

# GSATS 2040 METROPOLITAN TRANSPORTATION PLAN UPDATE

## APPENDIX G

Technical Memorandum

## PEDESTRIAN WALKWAYS AND BIKEWAYS

Prepared for:



Prepared by:



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# 1. INTRODUCTION

In recent years, communities throughout the United States and particularly in the Carolinas have experienced a growing interest in implementing transportation infrastructure improvements that enhance walking and biking. Towns, cities, counties, and metropolitan planning organizations understand the need to plan, design, and implement non-motorized transportation options as well as increase opportunities for recreation. Advancing bike and pedestrian networks is essential to meeting safety, mobility, livability, environmental, and economic goals. Additionally, active transportation options provide a host of benefits to individual communities and larger regions by connecting destinations and creating enjoyable transportation options that can improve the health of users.

People throughout the Grand Strand Area Transportation Study (GSATS) area have embraced biking and walking as viable forms of transportation and recreation. As the communities within the GSATS region grow, extending a safe and comfortable network for biking and walking facilities should result in an increase in the number of people biking and walking within the region for shorter transportation trips.

The purpose of this document is to provide an understanding of the context of biking and walking, or active transportation, within the GSATS area. In addition to documenting existing conditions, this technical memorandum presents analysis of where and how these facilities should be implemented as well as policy recommendations for moving bicycling and walking forward as viable transportation modes.

## 1.1 FIVE E'S OF BICYCLING AND WALKING

At the heart of any quality active transportation network are what have been termed as the “Five E’s” - Engineering, Education, Encouragement, Enforcement, and Evaluation. Considering each of the Five E's results in a thorough understanding of the issues at hand within individual GSATS communities and the region as a whole, and leads to the development of comprehensive strategies to improve safety, enhance mobility, and increase the number of people walking and biking. The Five E's are described in more detail below.

***Engineering*** refers to providing physical infrastructure for safe, convenient walking and biking. Engineering can be reflected in the capital improvement recommendations of planning documents or in the actual implementation of active transportation facilities. Engineering includes:

- On-street bike lanes, crosswalks, and paved shoulders
- Off-street shared use paths, trails, and greenways



- Sidewalks
- Grade separations, including pedestrian/bicycle tunnels and bridges
- Traffic calming devices
- Directional and wayfinding signage
- Anything physical in nature

*Education* efforts typically focus on teaching all users (i.e., people who drive cars, ride bikes, and walk) how to safely operate within the transportation network. Education may focus on teaching bicyclists, particularly children, how to properly interact with motorists and how to avoid the most dangerous situations that commonly occur for bicyclists. Motorist education typically focuses on reminding drivers of the rules of the road and how to properly interact with bicyclists and pedestrians. Education efforts include:



- Bike rodeos and helmet fairs
- Safe Routes to School programs
- Public Service Announcements (PSAs)
- Informational brochures and marketing campaigns
- Driver education courses

*Encouragement* activities focus on increasing biking and walking through fun and interesting activities, promotional events, and avenues that make walking and biking more convenient. Encouragement efforts seek to demonstrate that biking and walking are valid modes of transportation. Encouragement activities include:



- Bike to Work Week and Bike and Walk to School Day activities
- Walk to Lunch Day activities
- Open Streets events (i.e., closing a street for a few hours and allowing biking, walking, skating, etc.)
- Community bike rides
- Bike share systems
- Maps, brochures, websites, apps, and other ways of providing information to users

**Enforcement** activities focus on enforcing the rules of the road for all users (i.e., people who drive cars, ride bikes, and walk).

Enforcement also prioritizes having links between the law enforcement community and the active transportation community. Enforcement activities include:

- Training programs for drivers
- Training programs for bicyclists
- Training programs for law enforcement officers
- Efforts to reduce speeding, red light/stop sign running, and distracted driving
- Efforts to increase yielding to pedestrians
- Efforts to reduce leading bicycle/pedestrian crash types
- Efforts to reduce improper or unlawful cyclist and pedestrian behaviors



**Evaluation** efforts, which seek to quantify the impact of the other "E's," occur at the beginning of the planning process, during implementation, and as follow-up to implementation. Evaluation efforts may include:

- Measuring the growth of bicycle and pedestrian facilities in a region
- Walkability and bikeability audits
- Measuring the rate of walking or biking in an area or the number of users on a specific facility
- Evaluating the increase of users based on increase in facilities
- Evaluating crash data for patterns or frequency



## 1.2 UNDERSTANDING USERS

In addition to the Five E's, active transportation *Equity* should be considered as well. Equity seeks fairness in the distribution of benefits and costs, providing the right solutions for the right users regardless of age, income, gender, or ability. Equity should not be confused with equality; equality assumes that all needs are the same, while equity allows resources to be provided based on need. In active transportation planning and design, discussion of equity acknowledges that, based on context, different solutions may be appropriate in different communities or for specific populations.



Bicycle and pedestrian facilities have evolved from serving as “alternative transportation” facilities to filling a critical gap in communities’ transportation networks. Previously, bicycle facilities placed people riding bikes in or directly adjacent to vehicle travel lanes. While this approach met, and continues to meet the needs of confident cyclists, it did not attract new users or encourage a broader bike culture. Today, 60% of people indicate that they are “interested but concerned” in bicycling and would like to ride more often.<sup>1</sup> Over 50% say they are worried about being hit by a car and nearly 50% say they would more likely ride a bike if physical separation were provided between motor vehicles and bicycles.<sup>2</sup> Similarly, pedestrians prefer to be placed further away from the curb and/or have a buffer between themselves and motor vehicle traffic. Lower stress environments result in increased numbers of people biking and walking.



*Successful active transportation networks address the needs of a wide spectrum of users*

<sup>1</sup> Dill, J., McNeil, N. (2012). Four Types of Cyclists? Examining a Typology to Better Understand Bicycling Behavior and Potential. Transportation Research Board. Bicycles 2013: Planning, Design, Operations, and Infrastructure, 01514640, 129-138.

<sup>2</sup> U.S. Bicycling Participation Benchmarking Study (2014).

## 2. EXISTING CONDITIONS

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To establish a baseline of understanding, existing plans and conditions regarding bicycle and pedestrian transportation were reviewed. The following sections outline existing active transportation conditions in the GSATS region.

### 2.1 PREVIOUS PLANS

Building upon the work that local governments within the GSATS region have completed to date is essential to enhancing the bike and pedestrian environment. Locally, the importance of improving existing facilities and increasing the connectivity of those facilities that support biking and walking for both transportation and recreation has been recognized.

Numerous planning efforts have been completed by GSATS member governments which have laid the foundation for what is to come. Each of these planning efforts received feedback from their respective communities and developed strategies based upon the goals and desires of the public. In addition, bicycle and pedestrian committees have been formed in several communities and act as local champions for new facilities and network enhancements. Planning documents should continue to be living documents that are updated regularly to ensure that the facilities planned will meet needs, increase safety, and provide more accessibility for members of individual communities and the region as a whole.

Each of the following plans makes recommendations that benefit the overall bike and pedestrian environment within the region:

- Brunswick County Greenway, Bikeway, and Paddle Trail Plan (in process)
- City of Conway Comprehensive Transportation Plan (2008)
- East Coast Greenway Master Plan: Horry and Georgetown Counties (2003)
- Georgetown Countywide Transportation Master Plan (2009)
- Georgetown County US 17 Corridor Study (2003)
- GSATS 2035 Long Range Transportation Plan (2011)
- Horry County Bicycle and Pedestrian Plan (2012, amended 2016)
- Horry County Envision 2025 (2008, last updated 2015)
- Northeast Area Transportation Plan (2008)
- Kings Highway Corridor Study (2008)
- Myrtle Beach Comprehensive Plan (2011)
- North Myrtle Beach US 17 Corridor Study (2003)
- North Myrtle Beach Comprehensive Plan (2010)

## 2.2 EXISTING INFRASTRUCTURE

The GSATS region currently has a number of bike and pedestrian facilities throughout the jurisdictions of its member governments. **Figure 2-1** shows the existing and planned facilities throughout the region along with inset maps of Conway and Myrtle Beach. Sidewalks are present in several municipalities. Predominantly, sidewalks exist within urban areas, but due to development regulation requirements, sidewalks are found in a number of residential areas as well. The coastal nature of the GSATS area may encourage walking due to the climate and number of visitors that travel to the area annually.

While bike and pedestrian facilities exist in the GSATS study area, there are numerous opportunities to strengthen connectivity within individual communities and throughout the region. Planning and design of bike and pedestrian infrastructure should build upon the existing segments and networks within the GSATS area and strive to implement facilities that attract new users while linking destinations and providing more accessibility. The planned facilities for biking and walking highlight the current gaps in the bike and pedestrian network. In many cases, the planned facilities not only provide active transportation corridors within a single community but also connect to neighboring communities and illustrate how a regional network of bikeways and walkways could exist.

Bike and pedestrian facilities, both existing and planned, are prevalent within the South Carolina portion of the GSATS region but the North Carolina area is lacking these facility types. Planning efforts and targeted strategies should be used to enhance the bike and pedestrian environments within the North Carolina portion of the GSATS region.

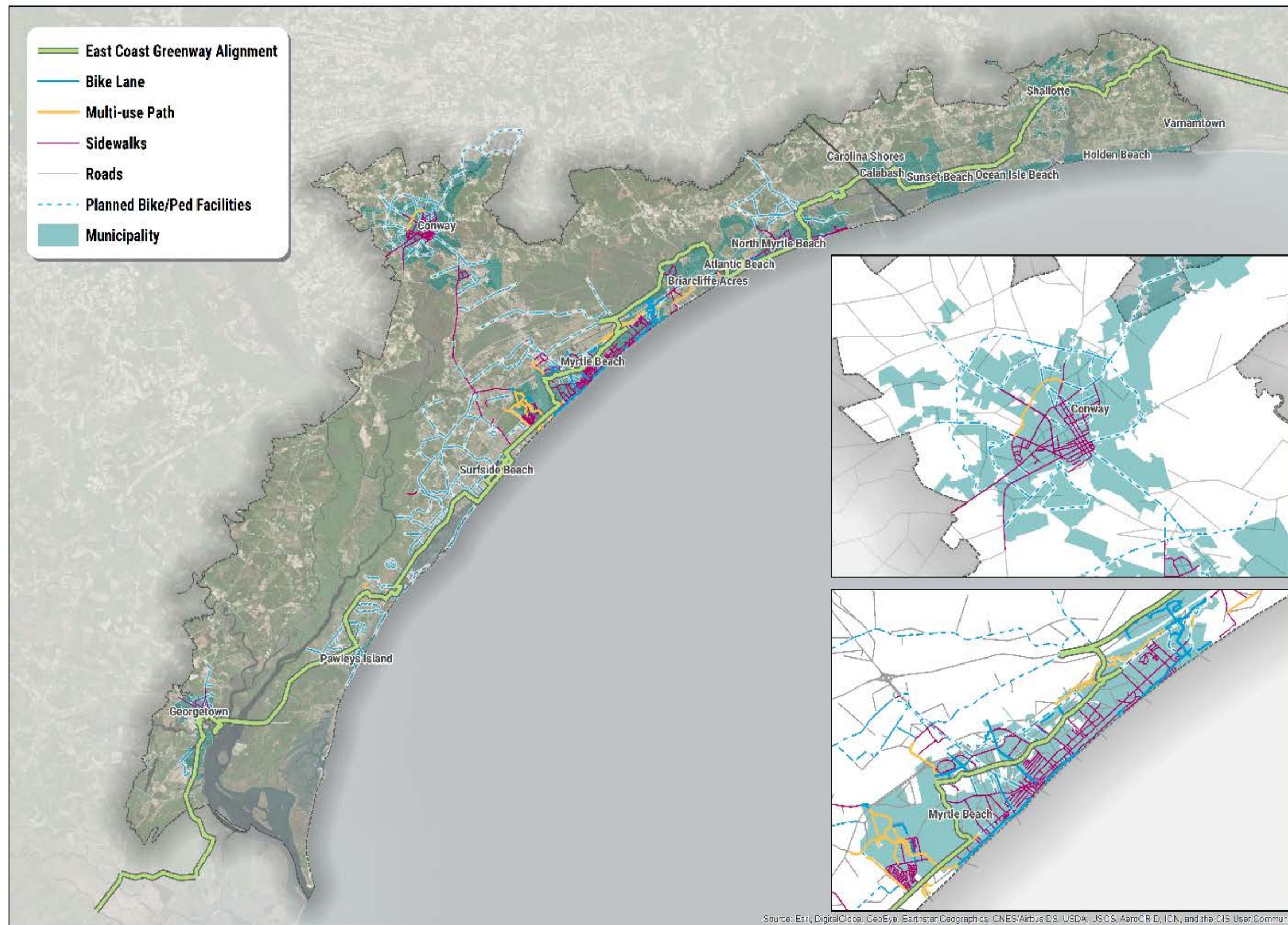


Figure 2-1:  
Existing Bicycle and  
Pedestrian Facilities

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## 2.3 PUBLIC INPUT

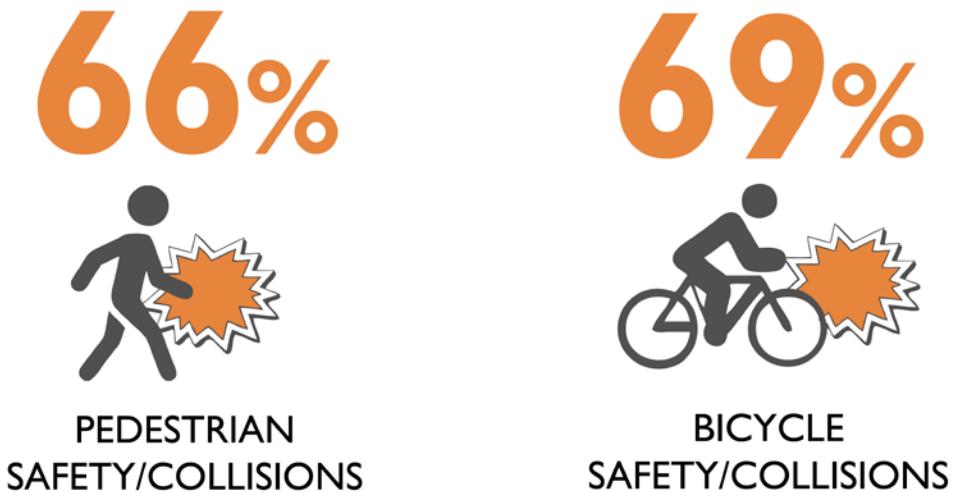
Biking and walking are not only recreational pastimes in the Grand Strand area but continue to gain momentum as viable transportation modes. Public participation during the MTP update has reinforced the excitement and opportunity for improvements to the bike and pedestrian network.

Community members were able to provide input for all modes of transportation on the existing regional network at public open house meetings and through the WikiMap, an online interactive mapping tool. Comments received through both methods of outreach have been reviewed and incorporated into the MTP update.



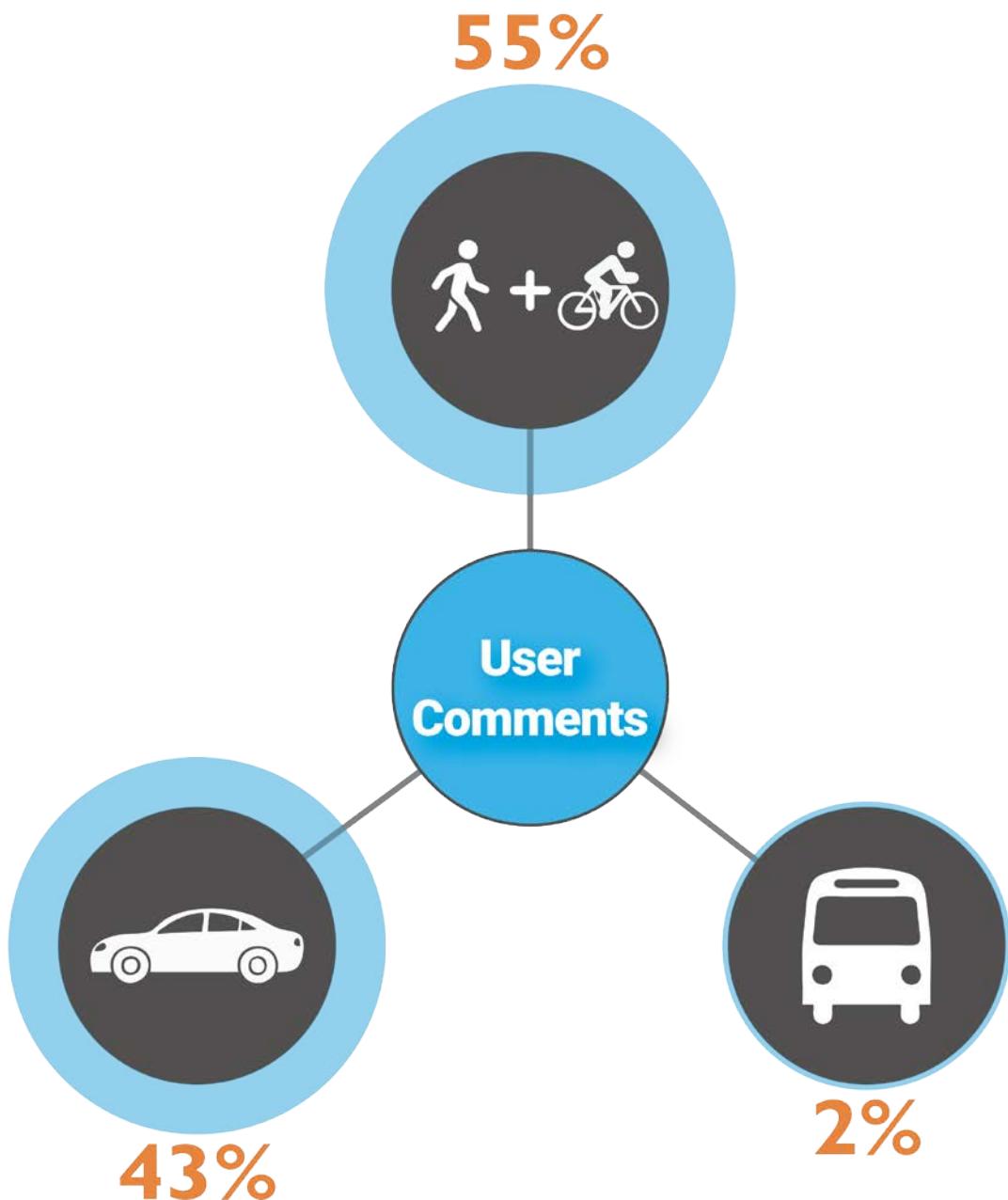
Participants feedback reflected national trends regarding “interested but concerned” populations for biking and walking in the GSATS study area. The WikiMap alone received over 350 comments from more than 130 users. Based on survey results, over 65 percent of participants expressed concern for pedestrian and bicycle safety/collisions (Figure 2-2). New facilities and the expansion of the East Coast Greenway can be designed to increase safety and comfort for users and enhance the experience of residents and visitors within the GSATS study area.

Figure 2-2: User Concern for Bike and Pedestrian Safety



Not only were participants concerned with bike and pedestrian safety, but as Figure 2-3 illustrates, 55 percent of all WikiMap comments were related to bike and pedestrian issues. Comments provided insight into the barriers that exist within the region along with existing routes and destinations that are used by cyclists and pedestrians. Public input was essential to understanding the value that communities place on active transportation. The existing and planned bike and pedestrian infrastructure within the GSATS study area are perceived as assets by those that live and work within the region.

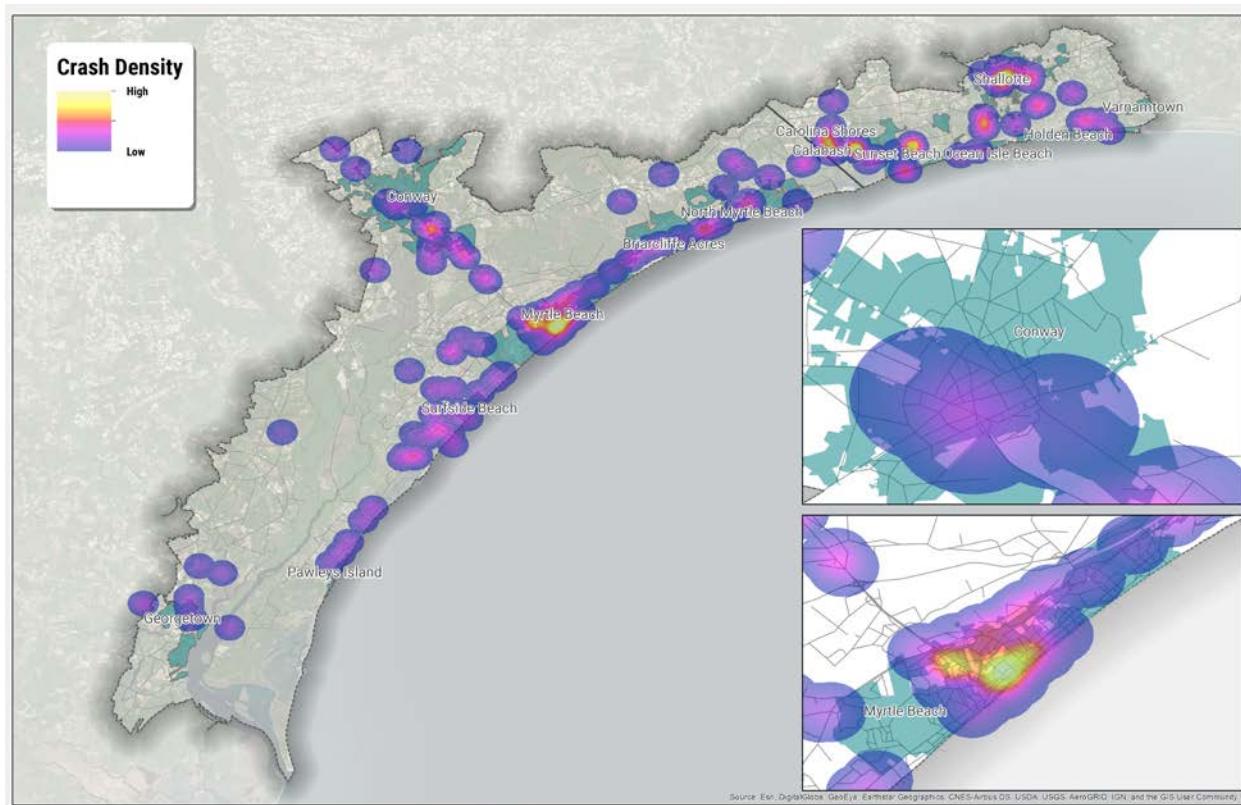
Figure 2-3: User Comments by Transportation Mode



## 2.4 BIKE AND PEDESTRIAN CRASH ANALYSIS

Crash data provided by the South Carolina Department of Transportation (SCDOT) and North Carolina Department of Transportation (NCDOT) identified location and nature of bike- and pedestrian-related street crashes. Out of the 124 reported bike and pedestrian crashes in South Carolina from 2011 to 2014, 35 resulted in fatalities, while 2 fatalities occurred out of the 50 reported crashes in the North Carolina portion of the study area. Crashes involving cyclists and pedestrians occurred throughout the GSATS region in several of the municipalities and within unincorporated areas, as shown in **Figure 2-4**. Crash density is shown to more clearly identify locations where bike and pedestrian crashes occurred with greater frequency. In addition to illustrating the locations of crashes, **Figure 2-4** provides insight into the areas that people are already biking and walking within the study area, and the need for enhancements that provide a safe bike and pedestrian network for users.

**Figure 2-4: Crash Analysis**



## 2.5 EAST COAST GREENWAY

The East Coast Greenway is an urban trail system planned to link 25 major U.S. cities from Calais, Maine to Key West, Florida. The main spine of the trail will stretch 3,000 miles along the East Coast, with an additional 2,000 miles of alternate routes to provide connectivity to towns, cities, parks, and natural areas. The trail is designed to accommodate pedestrians, cyclists, and other non-motorized modes of transportation.

Each segment of the trail is master planned, designed, constructed, and maintained by local governments. The East Coast Greenway Master Plan for Horry and Georgetown Counties was developed in 2003, detailing a 90-mile route through both counties and many of their municipalities. According to the East Coast Greenway website, “Of the 270-mile route through South Carolina, 15% is complete on greenway trails, and another 20% is in development. The ECG Association is working closely with agencies, municipalities, and organizations throughout the state to get the trail on the ground and find solutions to help progress accelerate.”<sup>3</sup>

GSATS and its member governments support the implementation of the ECG; representatives from Myrtle Beach, North Myrtle Beach, Murrells Inlet, Horry County, and Waccamaw Regional Council of Governments (WRCOG) are active participants on the South Carolina ECG Steering Committee. Additionally, GSATS has dedicated 80 percent of their Transportation Alternatives Program (TAP)<sup>4</sup> funds over approximately 20 years to realizing the ECG within the South Carolina portion of GSATS’ study area. This commitment has resulted in implemented facilities along approximately 50 percent of the ECG alignment within Horry and Georgetown counties. Key accomplishments include the first ECG trailhead in South Carolina at the Horry County Bike and Run Park, another trailhead being developed by the City of Myrtle Beach just south of Market Common, and the completion of the entire greenway route within the municipal limits of the City of Myrtle Beach.

It is important to note that to receive the official designation as part of the ECG the constructed path must be separated from the roadway and be 10 feet in width to accommodate both bicyclists and pedestrians. In some instances, an 8-foot path may be accepted, if physical constraints prevent a wider path. These design criteria directly impact project costs. While there are several segments of the route that are still routed along streets in South Carolina, the GSATS region has become a leader in developing the ECG per the required specifications.

Currently, there are not any completed sections of the ECG within the North Carolina portion of the GSATS region. Brunswick County in North Carolina was recently incorporated into the GSATS study area and will be included in the amendment to the existing ECG Master Plan for the region. The East Coast Greenway website reports that, “25% of North Carolina’s 372-mile spine route is currently on greenway trails. The Triangle section of the route is 94% complete for 72 miles, including the extensive American Tobacco Trail and Neuse River Greenway. The

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<sup>3</sup> East Coast Greenway (2017), <http://www.greenway.org/explore-by-state/sc>

<sup>4</sup> Under the FAST Act, adopted in 2016, TAP became a set-aside of the Surface Transportation Block Grant program; however, most MPOs continue to refer to it as TAP.

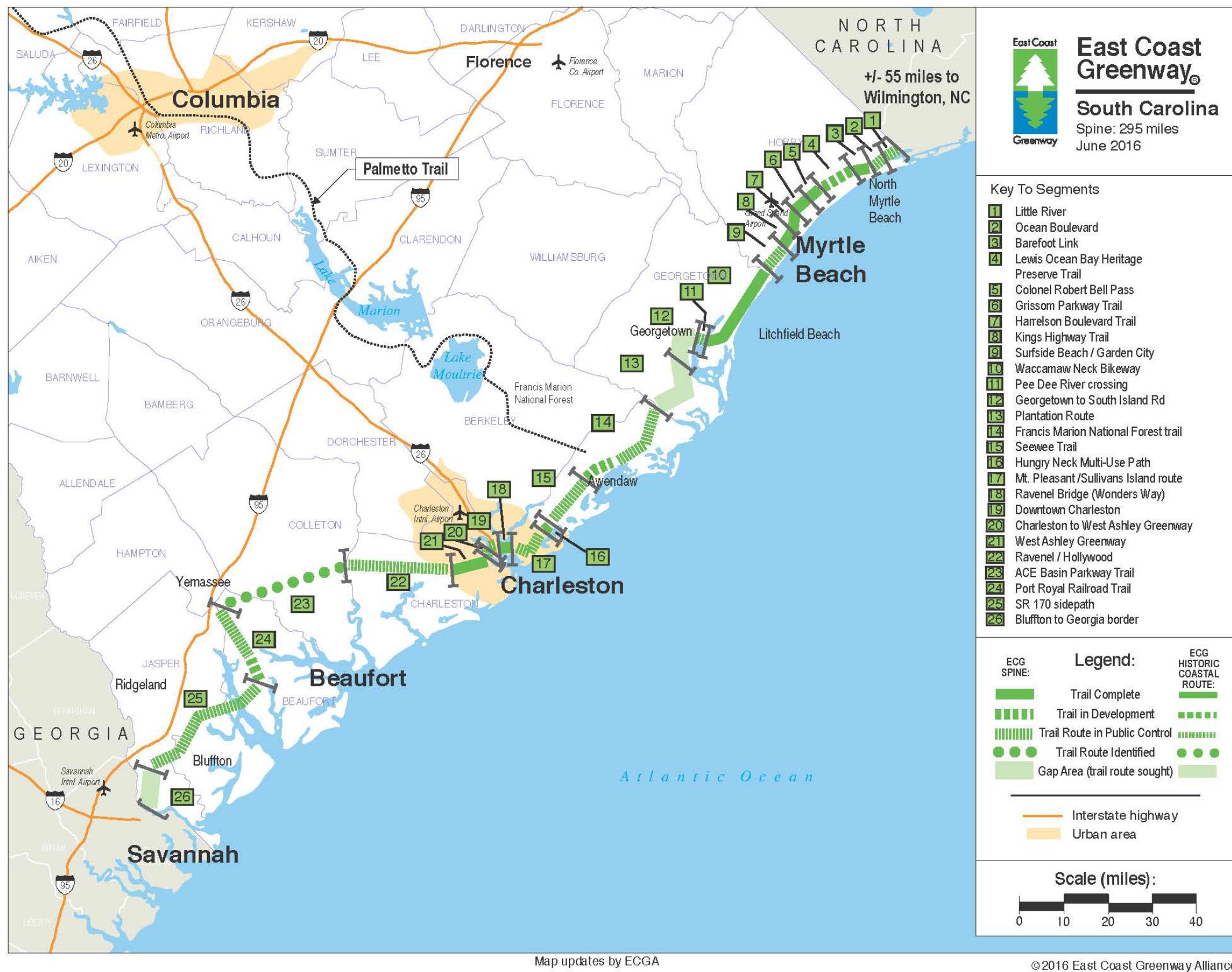
NC Committee is working hard to improve the on-road route through bike lanes, sharrows and other amenities, and is collaborating with state agencies and organizations to move the trail forward as quickly as possible.”<sup>5</sup>

While a conceptual alignment has been created within the GSATS region in North Carolina, GSATS has not adopted a route for the North Carolina portion of its study area. A grant was recently awarded by the National Park Service, through the Rivers, Trails, and Conservation Assistance Program (RTCA), to assist with the development of a detailed study of a route for the ECG through Brunswick County, North Carolina. As part of this process, alternative alignments should be considered that keep the greenway closer to the Atlantic Ocean, as an alignment that is truly along the coast may benefit local economies and make the GSATS area more of a regional destination for long distance cycling.

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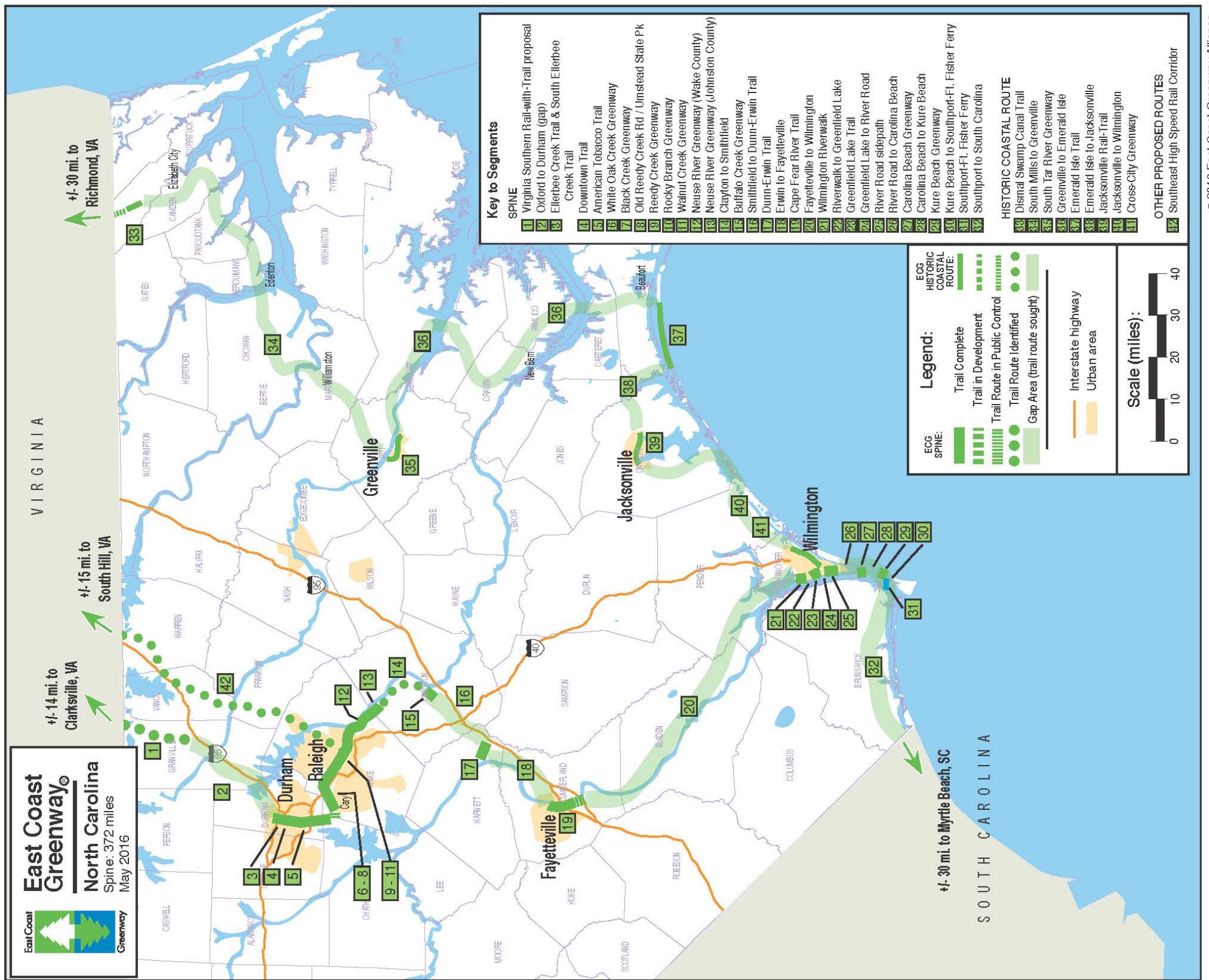
<sup>5</sup> East Coast Greenway (2017), <http://www.greenway.org/explore-by-state/nc>

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**Figure 2-5:**  
**East Coast Greenway South Carolina**

Figure 2-6: East Coast Greenway North Carolina



## 2.6 SAFE ROUTES TO SCHOOL

The Safe Routes to School (SRTS) program was developed to encourage school children to walk and bike to school through a variety of strategies. SRTS assists community groups and schools with planning and developing safe, dedicated bicycle and pedestrian facilities in the direct vicinity of schools. When originally established, SRTS had a dedicated federal funding source. Beginning in 2012, federal funding guidelines no longer dedicated funding to SRTS. Rather, funding for SRTS now comes out of TAP and is discretionary. Because GSATS dedicates 80% of their TAP funding in South Carolina to the completion of the East Coast Greenway (see Section 2.5), very little remains to fund initiatives like SRTS. However, GSATS has completed two very successful SRTS projects in the past that can be held up as models to the rest of the region:

- Waccamaw Elementary School - A multipurpose path along Waverly Road was implemented to enhance access to the elementary school as part of this SRTS project. The multipurpose path is approximately a half-mile in length and is parallel to Waverly Road from Shipmaster Avenue to Kings River Road. Other infrastructure improvements enhanced crossings for the path along the corridor.
- Georgetown Middle School - The SRTS Committee recommended a multipurpose path along Church Street along with other infrastructure and non-infrastructure improvements to enhance safety and access to the school. Approximately one-tenth of a mile of multipurpose path was implemented from Anthuan Maybank Drive to IP Canal Road.

Should additional or dedicated funding for SRTS projects be realized in the future, the GSATS region would benefit from pursuing more SRTS projects. Based on limited existing resources, interest in pursuing SRTS projects should originate at the local level. Through partnerships, TAP funds can be applied for and used on SRTS projects that may also improve safety and connectivity for surrounding neighborhoods.

To generate more interest in SRTS projects, GSATS should consider advancing broader Transportation Demand Management plans for schools. These would focus on all modes of school transportation (e.g., walking, biking, student drop-off/pickup by personal automobile, buses, etc.), and how best to coordinate those modes to allow for the most efficient internal and external transportation network surrounding one or more schools. Additionally, local development regulations should be considered to support SRTS. For example, Horry County's land development regulations require that new subdivisions built within 1.5 miles of a school or park include external sidewalks or the developer may pay a fee in lieu to fund future sidewalks.

## 2.7 BICYCLE AND PEDESTRIAN DEMAND

A key component to identifying the need for bike and pedestrian facilities is to understand where existing and potential biking and walking demand is within the region. Demand can be measured in numerous ways with a variety of factors. In order to capture the previous efforts of the communities within the GSATS region as well as input received as part of public outreach for the MTP Update, the factors presented in Table 2-1 were used to calculate demand for the region.

**Table 2-1: Active Transportation Demand Criteria**

| Input                                    | Description  | Weight |
|--|--|--------|
| Existing Bike and Pedestrian Facilities* | Existing facilities include bike lanes, shared roads marked by sharrows, and shared-use or multi-purpose paths.  | 30     |
| Planned Bike and Pedestrian Facilities*  | Planned facilities include any alignment or route that has been identified by previous municipal or regional plans.  | 20     |
| Sidewalks                                | Sidewalks are existing and are primarily within municipal boundaries in the GSATS region.  | 10     |
| Public Input                             | <p>Input received from public meetings and the Wikimap include:</p> <ul style="list-style-type: none"> <li>● Destinations</li> <li>● Routes currently biked/walked</li> <li>● Routes desired for biking/walking</li> <li>● Transit route needed</li> </ul> | 20     |

\*The East Coast Greenway is included within the existing and planned bike facilities factors

A weight is given to each of the factors used for the demand analysis in order to illustrate where people are biking and walking within the Grand Strand region. The highest weight was given to existing facilities in order to illustrate areas where demand already exists.

Furthermore, weighting existing facilities higher than all other inputs will illustrate the importance of connecting or extending the existing network along routes that are planned, confirmed by public input, or have existing sidewalks in close proximity. Figure 2-7 geographically depicts bike and pedestrian demand.

This “heatmap” clearly shows areas that have varying degrees of demand for active transportation facilities. High demand along planned bike and pedestrian facilities is a result of public input supporting the future expansion of the active transportation network along these corridors. While all projects planned in the GSATS region should include active transportation facilities, particular attention should be given to projects that fall within these high demand areas.

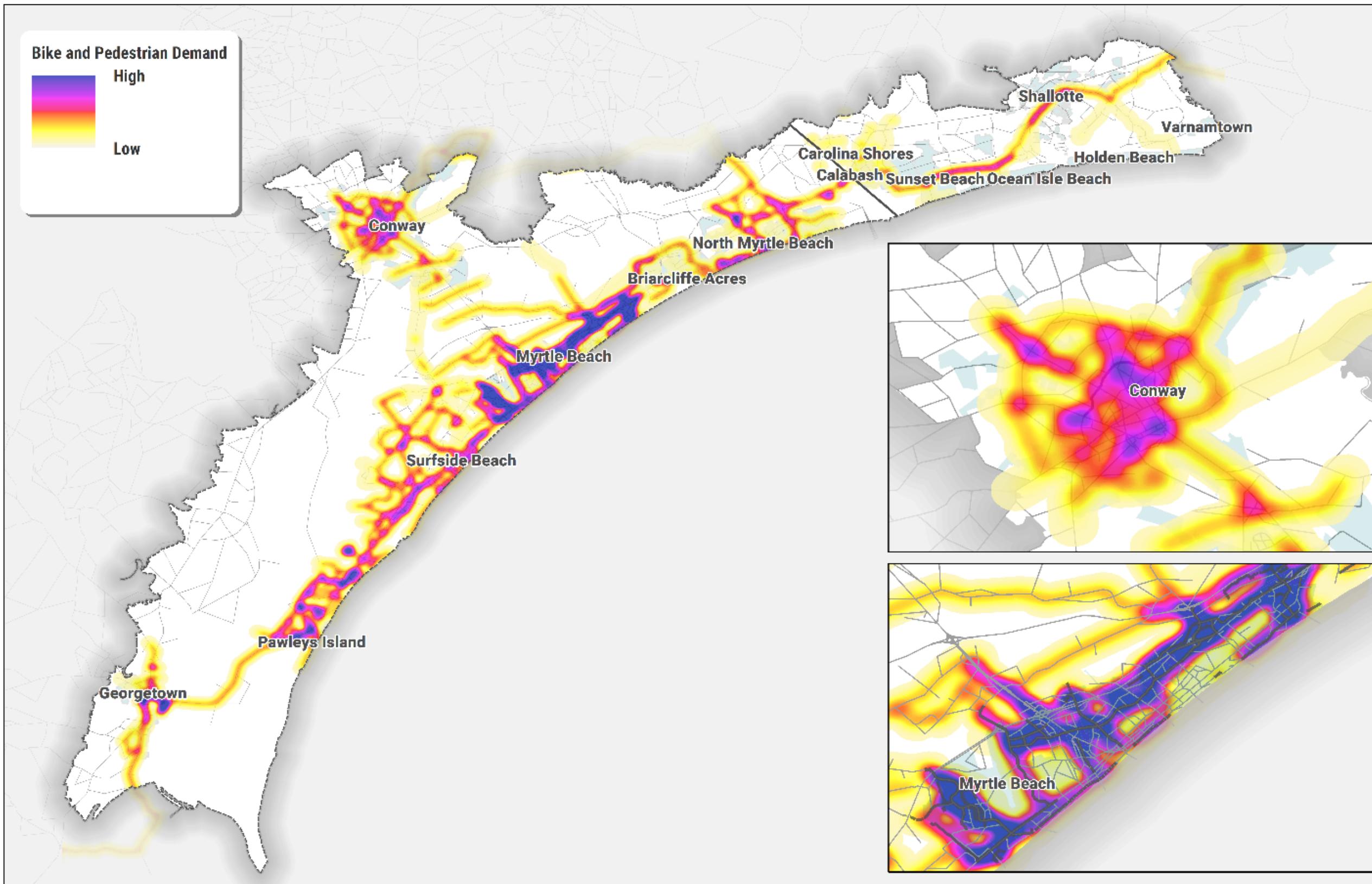


Figure 2-7:  
Active  
Transportation  
Demand Heatmap

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### 3. AVAILABLE FACILITY TYPES

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There are a variety of transportation facilities that are constructed specifically for bicycle and pedestrian use to improve safety, provide designated space, and increase comfort for non-motorized users. When planning bicycle and pedestrian facilities, it is important that all user types and their abilities be considered. A menu of bicycle and pedestrian facility types were presented during the first round of public meetings in the fall of 2016. These were not recommendations nor were they all-inclusive of every facility type available; rather, these were possible facility types to which participants could express their preferences. **Figure 3-1 and Figure 3-2** illustrate these bicycle and pedestrian facility types respectively.

Based on public input received for each of the facility types and national best practices, design guidelines have been prepared specific to the GSATS region and are presented in Section 4 of this technical memorandum.

**Figure 3-1: Bicycle Facility Types<sup>6</sup>**

| <b>BICYCLE FACILITY TYPES</b> |   |
|-------------------------------|---|
| Facility                      | Description   |
| Shared-Use Path               | <ul style="list-style-type: none"> <li>A shared-use path is defined as a trail permitting more than one type of user. Paths serve as part of a transportation circulation system and support multiple recreation opportunities, such as walking, bicycling, and inline skating. A shared-use path is physically separated from motor vehicular traffic with an open space or barrier.</li> </ul>  |
| Side Path                     | <ul style="list-style-type: none"> <li>A side path is a two-way path, fully separated from a roadway, open to bicycles, pedestrians, and most other non-motorized uses.</li> <li>This type of path often provides a shortcut around a circuitous, high-stress, or prohibited on-road route.</li> <li>Side paths are typically 10'-12' minimum in width.</li> </ul>  |
| Raised Cycle Track            | <ul style="list-style-type: none"> <li>Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. Some may be paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. Benefits include that motorists are kept from easily entering and it is more attractive to a wider range of bicyclists at all abilities and ages.</li> </ul>  |
| Bike Lane                     | <ul style="list-style-type: none"> <li>Bike lanes designate an exclusive space for bicyclists through the use of pavement markings, striping, and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street. Benefits include providing obvious space on the road for cyclists and sending a message to other road users to expect cyclists.</li> </ul> |
| Buffered Bike Lane            | <ul style="list-style-type: none"> <li>A buffered bicycle lane is a bike lane with additional striping or hatching (buffer) adjacent to it.</li> <li>The buffer may separate the bicycle lane from motor vehicle travel, parking, or both.</li> <li>The buffer width is typically 2'-3'.</li> </ul>   |

<sup>6</sup> A menu of bicycle facility types were presented during the first round of public meetings in the fall of 2016. These were not recommendations nor were they all-inclusive of every facility type available; rather, these were possible facility types to which participants could express their preferences.



## BICYCLE FACILITY TYPES

| Facility  | Description  |
|---|--|
| <br>Left-Side Bike Lane    | <ul style="list-style-type: none"> <li>Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets. They are usually implemented where the majority of bicycle traffic is going straight or accessing streets or other connections more easily from the left side. Benefits include avoidance of potential right-side bike lane conflicts on streets, such as parking or buses.</li> </ul>   |
| <br>Shared Street          | <ul style="list-style-type: none"> <li>A shared street is one where there is no curbed delineation between the roadway and the sidewalk and all users share the space. Vehicle volumes are either low or discouraged. The concept is also known as a "woonerf" (a Dutch term loosely translated to "living street").</li> <li>Travel zones can be delineated by pavers, bollards (sometimes removable), and/or plantings. Motorists are welcomed as 'guests' in a nonmotorized dominated space.</li> </ul> |
| <br>Separated Bike Lane   | <ul style="list-style-type: none"> <li>Separated bike lanes are at street level and can be one- or two-way. A separated bike lane may use a parking lane or other barrier between the bike lane and the motor vehicle travel lane. Benefits include a reduced risk of "dooring," preventing double-parking, reducing risks from motorists entering/exiting parking spaces, and a higher degree of comfort for bicyclists of all abilities and ages.</li> </ul>   |
| <br>Shared Lane Marking  | <ul style="list-style-type: none"> <li>A shared lane uses street markings to indicate a shared lane for bicyclists and motorists.</li> <li>These markings reinforce to motorists that bicycles belong in the lane. The pavement markings also indicate to bicyclists where to physically position themselves in the lane.</li> </ul>   |
| <br>Contraflow Bike Lane | <ul style="list-style-type: none"> <li>Contraflow bike lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. One advantage is that they can provide more direct connections for cyclists.</li> </ul>   |

**Figure 3-2: Pedestrian Facility Types<sup>7</sup>**

**GSATS**

## PEDESTRIAN FACILITY TYPES

| Facility  | Description   |
|---|---|
| <b>Sidewalk</b><br>                | <ul style="list-style-type: none"> <li>• Sidewalks are typically concrete or asphalt pathways adjacent to roadways for pedestrian travel.</li> <li>• Surfaces of sidewalks should be smooth and unobstructed by street furniture or utilities.</li> <li>• A 4' unobstructed width is the minimum for a sidewalk while 6' of width is preferred and 8'+ should be used for high-volume areas.</li> </ul> |
| <b>ADA Compliant Crossing</b><br>  | <ul style="list-style-type: none"> <li>• High visibility striping should be used at crossing areas.</li> <li>• A 4' minimum width should be used for ADA-accessible curb ramps.</li> <li>• A push button with audible status should be present at the crossing.</li> <li>• A pedestrian countdown signal should be present.</li> </ul>  |
| <b>Curb Extensions</b><br>        | <ul style="list-style-type: none"> <li>• A curb extension is an extension of the sidewalk at intersections to reduce pedestrian crossing distances and provide greater visibility to pedestrians attempting to cross a street.</li> </ul>   |
| <b>Leading Ped Interval</b><br>  | <ul style="list-style-type: none"> <li>• Leading pedestrian intervals allow the crosswalk/pedestrian movement to begin 3-6 seconds before a green light is given to motorists.</li> </ul>   |
| <b>Rapid Flashing Beacon</b><br> | <ul style="list-style-type: none"> <li>• Rapid flashing beacons are used to increase visibility of pedestrians as they cross the roadway at uncontrolled crosswalks.</li> <li>• This beacon is pedestrian-activated (i.e., the signal will only flash if a pedestrian has pushed a button, indicating that they need to cross the street).</li> </ul>   |

<sup>7</sup> A menu of pedestrian facility types were presented during the first round of public meetings in the fall of 2016. These were not recommendations nor were they all-inclusive of every facility type available; rather, these were possible facility types to which participants could express their preferences.



## PEDESTRIAN FACILITY TYPES

| Facility              | Description  |
|-----------------------|--|
| Median Refuge         |  <ul style="list-style-type: none"><li>A median refuge or island provides in-street refuge along the route of a pedestrian crossing.</li><li>The refuge width is ideally 7'+ to fit bicycles.</li><li>The approach to vehicle travel lanes must be ADA-compliant.</li></ul>   |
| HAWK Signal           |  <ul style="list-style-type: none"><li>A High-intensity Activated crossWalK (HAWK) signal is a full traffic signal activated on demand by bicyclists or pedestrians in order to stop motor vehicle traffic.</li><li>Red signals flash alternately to provide increased visibility to motorists.</li><li>Yellow signal blinks when the signal is not activated.</li></ul>                    |
| Raised Crosswalk      |  <ul style="list-style-type: none"><li>A raised crosswalk is an area of pavement where two streets intersect, raised from street level to sidewalk level.</li><li>This type of crossing is meant to calm traffic and increase pedestrian priority and visibility.</li></ul>  |
| Pedestrian Street     |  <ul style="list-style-type: none"><li>A pedestrian street is a street closed to vehicular traffic, used primarily by pedestrians.</li><li>Other nonmotorized modes are often allowed, such as bicycles.</li><li>This type of facility can be designated as pedestrian only year-round or during specific seasons.</li></ul>  |
| Bus Stop with Shelter |  <ul style="list-style-type: none"><li>A bus stop shelter should be a concrete pad with adequate space for persons in wheelchairs to enter the shelter and board the bus.</li><li>Other amenities can be offered such as maps, schedule, and contact information.</li><li>Bus stops should be located in areas with sufficient lighting or supplemented with lighting fixtures.</li></ul> |

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## 4. DESIGN GUIDANCE

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Often local communities recognize the need for bicycle and pedestrian infrastructure but are at a loss as to the best methods for implementing such in their communities. To assist with this, a series of design guidance elements have been incorporated into this technical memorandum. National best practices, combined with local context and an understanding of federal and state standards, were utilized to develop design guidance elements presented below.

Designs presented here provide broad guidance and require some level of adaptation based on site-specific context. Guidance addresses the general application of improvements and does not provide specifics regarding more detailed elements of design, such as cross-slope, user separation, signage placement, etc. It would be most appropriate for local jurisdictions to consider this guidance a “minimum standard” on which to build more detailed guidance for their individual circumstances.<sup>8</sup>

### 4.1 TYPICAL CROSS SECTIONS

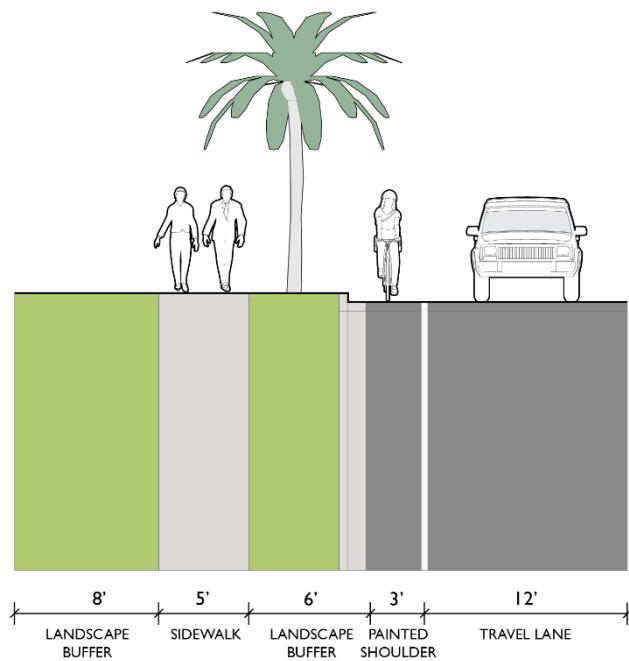
Cross sections for incorporating bicycle and pedestrian facilities in existing and planned roadway projects throughout the GSATS region are shown below. These provide design guidance for various types of bike and pedestrian facilities in a variety of contexts and settings from urban to rural. A brief description accompanies each cross section to identify potential application for individual communities, counties, or the region as a whole.

Selecting bike and pedestrian facility types is not a one size fits all proposition. There are a number of contextual and physical issues that play a role in selecting and implementing bike and pedestrian infrastructure. However, it is essential to acknowledge that bikes are not cars and should not be treated as such and that people are more likely to walk and bike when traffic is not directly adjacent to them. Therefore, providing separation between cyclists, pedestrians, and vehicles will improve comfort, increase safety, and result in more people using the bike and pedestrian infrastructure that is implemented.

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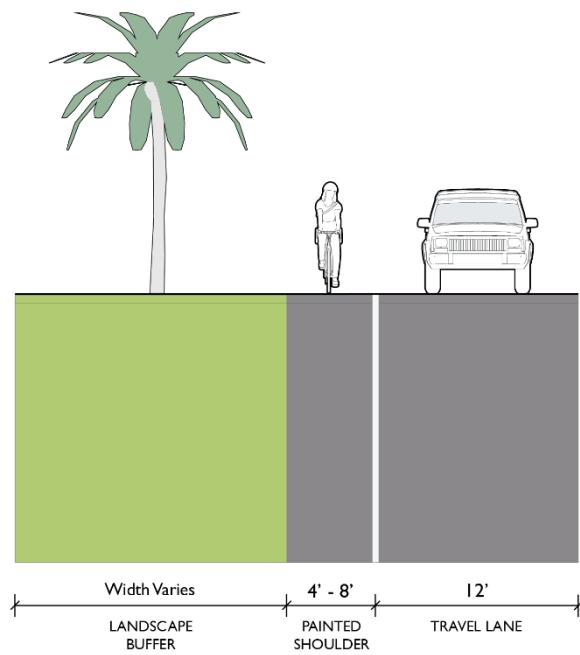
<sup>8</sup> Please reference existing design guidance documents for more specific and detailed standards, including the American Association of State Highway Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, the National Association of City Transportation Officials (NACTO) Urban Street Design Guide, and the Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way.

**Figure 4-1: Typical Cross Section - Striped Shoulder with Sidewalk**



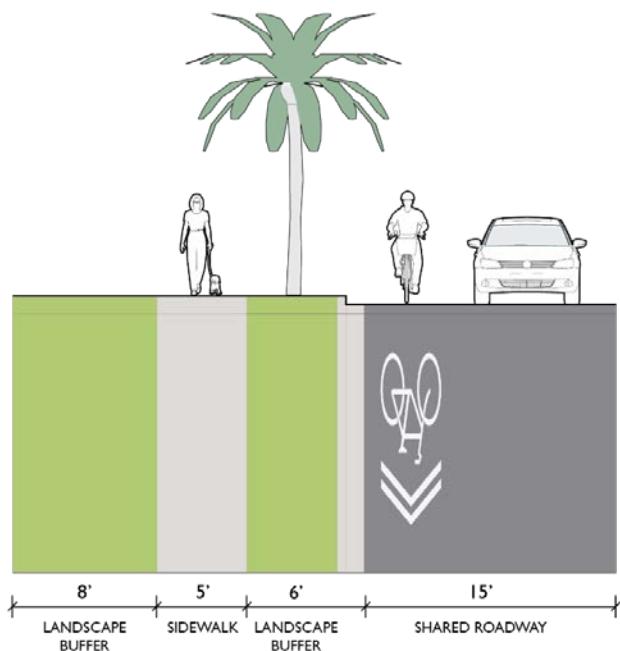
A striped shoulder provides space for confident cyclists to travel within the roadway. This treatment is a low cost improvement that may be used on roads that have low traffic volumes. A sidewalk is provided for pedestrians behind a landscape buffer to give added comfort and separation from traffic. Additionally, this treatment is appropriate for low speed rural roads where there may be wide travel lanes.

**Figure 4-2: Typical Cross Section - Striped Shoulder Rural Context**



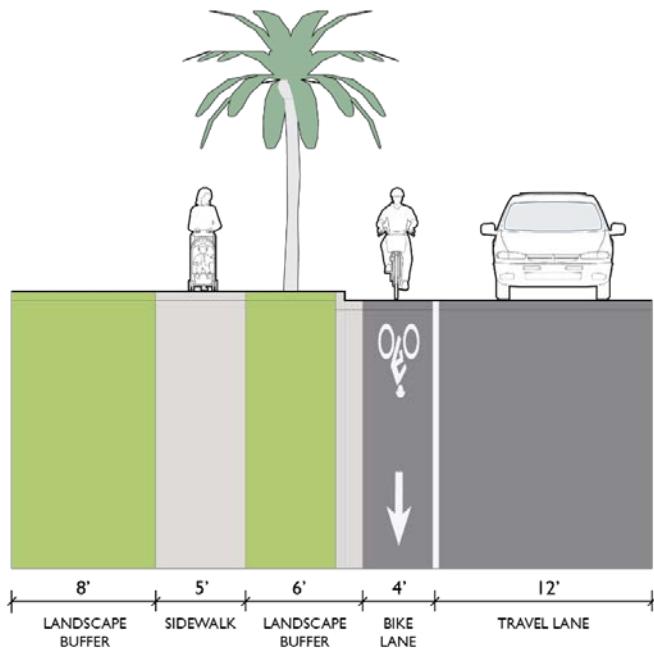
Along rural roadways, a striped shoulder may offer space for cyclists and/or pedestrians to connect to destinations. This cross section illustrates a striped shoulder of varying widths without curb and gutter and no sidewalk. This treatment can be a viable option for cyclists and pedestrians if adequate space is provided.

**Figure 4-3: Typical Cross Section - Shared Roadway with Sidewalk**



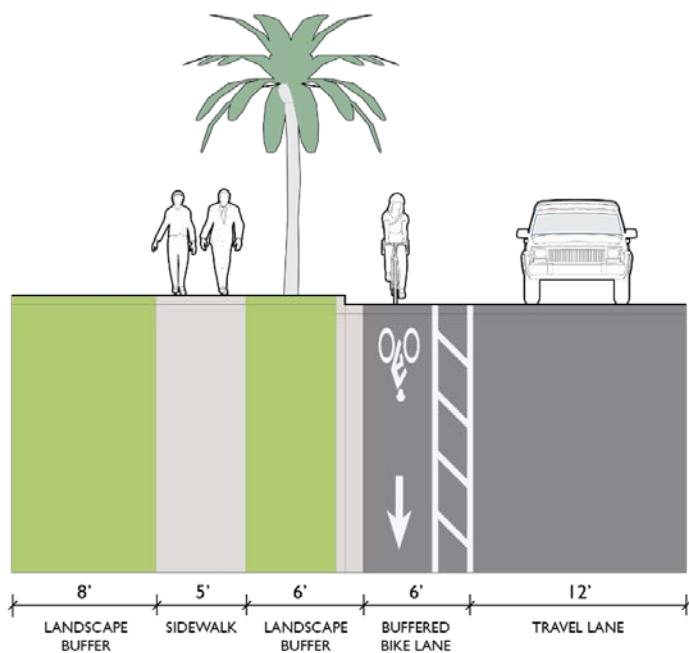
A shared roadway symbol reminds motorists that cyclists may be present and to cyclists where to ride. This type of facility may be applied on local streets with a speed limit of 35 mph or less and low traffic volumes. Often this facility can be found in residential areas and connecting to other designated bicycle facilities. A sidewalk is provided for pedestrians behind a landscape buffer to give added comfort and separation from traffic.

**Figure 4-4: Typical Cross Section - Bike Lane with Sidewalk**



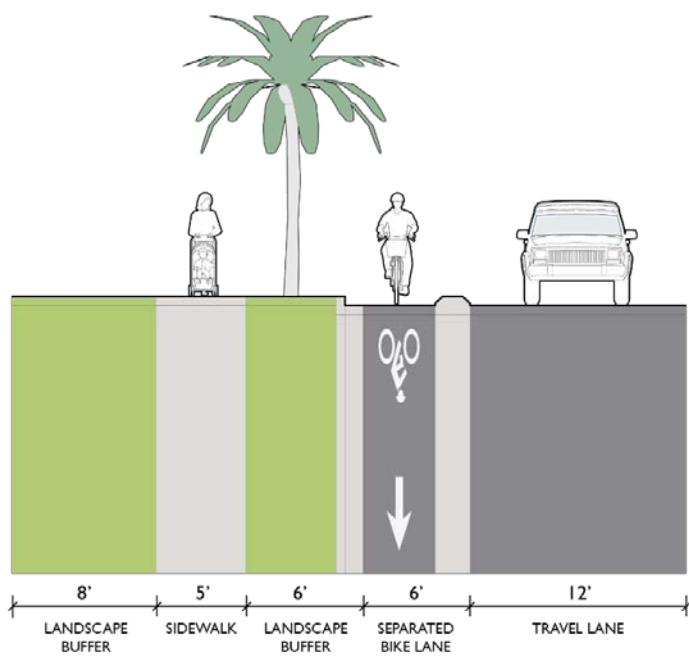
A bike lane provides designated space for cyclists through the use of a solid striped line. Bike lanes should be striped, signed, and include a bike lane symbol. These features adequately make drivers of vehicles aware that bikes have their own space within the roadway. Bike lanes may be appropriate for roadways that currently have wide outside lanes or connect major destinations within individual communities. A sidewalk is provided for pedestrians behind a landscape buffer to give added comfort and separation from traffic.

**Figure 4-5: Typical Cross Section - Buffered Bike Lane with Sidewalk**



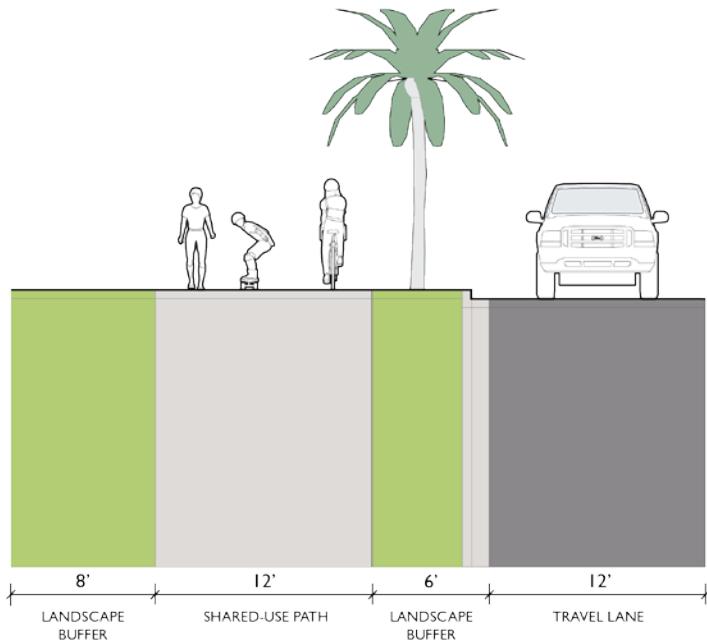
A buffered bike lane provides additional separation for cyclists from the vehicle travel lane by including a painted buffer. Increasing the separation between a vehicle travel lane and bike lane results in increased comfort for cyclists and drivers. This treatment may be appropriate for denser city environments on roadways with higher speeds that connect several destinations. A sidewalk is provided for pedestrians behind a landscape buffer to give added comfort and separation from traffic.

**Figure 4-6: Typical Cross Section - Separated Bike Lane with Sidewalk**



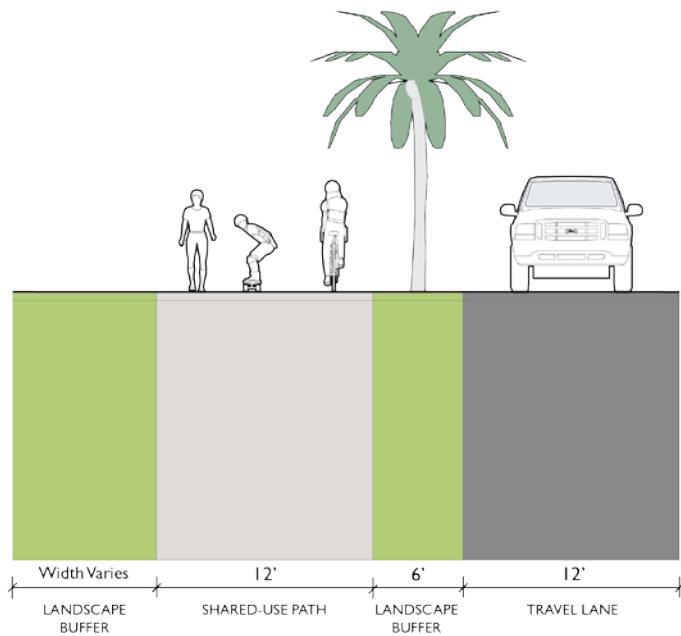
Separated bike lanes provide a physical barrier between the vehicle travel lane and the bike lane. Separated bike lanes increase comfort for cyclists by creating designated space that is adjacent to vehicle travel lanes but separated by a concrete curb, landscaping, flex posts, or other types of physical barriers. This type of treatment is beneficial in a variety of applications such as within downtown areas, collector and/or arterial streets, and to connect major destinations. Due to increased safety and comfort, separated bike lanes may attract new users. A sidewalk is provided for pedestrians behind a landscape buffer to give added comfort and separation from traffic.

Figure 4-7: Typical Cross Section - Shared-Use Path/Sidepath



A shared-use path or sidepath removes bike and pedestrian travel from the vehicle travel lane. This cross section illustrates a multi-use path that may be implemented within a more urban setting with curb and gutter provided. This treatment attracts both transportation and recreation users and can connect destinations that are farther apart.

Figure 4-8: Typical Cross Section - Shared-Use Path/Sidepath Rural Context

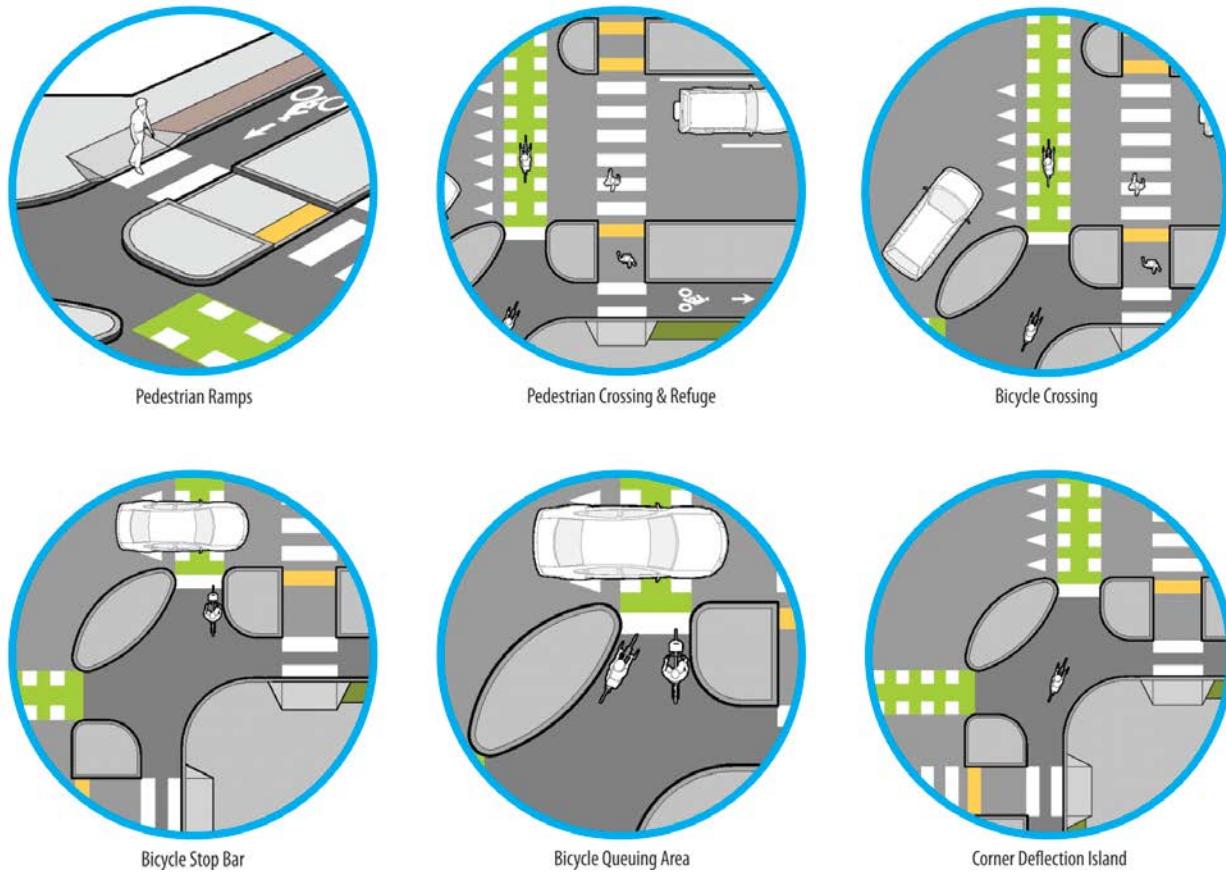


A shared-use path or sidepath may be beneficial in more rural settings and provide opportunities for transportation and recreation. This treatment may be used to connect residential areas to schools, shopping, and recreation in rural settings or link other bike and pedestrian infrastructure between communities in the GSATS area.

## 4.2 INTERSECTION IMPROVEMENTS

Intersections are where many modal conflicts occur because this is where all modes come together. Therefore, providing separation and protection of cyclists and pedestrians at intersections is of paramount importance. Figure 4-9 illustrates several protected intersection treatments that provide additional separation for people riding bikes and traveling on foot. Each treatment improves the safety of non-motorized transportation modes; in addition, these treatments may also relieve congestion and can be paired with other intersection improvements to increase safety and functionality for all modes at intersections that can often be pinch points within a transportation network.<sup>9</sup>

Figure 4-9: Anatomy of a Protected Intersection



The illustrations on the previous page show green colored pavement within bicycle crossings. It is important to note that green colored pavement is not currently included as a traffic

<sup>9</sup> While the illustrations above depict more urban treatments, the design principles presented can be applied in suburban and rural environments as well.

control device in the Manual on Uniform Traffic Control Devices (MUTCD); however, after extensive experimentation, FHWA has provided Interim Approval for its use. "Interim Approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the MUTCD ... The Interim Approval does not create a new mandate compelling the use of green colored pavement, but will allow agencies to install green colored pavement, pending official MUTCD rulemaking, to enhance the conspicuity of a bicycle lane or a bicycle lane extension."<sup>10</sup>

Green colored pavement is an effective treatment for alerting motorists and bicyclists to potential conflict areas. Rather than placing green colored pavement in every bike lane, it should be reserved for accentuating conflict areas. Additionally, as a condition of the Interim Approval, permission must be granted by FHWA for the specific jurisdiction where the green colored pavement will be applied. If it is to be applied to local streets, the local government must request permission; if it is to be implemented on streets in the state and/or federal network, then SCDDOT/NCDOT must request permission for its use. Additionally, the requesting party must agree to monitor and evaluate the success of the application and remove the green colored pavement if Interim Approval is rescinded in the future.

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<sup>10</sup>

For more information, see [https://mutcd.fhwa.dot.gov/resources/interim\\_approval/ia14/](https://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/).

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## 5. RECOMMENDATIONS

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Having a broad vision for active transportation in the GSATS region is important; however, it is equally important to understand that active transportation improvements need to be implemented in an efficient manner. To this end, recommendations have been made that lay the groundwork for realizing a more connected and comfortable active transportation network while increasing the number of users of the network.

**Benchmark.** As the GSATS region moves toward a more integrated active transportation network, it will be important to be able to measure the effectiveness of the efforts that are being undertaken. Through partnerships with member governments, not-for-profits, and advocacy groups, benchmarking programs should be established. One such program would be recording bicycle and pedestrian counts on regular intervals. Counts will help in quantifying the success of implemented facilities and also in determining areas of demand where future facilities may be needed. GSATS should continue to collect and analyze bicycle and pedestrian crashes; understanding locations, frequency, and causes of crashes will assist in determining appropriate education, enforcement, and infrastructure countermeasures to reduce such crashes.

**Incentivize Facilities in Areas of Higher Demand.** GSATS' existing Transportation Alternatives Ranking Criteria has seven criteria that are used to score applications for TAP funding: 1) Funding Request Amount; 2) Funding Ratio (i.e., percentage of local match); 3) Environmental Benefit; 4) Level of Support; 5) Level of Benefit; 6) Local Commitment to Project; and 7) Connectivity. When TAP applications are considered, they are weighed against these criteria with a numerical score assigned to each. It is recommended that once overall scoring is complete that additional bonus points be awarded for projects that fall within the potential demand areas shown in Figure 2-7. This could be a lump sum bonus or could be awarded on a sliding scale based on the level of potential demand. This would encourage projects that will meet potential active transportation demand.

**Develop Active Transportation Design Policies.** GSATS should partner with member governments and the SCDOT and NCDOT to develop active transportation design policies. At a minimum, these four areas of design should be considered:

- **Paved Shoulders** - Roads having a more rural character (i.e., roads that do not have curb and gutter, lack shoulders, and/or have open ditches) within the GSATS area offer a unique opportunity for biking between coastal communities without traveling along corridors with higher vehicle volumes. Rural roadway designs should include 4- to 8-foot paved shoulders to provide bicyclists and walkers an area of refuge from automobile traffic. Paved shoulders also provide an area where motorists may make course corrections when lane departures occur.
- **Rumble Strips** - While popular on rural roads for vehicular safety, rumble strips create hazards for people riding bikes. When rumble strips are necessary, their design and placement are critical to safe bicycle travel. If rumble strips consume the entirety of the shoulder, or leave little to no shoulder passable, bicyclists are forced to ride in the

travel lane, increasing the potential for automobile/bicycle conflicts. Additionally, periodic breaks or “skips” in the rumble strips allow bicyclists to enter and exit the shoulder area when needed.

In 2015, SCDOT adopted Engineering Directive 53 (ED-53), which established new standards for rumble strips. Working with the South Carolina cycling community, SCDOT implemented several rumble strip accommodations to address the presence of cyclists as part of ED-53, including: reducing the maximum depth of the milled groove; providing differing standards based on available shoulder width; establishing minimum average daily traffic and roadway width standards; and inclusion of a skip pattern to allow cyclists to safely enter/exit the rumble strip area.

NCDOT adopted similar accommodations in 2012 with its Rumble Strip Standard Practice (R-44), but these are presented as guidance rather than standards. Additionally, R-44 does not speak to minimum thresholds for shoulder width and the application of rumble strips; rather, it states that, “It is desirable to provide a nominal width of four (4) feet of useable shoulder between the outside edge of the shoulder rumble strip/stripe to the edge of pavement. However, even though a four-foot nominal width is desired, it will not preclude the installation of a proven safety countermeasure where there is the presence of treatable lane departure events.”

Within the South Carolina portion of its study area, GSATS should ensure that ED-53 is followed in all retrofit and new design projects. Similarly, GSATS should ensure that R-44 is followed on North Carolina projects, but should also advocate that the discretionary aspects be removed from the standard practice and that appropriate paved shoulder area be present when rumble strips are implemented.

- **Bridges** - Bridges are classic choke points for pedestrians and bicyclists. When bridges only provide the necessary width for vehicular travel lanes, walkers and bicyclists have no safe travel zone. Whenever possible, bridge replacement projects should include the continuation of shoulder facilities (at a minimum) across their entire length. Even when these shoulders do not presently exist on the approaches, providing them on the bridge is good practice, as many years will pass before the bridge is replaced again.
- **Signage** - Basic signage is a very low cost infrastructure improvement that provides increased safety and comfort to walkers and bikers. By including “Bikes May Use Full Lane” signs in general roadway improvement designs, motorists become more aware of bicyclists even when bikes are not physically present. Improvements that are more directly targeted at bicyclists and pedestrians (i.e., TAP projects) should include more extensive signage appropriate for the context of the project.

***Make Active Transportation Part of Every Project.*** For far too long, bicycle and pedestrian projects have been considered “alternative transportation” or amenities and viewed as projects that must be tackled independently and as desired. The reality is that active transportation should be an integrated part of the overall transportation network, and it is much more efficient and cost effective to incorporate active transportation facilities into larger roadway and bridge projects. The GSATS region has seen this approach work very successfully with projects like the Robert Grissom Parkway. When pursuing all roadway, intersection, and bridge projects, GSATS will consider how

bicyclists and pedestrians will be accommodated in a safe, convenient, and comfortable manner. All new projects must make accommodations for non-motorized modes of transportation throughout the GSATS study area.

***Continue to Prioritize Separated Facilities.*** Through the dedication of 80 percent of its South Carolina TAP funding to the East Coast Greenway, GSATS has made a bold statement about the importance of separated facilities. To meet the needs of all GSATS area residents and visitors, GSATS should continue to prioritize bicycle and pedestrian facilities that are physically separated from motorized traffic. While on-road facilities such as bike lanes are certainly valid in certain situations, separated bicycle facilities provide lower stress environments that 60% of the public desire. These facilities also provide greater separation for pedestrians, making the walking environment more comfortable as well. Such would include separated bike lanes, shared-use paths, sidepaths, trails, and greenways. Moving beyond just the East Coast Greenway, when new location and widening projects are considered, GSATS should advocate for separated facilities over SCDOT and NCDOT's standard cross sections; in many cases, separated facilities require less right-of-way than on-road bike lanes. By providing facilities that everyone can use, especially the most vulnerable users like children and the elderly, GSATS will elevate the perception of active transportation, encourage more people to use the provided facilities, and meet the needs of a greater number of its constituents.

***Continue to Connect the Network.*** GSATS understands the importance of connecting the network, as shown by its focus on connecting the East Coast Greenway. Rather than having a myriad of facilities splashed here and there across the region, GSATS should continue to direct its attention on connecting the bicycle and pedestrian network as funding allows, including the East Coast Greenway and beyond. By providing a better-connected network, facilities will be more useful for transportation trips as more destinations are reachable via active transportation. This in turn will make it more plausible to expand beyond TAP funding and advocate for the use of Surface Transportation Block Grant Program<sup>11</sup> funding for bicycle and pedestrian projects, as they will have a legitimate transportation nexus.

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<sup>11</sup> Per FHWA's website, "The FAST Act converts the long-standing Surface Transportation Program into the Surface Transportation Block Grant Program acknowledging that this program has the most flexible eligibilities among all Federal-aid highway programs and aligning the program's name with how FHWA has historically administered it. The STBG promotes flexibility in State and local transportation decisions and provides flexible funding to best address State and local transportation needs." For more information visit:

<https://www.fhwa.dot.gov/fastact/factsheets/stbgs.cfm>.

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