2045 METROPOLITAN TRANSPORTATION PLAN UPDATE

Appendix D: Level of Service Standards and Road Functional Classifications

Prepared for:

GSATS
The Grand Strand Area Transportation Study

Prepared by:

CDM Smith

JULY 2023

GRAND STRAND AREA TRANSPORTATION STUDY
METROPOLITAN PLANNING ORGANIZATION

CONTENTS

TABLES

FIGURES

INTRODUCTION

This technical memorandum discusses several key concepts relating to the update of the Grand Strand Area Transportation Study (GSATS) Metropolitan Transportation Plan (MTP). The concepts of level of service (LOS) and functional classification have implications for goal and objective setting as well as understanding existing (2019) and future (2045) conditions within the GSATS region. Understanding and employing these concepts is key to meeting the transportation needs of the region.

INTRODUCTION TO LEVEL OF SERVICE

LOS is a qualitative measure used to determine the performance level at which transportation infrastructure is functioning. LOS is categorized into six letter grades of A through F. From a user's perspective, a LOS A represents the best operating conditions and LOS F the worst. LOS is used across all modes as it provides a generalized and conceptual planning measure that assesses multimodal service inside the roadway environment (inside the right-of-way). **Figure 1** shows LOS from a user's perspective across various modes of transportation.

Figure 1: Level of Service by Mode

Source: Florida Department of Transportation, 2013 Quality/LOS Handbook

There is a variety of factors and concepts important in understanding how LOS is calculated for the various modes of transportation and facility types. For roadways, the primary factor to consider is the volume to capacity (V/C) ratio, or the number of vehicles using the facility to the design capacity of the facility. The capacity of a roadway facility varies and is dependent on factors such as the functional classification of the roadway, the number of lanes, the number and spacing of intersections, and the presence of access control, turn lanes, and other such features. For transit, LOS is based on factors such as transit headways, frequency of service, and the presence of transit shelters. For bike and pedestrian, LOS is based on features such as the width of the outside through lane, the presence of bicycle and pedestrian facilities, and the existence of sidewalks or similar facilities. These measures are

designed to reflect the quality of the user's experience rather than a numerical threshold or capacity ratio.

LOS and other related measurements are often used as performance measures and metrics to gauge progress towards the goals and objectives of transportation plans. It is particularly useful as a performance measure due to the ease with which transportation models can calculate it for existing and projected future conditions. LOS is defined in this document for the use of goal setting in the GSATS MTP Update.

LOS Use in South Carolina

LOS is used in the South Carolina (SCDOT) 2045 Multimodal Transportation Plan to analyze existing and future conditions of the Interstates and transit service. Specifically, LOS is used to measure progress towards established Goal 8: Congestion and Reliability, which is to "reduce congestion and improve the reliability of the multimodal transportation system".

While LOS is not specifically called for as a performance measure in the Act 114 prioritization process, some of the measurements used to calculate LOS and other related measurements are. These measurements are grouped by respective project type below:

- Bridge Replacements
  - Average Daily Traffic
- Interstate Mainline Capacity Projects
  - Volume to Capacity
- Interstate Interchange Projects
  - Passenger Vehicle Travel Time
  - Truck Vehicle Travel Time
  - Passenger Travel Delay
  - Truck Travel Time
- Resurfacing Projects
  - Average Daily Traffic
  - Average Daily Truck Traffic

LOS Use in North Carolina

The North Carolina Department of Transportation has a Strategic Transportation Investments (STI) process to prioritize transportation projects in partnership with local governments. A key part of this process includes utilizing project prioritization criteria for project selection. One of the primary criteria used for highway widening and interchange/large intersections improvements is traffic volume and congestion, which are both directly related to LOS.

LEVEL OF SERVICE

LOS goals have been established for each facility and user type in the GSATS region and will be used to evaluate progress towards meeting the goals and objectives of this plan. These LOS standards will be used to evaluate both existing and future conditions and to identify where improvements may be needed.

ROADWAYS

The roadway network is the most important aspect of the Metropolitan Planning Organization (MPO) planning area transportation system as it bears the burden of transporting the majority of goods and people throughout the region. The region's economic vitality is dependent on this roadway network, which makes the region accessible for commuter, industrial, commercial, tourism and other day-to-day uses. This system should be viewed as an indispensable regional economic asset that requires constant reinvestment to protect the economic stability of the region. Maintenance of the roadway network is a critical factor in ensuring the safe and efficient travel of both residents and visitors alike.

Goals and Priorities

SCDOT has established a LOS goal of D for measuring the Peak Season Daily LOS for state roads. NCDOT has established a LOS goal of D for system level planning analysis. Like the state DOTs, roadway LOS goals are also used by GSATS to establish the desired operating conditions of the roadway network. When establishing a LOS goal, a key factor to consider is the need to balance the provision of adequate infrastructure to serve peak conditions while conserving often limited financial resources. Keeping this balance in mind, a planning goal of **LOS D** has been established for roadways in the GSATS area.

The appropriate degree of congestion (or LOS) to be used in planning and designing highway improvements is determined by considering a variety of factors. These factors include the desire of motorists, adjacent land use type and development intensity, environmental factors, aesthetic values, and historic values. These factors must also be weighed against the financial resources available for infrastructure improvements.

Roadway LOS Criteria

The LOS criteria for roadway capacities are established based on the thresholds established by the South Carolina Statewide Travel Demand Model (SCSWM). For the GSATS 2045 MTP Update, roadway LOS is expressed as a ratio of the peak season peak hour traffic volume and the capacity of the roadway segment. Table 1 provides the LOS criteria for proposed roadway V/C ratios. The thresholds reflect the LOS values of D or greater represent deficient conditions. This is where the V/C > 1.0, which means that the forecasted volume (demand) exceeds the roadway capacity.

Table 1: SCSWM Roadway V/C Ratio LOS Criteria

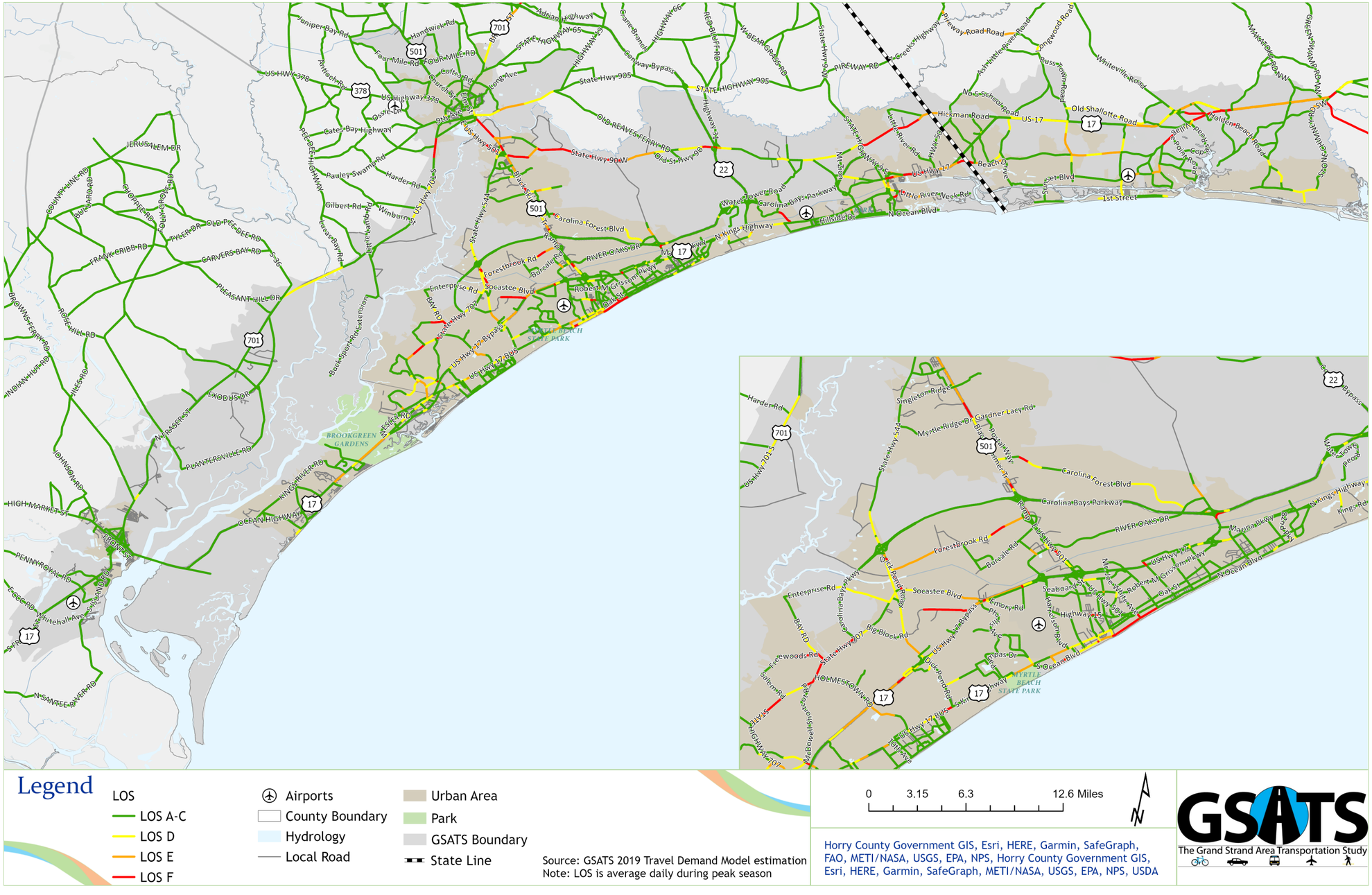
LOS	Volume to Capacity (V/C) Ratio
A	< 0.5
B	> 0.49 and ≤ 0.74
C	> 0.74 and ≤ 1.0
D	> 1.0 and ≤ 1.15
E	> 1.15 and ≤1.34
F	> 1.34

Source: South Carolina Statewide Travel Demand Model Documentation – Model Validation

Existing (2019) Conditions

Existing conditions are established to understand the current operations of the roadways in the GSATS region. Figure 2 provides the existing (2019) conditions peak season daily LOS results for key roadways.

Figure 2: Existing (2019) Conditions Peak Season Daily Roadway LOS



Out of the total 791 roadways analyzed in the existing TDM, 70 roadways (9%) operate at a LOS D or worse. Out of those 70 roadways, 32 operate at LOS D, 20 at LOS E, and 18 at LOS F. **Table 2** shows the segment LOS distribution for the entire GSATS network and between North Carolina and South Carolina. **Table 3** provides the roadways in the GSATS network that currently operate at a LOS D or worse.

Table 2: Existing (2019) Segment LOS Distribution Between NC and SC

	Total		NC		SC	
A	503	64%	39	8%	464	92%
B	115	15%	23	20%	92	80%
C	103	13%	24	23%	79	77%
D	32	4%	10	31%	22	69%
E	20	3%	5	25%	15	75%
F	18	2%	7	39%	11	61%
Total	791		108		683	

Table 3: Existing (2019) Segments with LOS D-F Conditions

Road Name | City	Functional Class	V/C	LOS	State
11th Avenue | Myrtle Beach	Undivided Minor Arterial	1.73	F	South Carolina
6th Avenue | North Myrtle Beach	Undivided Collector	1.02	D	South Carolina
Beach Drive | Calabash	Undivided Major Collector	1.12	D	North Carolina
Beach Drive | Ocean Isle Beach	Undivided Major Collector	1.44	F	North Carolina
Beaver Run Boulevard | Myrtle Beach	Undivided Collector	1.03	D	South Carolina
Brick Landing Road | Shallotte	Undivided Major Collector	1.53	F	North Carolina
Bridger Road | Shallotte	Divided Collector	1.25	E	North Carolina
Broad Street | Homewood	Undivided Minor Arterial	1.00	D	South Carolina
Broad Street | US 701 between Conway and Loris	Undivided Minor Arterial	1.07	D	South Carolina
Burgess Road | Murrells Inlet	Undivided Minor Arterial	1.31	E	South Carolina
Carolina Forest Boulevard | Carolina Forest	Divided Minor Arterial	1.06	D	South Carolina
Causeway Drive | Ocean Isle Beach	Undivided Collector	1.04	D	North Carolina
Dick Pond Road | Socastee	Undivided Minor Arterial	1.16	E	South Carolina
E Cox Ferry Road | Conway	Undivided Collector	1.41	F	South Carolina
E US Highway 501 | Carolina Forest	Divided Principal Arterial	1.19	E	South Carolina
E US Highway 501 | Conway	Divided Principal Arterial	1.17	E	South Carolina
E US Highway 501 | Red Hill	Divided Principal Arterial	1.40	F	South Carolina
Enterprise Road | Socastee	Undivided Collector	1.02	D	South Carolina
Forestbrook Road | Forestbrook	Undivided Collector	1.27	E	South Carolina
Fulford Avenue | Holden Beach	Undivided Major Collector	1.07	D	North Carolina
Gardner Lacy Road | Conway	Undivided Collector	1.10	D	South Carolina
Glenns Bay Road | Garden City	Divided Minor Arterial	1.18	E	South Carolina
Hickman Road | Carolina Shores	Major Collector	1.08	D	North Carolina

Road Name | City	Functional Class	V/C	LOS	State
Hickman Road | Shallotte	Divided Major Collector	1.58	F	North Carolina
Highway 179 | Little River	Undivided Major Collector	1.53	F	South Carolina
Hill Street | North Myrtle Beach	Undivided Collector	1.43	F	South Carolina
Holden Beach Road | Shallotte	Major Collector	1.18	E	North Carolina
Loyola Drive | Myrtle Beach	Undivided Collector	1.10	D	South Carolina
Midway Road | Oak Island Beach	Undivided Collector/Local	1.68	F	North Carolina
N Kings Highway | Briarcliff Acres	Divided Principal Arterial	1.08	D	South Carolina
Ocean Highway | Murrells Inlet	Divided Principal Arterial	1.17	E	South Carolina
Ocean Isle Beach Road | Ocean Isle Beach	Undivided Major Collector	1.10	D	North Carolina
Old Georgetown Road | Ocean Isle Beach	Undivided Major Collector	1.22	E	North Carolina
Old Georgetown Road | Sunset Beach	Undivided Major Collector	1.02	D	North Carolina
Palmetto Point Boulevard | Socastee	Undivided Collector	1.56	F	South Carolina
Pireway Road | Longs	Undivided Major Collector	1.03	D	South Carolina
Powell Lane | Myrtle Beach	Undivided Collector	1.15	D	South Carolina
Queen Harbour Boulevard | Myrtle Beach	Undivided Collector	1.15	D	South Carolina
S Kings Highway | Myrtle Beach	Divided Principal Arterial	1.11	D	South Carolina
S Ocean Boulevard | Myrtle Beach	Undivided Minor Arterial	1.07	D	South Carolina
Sabbath Home Road | Holden Beach	Undivided Collector/Local	1.05	D	North Carolina
Seaside Road | Sunset Beach	Undivided Major Collector	1.03	D	North Carolina
Socastee Boulevard | Myrtle Beach	Undivided Minor Arterial	1.21	E	South Carolina
Socastee Boulevard | Socastee	Undivided Minor Arterial	1.01	D	South Carolina
Southport Supply Road | Bolivia	Major Collector	1.65	F	North Carolina
Southport Supply Road | Oak Island Beach	Divided Major Collector	1.78	F	North Carolina
Southport Supply Road | St. James	Major Collector	2.81	F	North Carolina
Springs Avenue | Pawleys Island	Undivided Collector	1.12	D	South Carolina
State Highway 544 | Socastee	Undivided Principal Arterial	1.03	D	South Carolina
State Highway 707 | Myrtle Beach	Undivided Minor Arterial	1.21	E	South Carolina
State Highway 707 | SC 707 between Socastee and Murrells Inlet	Undivided Minor Arterial	1.31	E	South Carolina
State Highway 90 | Conway	Undivided Minor Arterial	1.28	E	South Carolina
State Highway 90 | Little River	Undivided Minor Arterial	1.18	E	South Carolina
State Highway 90 | SC 90 between Conway and North Myrtle Beach	Undivided Minor Arterial	1.19	E	South Carolina
State Highway 905 | Conway	Undivided Minor Arterial	1.10	D	South Carolina
US Highway 17 | Little River	Divided Principal Arterial	1.10	D	South Carolina
US Highway 17 | Shallotte	Divided Principal Arterial	1.14	D	North Carolina
US Highway 17 | US 17 from Carolina Shores to Shallotte	Divided Principal Arterial	1.00	D	North Carolina
US Highway 17 Business | Shallotte	Divided Major Collector	1.22	E	North Carolina
US Highway 17 Business | Surfside Beach	Divided Principal Arterial	1.10	D	South Carolina
US Highway 17 Bypass | Garden City	Divided Principal Arterial	1.14	D	South Carolina
US Highway 501 | Carolina Forest	Divided Principal Arterial	1.02	D	South Carolina
US Highway 501 | Conway	Divided Principal Arterial	1.23	E	South Carolina

Road Name | City	Functional Class	V/C	LOS	State
US Highway 501 Business | Conway	Undivided Minor Arterial	1.52	F	South Carolina
US Highway 501 Business | Red Hill	Undivided Minor Arterial	1.35	F	South Carolina
US Highway 701 | Loris	Divided Minor Arterial	1.24	E	South Carolina
US Highway 701 | US 701 from Brunswick County Line to Loris	Undivided Minor Arterial	1.45	F	South Carolina
Village Road | Shallotte	Undivided Collector	1.30	E	North Carolina
Wampee Road | Little River	Undivided Collector	1.48	F	South Carolina
Wildair Circle | Conway	Undivided Minor Arterial	1.49	F	South Carolina

INTERSECTIONS

Intersection capacity in the TDM is dependent on the intersecting roadway's functional classification, number of lanes, speed limits, and presence of medians and intersections.

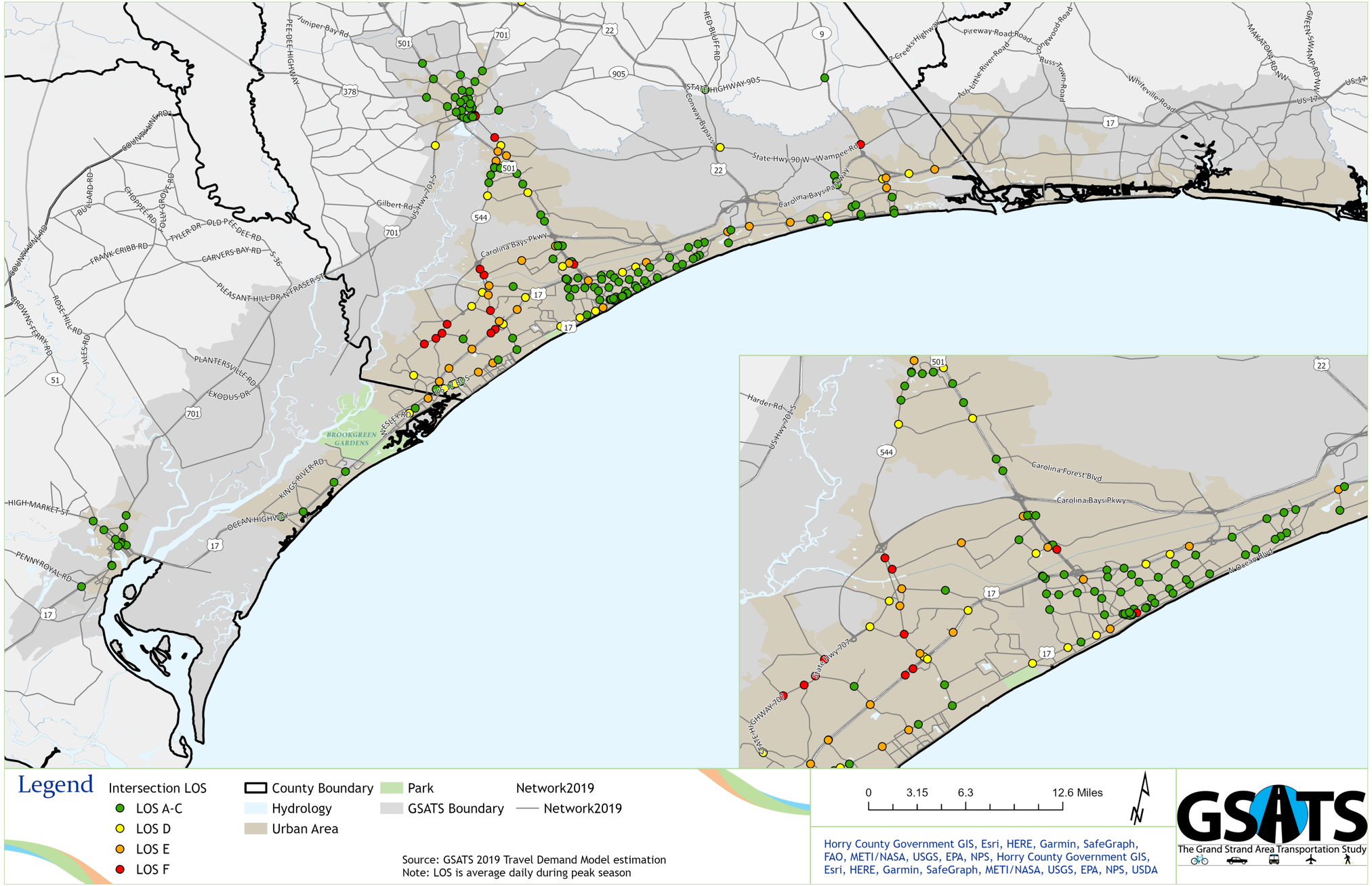
Intersection LOS Criteria

A sketch level analysis was conducted using the GSATS travel demand model to determine intersection LOS. This involved using the V/C ratios on approach links for intersections with signals. The GSATS travel demand model calculates signal delay for intersections with signals and adds these delays to the travel time on the approach legs which is used in the traffic assignment. To remain consistent with roadway LOS criteria, the LOS thresholds provided **Table 1** are also applicable for proposed intersection V/C ratios. Setting an intersection planning goal of LOS D is proposed for this GSATS 2045 MTP Update, maintaining consistency with the proposed roadway LOS.

Existing (2019) Conditions

Existing conditions are established to understand the current operation of the intersections in the GSATS region. **Figure 3** provides the existing (2019) conditions peak season daily LOS results for all signalized intersections in the GSATS region.

Figure 3: Existing (2019) Conditions Peak Season Daily Intersection LOS



Out of the 217 intersections analyzed in the existing TDM, 69 intersections operate at a LOS D or worse. This means 32% of intersections in the existing GSATS network are deficient. Of those 69 intersections, 28 operate at LOS D, 27 at LOS E, and 14 at LOS F. **Table 4** provides the intersections in the GSATS network that currently operate at a LOS D or worse.

Table 4: Existing (2019) Intersections with LOS D-F Conditions

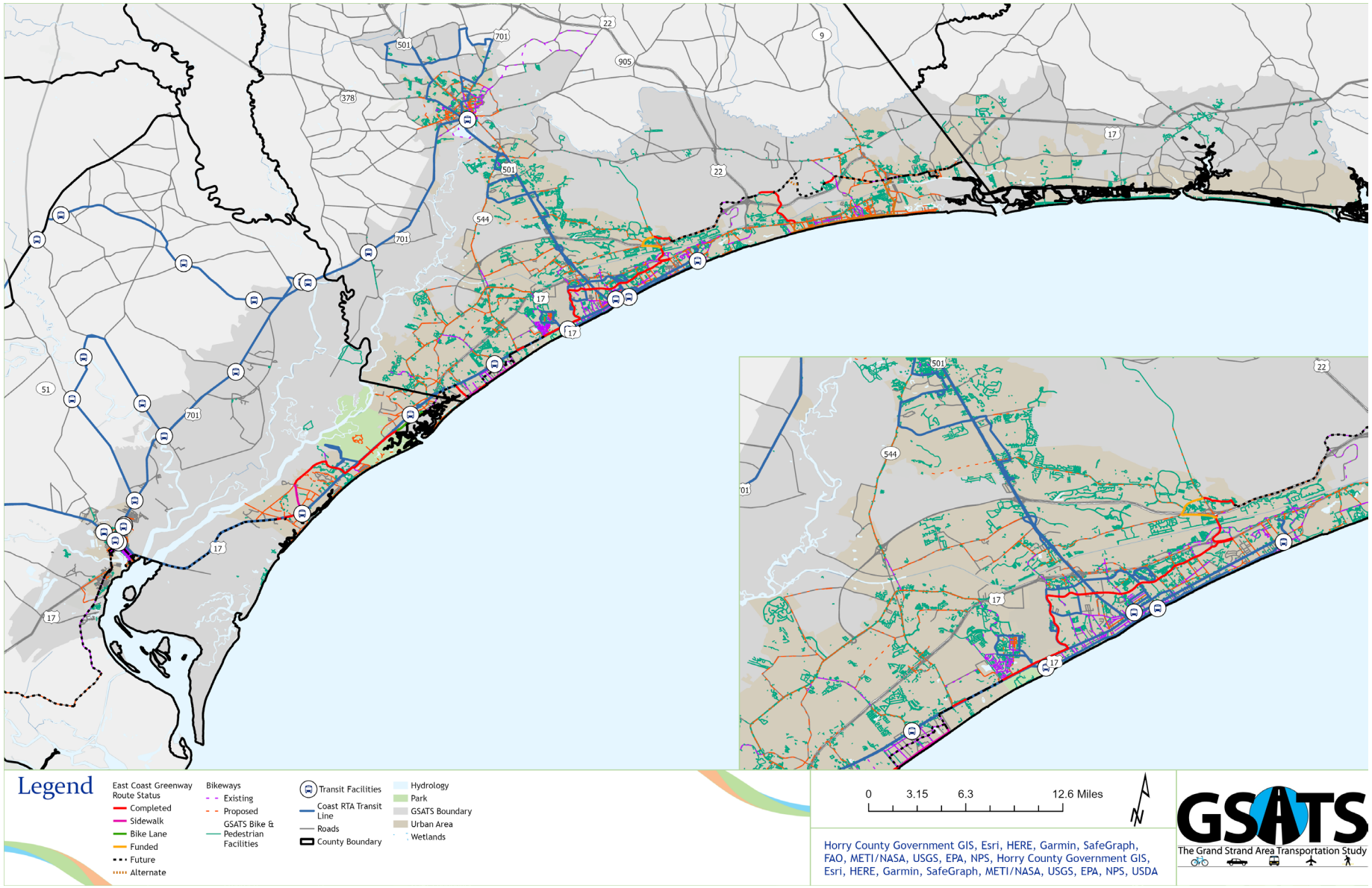
Main Roadway	Intersecting Roadway	V/C	LOS
US 501 Bus	SC 544	1.1	D
US 501	Seaboard St	1.22	E
U S501 On Ramp/Off Ramp	George Bishop Pkwy	1.28	E
Dick Pond Rd	Forestbrook Rd	1.51	F
SC 707	Salem Rd	1.46	F
SC 707	McDowell Shortcut Rd	1.53	F
SC 707	Bay Rd	1.93	F
US 701	Pitch Landing Rd	1.11	D
US 17	Esso Rd	1.32	E
US 17 On Ramp/Off Ramp	Glenns Bay Rd	1.3	E
US 17 Bus	Glenns Bay Rd	1.16	E
SC 707	Dick Pond Rd	1.24	E
SC 544	US 17 On Ramp/Off Ramp	1.07	D
SC 544	US 17 On Ramp/Off Ramp	1.12	D
SC 707	Holmestown Rd	1.53	F
SC 707	Enterprise Rd	1.14	D
SC 707	Big Block Rd	1.15	D
SC 544	Dick Pond Rd	1.19	E
SC 544	Big Block Rd	1.36	F
US 17	Palmetto Pointe Blvd	1.13	D
US 17 Bus	Farrow Pkwy	1.15	D
US 17 Bus	Harrelson Blvd	1.13	D
Forestbrook Rd	Whatuthink Rd	1.3	E
SC 544	Pine Hollow Rd	1.4	F
US 501	University Blvd	1.06	D
SC 544	Myrtle Ridge Dr	1.05	D
US 501	SC 544	1.31	E
SC 544	Founders Dr	1.2	E
US 501	Cox Ferry Rd	1.28	E
US 501	Gardner Lacy Rd	1.13	D
Forestbrook Rd	Fantasy Harbour Blvd	1.2	E
US 501	Waccamaw Blvd	1.37	F
US 501 On Ramp/Off Ramp	Dick Scobee Rd	1.02	D
US 501 Bus	SC 90	1.68	F
US 501	US 378	1.01	D
US 501 Bus	4th Ave	1.14	D
US 701	Adrian Hwy	1.01	D
US 17	Kings Rd	1.22	E
US 17 Bus	3rd Ave S	1.18	E
US 17 Bus	9th Ave S	1.1	D
US 17	Arundel Rd	1.04	D

Main Roadway	Intersecting Roadway	V/C	LOS
US 17 Bus	11th Ave N	1.44	F
US 17	29th Ave N	1.11	D
US 17	48th Ave N	1.18	E
US 17	Barefoot Resort Bridge Rd	1.29	E
US 17	Lake Arrowhead Rd	1.33	E
US 17	17th Ave	1.04	D
SC 90	Monaca Rd	1.11	D
SC 9	SC 57	1.41	F
Old Highway 17 N	Sea Mountain Hwy	1.24	E
SC 90	Sea Mountain Hwy	1.14	D
SC 9 On Ramp/Off Ramp	SC 90	1.22	E
US 17	Mineola Ave	1.28	E
US 17	Coquina Harbour Dr	1.15	D
US 17	Wachesaw Rd	1.09	D
US 17	SC 707	1.22	E
US 17 Bus	Inlet Square Dr	1.01	D
US 17 Bus	Atlantic Ave	1.1	D
US 17	Tournament Blvd	1.27	E
US 17	Indigo Club Dr	1.16	E
US 17	Indigo Club Dr	1.2	E
US 17 Bus	Melody Ln	1.17	E
Fantasy Harbour Blvd	George Bishop Pkwy	1.18	E
George Bishop Pkwy	Claypond Rd	1.1	D
SC 707	Tournament Blvd	1.14	D
US 17	Coventry Rd	1.38	F
SC 544	N Strand Pkwy	1.3	E
US 501 Bus	3rd Ave	1.5	F
US 17	Queens Harbour Blvd	1.44	F

BICYCLE, PEDESTRIAN AND TRANSIT

As GSATS plans for accommodating bicyclists, pedestrians, and transit within the region, a number of factors must be considered when developing standards. Standards for these three transportation modes may differ based upon the vision and goals setting for communities throughout the region. This section can be used to help establish standards for each user group and determine the appropriate analysis and facilities to best align with the community's goals. The following will begin with considerations during the goal setting process that may influence the standards adopted for bike, pedestrian, and transit modes. Next, several key measures are provided to guide decision making on priority projects to enhance the bike, pedestrian, and transit networks. Lastly, recommendations on facility types and corresponding level of comfort for users will be provided along with resources for analysis of individual roadways or intersections. **Figure 4** illustrates the location of existing (2019) and funded bikeways, pedestrian facilities, and public transit facilities.

Figure 4: Existing (2019) and Funded GSATS Area Bikeway, Pedestrian, and Public Transit Facilities



Goals and Priorities

Establishing goals and priorities within the local or regional context drive the standards adopted for bikes, pedestrians, and transit. Key considerations during the goal setting process with respect to transportation are:

- Transportation mode shift goals
- Priority networks for bikes and pedestrians
- Crash data
- Traffic generators
- Existing multimodal networks
- Roadway classifications
- Priority user goals for networks or individual streets

Each of these considerations will influence the goal setting process. For example, if pedestrians are identified as a priority user for certain networks or streets within an area, the standard for LOS for vehicles may not be as high to keep speeds slow and increase visibility and safety for pedestrians. Additionally, goals to see a transportation modal shift or more of a modal split may encourage adopting standards that accommodate all modes equally by encouraging the implementation of complete streets within a community, network of streets, or individual roadway or intersection.

Although each community will have goals that are context sensitive, there are several broad goals that encompass more detailed and targeted goals. The Federal Highway Administration's (FHWA) Guidebook for Developing Pedestrian & Bicycle Performance Measures[1] identifies seven community goals along with explanations of each goal that can be used in determining the standards for bikes, pedestrians, and transit. These seven goals, along with short descriptions, are provided below:

1. CONNECTIVITY – interconnected pedestrian and/or bicycle transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

2. ECONOMIC – describes how transportation decisions impact the economic health of a municipality or region.

3. ENVIRONMENT – environmental measures promote the creation and maintenance of a transportation system that minimizes and/or mitigates impacts to the natural environment. Air quality impacts are the most common type of environmental measure, but others evaluate impervious surface and stormwater and noise pollution.

4. EQUITY – recognizing the disparate costs and impacts of transportation decisions on populations of different income levels, agencies are beginning to calculate equity factors. Households without access to vehicles are not usually well-served by auto-

[1] FHWA, Guidebook for Developing Pedestrian and Bicycle Performance Measures. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/performance_measures_guidebook/

oriented transportation solutions and require walking, bicycling, and transit infrastructure. One component of equity is ensuring that pedestrian facilities along public rights-of-way are accessible, so they do not discriminate against people with disabilities and serve people of all ages and abilities.

5. HEALTH – public health impacts of transportation decisions typically include changes to levels of physical activity, safety, and air quality. Increases in walking and bicycling are correlated with higher levels of public health.

6. LIVABILITY – quality of life impacts of transportation systems are evaluated by many local jurisdictions. Livability measures directly acknowledge the trade-offs between the demands of auto travelers passing through an area and those living adjacent to transportation infrastructure. Measures that reflect public opinion are also included within this category.

7. SAFETY - addresses the safety of the transportation system for all users. Safety performance measures typically track crashes, injuries, and fatalities, though some are based on estimated changes in numbers of crashes.

It is important to note that these seven FHWA community goals are all consistent with and fall under the eight GSATS 2045 MTP goals. **Table 5** identifies which of the seven FHWA community goals can be met or implemented by each of the eight GSATS 2045 MTP goals.

Table 5: GSATS 2045 MTP Goals and FHWA Community Goals

GSATS 2045 MTP Goals	FHWA Community Goals
Coordinated Land Use and Transportation	1, 3, 4, 5, 6 and 7
Economic Competitiveness	2
Mobility and System Accessibility	1 and 4
Environmental Stewardship	1 and 3
Modal Choices and Balanced System	1, 4, and 6
Safety and Security	7
Infrastructure Preservation and Maintenance	2
Congestion and Reliability	1, 2, 3, and 6

Measures and Amenities

Along with the community goals, transportation measures and amenities are quantifiable items that can be measured to understand the existing (2019) conditions of bike, pedestrian, and transit facilities. Additionally, understanding these measures and amenities can help to plan for future enhancements based on the adopted standards of the community. Measures and amenities can be broadly put into the following categories.[2]

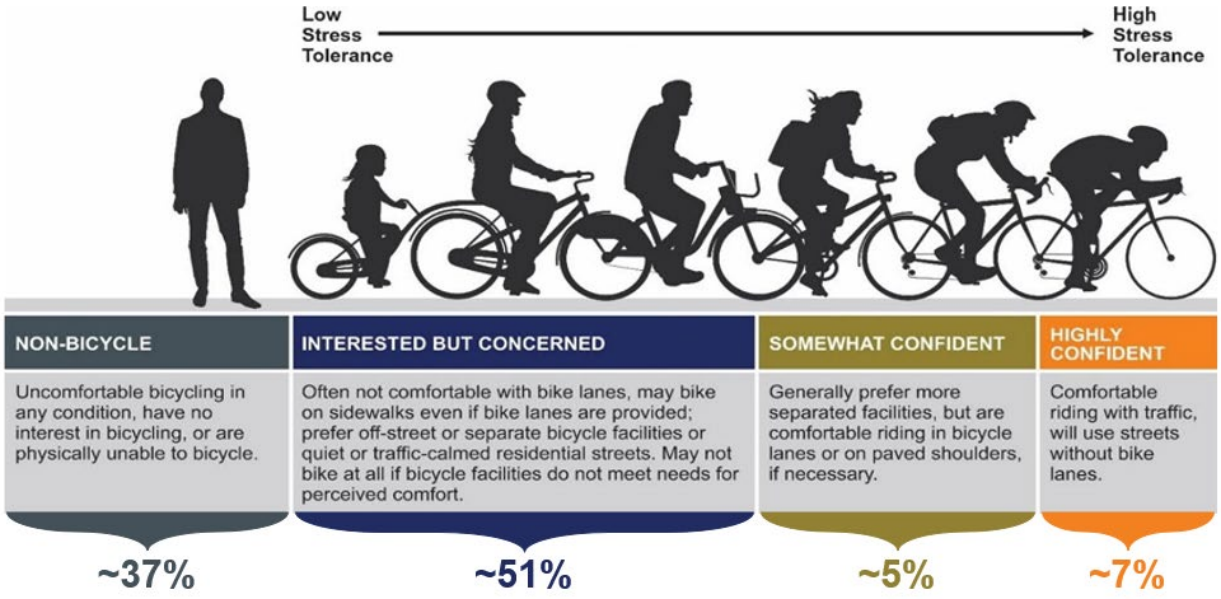
[2] FHWA, Guidebook for Developing Pedestrian and Bicycle Performance Measures. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/performance_measures_guidebook/

- Accessibility
- Compliance
- Demand
- Reliability
- Mobility
- Infrastructure

Bicycle Facilities

For years, bicycle facilities placed people riding bikes within or directly adjacent to vehicle travel lanes. While such facilities meet the needs of confident cyclists, they do not attract new users nor encourage a broader bicycle culture. Research indicates that a variety of bicyclists exist, each with different roadway tolerances, facility needs, and interest in biking as a mode of transportation, as illustrated in **Figure 5:**.[3] This framework suggests that the majority of the population wants to ride more but doesn't feel safe riding on unprotected facilities alongside vehicular traffic.

Figure 5: Four Types of Bicyclists



Source: Dill, J. & McNeil, N. 2016. Revisiting the Four Types of Cyclists

Facility metrics have been established to identify the degree to which bicycle routes accommodate riders of different levels. Two different methodologies have been established to measure bicycle routes in this manner: Bicycle Level of Service (BLOS) and Bicycle Level of Traffic Stress (BLTS).

BLOS was developed in 2007 in the Highway Capacity Manual (HCM) for determining how comfortable bicyclists may be on a given road. BLOS uses available roadway space and traffic

[3] Dill, J. & McNeil, N. 2016. Revisiting the Four Types of Cyclists. https://doi.org/10.3141/2587-11

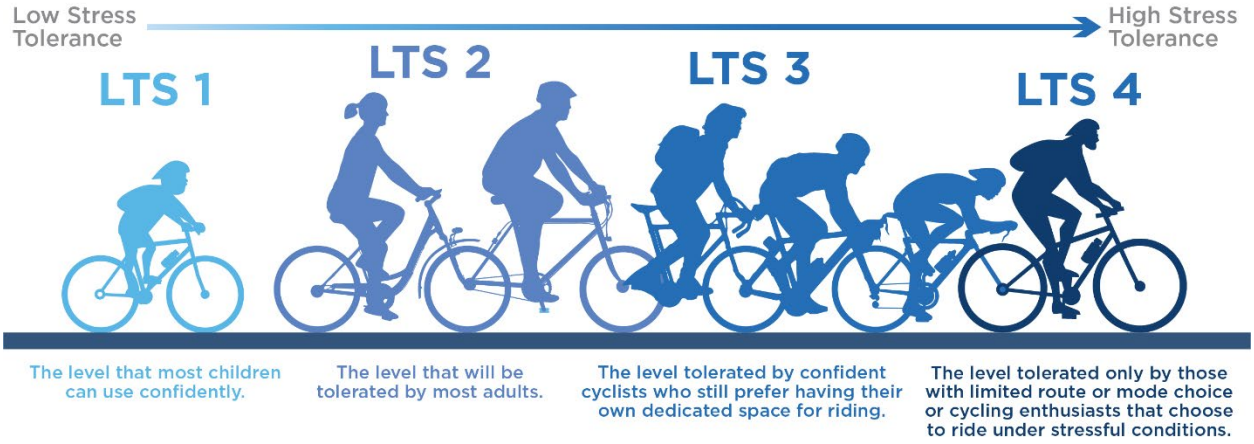
flow to calculate a numerical score between 0-5 that corresponds to a letter grade A through F (similar to roadway LOS). However, BLOS has been found to be insensitive to bicyclist delay, bicycle facilities at intersections, and other crucial details of the bicycle network, and therefore its validity has been questioned.[4]

The BLTS method was developed in 2012 to better measure the comfort level of a given roadway for people riding bicycles, particularly with consideration for the *four types of bicyclists* model.[5] The Florida Department of Transportation (FDOT) and other leading transportation agencies utilize the BLTS model, and therefore this memo for the 2045 MTP incorporates the BLTS standards as well.[6,7]

BLTS measures the quality of a route or crossing based on the discomfort that people of different riding levels feel when they ride in close proximity to vehicular traffic, as illustrated in **Figure 6**:. BLTS is rated on a discrete scale of four levels corresponding to amount of discomfort experienced by bicyclists:

- **BLTS 1:** Roadway segments with this rating are suitable for all users including children. People are likely to feel safe and comfortable riding a bike in this facility.
- **BLTS 2:** Roadway segments with this rating are suitable for most adults.
- **BLTS 3:** Roadway segments with this rating can be tolerated by confident cyclists who still prefer having their own dedicated space for riding.
- **BLTS 4:** Roadway segments with this rating are tolerated only by those with limited mode choice or cycling enthusiasts that choose to ride under stressful conditions.

Figure 6: BLTS Scale, Comfort Levels, and Bicyclist Types



[4] Huff, H. & Liggett, R. 2014. The Highway Capacity Manual's Method for Calculating Bicycle and Pedestrian Levels of Service: the Ultimate White Paper.
[5] Mekuria, M. C., Furth, P. G., & Nixon, H. 2012. *Mineta Transportation Institute Publications*. Low-Stress Bicycling and Network Connectivity. https://transweb.sjsu.edu/research/Low-Stress-Bicycling-and-Network-Connectivity
[6] Florida Department of Transportation. 2023. Multimodal Quality/Level of Service Handbook. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/systems-management/document-repository/qlos/fdot_qlos_handbook_v6-0_clean-june-2023.pdf?sfvrsn=198c6846_2
[7] Huertas, J. A., et al. 2020. Level of traffic stress-based classification: A clustering approach for Bogotá, Colombia. *Transportation Research*. Part D, Transport and Environment, 85. https://doi.org/10.1016/j.trd.2020.102420

Source: FDOT, 2023 Multimodal Quality/Level of Service Handbook

Segments with higher BLTS levels impose more stress on bicyclists and may only be suitable for the most experienced riders. Segments with lower BLTS levels are less stressful and are suitable for most bicycle riders, including children and novice bicyclists, while also being safer and more comfortable for experienced riders.

BLTS uses the following characteristics to assess bicyclists' perceptions of the roadway environment:

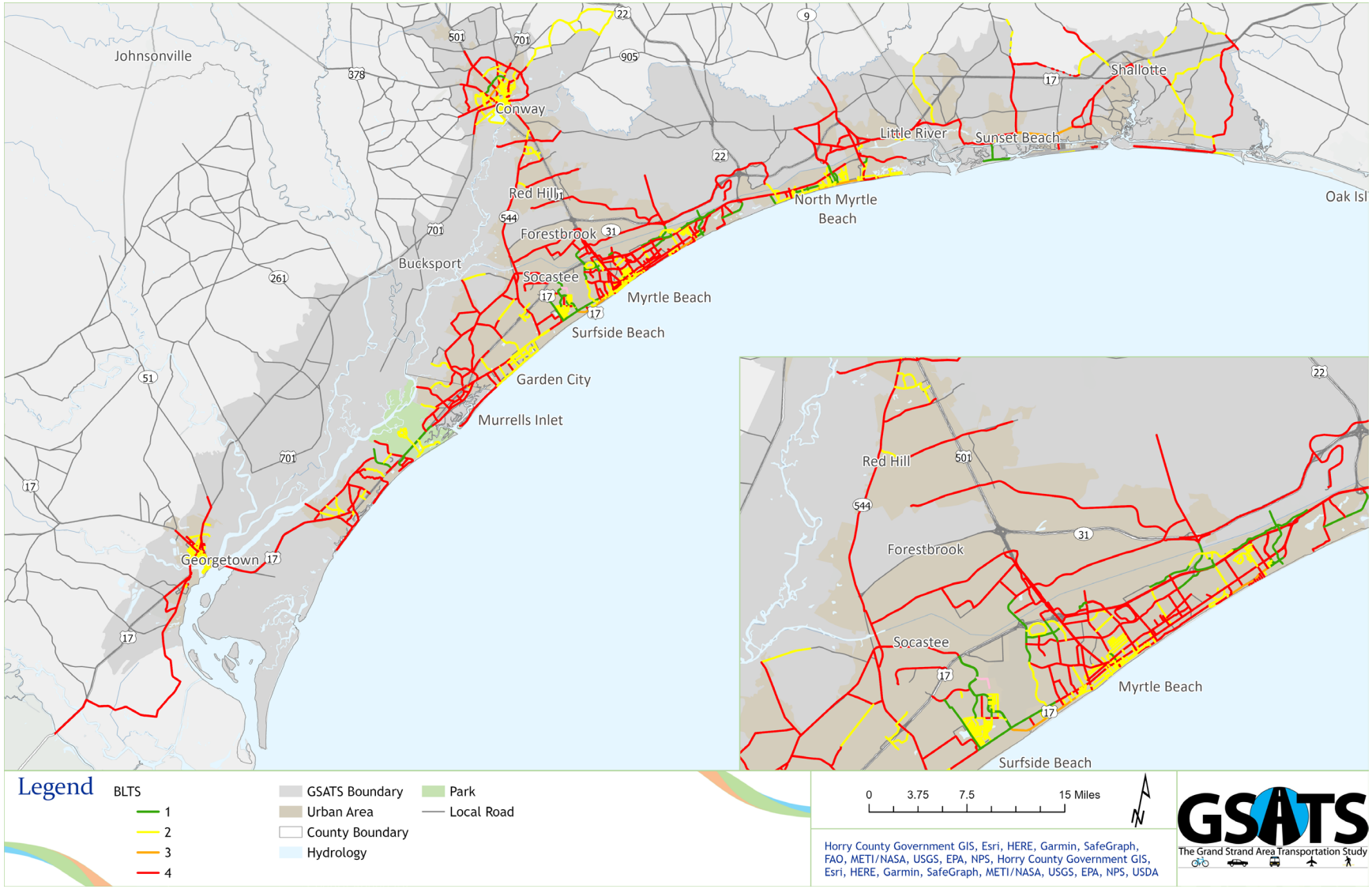
- Bicycle facility type
- Bicycle facility width
- Posted speed
- Separation from traffic
- AADT

When determining the overall level of traffic stress for a planned route, BLTS uses a "weakest link" methodology, where the route takes on the BLTS rating of the poorest rated link within it. For example, if most of the links on a route have a BLTS level of 1 or 2, but one or a few links on a route have a BLTS level of 3, the entire route would be BLTS 3.

Figure 7 provides a BLTS map of the existing and planned bicycle routes within the GSATS boundary.[8] Scores were determined based on the BLTS methodology outlined in FDOT's Multimodal Quality/Level of Service Handbook.[9] The network is nearly entirely composed of BLTS 2 and BLTS 4 segments, with small clusters of somewhat low-stress routes in the town centers and beachfront neighborhoods. Routes connecting these clusters and the surrounding areas are almost exclusively BLTS 4, indicating the need for more low-stress connections between activity centers.

[8] Local and residential streets were not included in the BLTS analysis due to a limited availability of traffic volume data.
[9] Florida Department of Transportation. 2023. Multimodal Quality/Level of Service Handbook. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/systems-management/document-repository/qlos/fdot_qlos_handbook_v6-0_clean-june-2023.pdf?sfvrsn=198c6846_2

Figure 7: BLTS of GSATS Designated Bicycle Network (2019)



Bicycle Facility Types

Once the BLTS for an existing roadway is identified and the community has determined its transportation goals in relation to that roadway, the next step is to identify the type of bicycle facility that will best meet the community's needs and improve the BLTS of that roadway segment. A bicycle network for riders of all comfort levels and abilities is an important part of a connected transportation network within the Grand Strand Area. Bicycle routes should be thoughtfully designated and designed to increase comfort, safety, and access for riders of all comfort levels and abilities. Characteristics such as posted speed limit, vehicle volume, available right-of-way, percentage of trucks, and frequency of property access (i.e., driveways) should all be considered when designing appropriate bicycle facilities. Examples of roadways that would be suitable for each level of bicycle traffic stress are shown in **Figure 8**.

Figure 8: Existing Street BLTS Examples in the GSATS Region

Source: Google Earth, 2023

Pedestrian Facilities

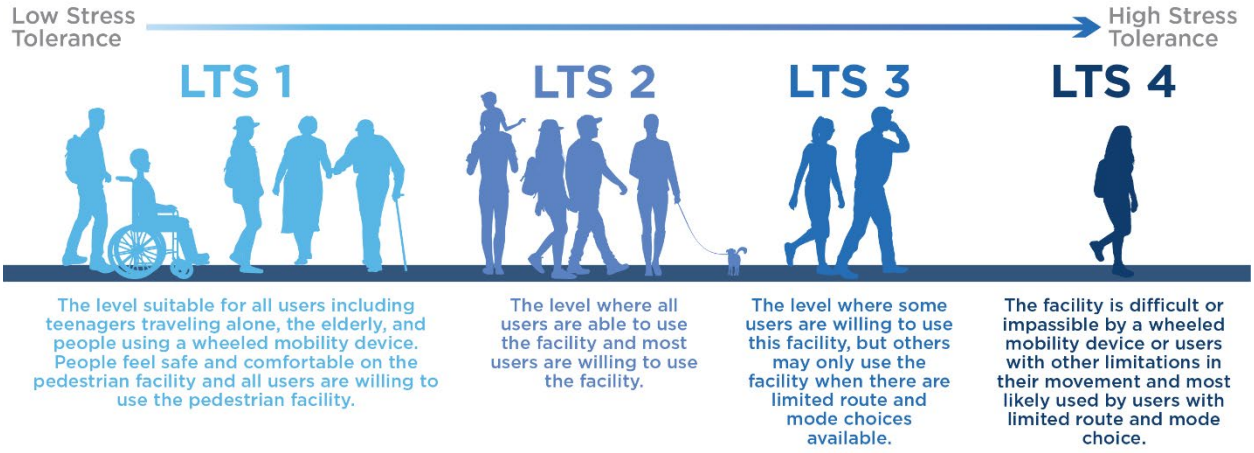
Pedestrian Level of Traffic Stress (PLTS) is adapted from the BLTS methodology to classify roadways by the level of discomfort pedestrians and other sidewalk users may experience on them.[10] Like BLTS, PLTS ranges from 1 to 4, with a lower rating indicating a more comfortable roadway and a higher rating indicating greater traffic stress for pedestrians, as indicated in **Figure 9**. The ratings are as follows:

- **PLTS 1:** Roadway segments with this rating are suitable for all users including children, groups of people, and individuals using wheeled mobility devices. People feel safe and comfortable on the pedestrian facility.
- **PLTS 2:** Roadway segments with this rating are suitable for children over 10 years of age, teens, and adults. While all users should be able to use the infrastructure, some factors may limit their use, especially for those with disabilities.

[10] Florida Department of Transportation. 2023. Multimodal Quality/Level of Service Handbook. https://www.fdot.gov/planning/systems/documents/sm/default.shtm

- **PLTS 3:** Roadway segments with this rating would make an able-bodied adult feel uncomfortable but relatively safe using this infrastructure. Some users are willing to use this facility, but others may only use it if other routes and mode choices are limited.
- **PLTS 4:** Roadway segments with this rating are difficult or impassible by a wheeled mobility device or users with other limitations in their movement and most likely used by those with limited route and mode choice. Only the most confident or trip-purpose driven users will use this infrastructure.

Figure 9: PLTS Scale, Comfort Levels, and Pedestrian Types



Source: FDOT, 2023 Multimodal Quality/Level of Service Handbook

Segments with a higher PLTS are not suitable for most sidewalk users. On roadways with high PLTS, it is likely that traffic speeds are moderate to high with narrow or no pedestrian infrastructure provided. Typical locations include high-speed, multi-lane roadways with narrow sidewalks and buffers or no sidewalk at all. Segments with lower PLTS are suitable for most people, including children and individuals with disabilities.

PLTS is determined by six characteristics of a given roadway segment that affects a pedestrian's perception of safety and comfort. These include:

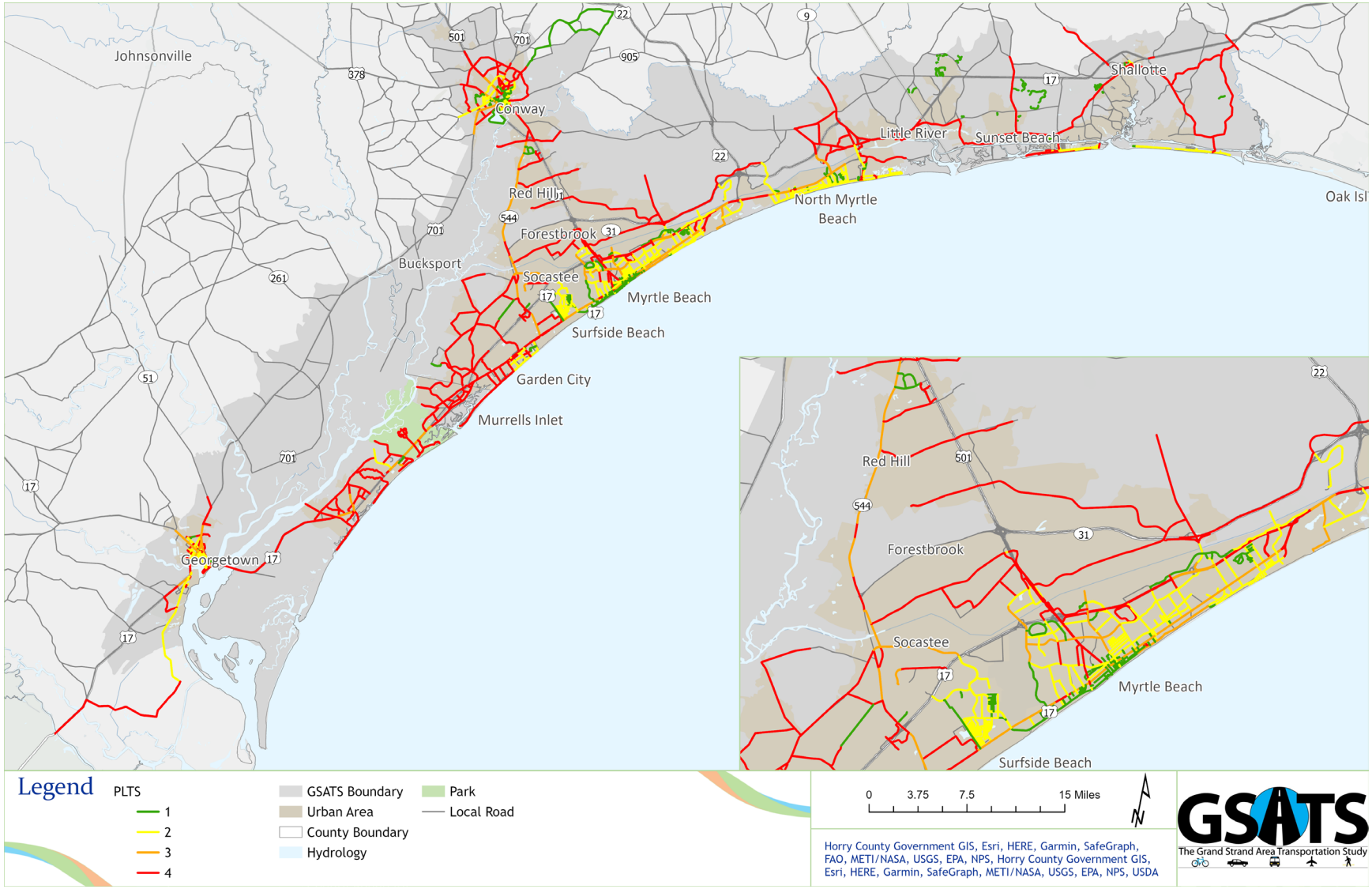
- Presence of sidewalk
- Sidewalk continuity
- Sidewalk width
- Posted speed limit
- Number of travel lanes
- Buffer between the sidewalk path and the roadway
- Presence of vertical separation

Like BLTS, the PLTS method uses the same weakest link logic as BLTS. That means that if most of the links on a route have a PLTS of 1 or 2, but one or a few links on a route have a PLTS of 3, the route as a whole would receive a PLTS of 3.

Figure 10 shows a PLTS map of the pedestrian network within the GSATS boundary.[11] Most road segments in the region have a PLTS of 2 or 4. Within municipal boundaries, most roads range from a PLTS of 1 to 3. Roadways throughout the region that connect cities or serve rural areas tend to have a PLTS of 4, though these roadways are less likely to see pedestrian traffic because of the long distances between destinations along them. However, there are some locations within urban areas that have several or all of their roadways with high PLTS. Such areas indicate a need for improved pedestrian connectivity to ensure safety and provide an all-ages-and-abilities transportation network.

[11] Local and residential streets were not included in the PLTS analysis due to a limited availability of traffic volume, sidewalk continuity, and buffer data.

Figure 10: PLTS of GSATS Designated Pedestrian Network (2019)



Pedestrian Facility Types

Once the PLTS for an existing roadway is identified and the community has determined its transportation goals in relation to that roadway, the next step is to identify the type of pedestrian facility that will best meet their needs and improve the PLTS of that roadway segment. It is also critical to be mindful of and address other roadway characteristics that affect the safety and comfort of pedestrians, such as roadway speed and network connectivity. Examples of roadways that would be suitable for each level of pedestrian traffic stress is shown in **Figure 11**. In general, roadways that separate pedestrians from motor vehicle traffic and that facilitate slower vehicle travel will reduce the stress and improve the safety and comfort for people walking.

Figure 11: Existing Street PLTS Examples in the GSATS Region

PLTS 1
Kingswood Drive, Myrtle Beach

PLTS 2
North Oak Street, Myrtle Beach

PLTS 3
Marina Parkway, Myrtle Beach

PLTS 4
Sunset Boulevard, Sunset Beach

Source: Google Earth, 2023

Transit Facilities

The Waccamaw Regional Transit Agency (Coast RTA) provides fixed-route, paratransit, and entertainment transit services to the Grand Strand Area. The agency's fixed-route system has 10 scheduled routes. The routes pass through Horry and Georgetown counties, and there is a ride tracker that shows the real-time location of actively running bus routes. COAST RTA also provides the opportunity to give feedback on the transit services which can be collected to improve rider experience and operational improvements.

Brunswick County provides a transit service, Brunswick Transit System (BTS). BTS is a non-profit transportation system that coordinates general public and human services available to the residents of Brunswick County. Each bus in the BTS fleet is categorized as a minibus that can hold about 15 passengers, which is smaller than a typical transit bus. This service provides non-emergency transportation services to the general public through our Dial-a-Ride grant funded program and to various agency clients through contracts with those respective agencies. [12]

[12] http://www.brunswicktransit.org/

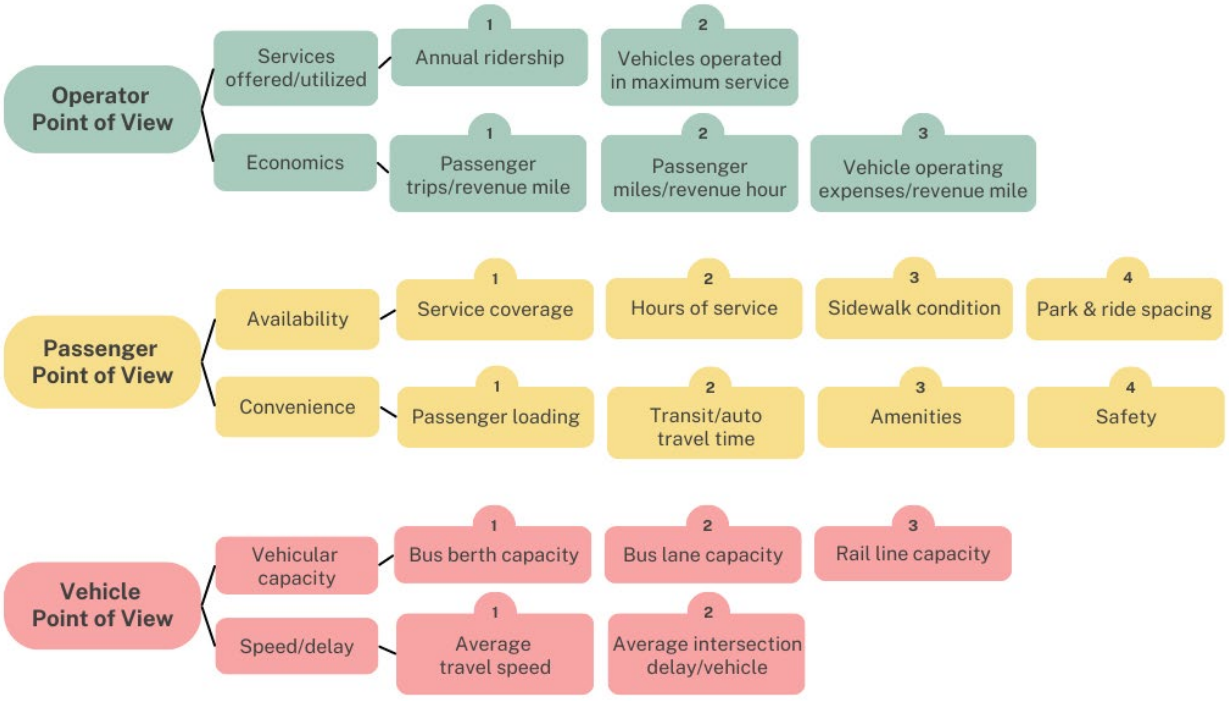
Transit facilities are an integral part of creating inclusive and accessible transportation systems. In addition to reducing traffic, collisions, and air pollution, public transit access improves public health and promotes physical activity as people are more able to access recreation spaces and healthcare services.

There are many variables that could influence the capacity and quality of transit services for riders. Various frameworks for measuring the effectiveness of transit services can be used when determining where transit services should be provided or how to improve existing services in a transit network.

According to a 2023 Multimodal Quality/Level of Service Handbook created by FDOT,[13] there are two nationally used resources for assessing transit quality of service (QOS): the HCM and TRB's *Transit Capacity and Quality of Service Manual* (TCQSM).[14] The TCQSM is the primary guideline used by transportation professionals to measure the quality of transit services, particularly fixed-route services.

The TCQSM manual outlines a method for categorizing transit performance measures from the point of view of operators, passengers, and vehicles, as shown in Figure 12.

Figure 12: Points of View for Transit Quality of Service



[13] Florida Department of Transportation. 2023. Multimodal Quality/Level of Service Handbook. https://www.fdot.gov/planning/systems/documents/sm/default.shtm

[14] Transportation Research Board. 2013. Transit Capacity and Quality of Service Manual. Third Edition. https://www.trb.org/Main/Blurbs/169437.aspx

The passenger point of view addresses the QOS framework that measures transit service quality in terms of availability and convenience. Like automobile LOS, QOS follows a range of six scores, with an LOS of A being the best and an LOS of F being the worst, in regard to the availability and convenience of transit services. QOS refers to the overall performance of transit, whereas LOS refers to a particular aspect of transit service. The overall quality of the transit service is determined by combining the LOS scores of the *availability* and *convenience* of transit services.[15] The six LOS metrics for availability and convenience are listed in **Table 6**.

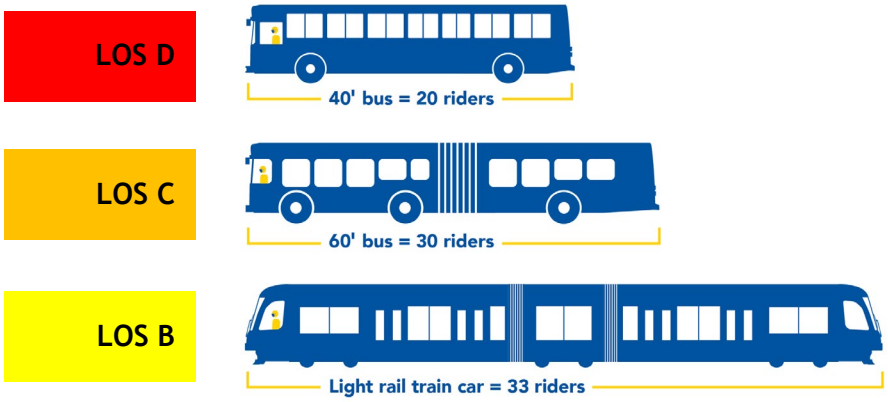
Table 6: Transit Level of Service Metrics

LOS Measure	Ways to Improve Each Measure
AVAILABILITY	
Service Frequency	• Policy-based • Compare service frequency to population and job density along route
Hours of Service	• Policy-based • Compare operating hours of major passenger generators to transit service hours
Service Coverage	• Policy-based • Evaluate service provided to transit-supportive areas
CONVENIENCE	
Passenger Loads	• Increase service frequency • Use larger buses or longer trains
Reliability	• Implement transit priority measures • Greater field-checking of schedule adherence by drivers • Improve maintenance procedures, replace old buses • Review schedules for realistic travel times
Transit/Auto Travel Time	• Implement transit priority measures • Consider cross-town routes to supplement radial service • Review need for express service to serve longer trips

The LOS for measuring availability and convenience can be calculated with data such as passenger load or hours of service as greater bus capacity or wider windows of operation will result in a better LOS score and improved services for riders. For instance, larger bus sizes will accommodate a greater number of people and reduce onboarding and offboarding time, as illustrated in **Figure 13**. The LOS scores for this example were derived from the TCQSM methodology as shown in **Table 7**.

[15] Transportation Research Board. 2013. Transit Capacity and Quality of Service Manual. Third Edition. https://www.trb.org/Main/Blurbs/169437.aspx

Figure 13: Passenger Load Level of Service Example



LOS scoring for passenger load is derived from the passenger's comfort level of the on-boarding process of the transit trip. There are multiple ways to measure passenger load. Their ability to find a seat and the crowd level is one way to score of the service. Poor passenger load could affect the overall travel time and reliability of the service if the dwell time at each stop takes longer. Passenger load could also be measured by the amount of time people will have to stand. In this chart, passenger load is measured by the area (f^2) available per passenger to choose where to sit and the number of passengers that can sit in that given area (p/seat) to satisfy the criteria mentioned in the description. As the descriptions indicate, an LOS score of A would apply if passengers had empty seats next to them, which they can use to store groceries or other baggage. A low LOS score of F would indicate overcrowding that exceeds the maximum load that the bus can carry.[16]

Table 7: TCQSM Methodology for Passenger Load LOS

Passenger Load LOS			
Ft²	**p/seat**	**LOS**	**Description**
> 12.9	0.00 - 0.50	A	No passenger need sit next to another
8.6 - 12.9	0.51 - 0.75	B	Passengers can choose where to sit
6.5 - 8.5	0.76 - 1.00	C	All passengers can sit
5.4 - 6.4	1.01 - 1.25	D	Comfortable standee load for design
4.3 - 5.3	1.26 - 1.50	E	Maximum schedule load
< 4.3	> 1.50	F	Crush loads

At the time of this memo, there is limited data available of Coast RTA's services and performance. However, there are some tools that can be used to understand the current state of Coast RTA's active service routes. The agency's route tracker and schedule maps can indicate certain characteristics of the transit service that can be assessed by LOS scores to determine the quality of service. For instance, the headway for Route 15N and Route 7 takes

[16] Transportation Research Board. 2013. Transit Capacity and Quality of Service Manual. Third Edition. https://www.trb.org/Main/Blurbs/169437.aspx

1-2 hours and only one vehicle services each stop, indicating a service frequency LOS F for fixed-route transit on these routes. Most Coast RTA routes provide 12-13 hours of service per day, indicating an Hours-of-Service LOS D as it aligns primarily with traditional daytime service, and people traveling in the early mornings or late nights may have to find alternative modes to get to their destinations. Poor LOS ratings like these make the transit service less attractive to most riders. While these are a few examples of the current state of the transit service quality, there are many other measures that, given the data, can be used to measure the QOS of the agency's services in the region and provide recommendations for service improvements.

HISTORIC GROWTH RATES

Calculated historic growth rates for the study area were developed using SCDOT and NCDOT traffic counts to check the traffic model reasonability and inform the planning process of growth trends in the region. **Table 8** provides the identified growth rates by roadway for the 10-year period of 2010 – 2019.

Table 8: Traffic Growth in the GSATS Area, 2010-2019

Route	Location	2010 AADT	2019 AADT	2010-2019 Percent Growth	2010-2019 Annual Growth Rate
Horry County					
SC 9 E	SC 905 To Sea Mountain Hwy	19,800	26,700	34.85%	4.36%
US 501 W	Marion County Line To Bluewater Rd	17,200	19,900	15.70%	1.96%
E US 501	US 701 (4TH Ave) To Waccamaw Dr	40,700	39,700	-2.46%	-0.31%
US 701 S	SC 79 To Pitch Landing Rd	7,400	9,300	25.68%	3.21%
SC 707	Georgetown County Line To Dick Pond Rd	18,600	23,800	27.96%	3.49%
21st Ave S	US 17 BUS (S Kings Hwy) To SC 825	10,500	9,300	-11.43%	-1.43%
SC 544	Wofford Rd To SC 814	25,900	35,000	35.14%	4.39%
US 501 BUS	SC 905 (4TH AVE) To SC 544	19,400	21,200	9.28%	1.16%
US 378	Nixon Ave To SC 29 (9TH Ave)	9,400	9,700	3.19%	0.40%
Conway Bypass	US 701 To SC 905	7,900	10,700	35.44%	4.43%
N Ocean Blvd	SC 80 (Haskell Cir) To N Ocean Blvd	7,100	7,900	11.27%	1.41%
Conway Bypass	SC 31 (Carolina Bays Pky) To US 17	24,000	29,300	22.08%	2.76%
SC 9 E	Sea Mountain Hwy To SC 90	25,900	22,300	-13.90%	-1.74%
SC 31	SC 90 To SC 905	4,000	5,100	27.50%	3.44%
US 701 N	SC 9 To North Carolina State Line	8,100	13,900	71.60%	8.95%
US 17	SC 9 (Sea Mountain Hwy) To SC 90	41,900	37,900	-9.55%	-1.19%
US 17	SC 179 To North Carolina State Line	15,100	13,200	-12.58%	-1.57%
Conway Bypass	SC 319 To US 701	5,100	7,400	45.10%	5.64%
Conway Bypass	SC 905 To SC 90	12,100	13,500	11.57%	1.45%
SC 9 W BYP	SC 9 BUS (Olive Dr) To SC 9 BUS	6,100	10,400	70.49%	8.81%
SC 90 W	Carolina Bays Pky To Sea Mountain Hwy	10,700	12,500	16.82%	2.10%
SC 90 E	Sea Mountain Hwy To US 17	15,700	16,000	1.91%	0.24%
E US 501	SC 31 (Carolina Bays Pky) To US 17	65,600	60,400	-7.93%	-0.99%
US 17 Bypass	SC 707 To US 501	56,400	46,800	-17.02%	-2.13%
Georgetown County					
US 17	Wachesaw Rd To Horry County Line	6,100	6,700	9.84%	1.23%
US 17 Alt	Ten Acre Rd To Powell Rd	2,700	2,800	3.70%	0.46%
S Fraser St	US 17 (Fraser St) To Ent of Paper Mill	3,600	3,100	-13.89%	-1.74%
N Fraser St	Summit Ave To SC 51 (Browns Ferry Rd)	15,700	19,900	26.75%	3.34%
US 17	US 17 To Wachesaw Rd	5,000	5,100	2.00%	0.25%
US 17 Bypass	SC 392 To Horry County Line	32,400	39,100	20.68%	2.58%
US 521	County Line Rd To Williamsburg County Line	5,400	5,500	1.85%	0.23%

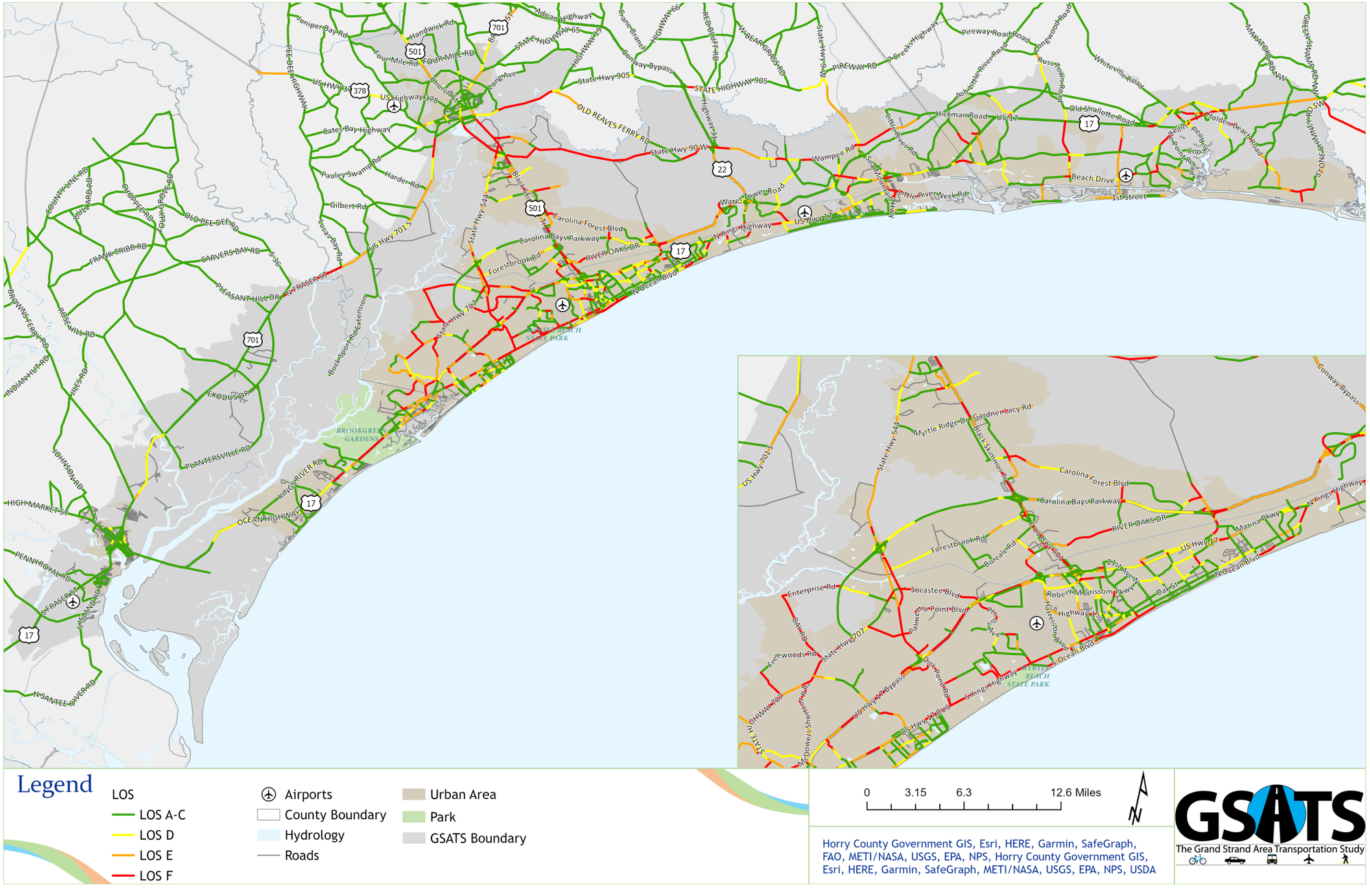
Route	Location	2010 AADT	2019 AADT	2010-2019 Percent Growth	2010-2019 Annual Growth Rate
Brunswick County					
Ash Little River Rd	S Of NC 130	790	780	-1.27%	-0.16%
Beach Dr	E Of Sr 1154	6,700	7,000	4.48%	0.56%
Hale Swamp Rd	S Of NC 179	2,000	4,700	135.00%	16.88%
Holden Beach Rd Sw	W Of Sr 1124	10,000	10,500	5.00%	0.63%
Mount Pisgah Rd Sw	S Of Sr 1133	5,700	4,400	-22.81%	-2.85%
Old Georgetown Rd	E Of Sr 1164	8,000	9,200	15.00%	1.88%
Old Georgetown Rd	E Of NC 179	3,900	6,900	76.92%	9.62%
Old Georgetown Rd	W Of NC 904	8,300	9,800	18.07%	2.26%
Old Ocean Hwy	E Of Us 17	4,300	4,300	0.00%	0.00%
Old Ocean Hwy	N Of Sr 1401	6,700	10,500	56.72%	7.09%
Seaside Rd	S Of US 17	0	9,200	100.00%	12.50%
Seaside Rd	S Of Sr 1163	11,000	10,500	-4.55%	-0.57%
Stone Chimney Rd Sw	N Of Sr 1231	0	4,300	100.00%	12.50%
Sunset Blvd	N Of Sr 1172	0	7,100	100.00%	12.50%
Thomasboro Rd	S Of US 17	3,300	4,100	24.24%	3.03%
US 17	N Of NC 130	21,000	28,500	35.71%	4.46%
US 17	W Of US 17 Bus	20,000	26,500	32.50%	4.06%
US 17	E Of NC 904	0	25,000	100.00%	12.50%
US 17	S Of Sr 1300	12,000	15,000	25.00%	3.13%
US 17	W Of NC 211	27,000	34,500	27.78%	3.47%
US 17 Business	E Of NC 130	13,000	12,500	-3.85%	-0.48%
Village Point Rd	S Of US 17 Bus	8,200	10,000	21.95%	2.74%

Sources: SCDOT and NCDOT

FUTURE CONDITIONS

The future (2045) conditions are obtained using the travel demand model and updated demographic and land use projections conducted as part of the GSATS 2045 MTP Update. **Figure 14** provides the future (2045) conditions peak season daily LOS results for key roadways in the GSATS region.

Figure 14: Future (2045) Conditions Peak Season Daily Roadway LOS



Out of the total 822 roadways analyzed in the future TDM, 183 (22%) roadways operate at a LOS D or worse. Out of those 183 roadways, 66 operate at LOS D, 46 at LOS E, and 71 at LOS F. **Table 9** shows the segment LOS distribution for the entire GSATS network and between North Carolina and South Carolina. **Table 10** provides the roadways in the GSATS network that are forecasted in 2045 to operate at a LOS D or worse.

Table 9: Future (2045) Segment LOS Distribution Between NC and SC

	Total		NC		SC	
A	400	49%	38	10%	362	91%
B	137	17%	26	19%	111	81%
C	102	12%	19	19%	83	81%
D	66	8%	8	12%	58	88%
E	46	6%	5	11%	41	89%
F	71	9%	14	20%	57	80%
Total	822		110		712	

Table 10: Future (2045) Roadways with LOS D-F Conditions

Road Name | City	Functional Class	V/C	LOS	State	County
11th Avenue | Myrtle Beach	Undivided Minor Arterial	1.97	F	South Carolina	Horry
17th Avenue | Myrtle Beach	Undivided Collector	1.06	D	South Carolina	Horry
48th Avenue | Myrtle Beach	Undivided Collector	1.06	D	South Carolina	Horry
48th Avenue | North Myrtle Beach	Undivided Minor Arterial	1.01	D	South Carolina	Horry
6th Avenue | North Myrtle Beach	Undivided Collector	1.06	D	South Carolina	Horry
7th Avenue | Myrtle Beach	Undivided Minor Arterial	1.09	D	South Carolina	Horry
Barefoot Resort Bridge Road | North Myrtle Beach	Undivided Minor Arterial	1.01	D	South Carolina	Horry
Bay Road | Socastee	Undivided Collector	1.60	F	South Carolina	Horry
Beach Drive | Calabash	Undivided Major Collector	1.14	D	North Carolina	Brunswick
Beach Drive | Ocean Isle Beach	Undivided Major Collector	1.18	E	North Carolina	Brunswick
Beach Drive | Sunset Beach	Undivided Major Collector	1.03	D	North Carolina	Brunswick
Beaver Run Boulevard | Myrtle Beach	Undivided Collector	1.72	F	South Carolina	Horry
Big Block Road | Socastee	Undivided Collector	1.43	F	South Carolina	Horry
Black Creek Road | Georgetown	Undivided Minor Arterial	1.03	D	South Carolina	Georgetown
Br 501 | Conway	Undivided Minor Arterial	1.19	E	South Carolina	Horry
Br 501 | Red Hill	Undivided Minor Arterial	1.03	D	South Carolina	Horry
Brick Landing Road | Ocean Isle Beach	Undivided Collector/Local	1.09	D	North Carolina	Brunswick
Brick Landing Road | Shallotte	Undivided Major Collector	1.45	F	North Carolina	Brunswick
Bridger Road | Shallotte	Divided Collector	1.40	F	North Carolina	Brunswick
Broad Street | Conway	Undivided Minor Arterial	1.17	E	South Carolina	Horry
Broad Street | Homewood	Undivided Minor Arterial	1.02	D	South Carolina	Horry
Broad Street | Loris	Undivided Minor Arterial	1.07	D	South Carolina	Horry

Road Name | City	Functional Class	V/C	LOS	State	County
Burgess Road | Murrells Inlet	Undivided Minor Arterial	1.37	F	South Carolina	Horry
Calabash Road | Carolina Shores	Undivided Collector	1.45	F	North Carolina	Brunswick
Canal St | Myrtle Beach	Undivided Collector	1.04	D	South Carolina	Horry
Cannon Road | Myrtle Beach	Undivided Collector	1.01	D	South Carolina	Horry
Carolina Bays Parkway | Carolina Forest	Expressway	1.10	D	South Carolina	Horry
Carolina Bays Parkway | North Myrtle Beach	Expressway	1.14	D	South Carolina	Horry
Carolina Forest Boulevard | Carolina Forest	Divided Minor Arterial	1.04	D	South Carolina	Horry
Causeway Drive | Ocean Isle Beach	Undivided Major Collector	1.29	E	North Carolina	Brunswick
Church Street | Conway	Undivided Collector	1.01	D	South Carolina	Horry
Claire Chapin Epps Drive | Myrtle Beach	Undivided Collector	1.12	D	South Carolina	Horry
Claypond Road | Myrtle Beach	Undivided Collector	1.29	E	South Carolina	Horry
Country Club Drive | Carolina Shores	Undivided Collector	1.01	D	North Carolina	Brunswick
Cox Ferry Road | Conway	Undivided Collector	1.04	D	South Carolina	Horry
Cox Ferry Road | Red Hill	Undivided Collector	1.07	D	South Carolina	Horry
Dick Pond Road | Myrtle Beach	Undivided Minor Arterial	1.62	F	South Carolina	Horry
Dick Pond Road | Socastee	Undivided Minor Arterial	1.53	F	South Carolina	Horry
Dick Pond Road | Surfside Beach	Undivided Minor Arterial	1.48	F	South Carolina	Horry
E Cox Ferry Road | Conway	Undivided Collector	2.25	F	South Carolina	Horry
E Us Highway 501 | Carolina Forest	Divided Principal Arterial	1.54	F	South Carolina	Horry
E Us Highway 501 | Conway	Undivided Principal Arteri	1.47	F	South Carolina	Horry
E Us Highway 501 | Forestbrook	Divided Principal Arterial	1.34	F	South Carolina	Horry
E Us Highway 501 | Myrtle Beach	Divided Principal Arterial	1.20	E	South Carolina	Horry
E Us Highway 501 | Red Hill	Divided Principal Arterial	1.70	F	South Carolina	Horry
Enterprise Road | Socastee	Undivided Collector	1.31	E	South Carolina	Horry
Forestbrook Road | Forestbrook	Divided Collector	1.10	D	South Carolina	Horry
Fred Nash Boulevard | Myrtle Beach	Undivided Collector	1.09	D	South Carolina	Horry
Fulford Avenue | Holden Beach	Undivided Major Collector	1.54	F	North Carolina	Brunswick
Garden City Connector | Garden City	Undivided Minor Arterial	1.15	E	South Carolina	Horry
Gardner Lacy Road | Carolina Forest	Undivided Collector	1.43	F	South Carolina	Horry
Gardner Lacy Road | Conway	Undivided Collector	1.27	E	South Carolina	Horry
George Bishop Parkway | Myrtle Beach	Divided Minor Arterial	1.24	E	South Carolina	Horry
Glenns Bay Road | Carolina Forest	Undivided Minor Arterial	1.38	F	South Carolina	Horry
Glenns Bay Road | Garden City	Undivided Minor Arterial	1.41	F	South Carolina	Horry
Glenns Bay Road | Surfside Beach	Undivided Minor Arterial	1.24	E	South Carolina	Horry
Gray Bridge Road | Shallotte	Undivided Collector/Local	1.14	D	North Carolina	Brunswick
Hale Swamp Road | Shallotte	Undivided Collector/Local	1.07	D	North Carolina	Brunswick
Hickman Road | Shallotte	Divided Major Collector	1.71	F	North Carolina	Brunswick
Highway 15 | Myrtle Beach	Undivided Collector	1.51	F	South Carolina	Horry
Highway 179 | Little River	Undivided Major Collector	1.43	F	South Carolina	Horry

Road Name | City	Functional Class	V/C	LOS	State	County
Hill Street | North Myrtle Beach	Undivided Collector	2.26	F	South Carolina	Horry
Holden Beach Road | Shallotte	Undivided Major Collector	1.41	F	North Carolina	Brunswick
Holmestown Road | Carolina Forest	Undivided Minor Arterial	1.24	E	South Carolina	Horry
Holmestown Road | Garden City	Undivided Minor Arterial	1.24	E	South Carolina	Horry
Howard Parkway | Myrtle Beach	Divided Collector	1.12	D	South Carolina	Horry
Inlet Square Drive | Garden City	Undivided Minor Arterial	1.07	D	South Carolina	Horry
Juniper Drive | Myrtle Beach	Undivided Collector	1.46	F	South Carolina	Horry
Kates Bay Highway | Conway	Undivided Minor Arterial	1.13	D	South Carolina	Horry
Kings Road | Myrtle Beach	Undivided Minor Arterial	1.16	E	South Carolina	Horry
Lake Arrowhead Road | Myrtle Beach	Undivided Minor Arterial	1.33	E	South Carolina	Horry
Little River Neck Road | North Myrtle Beach	Undivided Collector	1.59	F	South Carolina	Horry
Longwood Drive | Murrells Inlet	Undivided Collector	1.22	E	South Carolina	Horry
Loyola Drive | Socastee	Undivided Collector	1.43	F	South Carolina	Horry
Main Street | Conway	Undivided Minor Arterial	1.13	D	South Carolina	Horry
Mallardlake Drive | Myrtle Beach	Undivided Collector	1.46	F	South Carolina	Horry
Marlowtown Road | Carolina Shores	Undivided Collector/Local	1.42	F	North Carolina	Brunswick
Mcdowell Shortcut Road | Garden City	Undivided Collector	1.39	F	South Carolina	Horry
Meyers Avenue | Myrtle Beach	Divided Collector	1.04	D	South Carolina	Horry
Midway Road | Oak Island Beach	Undivided Major Collector	1.15	D	North Carolina	Brunswick
N Fraser Street | US 701 between Bucksport and Georgetown	Undivided Minor Arterial	1.06	D	South Carolina	Georgetown
N Hollywood Drive | Surfside Beach	Undivided Collector	1.19	E	South Carolina	Horry
N Kings Highway | Briarcliff Acres	Divided Principal Arterial	1.43	F	South Carolina	Horry
N Kings Highway | Myrtle Beach	Divided Minor Arterial	1.11	D	South Carolina	Horry
N Kings Highway | North Myrtle Beach	Divided Principal Arterial	1.33	E	South Carolina	Horry
N Ocean Boulevard | Myrtle Beach	Undivided Collector	1.13	D	South Carolina	Horry
Ocean Highway | Litchfield Beach	Divided Principal Arterial	1.18	E	South Carolina	Georgetown
Ocean Highway | Murrells Inlet	Divided Principal Arterial	1.45	F	South Carolina	Georgetown
Ocean Isle Beach Road | Ocean Isle Beach	Undivided Major Collector	1.23	E	North Carolina	Brunswick
Old Kings Highway | Murrells Inlet	Undivided Collector	1.14	D	South Carolina	Georgetown
Old Reaves Ferry Road | Conway	State Maintained Local	1.07	D	South Carolina	Horry
Old State Highway 90 | SC 90 between Conway and North Myrtle Beach	Undivided Collector	1.01	D	South Carolina	Horry
Palmetto Point Boulevard | Socastee	Undivided Collector	1.91	F	South Carolina	Horry
Palmetto Street | Conway	Undivided Minor Arterial	1.04	D	South Carolina	Horry
Persimmon Road | Carolina Shores	Undivided Collector/Local	1.22	E	North Carolina	Brunswick
Phillis Boulevard | Myrtle Beach	Undivided Collector	1.50	F	South Carolina	Horry
Posatal Way | Carolina Forest	Undivided Collector	1.21	E	South Carolina	Horry
Postal Way | Carolina Forest	Undivided Collector	1.03	D	South Carolina	Horry
Prestwick Club Drive | Myrtle Beach	Undivided Collector	2.17	F	South Carolina	Horry

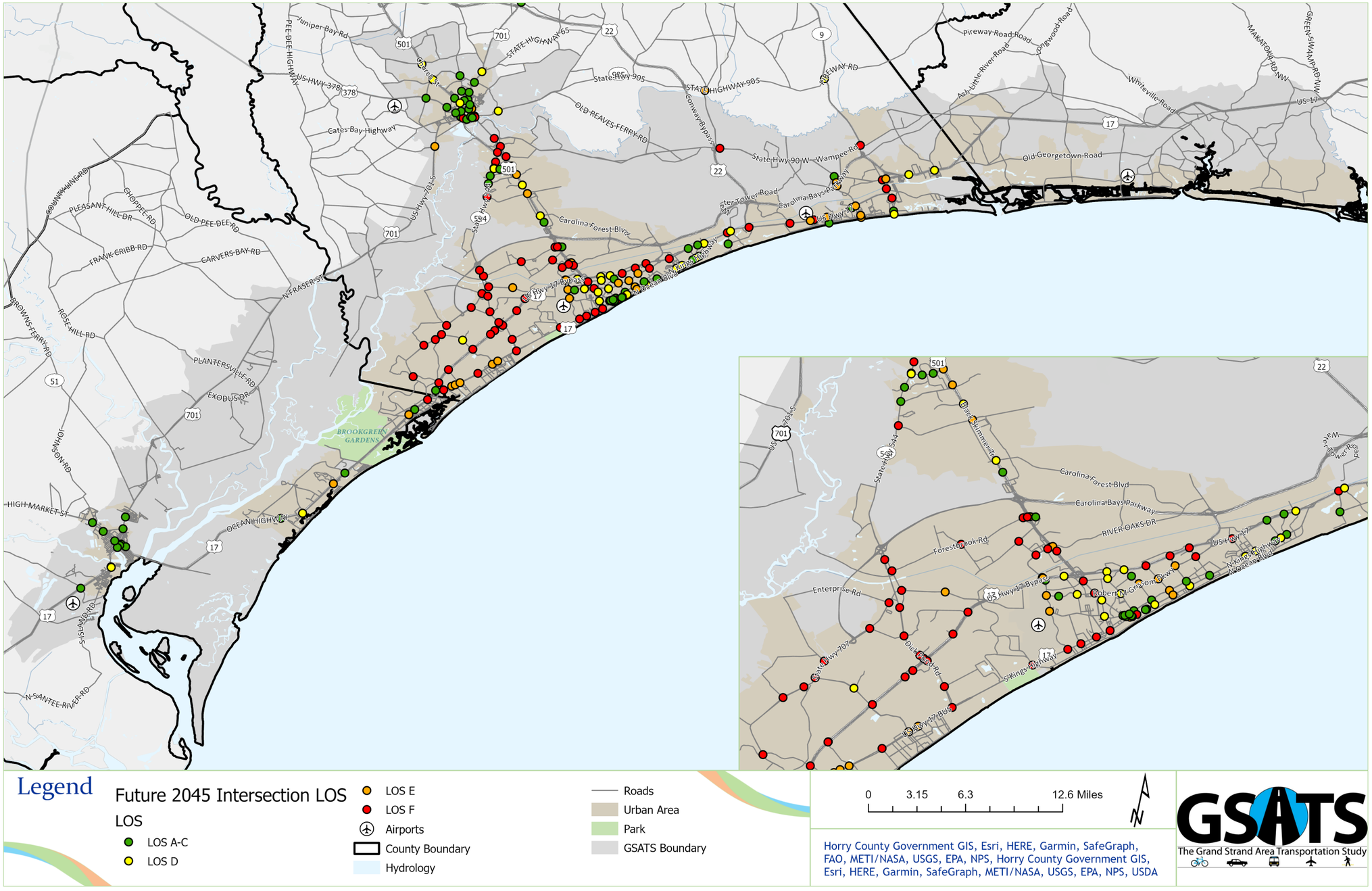
Road Name | City	Functional Class	V/C	LOS	State	County
Prince Creek Parkway | Murrells Inlet	Undivided Collector	1.15	D	South Carolina	Horry
Queen Harbour Boulevard | Socastee	Undivided Collector	1.75	F	South Carolina	Horry
Revolutionary War Way | Carolina Forest	Divided Minor Arterial	1.36	F	South Carolina	Horry
River Oaks Drive | Myrtle Beach	Divided Minor Arterial	1.55	F	South Carolina	Horry
Robert M Grissom Parkway | Carolina Forest	Expressway	1.13	D	South Carolina	Horry
Royal Tern Court | Conway	Undivided Minor Arterial	1.36	F	South Carolina	Horry
S Hollywood Drive | Surfside Beach	Undivided Collector	1.09	D	South Carolina	Horry
S Kings Highway | Myrtle Beach	Divided Minor Arterial	1.58	F	South Carolina	Horry
S Kings Highway | Surfside Beach	Divided Minor Arterial	1.58	F	South Carolina	Horry
S Ocean Boulevard | Myrtle Beach	Divided Minor Arterial	1.21	E	South Carolina	Horry
S Ocean Boulevard | Surfside Beach	Undivided Collector	1.14	D	South Carolina	Horry
Sabbath Home Road | Holden Beach	Undivided Collector/Local	1.44	F	North Carolina	Brunswick
Sayebrook Parkway | Socastee	Undivided Collector	2.92	F	South Carolina	Horry
Sea Mountain Highway | Little River	Undivided Minor Arterial	1.23	E	South Carolina	Horry
Seaside Road | Sunset Beach	Undivided Major Collector	1.38	F	North Carolina	Brunswick
Shetland Lane | Socastee	Undivided Collector	1.95	F	South Carolina	Horry
Singleton Ridge Road | Conway	Undivided Minor Arterial	1.29	E	South Carolina	Horry
Smith Street | Conway	Undivided Collector	1.44	F	South Carolina	Horry
Socastee Boulevard | Myrtle Beach	Undivided Minor Arterial	1.56	F	South Carolina	Horry
Socastee Boulevard | Socastee	Undivided Minor Arterial	1.43	F	South Carolina	Horry
South Strand Drive | Myrtle Beach	Undivided Collector	1.54	F	South Carolina	Horry
South Strand Drive | Socastee	Undivided Collector	1.99	F	South Carolina	Horry
Southport Supply Road | Bolivia	Undivided Collector/Local	1.47	F	North Carolina	Brunswick
Southport Supply Road | Oak Island Beach	Major Collector	1.44	F	North Carolina	Brunswick
Southport Supply Road | St. James	Major Collector	2.07	F	North Carolina	Brunswick
Spruce Drive | Myrtle Beach	Undivided Collector	1.46	F	South Carolina	Horry
State Highway 1342 | Myrtle Beach	Undivided Collector	1.65	F	South Carolina	Horry
State Highway 544 | Conway	Undivided Principal Arterial	1.19	E	South Carolina	Horry
State Highway 544 | Red Hill	Undivided Collector	1.36	F	South Carolina	Horry
State Highway 544 | Socastee	Divided Principal Arterial	1.24	E	South Carolina	Horry
State Highway 707 | Murrells Inlet	Undivided Minor Arterial	1.25	E	South Carolina	Horry
State Highway 707 | Myrtle Beach	Undivided Minor Arterial	1.56	F	South Carolina	Horry
State Highway 707 | SC 707 between Socastee and Murrells Inlet	Undivided Minor Arterial	1.61	F	South Carolina	Horry
State Highway 707 | Socastee	Undivided Minor Arterial	1.10	D	South Carolina	Horry
State Highway 9 | Little River	Undivided Principal Arteri	1.12	D	South Carolina	Horry
State Highway 90 | Conway	Undivided Minor Arterial	1.93	F	South Carolina	Horry
State Highway 90 | Little River	Undivided Minor Arterial	1.21	E	South Carolina	Horry

Road Name | City	Functional Class	V/C	LOS	State	County
State Highway 90 | Red Hill	Undivided Minor Arterial	1.33	E	South Carolina	Horry
State Highway 90 | SC 90 between Conway and North Myrtle Beach	Undivided Minor Arterial	1.60	F	South Carolina	Horry
State Highway 905 | Conway	Undivided Minor Arterial	1.06	D	South Carolina	Horry
State Highway 905 | SC 905 between Conway and NC State Line	Undivided Major Collector	1.00	D	South Carolina	Horry
Technology Boulevard | Conway	Undivided Collector	1.19	E	South Carolina	Horry
Tournament Boulevard | Garden City	Divided Minor Arterial	1.20	E	South Carolina	Horry
Tournament Boulevard | Murrells Inlet	Divided Minor Arterial	1.03	D	South Carolina	Horry
Tpg Boulevard | Murrells Inlet	Undivided Collector	1.31	E	South Carolina	Horry
Us Highway 17 | Atlantic Beach	Undivided Principal Arterial	1.21	E	South Carolina	Horry
Us Highway 17 | Murrells Inlet	Undivided Minor Arterial	1.12	D	South Carolina	Georgetown
Us Highway 17 | Myrtle Beach	Divided Principal Arterial	1.13	D	South Carolina	Horry
Us Highway 17 | Shallotte	Divided Principal Arterial	1.09	D	North Carolina	Brunswick
Us Highway 17 Business | Garden City	Divided Minor Arterial	1.23	E	South Carolina	Horry
Us Highway 17 Business | Shallotte	Divided Major Collector	1.19	E	North Carolina	Brunswick
Us Highway 17 Business | Socastee	Divided Minor Arterial	1.70	F	South Carolina	Horry
Us Highway 17 Business | Surfside Beach	Divided Minor Arterial	1.44	F	South Carolina	Horry
Us Highway 17 Bypass | Carolina Forest	Divided Principal Arterial	1.04	D	South Carolina	Horry
Us Highway 17 Bypass | Garden City	Divided Principal Arterial	1.34	E	South Carolina	Horry
Us Highway 17 Bypass | Murrells Inlet	Divided Principal Arterial	1.13	D	South Carolina	Georgetown
Us Highway 17 Bypass | Myrtle Beach	Divided Principal Arterial	1.15	D	South Carolina	Horry
Us Highway 17 Bypass | Socastee	Divided Principal Arterial	1.35	F	South Carolina	Horry
Us Highway 501 | Aynor	Undivided Minor Arterial	1.19	E	South Carolina	Horry
Us Highway 501 | Carolina Forest	Divided Principal Arterial	1.21	E	South Carolina	Horry
Us Highway 501 | Conway	Divided Principal Arterial	1.29	E	South Carolina	Horry
Us Highway 501 | Myrtle Beach	Divided Minor Arterial	1.03	D	South Carolina	Horry
Us Highway 501 | US 501 between Aynor and Conway	Divided Minor Arterial	1.13	D	South Carolina	Horry
Us Highway 501 | US 501 North of Conway	Divided Minor Arterial	1.03	D	South Carolina	Horry
Us Highway 501 Business | Conway	Undivided Minor Arterial	2.29	F	South Carolina	Horry
Us Highway 501 Business | Red Hill	Undivided Minor Arterial	1.91	F	South Carolina	Horry
Us Highway 701 | US 701 from Conway to Bucksport	Undivided Minor Arterial	1.15	E	South Carolina	Horry
Us Highway 701 | Bucksport	Undivided Minor Arterial	1.02	D	South Carolina	Horry
Us Highway 701 | Conway	Undivided Minor Arterial	1.05	D	South Carolina	Horry
Us Highway 701 | Loris	Undivided Minor Arterial	1.33	E	South Carolina	Horry
Us Highway 701 | US 701 from Brunswick County Line to Loris	Undivided Minor Arterial	1.68	F	South Carolina	Horry
Us Highway 701 | US 701 from Conway to Bucksport	Undivided Minor Arterial	1.04	D	South Carolina	Horry
Van Buren Drive | Garden City	Undivided Minor Arterial	1.25	E	South Carolina	Horry

Road Name | City	Functional Class	V/C	LOS	State	County
Van Buren Drive | Murrells Inlet	Undivided Minor Arterial	1.25	E	South Carolina	Horry
Village Road | Shallotte	Undivided Collector	1.41	F	North Carolina	Brunswick
Waccamaw Boulevard | Forestbrook	Divided Collector	1.16	E	South Carolina	Horry
Waccamaw Drive | Garden City	Undivided Minor Arterial	1.05	D	South Carolina	Horry
Wall Street | Shallotte	Undivided Collector/Local	2.22	F	North Carolina	Brunswick
Wampee Road | Little River	Undivided Collector	1.36	F	South Carolina	Horry
Waterside Lane | Murrells Inlet	Undivided Minor Arterial	1.12	D	South Carolina	Georgetown
Wildair Circle | Conway	Undivided Minor Arterial	1.65	F	South Carolina	Horry
Wilderness Lane | Murrells Inlet	Undivided Collector	1.07	D	South Carolina	Horry
William Finlayson Road | Red Hill	Undivided Collector	1.17	E	South Carolina	Horry
Winwyh Road | Conway	Undivided Collector	1.13	D	South Carolina	Horry

Figure 15 provides the future (2045) conditions peak season daily LOS results for key intersections in the GSATS region.

Figure 15: Future (2045) Conditions Peak Season Daily Intersection LOS



Of the 217 intersections analyzed in the future TDM, 137 intersections operate at a LOS D or worse. This means 63% of intersections in the future GSATS network are deficient. Of those 137 intersections, 33 operate at LOS D, 36 at LOS E, and 68 at LOS F. **Table 11** provides the intersections in the GSATS network that are forecasted in 2045 to operate at a LOS D or worse.

Table 11: Future (2045) Intersections with LOS D-F Conditions

Main Roadway	Intersecting Roadway	V/C	LOS
US 501	Frye Rd	1.12	D
US 501 Bus	SC 544	1.72	F
US 17	Mr Joe White Ave	1.15	D
US 501	Seaboard St	1.82	F
US 501	Robert M Grissom Pkwy	1.34	F
US 17 Bus	17th Ave S	1.55	F
George Bishop Pkwy	US 501 SB On Ramp/Off Ramp	1.57	F
River Oaks Dr	Waccamaw Blvd	1.23	E
Forestbrook Rd	Dick Pond Rd	1.95	F
SC 707	Luttie Rd	1.27	E
SC 707	Salem Rd	1.87	F
SC 707	McDowell Shortcut Rd	2.00	F
SC 707	Circle Ln	2.32	F
US 701	Pitch Landing Rd	1.29	E
US 17 Bus	SC 544	1.92	F
US 17	Esso Rd	1.76	F
US 17	Glenns Bay Rd	1.78	F
SC 544	Prestwick Club Dr	1.81	F
US 17 Bus	Glenns Bay Rd	1.17	E
SC 707	Dick Pond Rd	2.00	F
SC 544	US 17 SB On Ramp/Off Ramp	1.34	F
SC 544	US 17 NB On Ramp/Off Ramp	1.35	F
SC 707	Holmestown Rd	2.10	F
Holmestown Rd	Scipio Ln	1.12	D
SC 707	Enterprise Ln	1.78	F
SC 707	Big Block Rd	1.67	F
SC 544	Dick Pond Rd	1.75	F
SC 544	Palmetto Pointe Blvd	2.06	F
US 17	Palmetto Pointe Blvd	1.56	F
US 17 Bus	SC 707	1.88	F
US 17 Bus	Harrelson Blvd	1.49	F
US 501	Carolina Forest Blvd	1.12	D
Forestbrook Rd	McCormick Rd	1.51	F
SC 544	Dick Pond Rd	1.89	F
US 501	Singleton Ridge Rd	1.24	E
US 501	University Blvd	1.30	E
SC 544	Myrtle Ridge Dr	1.34	F
US 378	SC 544	1.93	F
SC 544	Founders Dr	1.49	F

Main Roadway	Intersecting Roadway	V/C	LOS
US 501	Cox Ferry Rd	1.59	F
US 501	Wild Wing Blvd	1.09	D
US 501	Gardner Lacy Rd	1.31	E
Forestbrook Rd	Fantasy Harbour Blvd	1.38	F
US 501 NB Off Ramp	Waccamaw Blvd	1.52	F
Dick Scobee Rd	US 501 NB On Ramp/Off Ramp	1.23	E
Robert M Grissom Pkwy	Pine Island Rd	1.09	D
Harrelson Blvd	Robert M Grissom Pkwy	1.31	E
Harrelson Blvd	SC 15	1.25	E
SC 9	Hill St	1.35	F
US 501 Bus	SC 90	2.74	F
US 701	SC 65	1.07	D
US 501	El Bethel Rd	1.04	D
US 501	SC 548	1.13	D
US 501	US 378	1.33	E
US 378	US 701	1.34	F
US 501 Bus	9th Ave	1.20	E
US 501	16th Ave	1.09	D
US 501 Bus	SC 905	1.43	F
SC 905	E Country Club Dr	1.12	D
US 17	Kings Rd	1.90	F
US 17 Bus	3rd Ave S	1.60	F
US 17 Bus	9th Ave S	1.51	F
US 17	62nd Ave N	1.49	F
US 17 Bus	79th Ave N	1.13	D
US 17 Bus	21st Ave N	1.05	D
US 17	38th Ave N	1.48	F
US 17 Bus	38th Ave N	1.02	D
N Oak St	29th Ave N	1.22	E
Robert M Grissom Pkwy	29th Ave N	1.27	E
US 17	21st Ave N	1.13	D
Robert M Grissom Pkwy	Mr Joe White Ave	1.14	D
3rd Ave S	SC 15	1.09	D
US 501	3rd Ave S	1.02	D
Seaboard St	Mr Joe White Ave	1.05	D
US 17 Bus	11th Ave N	1.77	F
US 17 Bus	US 501	1.19	E
N Oak St	Broadway St	1.26	E
US 17	Waterside Dr	1.05	D
Robert M Grissom Pkwy	21st Ave N	1.23	E
US 17	29th Ave N	1.51	F
US 17 Bus	29th Ave N	1.16	E
US 17	48th Ave N	1.91	F
Robert M Grissom Pkwy	48th Ave N	1.53	F
Robert M Grissom Pkwy	38th Ave N	1.22	E
US 17	Barefoot Resort Bridge Rd	1.71	F

Main Roadway	Intersecting Roadway	V/C	LOS
US 17 Bus	62nd Ave N	1.12	D
US 17 Bus	67th Ave N	1.11	D
US 17	Grande Dunes Blvd	1.02	D
US 17	Lake Arrowhead Rd	1.91	F
US 17	Chesnut Rd	1.11	D
US 17	17th Ave S	1.28	E
SC 9	SC 905	1.02	D
SC 31	SC 905	1.20	E
SC 31	SC 90	1.68	F
US 701	SC 9	1.10	D
SC 9	SC 57	1.80	F
Old Highway 17 N	Sea Mountain Hwy	1.85	F
Sea Mountain Hwy	SC 90	1.57	F
SC 9 Off Ramp/US 17 On Ramp	SC 90	1.33	E
US 17	Mineola Ave	1.04	D
US 17	River Hills Dr	1.08	D
US 17	Wachesaw Rd	1.07	D
US 17 SB Off Ramp	George Bishop Pkwy	1.73	F
US 17	Cravens St	1.10	D
US 17	Litchfield Dr	1.21	E
US 17	Waverly Rd	1.10	D
US 17	Wachesaw Rd	1.23	E
US 17	SC 707	1.58	F
US 17 Bus	Inlet Square Dr	1.42	F
US 17 Bus	Rebecca Ln	1.33	E
US 17 Bus	Jamestown Dr	1.31	E
US 17	Tournament Blvd	1.42	F
US 17	Indigo Club Dr	1.48	F
US 17	Indigo Club Dr	1.55	F
US 17 Bus	Melody Ln	1.67	F
SC 9	SC 65	1.00	D
US 17	Robert Edge Pkwy	1.32	E
SC 65	Main St	1.17	E
Main St	Hillside Dr N	1.17	E
US 17	SC 65	1.38	F
US 17	30th Ave S	1.21	E
SC 31 WB On Ramp/Off Ramp	Robert Edge Pkwy	1.16	E
Burcale Rd	Claypond Rd	1.38	F
George Bishop Pkwy	Fantasy Harbour Blvd	1.46	F
George Bishop Pkwy	Claypond Rd	1.62	F
SC 707	Tournament Blvd	1.51	F
SC EB On Ramp/Off Ramp	Robert Edge Pkwy	1.20	E
US 17 SB Off Ramp	George Bishop Pkwy	1.22	E
US 17	Coventry Rd	2.03	F
SC 544	Sayebrook Pkwy	2.43	F
US 17 Bus	5th Ave N	1.16	E

Main Roadway	Intersecting Roadway	V/C	LOS
US 17 Bus	Garden City Conn	1.27	E
SC 544	University Blvd	1.24	E
SC 544	University Blvd	1.04	D
Forestbrook Rd	US 501 SB On Ramp/Off Ramp	1.46	F
US 501 Bus	3rd Ave	2.20	F
US 17	Queens Harbour Blvd	1.88	F
US 501	Frye Rd	1.12	D
US 501 Bus	SC 544	1.72	F
US 17	Mr Joe White Ave	1.15	D
US 501	Seaboard St	1.82	F
US 501	Robert M Grissom Pkwy	1.34	F
US 17 Bus	17th Ave S	1.55	F
George Bishop Pkwy	US 501 SB On Ramp/Off Ramp	1.57	F
River Oaks Dr	Waccamaw Blvd	1.23	E
Forestbrook Rd	Dick Pond Rd	1.95	F
SC 707	Luttie Rd	1.27	E
SC 707	Salem Rd	1.87	F
SC 707	McDowell Shortcut Rd	2.00	F
SC 707	Circle Ln	2.32	F
US 701	Pitch Landing Rd	1.29	E
US 17 Bus	SC 544	1.92	F
US 17	Esso Rd	1.76	F
US 17	Glenns Bay Rd	1.78	F
SC 544	Prestwick Club Dr	1.81	F
US 17 Bus	Glenns Bay Rd	1.17	E
SC 707	Dick Pond Rd	2.00	F
SC 544	US 17 SB On Ramp/Off Ramp	1.34	F
SC 544	US 17 NB On Ramp/Off Ramp	1.35	F
SC 707	Holmestown Rd	2.10	F
Holmestown Rd	Scipio Ln	1.12	D
SC 707	Enterprise Ln	1.78	F
SC 707	Big Block Rd	1.67	F
SC 544	Dick Pond Rd	1.75	F
SC 544	Palmetto Pointe Blvd	2.06	F
US 17	Palmetto Pointe Blvd	1.56	F
US 17 Bus	SC 707	1.88	F
US 17 Bus	Harrelson Blvd	1.49	F
US 501	Carolina Forest Blvd	1.12	D
Forestbrook Rd	McCormick Rd	1.51	F
SC 544	Dick Pond Rd	1.89	F
US 501	Singleton Ridge Rd	1.24	E
US 501	University Blvd	1.30	E
SC 544	Myrtle Ridge Dr	1.34	F
US 378	SC 544	1.93	F
SC 544	Founders Dr	1.49	F
US 501	Cox Ferry Rd	1.59	F

Main Roadway	Intersecting Roadway	V/C	LOS
US 501	Wild Wing Blvd	1.09	D
US 501	Gardner Lacy Rd	1.31	E
Forestbrook Rd	Fantasy Harbour Blvd	1.38	F
US 501 NB Off Ramp	Waccamaw Blvd	1.52	F
Dick Scobee Rd	US 501 NB On Ramp/Off Ramp	1.23	E
Robert M Grissom Pkwy	Pine Island Rd	1.09	D
Harrelson Blvd	Robert M Grissom Pkwy	1.31	E
Harrelson Blvd	SC 15	1.25	E
SC 9	Hill St	1.35	F
US 501 Bus	SC 90	2.74	F
US 701	SC 65	1.07	D

ROAD FUNCTIONAL CLASSIFICATION

At its inception, roadway functional classification was developed by the federal government as a framework for identifying the role of a roadway. This early framework has expanded to include expectations regarding roadway design, speeds, capacity, and relationship to land use and access management, as well as federal funding implications. Functional classification is now used for many transportation planning purposes within states, MPOs, and local governments.

FEDERAL USE

Functional classification arose out of the need for the federal government to determine national needs and distribute Highway Trust Fund monies in an equitable manner. The Federal Aid Act of 1921 began the process of determining the functional classification of roadways across the nation. This process was completed in cooperation with state DOTs and local governments to obtain uniformity. The later Federal Aid Highway Act of 1973 required the realignment of federal aid roads to the standardized classification system and continues in current practice.

Today, functional classification provides important inputs into the Highway Performance Monitoring System (HPMS) program and the apportionment of federal funds, such as for the National Highway System (NHS) and Surface Transportation Program (STP).

Definitions of Functional Classification

The FHWA *Highway Functional Classification: Concepts, Criteria and Procedures*[17] manual provides procedures for assigning functional classification to a single roadway or network.

The functional classification system is first organized into three main categories of roadways. These categories along with the types of services they provide are shown in **Table 12**.

[17] FHWA: Highway Functional Classification Concepts, Criteria and Procedures, 2013 Edition. https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section00.cfm

Table 12: Roadway Functional Classification Purposes

Functional System	Services Provided
Arterial	Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control.
Collector	Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials.
Local	Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement.

Source: FHWA- Highway Functional Classification: Concepts, Criteria and Procedures

Due to the varying service provided by each type, a typical trip will use a combination of two or all three of the categories.

Further distinctions are also made among these three categories. All functional classification categories further classify as either "major", or "minor" as shown in **Table 13**. For the purpose of transportation planning and funding, roadways are also classified based on area type as being located in either "urban" or "rural" areas.

Table 13: Roadway Functional Classification Details

Functional Categories	Subcategories
Principal Arterial	Interstate Other Freeways and Expressways Other
Minor Arterial	
Collector	Major Collector Minor Collector
Local	

Source: FHWA - Highway Functional Classification: Concepts, Criteria and Procedures

Criteria Used to Determine Classification

One of the primary objectives of the functional classification system is to organize and connect traffic generators with a roadway network that efficiently channels trips to and from the generators. With that end in mind, the procedure to determine classification centers around serving traffic generators and is as follows:

1. **Identify traffic generators.** In rural areas, traffic generators may be population centers (cities and towns); recreational areas such as lakes, national and state parks; military facilities; consolidated schools; and shipping points. In urban areas, traffic generators may be business districts; air, rail, bus and truck terminals; regional shopping centers; colleges and universities; hospital complexes; military bases; industrial and commercial centers; stadiums; fairgrounds; tourist destinations and parks. Regional traffic generators adjacent, but outside of the area of interest, should also be identified.

2. **Rank traffic generators**. Traffic generators should be categorized based on their relative ability to generate trips and be first stratified into urban and rural groupings. Traffic generators thought to be significant enough to be served by a Major Collector or higher should be categorized into five to eight groups (it is better to have too many groups than to have too few, especially toward the lower end of the scale). Traffic generators with similar significance should be placed in the same group. These groups will be used to identify the functional classification of connecting roadways. Population, sales tax receipts, retail trade, visitation and employment are some examples of factors to consider when ranking traffic generations according to their significance.

3. **Map traffic generators.** Traffic generators should be mapped using graduated symbols of varying sizes and/or colors according to the group to which the generator belongs. This will produce a visual representation of the ranking. For example, the group of generators ranked highest should all be symbolized with the largest symbol.

4. **Determine the appropriate functional classification to connect traffic generators**. To determine the functional classification of roadways, work from the highest mobility facilities first by identifying Interstates, Other Freeways & Expressways, Other Principal Arterials, then Minor Arterials and Collectors (Major, then Minor). Then, by definition, Local Roads will be all of the roadways that were not classified as Arterials or Collectors. In other words, begin with a wide, regional perspective to identify Principal Arterials, then gradually move to smaller, more localized perspectives as Minor Arterials, Major Collectors and Minor Collectors are identified. In this process, consider the size of the traffic generators connected and the predominant travel distances and "travel shed" served.

State DOTs are responsible for maintaining and updating the functional classifications of their roadways. FHWA recommends a continuous process of updating classification as changes occur in the roadway system and adjacent land uses. A review of the functional classification system every ten years coincidental with the census and urban area update cycle is also recommended.

Implications to GSATS 2045 MTP Update

A key task of this GSATS 2045 MTP Update is to identify any discrepancies with the SCDOT, NCDOT and locally published roadway classifications and reconcile them to achieve consistency. This task has broad implications to the MTP Update as functional classification provides two link attribute values to the GSATS travel demand model used to analyze existing (2019) and future (2045) conditions. These link attribute values are free flow speed and 24-hour capacity, both of which can greatly affect model results. **Table 14** provides the discrepancies identified during this MTP Update.

Table 14: Identified Differences in Published Functional Classification

Road Name	From	To	GSATS Functional Class	SCDOT Functional Class
County Line Rd	US 521 Bypass	US Highway 521	Undivided Minor Arterial	Undivided Principal Arterial
S Fraser St	S Island Rd	S Fraser St	Divided Principal Arterial	Undivided Principal Arterial
Dock St	Bourne St	Gilbert St	Divided Principal Arterial	Undivided Principal Arterial
Church St	High Market St	N Fraser St	Undivided Collector	Undivided Principal Arterial
N Hazard St	Church St	N Fraser St	Undivided Principal Arterial	Undivided Minor Arterial
Black River Rd	Church St	N Fraser St	Undivided Minor Arterial	Undivided Minor Arterial
Horry St	Black River Rd	N Fraser St	Undivided Principal Arterial	Undivided Minor Arterial
N Fraser St	Anthuan Maybank Dr	Browns Ferry Rd	Undivided Principal Arterial	Undivided Minor Arterial
Ocean Highway	Hagley Dr	South Cswy Rd	Divided Principal Arterial	Undivided Principal Arterial
Ocean Highway	Waverly Rd	Lichfield Dr	Undivided Principal Arterial	Divided Principal Arterial
Indian Hut Rd	Ethridge Dr	Browns Ferry Rd	Undivided Minor Arterial	Undivided Collector/Local
Henry Rd	State Highway 41	County Line Rd	Undivided Collector	Undivided Major Collector
County Line Rd	State Highway 41	Pleasant Hill Dr	Undivided Minor Arterial	Undivided Major Collector
US 17 Bus	US Highway 17 Bypass	Van Buren Dr	Divided Minor Arterial	Divided Principal Arterial
US 17 Bus	Van Buren Dr	Rebecca Ln	Divided Minor Arterial	Undivided Principal Arterial
Van Buren Dr	US 17 Bus	US 17 Bus	Undivided Minor Arterial	Divided Minor Arterial
US Hwy 17 Bus	Misty Breeze Ln	Melody Ln	Divided Minor Arterial	Divided Principal Arterial
US Hwy 17 Bus	Melody Ln	17th Ave S	Divided Minor Arterial	Divided Principal Arterial
S Kings Highway	17th Ave S	5th Ave S	Divided Minor Arterial	Undivided Principal Arterial
N Kings Hwy	5th Ave S	Main St	Divided Minor Arterial	Divided Principal Arterial
N Kings Hwy	Main St	US Hwy 17	Divided Minor Arterial	Divided Principal Arterial
Us Hwy 501	US Hwy 17 Bypass	3rd Ave S	Divided Minor Arterial	Divided Principal Arterial
Us Hwy 501	3rd Ave S	Us 17 Bus	Divided Minor Arterial	Undivided Principal Arteria
S Ocean Blvd	Howard Pky	47th Ave N	Divided Minor Arterial	Undivided Minor Arterial
Harrelson Blvd	Highway 15	S Kings Highway	Divided Collector	Undivided Collector
Glenns Bay Rd	US Hwy 17 Bypass	US Hwy 17 Bus	Undivided Minor Arterial	Divided Minor Arterial
Dick Pond Rd	US Hwy 17 Bypass	S Kings Highway	Undivided Minor Arterial	Undivided Principal Arterial
State Highway 544	Carolina Bays Parkway	State Hwy 707	Divided Principal Arterial	Undivided Principal Arterial
US Hwy 501 Bus	Br 501	University Forest Dr	Divided Minor Arterial	Undivided Minor Arterial

Road Name	From	To	GSATS Functional Class	SCDOT Functional Class
Br 501	State Hwy 544	E US Hwy 501	Undivided Minor Arterial	Undivided Principal Arterial
State Hwy 544	Br 501	US Hwy 501 Bus	Undivided Collector	Undivided Minor Arterial
E US Hwy 501	State Hwy 544	E US Hwy 501	Divided Principal Arterial	Undivided Principal Arterial
E US Hwy 501	Brown Dr	Wright Blvd	Undivided Principal Arterial	Divided Principal Arterial
Church St	El Bethel Road	Pee Dee Highway	Divided Minor Arterial	Divided Principal Arterial
Green Sea Rd	Fair Bluff Highway	W Dogwood Rd	Undivided Collector	Undivided Major Collector
State Highway 9 W Bypass	Olive Dr	State Highway 9 E Bus	Undivided Principal Arterial	Divided Principal Arterial
State Highway 9 W	State Highway 9 E Byp	Waccamav River	Undivided Principal Arterial	Divided Principal Arterial
N Ocean Blvd	5th Ave N	20th Avenue N	Undivided Minor Arterial	Divided Minor Arterial
State Hwy 90 W	Wampee Rd	US Hwy 17	Expressway	Undivided Minor Arterial
Water Tower Road	Carolina Bays Parkway	Conway Bypass	Divided Minor Arteria	Undivided Minor Arterial
US Hwy 17	State Rd S-26-850	Nelson Rd	Divided Principal Arterial	Undivided Principal Arterial
Road Name	**From**	**To**	**GSATS Functional Class**	**NCDOT Functional Class**
7 Creeks Hwy	South/North Carolina Border	Old Dothan Rd	Undivided Major Collector	Undivided Collector/Local
Hickman Road	Mclamb Road	US-17	Undivided Collector	Major Collector
Old Georgetown Road	Beach Drive	Seaside Road	Undivided Collector	Undivided Major Collector
Southport Supply Rd Se	US-17	Stone Chimney Rd Sw	Undivided Collector/Local	Major Collector
Midway Rd Se	Southport Supply Rd SE	Old Ocean Hwy	Undivided Major Collector	Undivided Collector/Local
Swamp Fox Highway	Highway 66	External (End)	Undivided Collector	Major Collector

Sources: North Carolina Statewide Model (NCSTM) and the South Carolina Statewide Model (SCSWM)

SCDOT/NCDOT FUNCTIONAL CLASSIFICATION MAPS

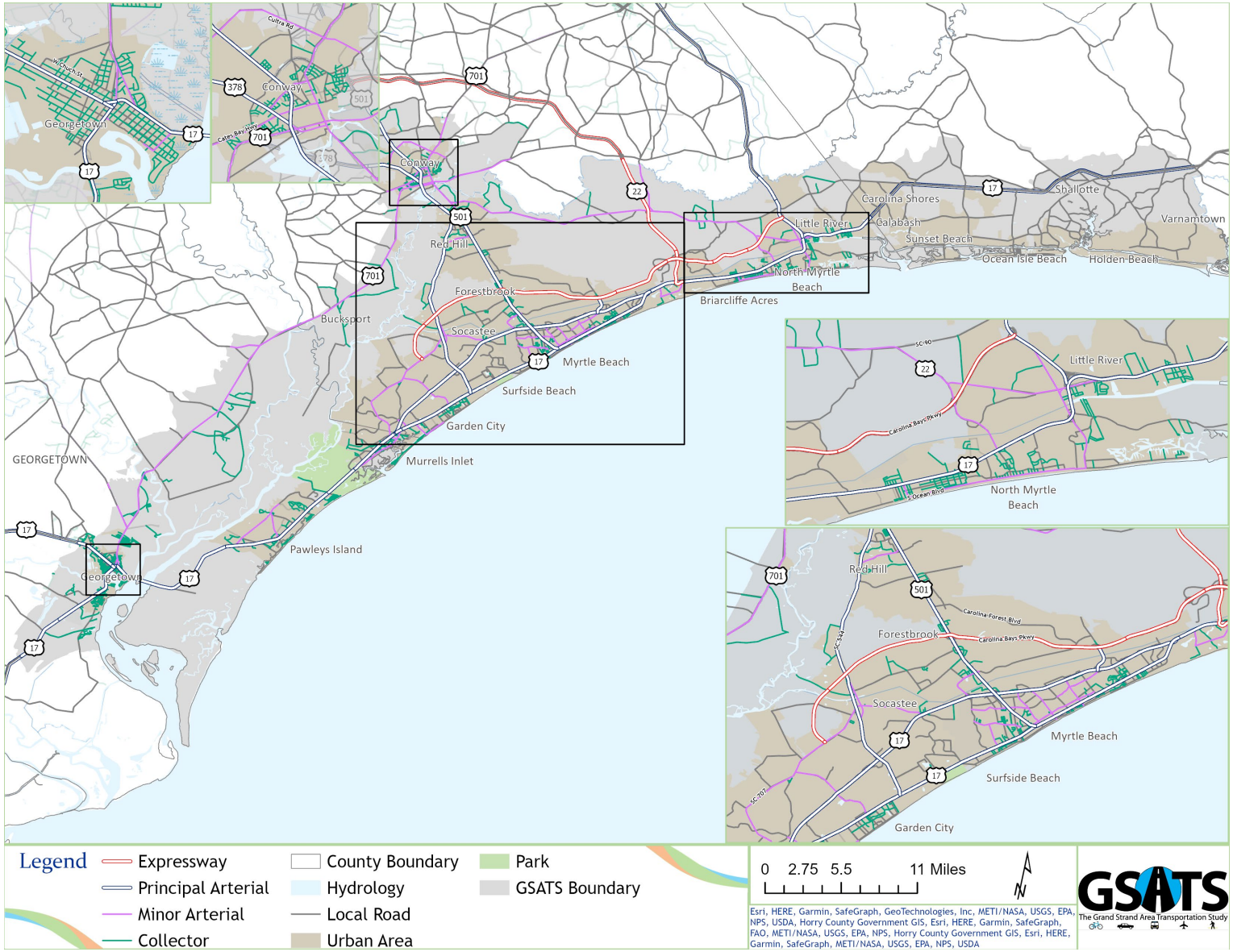
Definitions Used

The SCDOT and NCDOT utilize the federal roadway classification system and publish maps showing the following classes by county and cities:

- Freeways/Expressways
- Principal Arterials
- Minor Arterials Collector
- Local Roads

Figure 16 shows these SCDOT and NCDOT roadway classifications across the GSATS region.

Figure 16: Functional Classification of GSATS Roads



A summary of miles by functional class in the existing GSATS roadway network are detailed in **Table 15**. This table shows the distribution of roadway classifications in this region and the percentage split between South Carolina and North Carolina.

Table 15: Miles by Functional Classification in 2019 GSATS Roadway Network

Functional Classification	Total Existing (2019) Miles	Percentage in SC	Percentage in NC
Divided Collector	8.6	92%	8%
Divided Major Collector	7.2	0%	100%
Divided Minor Arterial	35.5	100%	0%
Divided Principal Arterial	222.1	92%	8%
Expressway	72.2	100%	0%
Major Collector	17.5	0%	100%
State Maintained Local	226.0	100%	0%
Undivided Collector	791.0	98%	2%
Undivided Collector/Local	138.3	0%	100%
Undivided Major Collector	206.7	52%	48%
Undivided Minor Arterial	297.2	99%	1%
Undivided Principal Arterial	75.5	100%	0%

A summary of this distribution of existing LOS for each functional class type in the GSATS roadway network is detailed in **Table 16**.

Table 16: Distribution of Existing (2019) LOS by Roadway Functional Class

Functional Classification	A	B	C	D	E	F
Divided Collector	75%	17%	0%	0%	8%	0%
Divided Major Collector	40%	0%	0%	0%	20%	40%
Divided Minor Arterial	30%	20%	35%	5%	10%	0%
Divided Principal Arterial	22%	20%	31%	16%	8%	2%
Expressway	33%	44%	22%	0%	0%	0%
Major Collector	17%	17%	0%	17%	17%	33%
State Maintained Local	100%	0%	0%	0%	0%	0%
Undivided Collector	75%	13%	7%	2%	1%	1%
Undivided Collector/Local	43%	27%	27%	2%	0%	2%
Undivided Major Collector	54%	11%	13%	13%	2%	7%
Undivided Minor Arterial	30%	22%	28%	6%	9%	6%
Undivided Principal Arterial	53%	20%	20%	7%	0%	0%

A summary of miles by functional class in the 2045 GSATS roadway network are detailed in **Table 17**. This table shows the distribution of roadway classifications in this region and the percentage split between South Carolina and North Carolina.

Table 17: Miles by Functional Classification in the 2045 GSATS Roadway Network

Functional Classification	Total Future (2019) Miles	Percentage in SC	Percentage in NC
Divided Collector	44.6	92%	8%
Divided Major Collector	2.5	0%	100%
Divided Minor Arterial	119.9	83%	0%
Divided Principal Arterial	192.4	89%	11%
Expressway	92.5	100%	0%
Major Collector	6.5	75%	0%
State Maintained Local	169.2	99%	5%
Undivided Collector	744.1	89%	2%
Undivided Collector/Local	64.6	69%	3%
Undivided Major Collector	161.7	26%	19%
Undivided Minor Arterial	361.9	11%	57%
Undivided Principal Arterial	105.6	13%	60%

A summary of this distribution of future LOS for each functional class type in the GSATS roadway network is detailed in **Table 18**.

Table 18: Distribution of Future (2045) LOS by Roadway Functional Class

Functional Classification	A	B	C	D	E	F
Divided Collector	23%	8%	31%	23%	8%	8%
Divided Major Collector	50%	0%	0%	0%	25%	25%
Divided Minor Arterial	7%	17%	23%	20%	13%	20%
Divided Principal Arterial	24%	5%	22%	14%	19%	16%
Expressway	0%	18%	55%	27%	0%	0%
Major Collector	50%	0%	0%	0%	0%	50%
State Maintained Local	93%	3%	2%	1%	0%	0%
Undivided Collector	61%	15%	10%	5%	2%	7%
Undivided Collector/Local	39%	26%	23%	5%	2%	6%
Undivided Major Collector	34%	32%	11%	8%	6%	9%
Undivided Minor Arterial	13%	24%	13%	18%	16%	16%
Undivided Principal Arterial	27%	27%	20%	7%	13%	7%

Update Procedures

The MPO MTP update process is an ideal time to update and address any identified discrepancies in the functional classification of GSATS study area roadways. If there is no existing local procedure in place, guidance provided by FHWA may prove useful.

This guidance is found in the FHWA's document *The Highway Functional Classification: Concepts, Criteria and Procedures, 2013 Edition*, as it describes the procedures and processes for assigning functional classifications to roadways and adjusting urban area boundaries.

The *FHWA Highway Functional Classification Concepts, Criteria and Procedures* recommends the following procedure for revising the functional classification of a roadway:

> *"MPOs are the primary local contact for the DOTs in Urbanized Areas. MPOs may initiate requests for revising the functional classification of a roadway within their planning area, either on their own initiative or on behalf of member jurisdictions. For requests originating from a member jurisdiction, the MPO may conduct an initial review to ensure compliance with functional classification criteria. Typically, MPOs will forward requests along with their recommendation for approval or disapproval to the State DOT unit responsible for maintaining the functional classification information. In some cases, local governments work directly with the State DOT, with concurrence from the MP."*