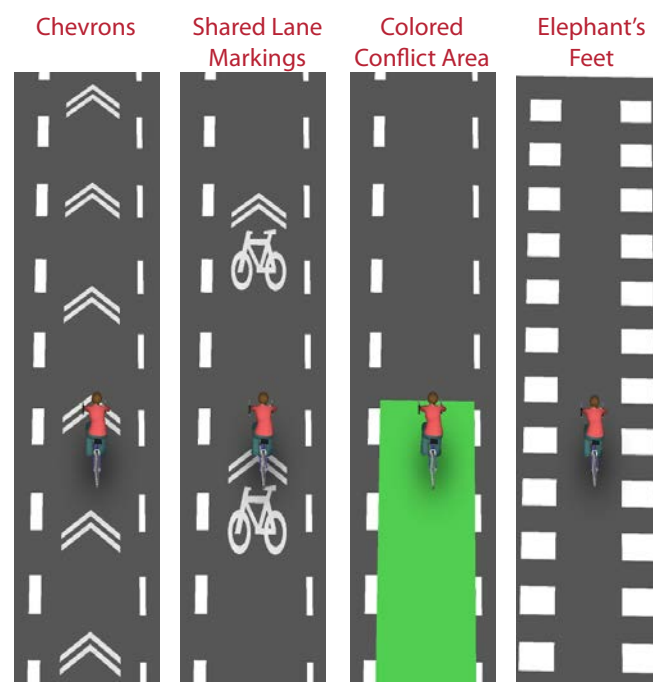
INTERSECTION CROSSING MARKINGS

Description

Bicycle pavement markings through intersections indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane.

Guidance

- See MUTCD Section 3B.08: “dotted line extensions”
- Crossing striping shall be at least six inches wide when adjacent to motor vehicle travel lanes. Dotted lines should be two-foot lines spaced two to six feet apart.
- Chevrons, shared lane markings, or colored bike lanes in conflict areas may be used to increase visibility within conflict areas or across entire intersections. Elephant’s Feet markings are common in Europe and Canada.



Discussion

Additional markings such as chevrons, shared lane markings, or colored bike lanes in conflict areas are strategies currently in use in the United States and Canada. Cities considering the implementation of markings through intersections should standardize future designs to avoid confusion.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. (3A.06). 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority.

TWO-STAGE TURN BOX

Description

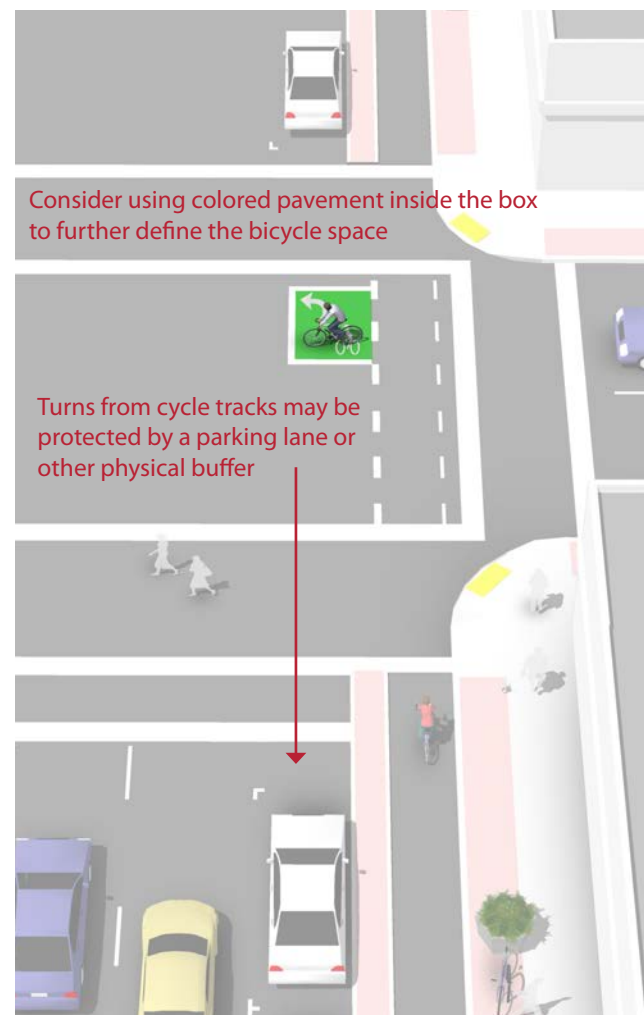
Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane.

On right side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation, making the provision of two-stage left turn boxes critical. Design guidance for two-stage turns apply to both bike lanes and cycle tracks.

Guidance

- The queue box shall be placed in a protected area. Typically this is within an on-street parking lane or cycle track buffer area.
- 6’ minimum depth of bicycle storage area
- Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning.
- A “No Turn on Red” (MUTCD R10-11) sign shall be installed on the cross street to prevent vehicles from entering the turn box.

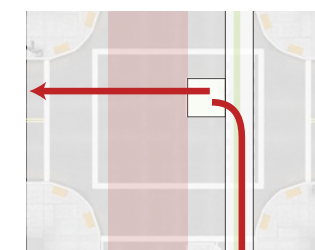
Turns from a bicycle lane may be protected by an adjacent parking lane or crosswalk setback space



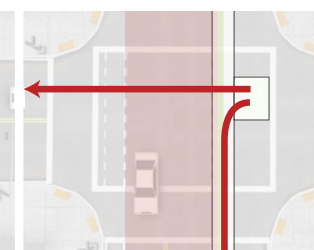
Consider using colored pavement inside the box to further define the bicycle space

Turns from cycle tracks may be protected by a parking lane or other physical buffer

Cycle track turn box protected by physical buffer:



Bike lane turn box protected by parking lane:



Discussion

Two-Stage Turn boxes are considered experimental by FHWA.

While two stage turns may increase bicyclist comfort in many locations, this configuration will typically result in higher average signal delay for bicyclists due to the need to receive two separate green signal indications (one for the through street, followed by one for the cross street) before proceeding.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates.



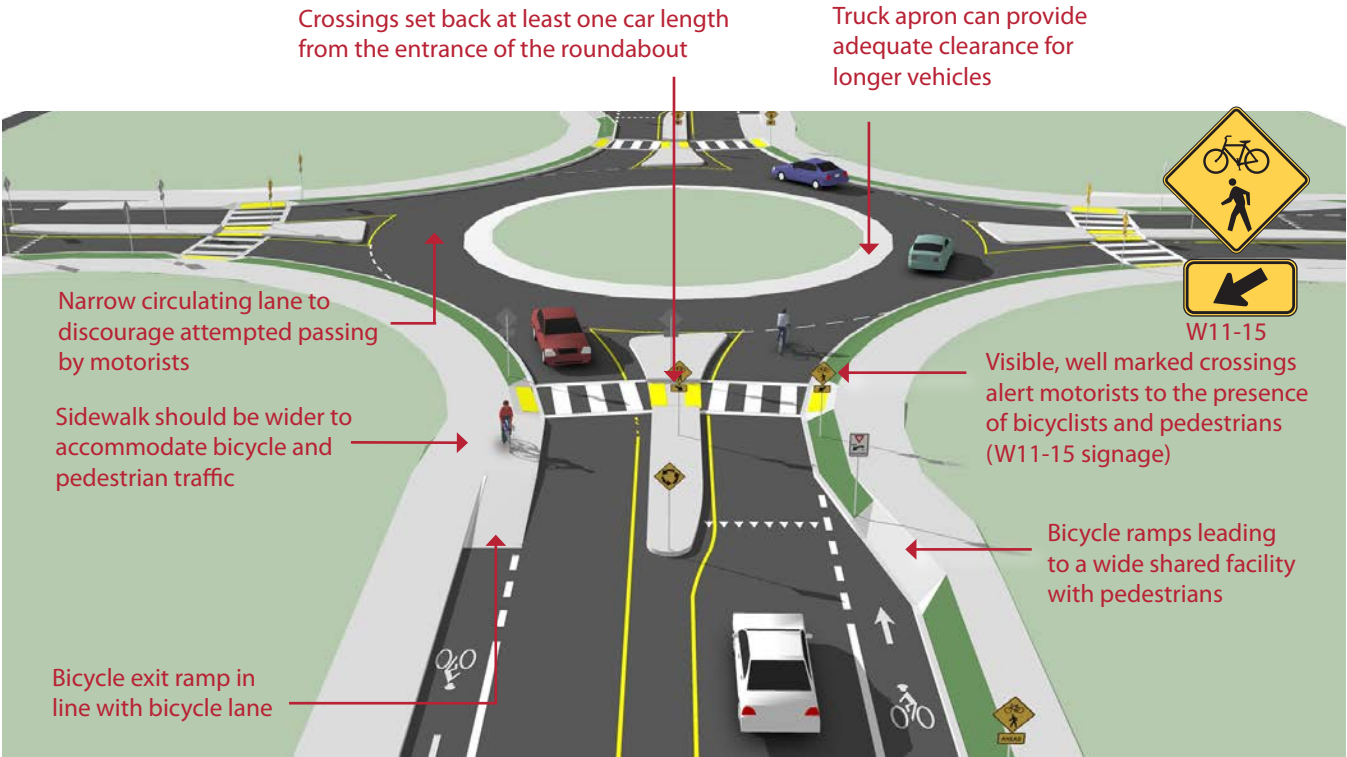
BICYCLISTS AT SINGLE LANE ROUNDABOUTS

Description

In single lane roundabouts it is important to indicate to motorists, bicyclists and pedestrians the right-of-way rules and correct way for them to circulate, using appropriately designed signage, pavement markings, and geometric design elements.

Guidelines

- 25 mph maximum circulating design speed.
- Design approaches/exits to the lowest speeds possible.
- 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.



BIKE LANES AT HIGH SPEED INTERCHANGES

Description

Some arterials may contain high speed freeway-style designs such as merge lanes and exit ramps, which can create difficulties for bicyclists. The entrance and exit lanes typically have intrinsic visibility problems because of low approach angles and feature high speed differentials between bicyclists and motor vehicles.

Strategies to improve safety focus on increasing sight distances, creating formal crossings, and minimizing crossing distances.

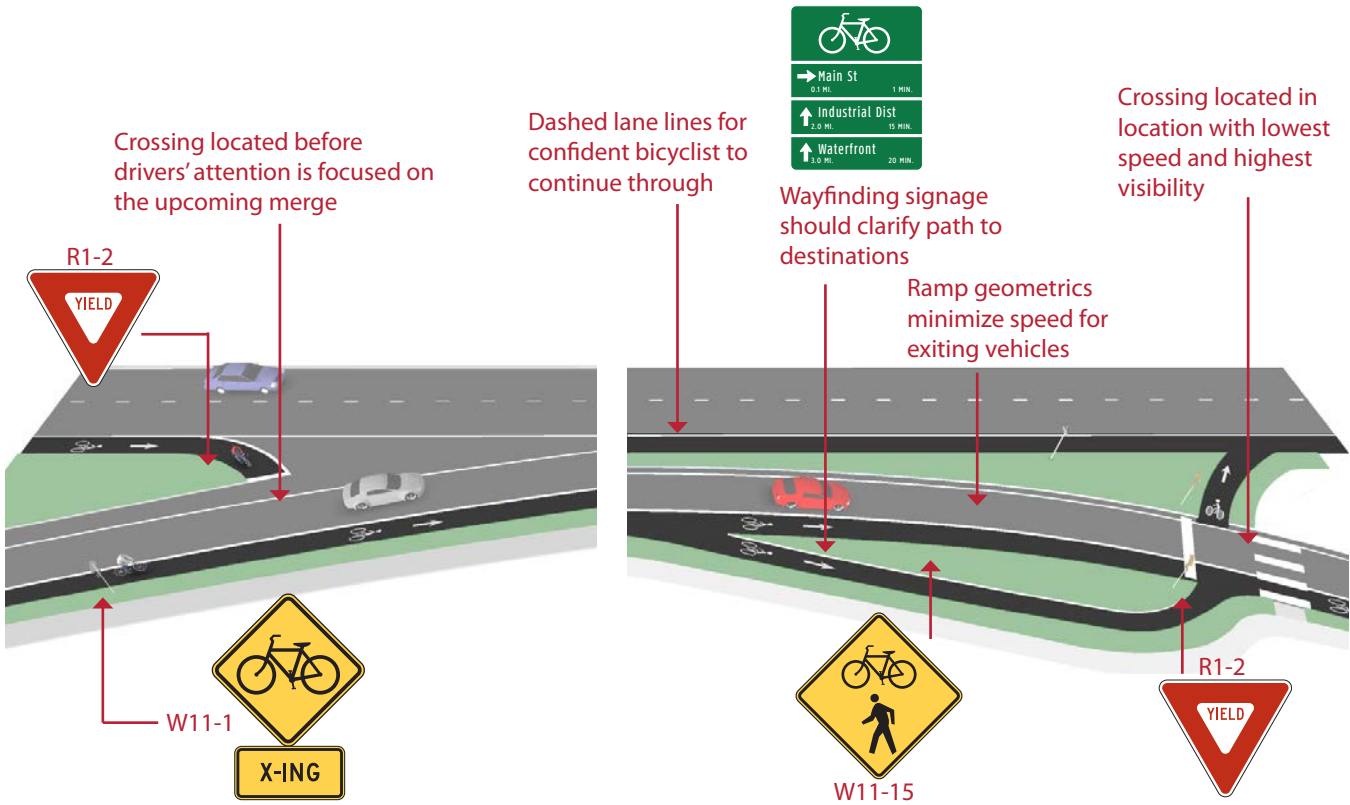
Guidance

Entrance Ramps:

Angle the bike lane to increase the approach angle with entering traffic. Position crossing before drivers’ attention is focused on the upcoming merge.

Exit Ramps:

Use a jug handle turn to bring bicyclists to increase the approach angle with exiting traffic, and add yield striping and signage to the bicycle approach.



Discussion

Research indicates that while single-lane roundabouts may benefit bicyclists and pedestrians by slowing traffic, multi-lane roundabouts may present greater challenges and significantly increase safety problems for these users.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.

FHWA. *Roundabouts: An Informational Guide*. 2000.

TRB. *Roundabouts: An Informational Guide, Second Edition*. NCHRP 672. 2010.

Materials and Maintenance

Signage and striping require routine maintenance.

Discussion

While the jug-handle approach is the preferred configuration at exit ramps, provide the option for through bicyclists to perform a vehicular merge and proceed straight through under safe conditions.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.

FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

FHWA. *Bicycle and Pedestrian Transportation. Lesson 15: Bicycle Lanes*. 2006.

Materials and Maintenance

Locate crossing markings out of wheel tread when possible to minimize wear and maintenance costs.



BIKE/PED FACILITIES AT DIVERGING DIAMOND INTERCHANGES

Description

The Diverging Diamond Interchange (DDI) is a modern interchange configuration designed to reduce conflict points and improve safety and performance for automobile users.

Highway interchanges are not typically comfortable for bicyclists or pedestrians due to the high speed and volume of motor vehicle traffic. Key design features at conflict areas in DDIs should be included to improve the experience for vulnerable road users such as bicyclists and pedestrians.

Guidance

- A buffered bike lane or cycle track approaching the interchange offers a lower stress approach for bicyclists.
- Through bike lane striping provides clear priority for bicyclists at right turn 'add lane' on-ramps.
- Raised crosswalks increase yielding compliance at the channelized right turn on- and off- ramps.
- A raised bike lane provides separation from moving traffic, and provides an added buffer for pedestrians.
- Median island offers a safe refuge from moving traffic.



Low Stress Bikeway



Raised Crosswalk



Raised Cycle Track



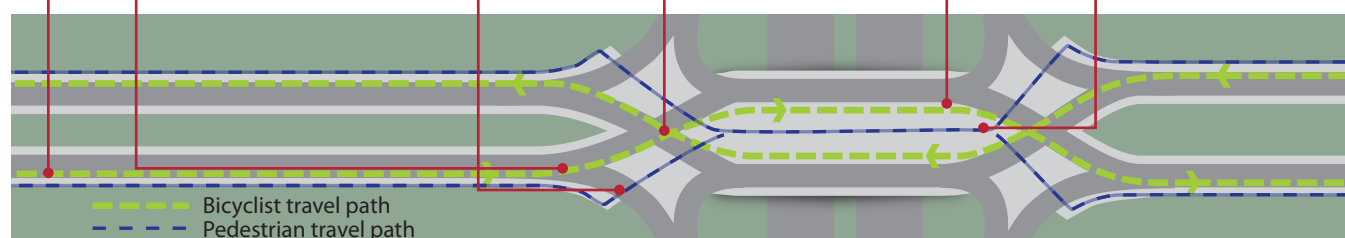
Through Bike Lane with 'Add Lane'



Intersection Crossing Markings



Pedestrian Refuge



Discussion

The on-ramps should be configured as a right-turn-only "add lane" to assert through bicyclist priority. The center running island may provide a physical barrier between the auto lanes and the cycle track or pedestrian way to provide additional protection. Elephant's feet markings (shown) offer more visibility through the intersection than conventional dotted line extensions.

Additional References and Guidelines

TRB. NCHRP 674: Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities. 2011.
Missouri DOT. Engineering Policy Guide. 234.6 Diverging Diamond Interchanges. 2012.

Materials and Maintenance

Maintenance issues of DDIs are very similar to other types of interchanges .

BIKEWAYS AT RAILROAD GRADE CROSSINGS

Description

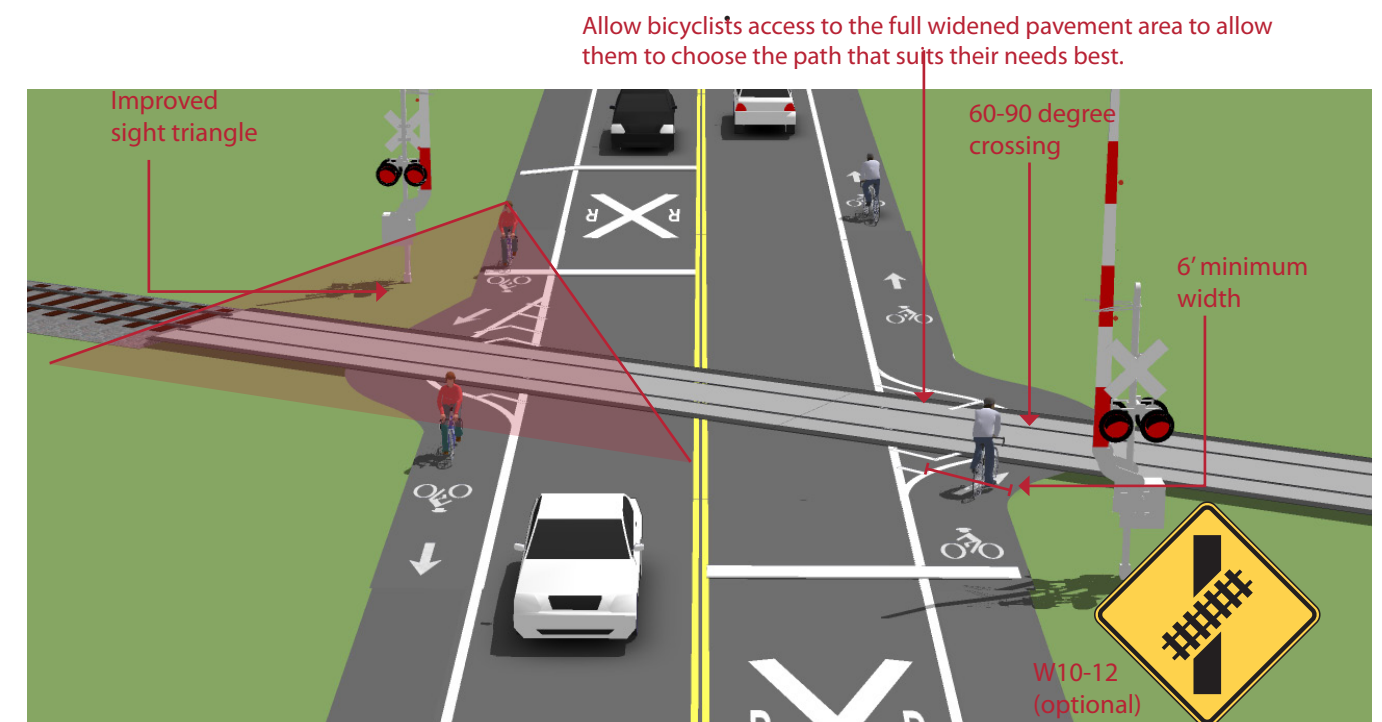
Bikeways that cross railroad tracks at a diagonal may cause steering difficulties or loss of control for bicyclists due to slippery surfaces, degraded rough materials, and the size of the flangeway gaps.

Angled track crossings also limit sight triangles, impacting the ability to see oncoming trains.

Bicyclist crashes at railroad tracks are often sudden and unexpected. Improvements to track placement, surface quality, flangeway opening width and crossing angle can minimize risks to people riding.

Guidance

- 6 ft minimum shoulder/bike lane width.
- If the skew angle is less than 45 degrees, special attention should be given to the sidewalk and bicycle alignment to improve the approach angle to at least 60 degrees (90 degrees preferred where possible).
- Consider posting W-10 or W-12 signs to alert bicyclists.
- Sight triangles of 50 feet by 100 feet will be provided at the railroad and street right of way. (Sight triangles are measured from the centerline of the railroad track).



Discussion

Crossing design and implementation is a collaboration between the railroad company and highway agency. The railroad company is responsible for the crossbucks, flashing lights and gate mechanisms, and the highway agency is responsible for advance warning markings and signs. Warning devices should be recommended for each specific situation by a qualified engineer based on various factors including train frequency and speed, path and trail usage and sight distances.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
TRB. TCRP 17: Integration of Light Rail Transit into City Streets. 1996.
FHWA. Railroad-Highway Grade Crossing Handbook. 2007.
Rails-to-Trails Conservancy. Rails-with-Trails: A Preliminary Assessment of Safety and Grade Crossings. 2005.

Materials and Maintenance

Concrete is the preferred material for use at bikeway railroad crossings. Rubber crossings are rideable when new and dry, but become slippery when wet and degrade over time. (AASHTO 2012)

CROSSING BEACONS AND SIGNALS FOR BICYCLES





ACTIVE WARNING BEACONS

Description

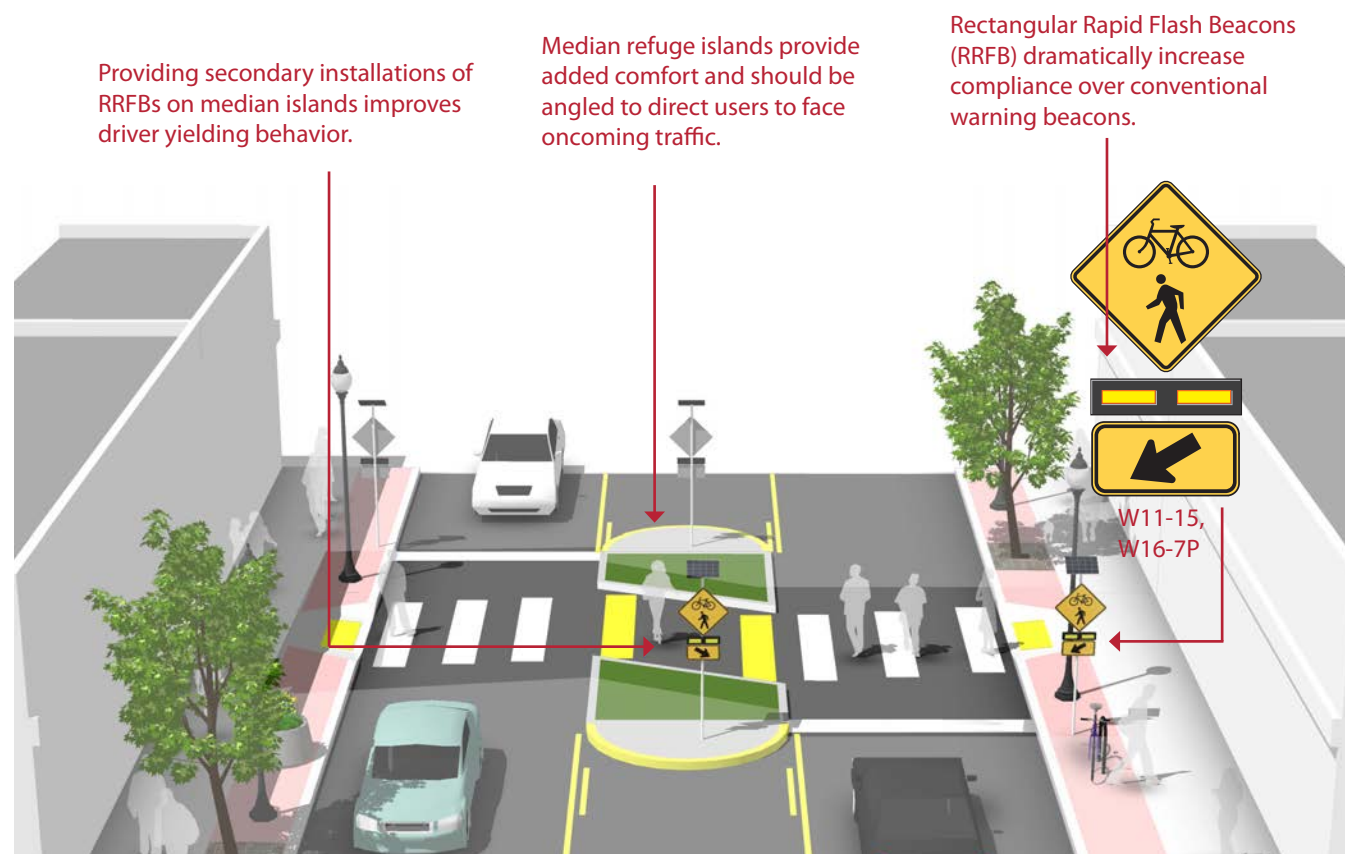
Active warning beacons are user actuated illuminated devices designed to increase motor vehicle yielding compliance at crossings of multi lane or high volume roadways.

Types of active warning beacons include conventional circular yellow flashing beacons, in-roadway warning lights, or Rectangular Rapid Flash Beacons (RRFB).

Guidance

Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs or traffic signals.

- Warning beacons shall initiate operation based on pedestrian or bicyclist actuation and shall cease operation at a predetermined time after actuation or, with passive detection, after the pedestrian or bicyclist clears the crosswalk.



Providing secondary installations of RRFBs on median islands improves driver yielding behavior.

Median refuge islands provide added comfort and should be angled to direct users to face oncoming traffic.

Rectangular Rapid Flash Beacons (RRFB) dramatically increase compliance over conventional warning beacons.

W11-15,
W16-7P

Discussion

Rectangular rapid flash beacons have the highest compliance of all the warning beacon enhancement options.

A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88 percent. Additional studies over long term installations show little to no decrease in yielding behavior over time.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
FHWA. *MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)*. 2008.
SCDOT. *Traffic Engineering Guideline TG-33: Rectangular Rapid Flash Beacons*.

Materials and Maintenance

Depending on power supply, maintenance can be minimal. If solar power is used, RRFBs can run for years without issue.

HYBRID WARNING BEACON (HAWK) FOR BICYCLE ROUTE CROSSING

Description

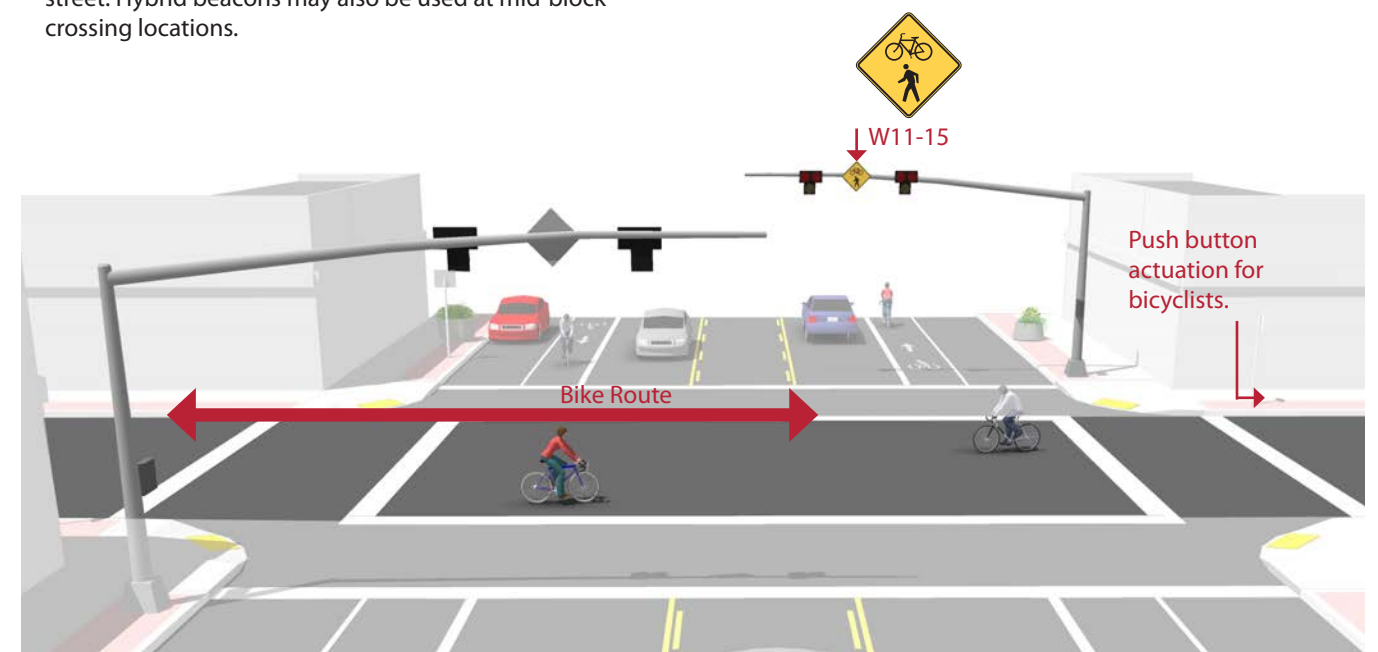
A hybrid beacon, formerly known as a High-intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian and/or bicycle signal heads for the minor street. There are no signal indications for motor vehicles on the minor street approaches.

Hybrid beacons are used to improve non-motorized crossings of major streets in locations where side-street volumes do not support installation of a conventional traffic signal or where there are concerns that a conventional signal will encourage additional motor vehicle traffic on the minor street. Hybrid beacons may also be used at mid-block crossing locations.

Guidance

Hybrid beacons may be installed without meeting traffic control signal warrants if roadway speed and volumes are excessive for comfortable user crossing.

- If installed within a signal system, signal engineers should evaluate the need for the hybrid signal to be coordinated with other signals.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.



Push button
actuation for
bicyclists.

Discussion

The hybrid beacon can significantly improve the operation of a bicycle route, particularly along neighborhood greenway corridors. Because of the low traffic volumes on these facilities, intersections with major roadways are often unsignalized, creating difficult and potentially unsafe crossing conditions for bicyclists.

Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.

Additional References and Guidelines

FHWA. *Pedestrian Hybrid Beacon Guide*. 2014.
SCDOT. *TG-26: Pedestrian Hybrid Beacon Guideline*.
NACTO. *Urban Bikeway Design Guide*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.

Materials and Maintenance

Hybrid beacons are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

RETROFITTING STREETS TO ADD BIKEWAYS





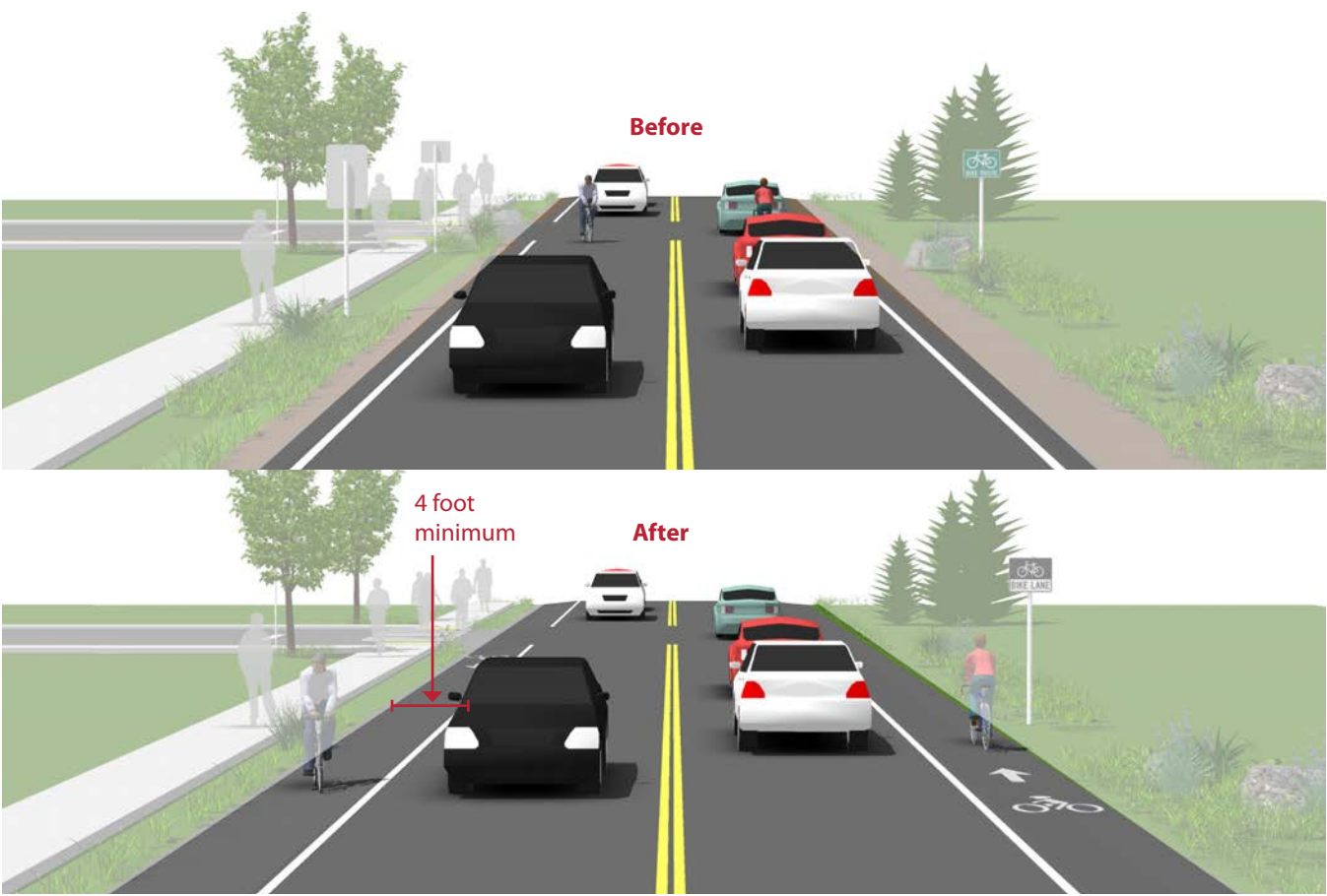
ROADWAY WIDENING

Description

Bike lanes can be accommodated on streets with excess right-of-way through shoulder widening. Although roadway widening incurs higher expenses compared with re-striping projects, bike lanes can be added to streets currently lacking curbs, gutters and sidewalks without the high costs of major infrastructure reconstruction.

Guidance

- Guidance on bicycle lanes applies to this treatment.
- 4 foot minimum width when no curb and gutter is present.
- 6 foot width preferred.



Discussion

Roadway widening is most appropriate on roads lacking curbs, gutters and sidewalks. If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.

Materials and Maintenance

The extended bicycle area should not contain any rough joints where bicyclists ride. Saw or grind a clean cut at the edge of the travel lane, or feather with a fine mix in a non-ridable area of the roadway.

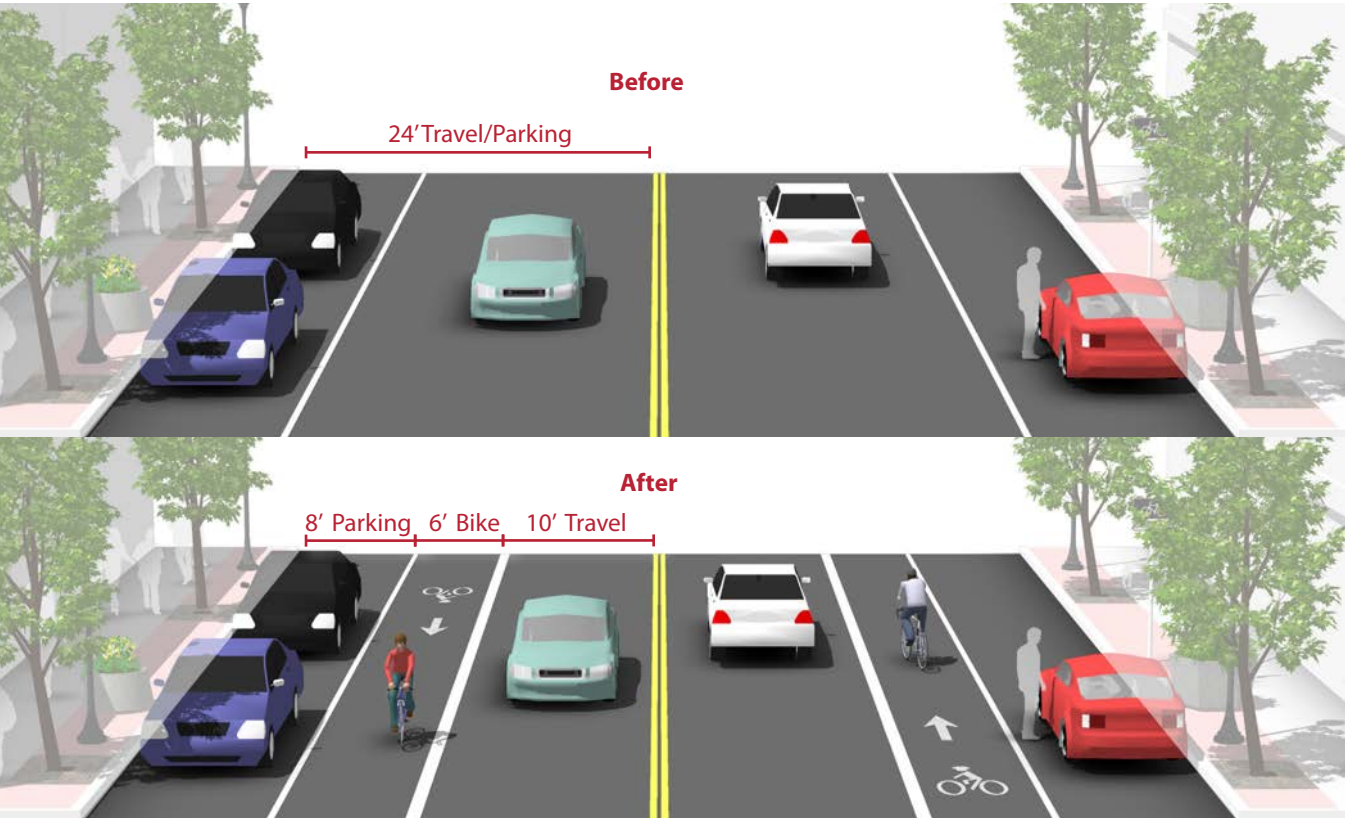
LANE NARROWING

Description

Lane narrowing utilizes roadway space that exceeds minimum standards to provide the needed space for bike lanes. Many roadways have existing travel 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.

Guidance

- Vehicle lane width:**
- Before: 10-15 feet
 - After: 10-11 feet
- Bicycle lane width:**
- Guidance on bicycle lanes applies to this treatment.



Discussion

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. AASHTO supports reduced width lanes in *A Policy on Geometric Design of Highways and Streets*: “On interrupted-flow operation conditions at low speeds (45 mph or less), narrow lane widths are normally adequate and have some advantages.”

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
SCDOT. *EDM 22: Considerations for Bicycle Facilities*.
NACTO. *Urban Street Design Guide*. 2013.
SCDOT. *Traffic Calming Guidelines*. 2006.

Materials and Maintenance

Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush with the pavement.



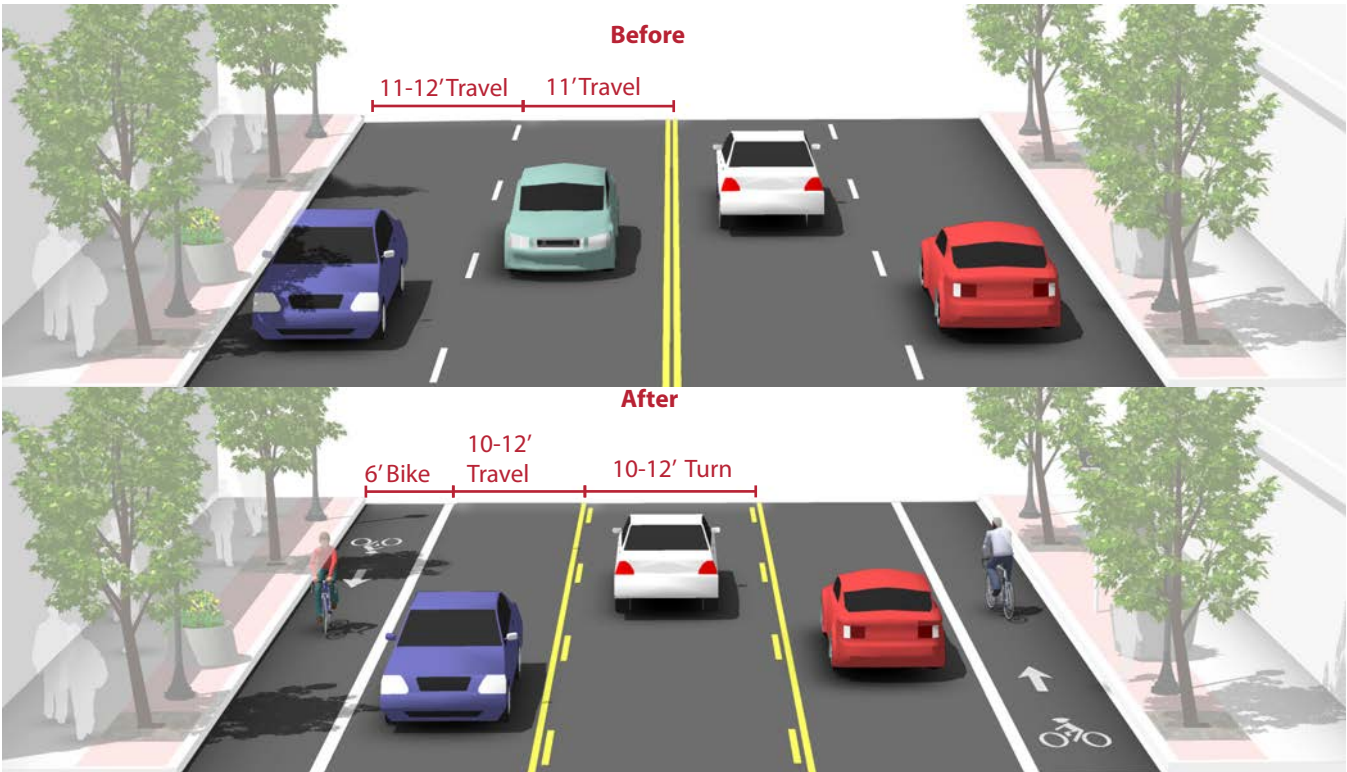
LANE RECONFIGURATION

Description

The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects.

Guidance

- Vehicle lane width:**
- Width depends on project. No narrowing may be needed if a lane is removed.
- Bicycle lane width:**
- Guidance on bicycle lanes applies to this treatment.



Discussion

Depending on a street’s existing configuration, traffic operations, user needs and safety concerns, various lane reduction configurations may apply. For instance, a four-lane street (with two travel lanes in each direction) could be modified to provide one travel lane in each direction, a center turn lane, and bike lanes. Prior to implementing this measure, a traffic analysis should identify potential impacts.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Evaluation of Lane Reduction “Road Diet” Measures on Crashes*. Publication Number: FHWA-HRT-10-053. 2010.
NACTO. *Urban Street Design Guide*. 2013.

Materials and Maintenance

Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush with the pavement.

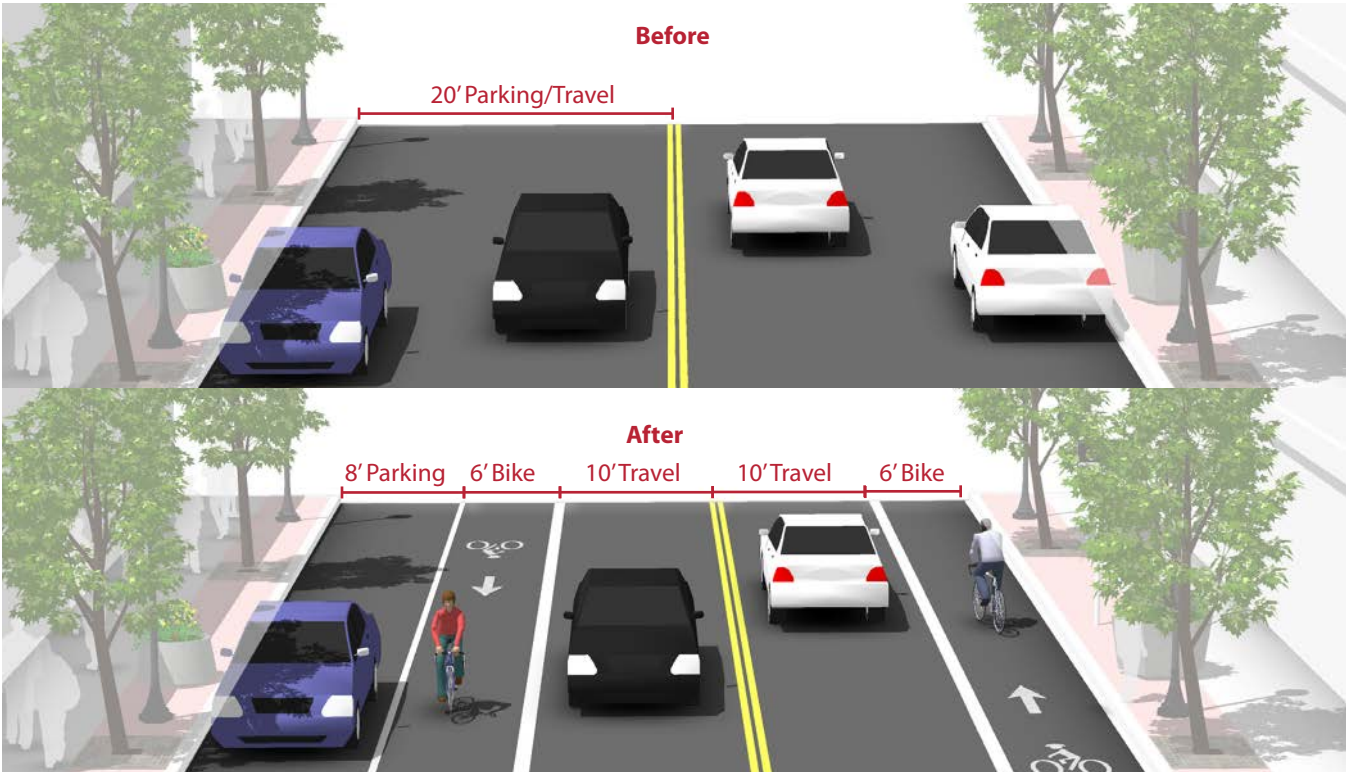
PARKING REDUCTION

Description

Bike lanes can 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 example, parking may be needed on only one side of a street. Eliminating or reducing on-street parking also improves sight distance for bicyclists in bike lanes and for motorists on approaching side streets and driveways.

Guidance

- Vehicle lane width:**
- Parking lane width depends on project. No travel lane narrowing may be required depending on the width of the parking lanes.
- Bicycle lane width:**
- Guidance on bicycle lanes applies to this treatment.



Discussion

The City of Columbia has bonds issued against future parking revenue which requires any paid parking removed from the street be relocated elsewhere. Removing or reducing on-street parking to install bike lanes requires comprehensive outreach to the affected businesses and residents. 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.

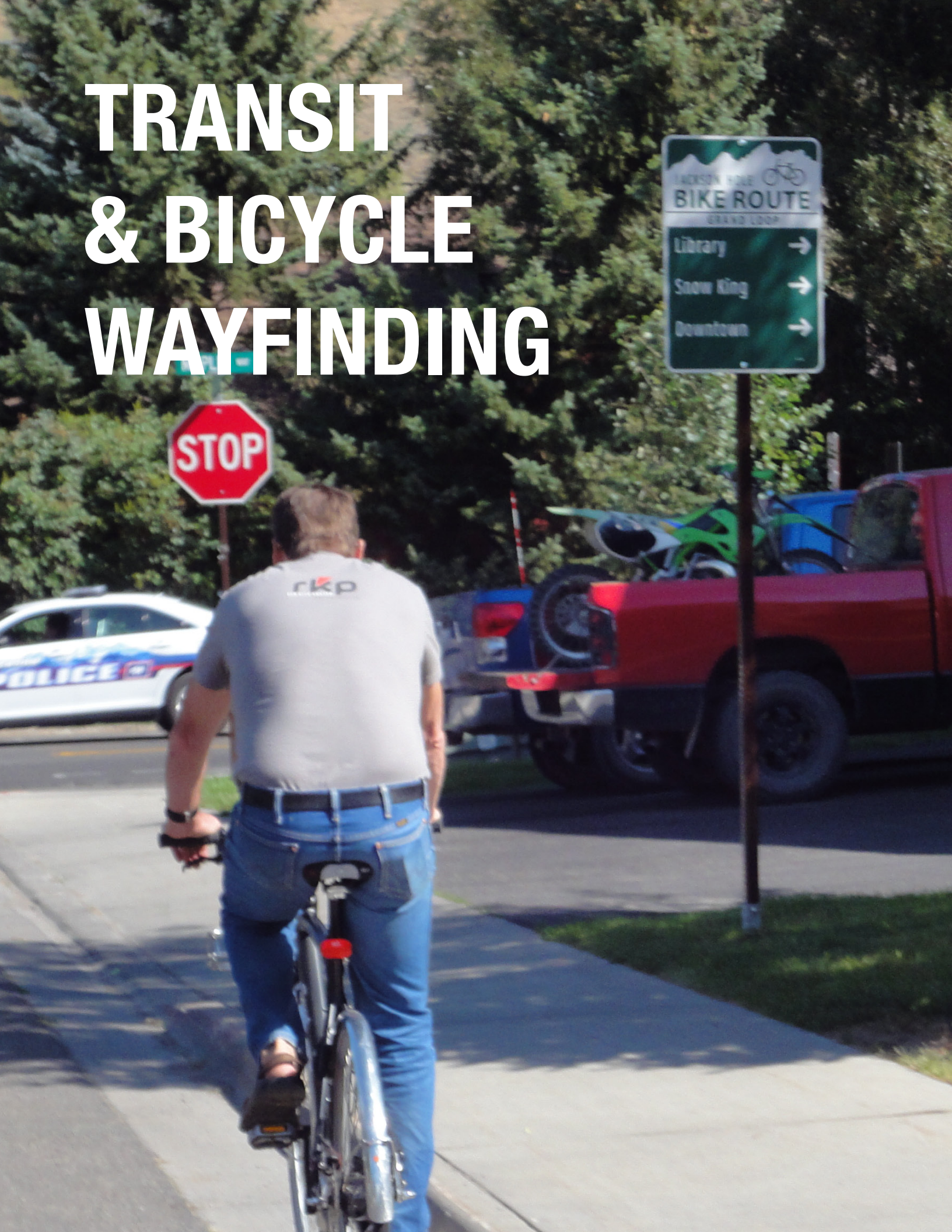
Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
AASHTO. *A Policy on Geometric Design of Highways and Streets*. 2004.

Materials and Maintenance

Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush with the pavement

TRANSIT & BICYCLE WAYFINDING



TRANSIT WAYFINDING

Description

Transit wayfinding is important primarily for informing the public on where to access transit, and to assist users in making educated route plans to reach their destinations. Well planned and designed transit wayfinding can encourage people to use transit – likewise, poorly designed transit wayfinding can discourage transit use. Taking trips with transit involves several important steps that can be generalized into three phases:

Trip planning – locating a destination and deciding what mode or modes to utilize for the trip.

Trip segment assessment – understanding the necessary steps required to successfully reach a destination.

En route decision points – successfully judging options and navigating transfers between transit routes or modes within the trip.



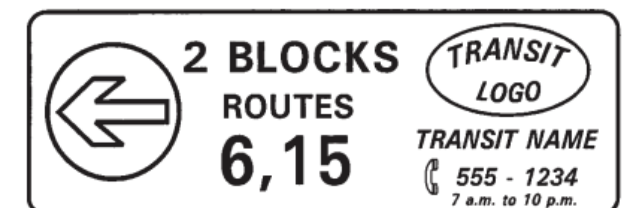
Supplemental information can be included to assist in decision making and increase the convenience for passengers and may include:

- Hours of operation
- Route frequency and/or timetables
- Diagrammatic route maps
- System maps
- Distances, directions and travel times to popular destinations

Guidance

There are several media for providing wayfinding information to transit users - most often oral communication, signage (static and dynamic), pamphlets and digital communication are used. All can be effective means of conveying wayfinding information, and typically a combination of all should be considered. For the purposes of these Design Guidelines, we will be focusing on information conveyance through wayfinding signage.

- Signs should be mounted to be conspicuous against other signs, advertising, and other visual clutter. Consideration must also be given to local ordinances and protection against vandalism.
- Sign must be visible to bus passengers inside bus when bus is at stop.
- Consider use of duplicate sign with 3-in. raised letters/symbols in location suitable for approach to within 3 in., with Grade II Braille under each character.
- Bus stop signage should include the transit system logo/name, transit information telephone number, names of streets and landmarks where bus stop is located, and route number(s) serving the bus stop.



A "Trailblazer sign" can be used along or nearby routes to direct people to stops within close proximity. Such signage is also helpful guiding transit users between two nearby stops

Discussion

Signage siting is an important aspect of transit wayfinding. In order to be noticed and effective, information must be perceived at or shortly before the decision point. Signage site characteristics to consider include light levels, density of people using the facility, ceiling heights and corridor widths. (from TCRP Report 12: Guidelines for Transit Facility Signing and Graphics)

Additional References and Guidelines

OCTA. *Bus Stop Safety and Design Guidelines*. 2004.
TCRP. *Report 12: Guidelines for Transit Facility Signing and Graphics*. 1996.

Materials and Maintenance

Maintenance needs for transit wayfinding signs are similar to other signs and will need periodic replacement due to wear.



BIKEWAY WAYFINDING SIGN TYPES

Description

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. There are three general types of wayfinding signs:

Confirmation Signs

Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.

Can include destinations and distance/time. Do not include arrows.

Turn Signs

Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.

Include destinations and arrows.

Decisions Signs

Mark the junction of two or more bikeways.

Inform bicyclists of the designated bike route to access key destinations. Includes destinations and arrows and distances.

Travel times are optional but recommended.



Discussion

There is no standard color for bicycle wayfinding signage. Section 1A.12 of the MUTCD establishes the general meaning for signage colors. Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

BIKEWAY WAYFINDING SIGN PLACEMENT

Confirmation Signs

Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.

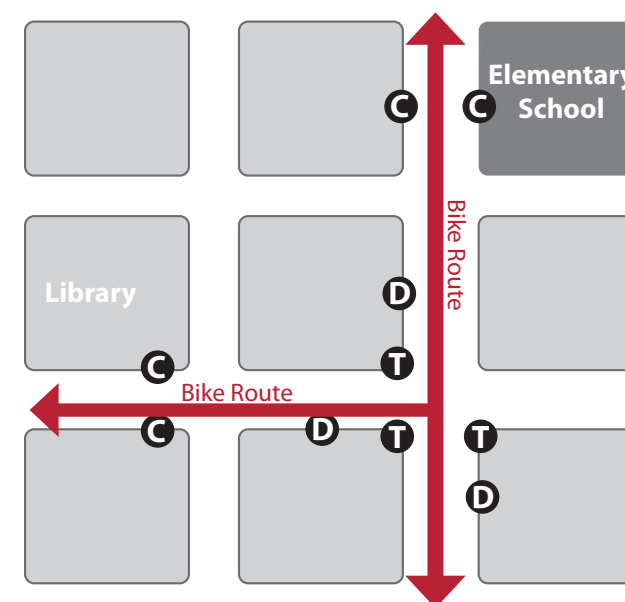
Guidance

Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

Decisions Signs

Near-side of intersections in advance of a junction with another bicycle route.

Along a route to indicate a nearby destination.



Discussion

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed. For example, primary destinations (such as the downtown area) may be included on signage up to 5 miles away. Secondary destinations (such as a transit station) may be included on signage up to two miles away. Tertiary destinations (such as a park) may be included on signage up to one mile away.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
NACTO. *Urban Bikeway Design Guide*. 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

BICYCLE SUPPORT FACILITIES





BICYCLE RACKS

Description

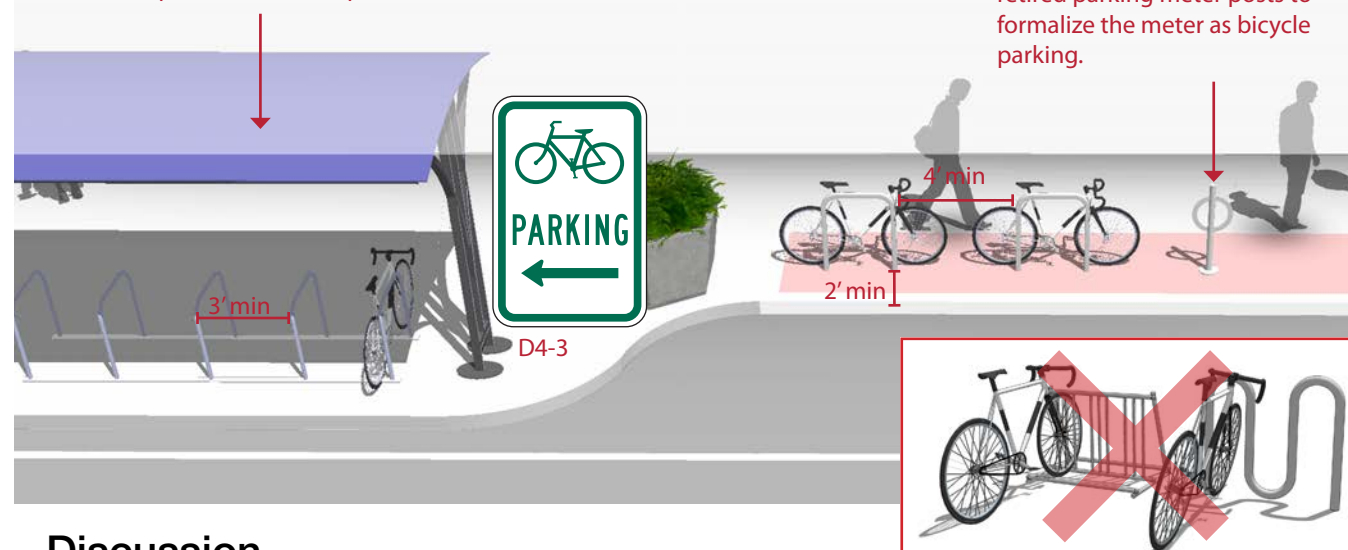
Short-term bicycle parking is meant to accommodate visitors, customers, and others expected to depart within two hours. It should have an approved standard rack, appropriate location and placement, and weather protection. The Association for Pedestrian and Bicycle Professionals (APBP) recommends selecting a bicycle rack that:

- Supports the bicycle in at least two places, preventing it from falling over.
- Allows locking of the frame and one or both wheels with a U-lock.
- Is securely anchored to ground.
- Resists cutting, rusting and bending or deformation.

Guidance

- 2' minimum from the curb face to avoid 'dooring.'
- Close to destinations; 50' maximum distance from main building entrance.
- Minimum clear distance of 6' should be provided between the bicycle rack and the property line.
- Should be highly visible from adjacent bicycle routes and pedestrian traffic.
- Locate racks in areas that cyclists are most likely to travel.
- Post signage that clearly indicates mopeds and motorcycles are prohibited from parking at bike racks. Direct mopeds/motorcycles to designated moped/motorcycle parking areas.

Bicycle shelters consist of bicycle racks grouped together within structures with a roof that provides weather protection.



Discussion

Some types of bicycle racks may meet design criteria, but are discouraged except in limited situations. This includes undulating "wave" racks, schoolyard "wheel bender" racks, and spiral racks. (See illustration above).

Decorative racks may enhance the aesthetic nature of a streetscape, but the custom design should not interfere with the functionality of the rack. Standard "U" racks are preferred over decorative racks in most regular installations, but decorative racks may be preferred in special districts or in areas with space constraints.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
APBP. *Bicycle Parking Guide 2nd Edition*. 2010.

Materials and Maintenance

Use of proper anchors will prevent vandalism and theft. Racks and anchors should be regularly inspected for damage. Educate snow removal crews to avoid burying racks during winter months.

ON-STREET BICYCLE CORRAL

Description

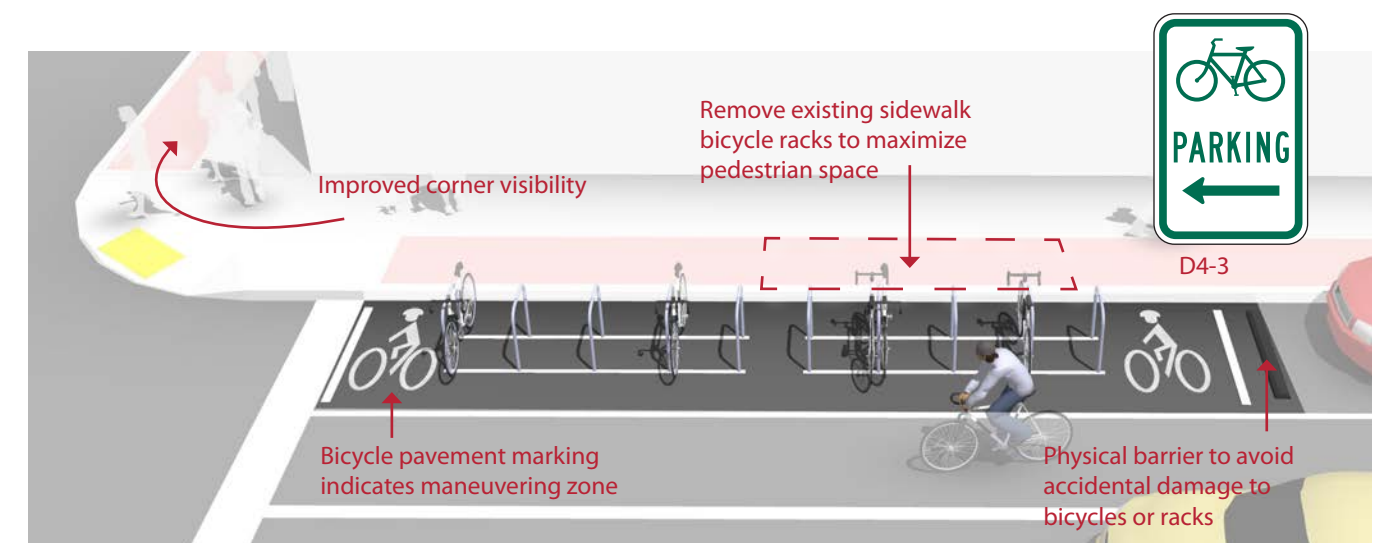
Bicycle corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

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.

Guidance

See guidelines for sidewalk bicycle rack placement and clear zones.

- Bicyclists should have an entrance width from the roadway of 5' – 6'.
- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.



Discussion

In many communities, 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. Communities can establish maintenance agreements with the requesting business. Bicycle corrals can be especially effective in areas with high bicycle parking demand or along street frontages with narrow sidewalks where parked bicycles would be detrimental to the pedestrian environment.

Additional References and Guidelines

APBP. *Bicycle Parking Guide 2nd Edition*. 2010.

Materials and Maintenance

Physical barriers may obstruct drainage and collect debris. Establish a maintenance agreement with neighboring businesses. In snowy climates the bicycle corral may need to be removed during the winter months.



BICYCLE LOCKERS

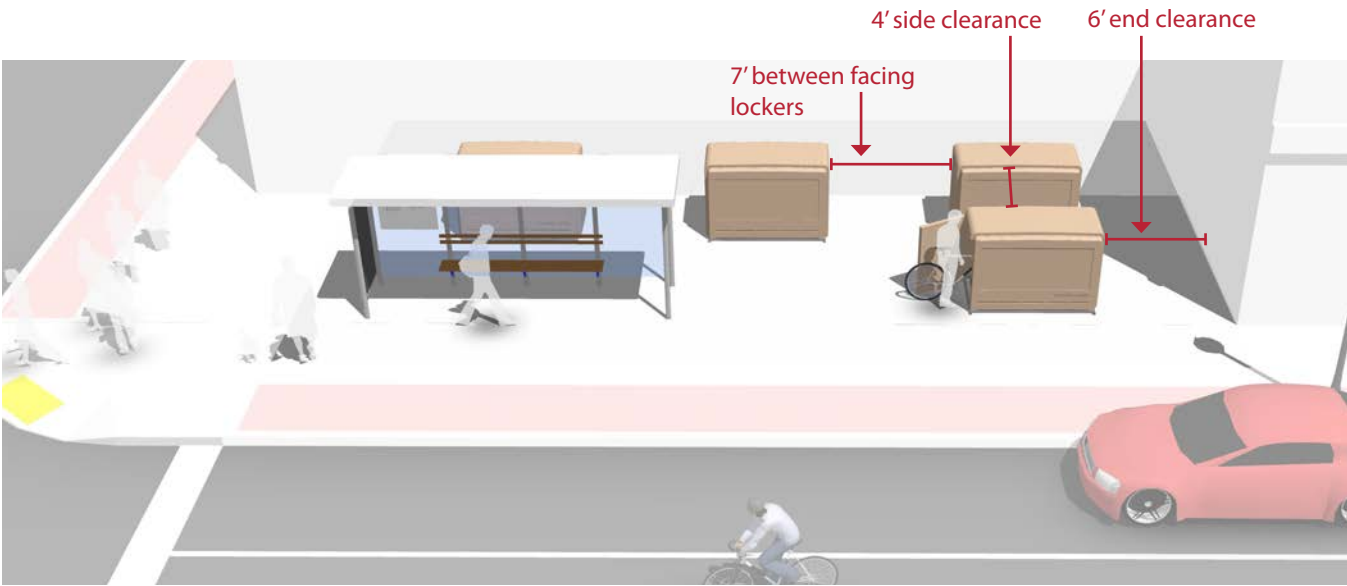
Description

Bicycle lockers are intended to provide long-term bicycle storage for employees, students, residents, commuters, and others expected to park more than two hours. Long-term facilities protect the entire bicycle, its components and accessories against theft and against inclement weather, including snow and wind-driven rain.

Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle. Some lockers allow access to two users - a partition separating the two bicycles can help 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.

Guidance

- Minimum dimensions: width (opening) 2.5'; height 4'; depth 6'.
- 4 foot side clearance and 6 foot end clearance.
- 7 foot minimum distance between facing lockers.
- Locker designs that allow visibility and inspection of contents are recommended for increased security.
- Access is controlled by a key or access code.



SECURE PARKING AREA (SPA)

Description

A Secure Parking Area for bicycles, also known as a Bike SPA or Bike & Ride (when located at transit stations), is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Accessible via key-card, combination locks, or keys, Bike SPAs provide high-capacity parking for 10 to 100 or more bicycles. Increased security measures create an additional transportation option for those whose biggest concern is theft and vulnerability.

Guidance

- Bike SPAs may be stand alone or integrated into the ground floor of parking garage structure.
- Key features may include:**
- Closed-circuit television monitoring.
 - Double high racks & cargo bike spaces.
 - Bike repair station with bench.
 - Bike tube and maintenance item vending machine.
 - Bike lock “hitching post” – allows people to leave bike locks.
 - Secure access for users.



Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. 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.

Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. Bike SPAs are ideal for transit centers, airports, train stations, or wherever large numbers of people might arrive by bicycle and need a secure place to park while away.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
APBP. *Bicycle Parking Guide 2nd Edition*. 2010.

Materials and Maintenance

Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
APBP. *Bicycle Parking Guide 2nd Edition*. 2010.

Materials and Maintenance

Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.



BICYCLE PARKING AT TRANSIT

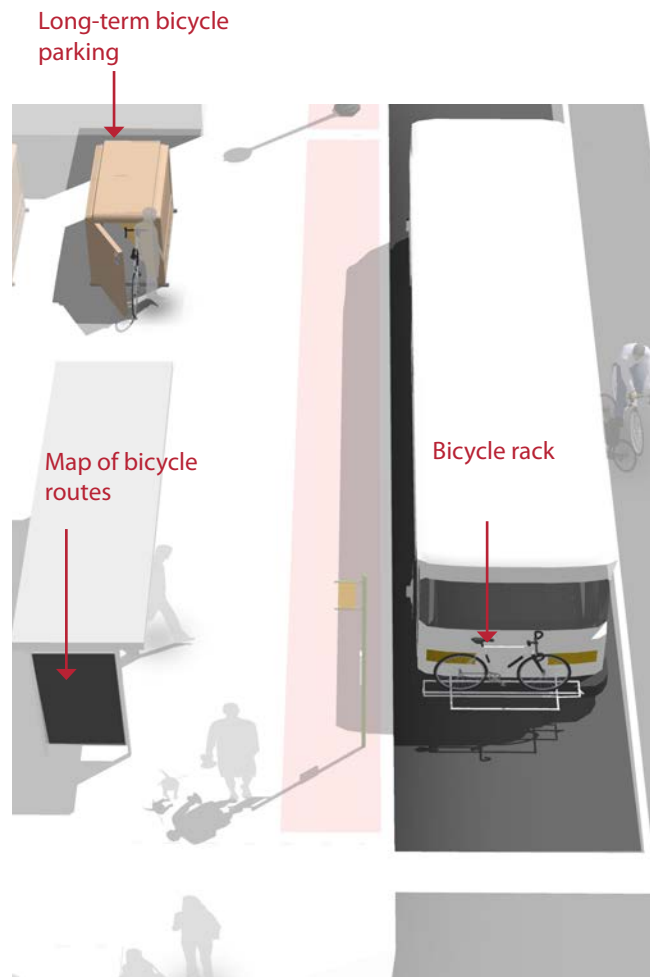
Description

Bicycle parking facilities, such as securement devices (bike racks and storage lockers), may be provided at bus stops by local jurisdictions or adjacent property owners for the convenience of bicyclists using transit.

Bicycle parking facilities discourage the practice of locking bicycles onto bus facilities or onto adjacent property. By confining bicycles to one area, securement devices can reduce visual clutter and maintain appropriate pedestrian clearances. Below are guidelines for the placement of bicycle parking facilities.

Guidance

- Locate securement devices or bicycle lockers away from other pedestrian or bus patron activities to improve safety and reduce congestion.
- Coordinate the location of bicycle parking facilities with existing on-site or street lighting.
- Ensure parked bikes are visible at all times. Do not locate bicycle parking where views are restricted by a bus shelter, landscaping, or existing site elements, such as walls.
- Design and placement of bicycle parking facilities should complement other transit furniture at bus stop.
- Covered or weather protected parking locations is an important bonus to bicyclists.



Discussion

There are two bicycle locker facilities available for secure parking at transit stops. A key based locker is a long term rental, typically provided by the transit agency. A key based system allows access to only one individual. An alternative bicycle locker is a code or combo based system. These lockers allow users to rent the locker on a need-only basis.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
APBP. *Bicycle Parking Guide 2nd Edition*. 2010.
FHWA. *Federal Highway Administration University Course on Bicycle and Pedestrian Transportation. Lesson 18: Bicycle and Pedestrian Connections to Transit*. 2006.

Materials and Maintenance

Regularly inspect the functioning of long-term parking moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

BIKE SHARE STATION PLACEMENT

Description

Bike sharing is a nonmotorized transportation service, typically structured to provide users point-to-point transportation for short distance trips. Users pick up a bicycle at self-serve bike sharing stations and return it to the same or other station at the end of their trip.

Bike sharing stations holds the automated customer kiosk and bicycle docks.

Guidance

Bike sharing station should be placed in safe, convenient and highly visible locations. If they are intended to support transit stations, they should be visible from the entrance/exit of the station.

Placement:

On-street stations are placed within the parking lane of a street. On-street stations are accessible from within the street. These stations are typically located adjacent to on-street bicycle facilities such as bike lanes.

Sidewalk stations are located on the furnishing or frontage zone of a wide sidewalk.

Public space stations are located in plazas or parks. These locations may be privately owned.

An 11 dock bike sharing station will require an approximate space of 32 feet wide and 10-12 feet deep for infrastructure and access.



Discussion

Two-sided stations may be provided in locations with adequate access from both sides, and offer the potential for increased station capacity given a certain footprint.

Solar powered stations should be placed in locations with access to sunlight for a portion of the day, and have 11 ft vertical clearance.

Additional References and Guidelines

FHWA. *Bike Sharing in The United States: State of the Practice and Guide to Implementation*. 2012.

Materials and Maintenance

Provide a 1 ft gap between on-street stations and the curb of the sidewalk to allow for water drainage and debris removal.

BIKEWAY MAINTENANCE

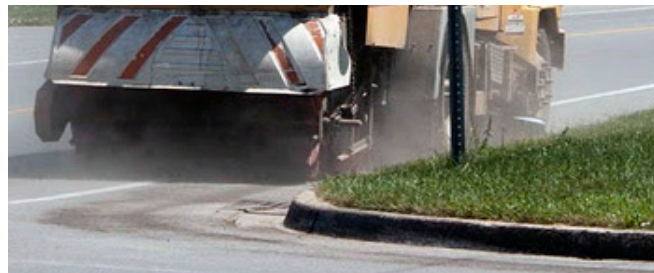
Photo by VeloBusDriver via Flickr (CC BY-SA) 2.0)



SWEEPING

Description

Bicyclists often avoid shoulders and bike lanes filled with gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, potentially causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway. A regularly scheduled inspection and maintenance program helps ensure that roadway debris is regularly picked up or swept.



Guidance

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.
- Pave gravel driveway approaches to minimize loose gravel on paved roadway shoulders.
- Perform additional sweeping in the Spring to remove debris from the Winter.
- Perform additional sweeping in the Fall in areas where leaves accumulate .

ROADWAY SURFACE

Description

Bicycles are much more sensitive to subtle changes in roadway surface than are motor vehicles. Various materials are used to pave roadways, and some are smoother than others. Compaction is also an important issue after trenches and other construction holes are filled. Uneven settlement after trenching can affect the roadway surface nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks. When resurfacing streets, use the smallest chip size and ensure that the surface is as smooth as possible to improve safety and comfort for bicyclists.



Guidance

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼”.
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- If chip sealing is to be performed, use the smallest possible chip on bike lanes and shoulders. Sweep loose chips regularly following application.
- During chip seal maintenance projects, if the pavement condition of the bike lane is satisfactory, it may be appropriate to chip seal the travel lanes only. However, use caution when doing this so as not to create an unacceptable ridge between the bike lane and travel lane.

SIGNAGE

Description

Bike lanes, shared shoulders, Bicycle Boulevards and paths all have different signage types for wayfinding and regulations. Such signage is vulnerable to vandalism or wear, and requires periodic maintenance and replacement as needed.



Guidance

- Check regulatory and wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear.
- Replace signage along the bikeway network as-needed.
- Perform a regularly-scheduled check on the status of signage with follow-up as necessary.
- Create a Maintenance Management Plan.

PAVEMENT OVERLAYS

Description

Pavement overlays represent good opportunities to improve conditions for bicyclists if done carefully. A ridge should not be left in the area where bicyclists ride (this occurs where an overlay extends part-way into a shoulder bikeway or bike lane). Overlay projects also offer opportunities to widen a roadway, or to re-stripe a roadway with bike lanes.



Guidance

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge.
- If the shoulder or bike lane pavement is of good quality, it may be appropriate to end the overlay at the shoulder or bike lane stripe provided no abrupt ridge remains.
- Ensure that inlet grates, manhole and valve covers are within ¼ inch of the finished pavement surface and are made or treated with slip resistant materials.
- Pave gravel driveways to property lines to prevent gravel from being tracked onto shoulders or bike lanes.



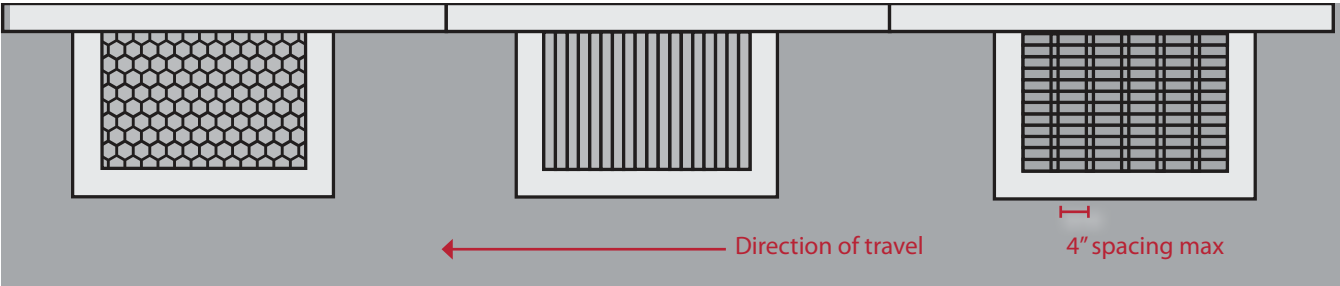
DRAINAGE GRATES

Description

Drainage grates are typically located in the gutter area near the curb of a roadway. Drainage grates typically have slots through which water drains into the municipal storm sewer system. Many older grates were designed with linear parallel bars spread wide enough for a tire to become caught so that if a bicyclist were to ride on them, the front tire could become caught in the slot. This would cause the bicyclist to tumble over the handlebars and sustain potentially serious injuries.

Guidance

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.



GUTTER TO PAVEMENT TRANSITION

Description

On streets with concrete curbs and gutters, 1 to 2 feet of the curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the bikeway is situated near the transition between the gutter pan and the pavement edge. This transition can be susceptible to erosion, creating potholes and a rough surface for travel.

The pavement on many streets is not flush with the gutter, creating a vertical transition between these segments. This area can buckle over time, creating a hazardous condition for bicyclists.



Guidance

- Ensure that gutter-to-pavement transitions have no more than a 1/4" vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- Provide at least 3 feet of pavement outside of the gutter seam.

LANDSCAPING

Description

Bikeways can become inaccessible due to overgrown vegetation. All landscaping needs to be designed and maintained to ensure compatibility with the use of the bikeways. After a flood or major storm, bikeways should be checked along with other roads, and fallen trees or other debris should be removed promptly.

Guidance

- Ensure that shoulder plants do not hang into or impede passage along bikeways
- After major damage incidents, remove fallen trees or other debris from bikeways as quickly as possible



MAINTENANCE MANAGEMENT PLAN

Description

Bikeway users need accommodation during construction and maintenance activities when bikeways may be closed or unavailable. Users must be warned of bikeway closures and given adequate detour information to bypass the closed section. Users should be warned through the use of standard signing approaching each affected section (e.g., "Bike Lane Closed," "Trail Closed"), including information on alternate routes and dates of closure. Alternate routes should provide reasonable directness, equivalent traffic characteristics, and be signed.

Guidance

- Provide fire and police departments with map of system, along with access points to gates/bollards
- Enforce speed limits and other rules of the road
- Enforce all trespassing laws for people attempting to enter adjacent private properties

