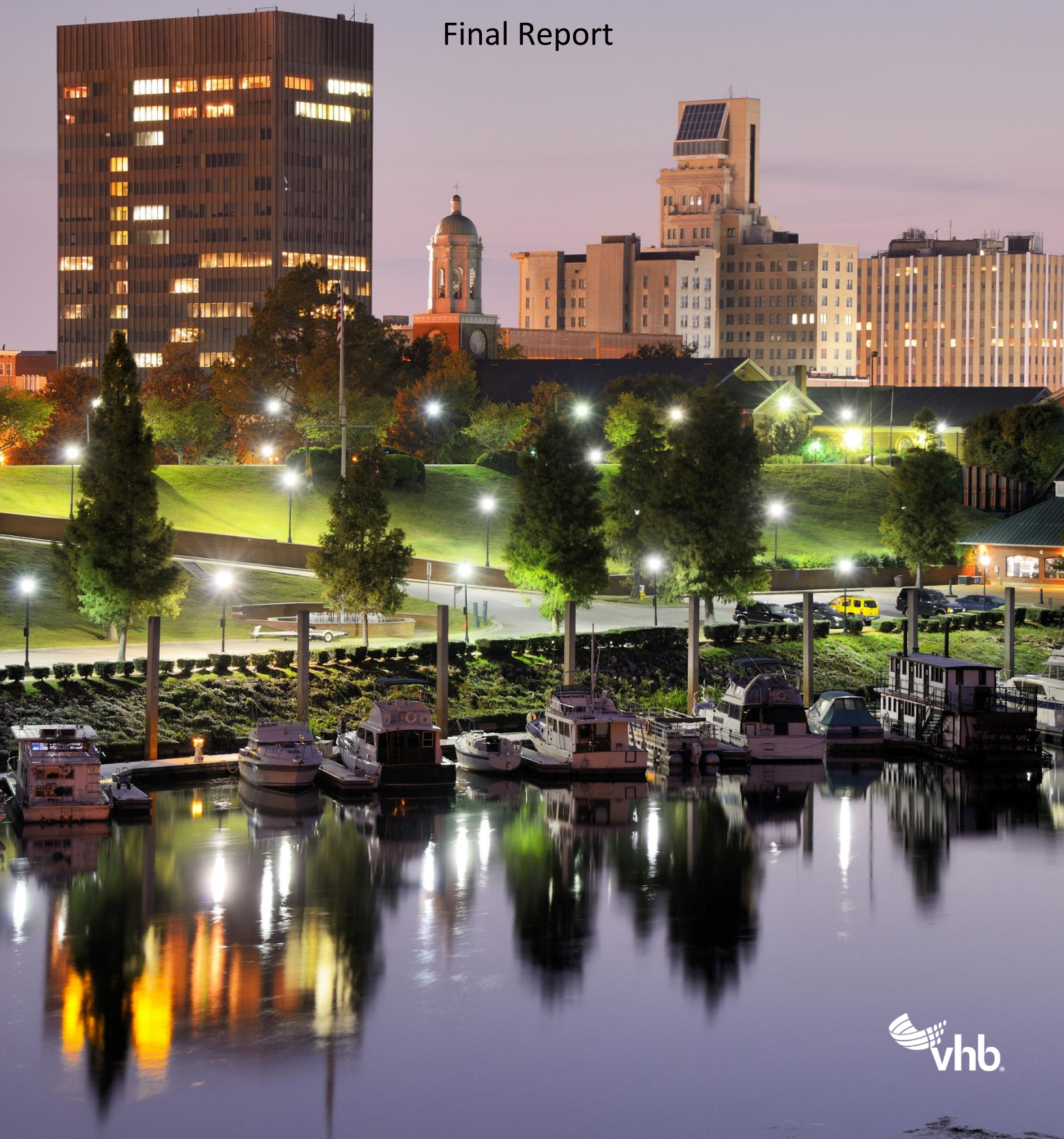
Augusta Regional Transportation Study Congestion Management Process 2018 Update

Final Report



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Acronyms

- APT - Augusta Public Transit
- ARTS - Augusta Regional Transportation Study
- BFE - Best Friend Express
- CORE - Coastal Region MPO (Savannah, GA)
- COATS - Columbia Area Transportation Study (Columbia, SC)
- CPCTS - Columbus-Phenix City Transportation Study (Columbus, GA)
- CMP - Congestion Management Process
- CMS - Congestion Management System
- FHWA - Federal Highway Administration
- FAST - Fixing America's Surface Transportation
- GDOT - Georgia Department of Transportation
- GEARS - Georgia Electronic Accident Reporting System
- GPATS - Greenville-Pickens Area Transportation Study (Greenville, SC)
- HOV - High Occupancy Vehicle
- ISTEA - Intermodal Surface Transportation Efficiency Act
- LOS - Level of Service
- LSCOG - Lower Savannah Council of Governments
- MOE - Measure of Effectiveness
- MPO - Metropolitan Planning Organization
- MTP - Metropolitan Transportation Plan
- PMT - Project Management Team
- NTD - National Transit Database
- SAFETEA-LU - Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
- SOV - Single Occupancy Vehicle
- SCDNR - South Carolina Department of Natural Resources
- SCDOT - South Carolina Department of Transportation
- SMART - Specific, Measurable, Agreed, Realistic, and Time-Bound
- TEA-21 - Transportation Equity Act for the 21st Century
- TIP - Transportation Improvement Program
- TMA - Transportation Management Area
- TDM - Travel Demand Management
- TTI - Travel Time Index
- TTTR - Truck Travel Time Reliability
- USDOT - United States Department of Transportation

Executive Summary

The Augusta Regional Transportation Study (ARTS) is the federally designated Metropolitan Planning Organization (MPO) for the Augusta-Richmond County GA; and, Aiken County SC urbanized areas. As the MPO, ARTS is required by federal law to periodically update the Congestion Management Process (CMP), which is intended to improve traffic operations and safety as well as mitigate congestion using travel demand reduction strategies, the implementation of operational improvements, bicycle and pedestrian infrastructure, increased public transit service, or roadway widenings.

The Congestion Management Process

According to the Federal Highway Administration (FHWA), the CMP is, “a systematic approach collaboratively developed and implemented throughout a metropolitan region, that provides for the safe and effective management and operation of new and existing transportation facilities through the use of demand reduction and operational management strategies.” The following eight steps are undertaken to complete the CMP update:

1. Develop regional objectives
2. Define the CMP network
3. Develop multimodal performance measures
4. Collect data and monitor system performance
5. Analyze congestion problems and needs
6. Identify and assess strategies
7. Program and implement strategies
8. Evaluate strategy effectiveness

The outcome of the CMP is a list of transportation improvements that can be implemented in a shorter time frame, generally within five to 10 years, than traditional capacity improvements such as adding travel lanes to existing roads or constructing new roads. This CMP Update is organized in the following sections:

- Review and Assessment of the Existing Congestion Management Process – opportunities to take advantage of new data sources facilitating the examination of of regional goals and objectives that will improve the CMP
- Congestion Management Process Best Practices – based on an analysis of CMPs produced by four peer MPOs, several best practices were identified to guide this CMP Update
- Definition of the CMP Network – details on facilities included in the CMP network for this update, which generally consists of all roadways classified as collector and above, Augusta Public Transit (APT) and Best Friend Express (BFE) transit routes, and bicycle and pedestrian facilities
- Data Collection and System Performance Monitoring – an overview of the data collection and performance monitoring used to identify congested corridors
- Traffic Congestion Problems and Needs – an analysis of the CMP network using real-time traffic data to determine congestion levels
- Develop Goals and Objectives – an explanation of the methodology used to develop the CMP goals and objectives, as well as the goals and objectives themselves
- Performance Measures – measures to be used as part of the performance monitoring dashboard
- Congestion Management Process Strategies – strategies to address traffic congestion problems and needs for each of the CMP corridors
- Performance Monitoring Dashboard Implementation – an explanation of how the dashboard was implemented and overview of outputs
- Monitoring and Performance Reporting Process – a detailed overview of how the performance monitoring dashboard works
- Congestion Management Process Dashboard User Guide – a manual for ARTS staff to use when updating the CMP dashboard in the future and fulfilling performance reporting requirements

The CMP is an integral part of the metropolitan planning process, which represents a comprehensive, continuing, and cooperative (3C) process. Continuing updated periodically. Cooperative data-driven, agencies, etc. As part of a comprehensive planning process, the CMP is integrated with the development of the Metropolitan Transportation Plan (MTP), Transportation Improvement Program (TIP) and the Unified Planning Work Program (UPWP). As such, the CMP provides data and analysis in support of these planning tools and is also supported by them. The CMP and MTP are both required to be updated periodically. While federal regulations do not establish a specific update cycle for the CMP, they do require that it is updated often enough to provide relevant and recent information as an input to the MPT through a continuing planning process. As part of a cooperative planning process, the CMP provides input based on detailed analysis of individual segments and corridors to the MTP while reflecting regional objectives the MTP. Additionally, the CMP can also provide a starting point for identifying a proposed project's purpose and need as well as alternatives for further development and screening.

1. Review and Assessment of the Existing CMP

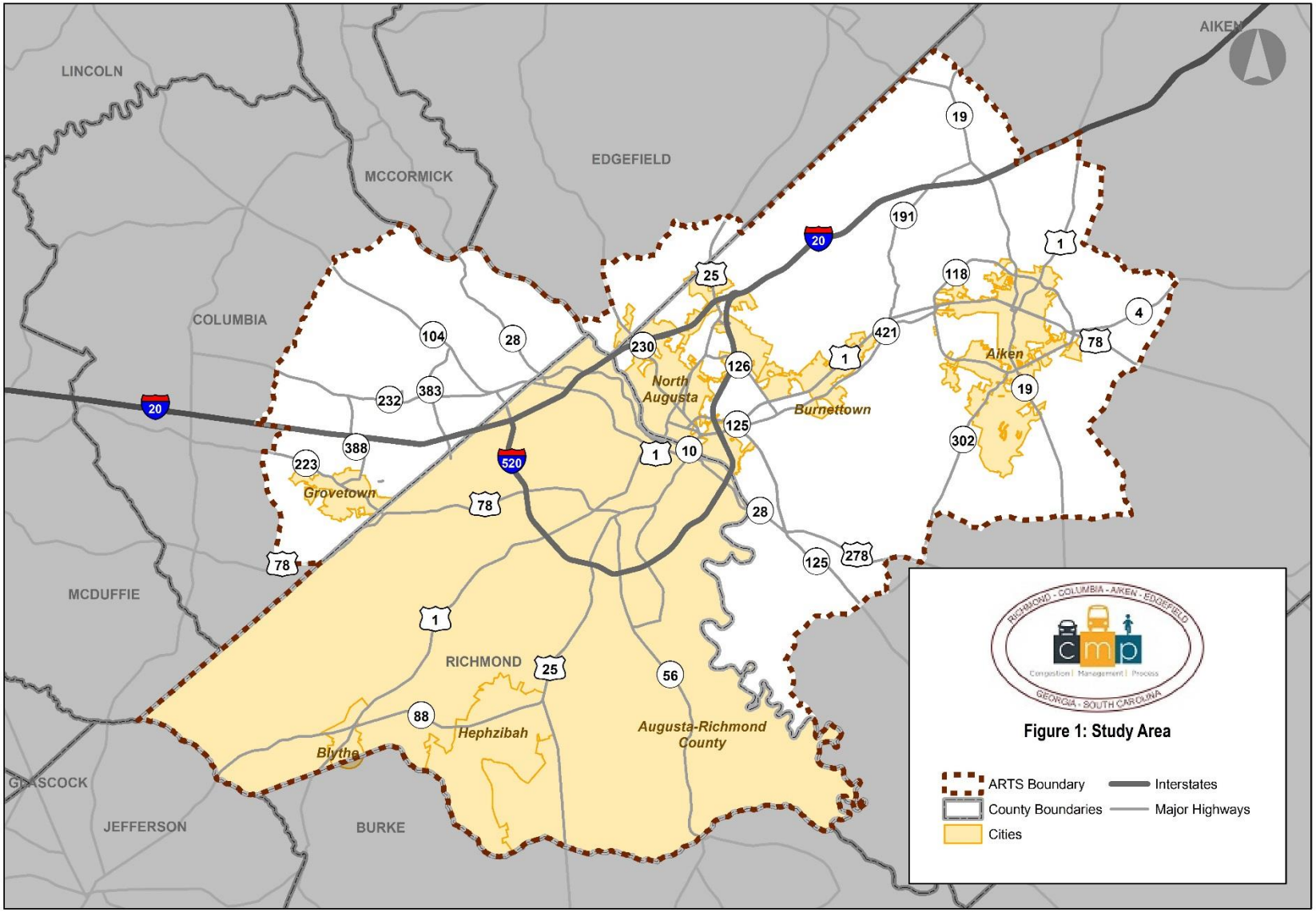
A review and assessment of the existing Augusta Regional Transportation Study (ARTS) CMP was undertaken to identify potential improvements to the CMP. This review and assessment consists of three parts, which are: 1) an outline of the assessment methodology; 2) results of the assessment; and, 3) opportunities for improvements. This report focuses on the ARTS Planning Area, which spans the Georgia and South Carolina border and includes Augusta-Richmond County and parts of Columbia, Aiken, and Edgefield Counties (Figure 1: Study Area shown in on the following page). Because the population of this area is over 200,000 persons, the ARTS planning area is classified as a Transportation Management Area (TMA), and is required by federal regulations to develop, adopt, and update the CMP periodically. The most recent update was published by ARTS in July of 2015.

1.1 History of the Congestion Management Process

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) was signed into law and changed many aspects of the highway program. A key change was a new focus on multimodal transportation planning and increased flexibility in determining transportation solutions. For the first time, ISTEA also required the development and implementation of six management systems, including the Congestion Management System (CMS). Under the legislation, each TMA was required to have an operational CMS by October 1997. ARTS was ahead of this deadline by two years, producing their first CMS in 1995. The successor law, the Transportation Equity Act for the 21st Century (TEA-21), continued the requirement for a CMS. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) updated the CMS nomenclature to CMP to emphasize that the law was now requiring an ongoing process integrated into metropolitan transportation planning. The most recent surface transportation authorization law, Fixing America's Surface Transportation (FAST) Act, continues the requirement for TMAs to implement a CMP. As such, ARTS has periodically updated their CMP since the initial CMS was completed in 1995, with the most recent update in 2014 and results published in July 2015.

1.2 Congestion Management Process Assessment Methodology

The first task in the CMP Update is to evaluate the previous CMP and identify opportunities for potential CMP process improvements. This task is important because the CMP is an on-going process that continuously progresses and adjusts over time to meet the changing priorities and needs of the region implementing the CMP. Considering this process of continual improvement, a best practices study was conducted concurrently with this evaluation. Best practices from MPOs like ARTS with potential to enhance the CMP were identified.



0 4.25 8.5 17 Miles

Sources: *ARTS, GDOT, SCDOT, SCDNR* **Prepared by:** *VHB* **Date:** *October 2018*

Augusta, GA Disclaimer: The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the consolidated government of Augusta, GA. Augusta, GA and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the Augusta-Richmond County Commission.

Congestion Management Process: A Guidebook (the Guidebook), published by the United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) was used as the basis for the evaluation of the existing CMP. The guidebook outlines an eight-step process model that identifies activities and actions common to successful CMPs and that must be implemented to comply with federal regulations. Figure 2: Elements of the Congestion Management Process below shows the eight-step process.

Figure 2: Elements of the Congestion Management Process

1.3 Assessment Results

The 2014 CMP update included several of the activities identified in Figure 2: Elements of the Congestion Management Process, shown above. The following list summarizes the elements of the CMP that were fulfilled or partially fulfilled as part of the 2014 CMP update:

- All interstates, freeways, and principal arterials as well as minor arterials and collectors with a demonstrated potential for congestion are included in the CMP Network, fulfilling the 'Define the CMP Network' element
- Performance measures based on the difference between driving speed and the posted limit were developed, partially fulfilling the 'Develop Multimodal Performance Measures' element
- Travel time surveys on major roads in the ARTS area as well as a before and after comparison of six corridors that had congestion mitigation improvements completed during 2013 fulfilled the 'Collect Data and Monitor System Performance' element

- A matrix of strategies was matched to seriously congested corridors to recommend projects to alleviate congestion, fulfilling the 'Identify and Assess Strategies' element
- The strategies identified were programmed for implementation as part of the ARTS transportation planning process (i.e. added to the Transportation Improvement Program (TIP)) or assigned directly to state or local governments as appropriate, fulfilling the 'Program and Implement Strategies' element
- A standard CMP evaluation process was used to assess effectiveness and improve performance, meeting the 'Evaluate Strategy Effectiveness' element

The existing CMP met or partially met six of the eight elements of the federal process model, providing a strong foundation to build upon during this CMP update. Using this information, the following section outlines opportunities for continuing to improve the CMP.

1.4 Opportunities

Based on the Guidebook and the eight-step process model, the following opportunities to improve the CMP as a part of this update have been identified:

- Develop regional objectives – objectives can be developed specifically for the CMP, or congestion management objectives from other sources such as the Metropolitan Transportation Plan (MTP) can be used to guide the CMP
- Enhance the definition of the CMP network – currently, the network only includes roadways and an opportunity exists to incorporate transit services as well as bicycle and pedestrian networks and their interfaces with the highway network
- Develop multi-modal performance measures – the existing CMP is focused exclusively on driving times, measures addressing transit system congestion and reliability and availability and freight movements represent an opportunity to improve the performance measures
- Collect data/monitor system performance – technology has improved rapidly since the last CMP update and a number of real-time data sources are now available that can be used to improve both the data collection and system performance monitoring aspects of the CMP
- Evaluate strategy effectiveness – an opportunity exists to implement project-level or program-level analysis of conditions before and after the implementation of a congestion mitigation effort

As these opportunities are addressed through the CMP update, a number of stakeholders will potentially be impacted. Extensive coordination with planning partners including transit, bicycle, and pedestrian stakeholders as well as the freight community will be important.

2. Congestion Management Process Best Practices

A CMP best practices study focused on Metropolitan Planning Organizations (MPOs) with a similar regional population and geography to ARTS was conducted. The MPOs selected for the best practices study include Columbus and Savannah in Georgia, as well as Columbia and Greenville in South Carolina. The population for each peer MPO is shown in Table 1: Peer Metropolitan Planning Organizations by Population. The CMPs from the peer MPOs selected were analyzed and a summary of best practices was developed. These best practices are related to each of the CMP elements and can quickly be identified for immediate implementation as part of this CMP update. Some best practices may not be implementable by ARTS in the short-term; however, these should be considered during future CMP updates.

Table 1: Peer Metropolitan Planning Organizations by Population

Metropolitan Planning Organization (MPO)	Population of MPO	Population Year
Columbia Area Transportation Study (COATS) – Columbia, South Carolina	647,091	2010
Coastal Region (CORE) – Savannah, Georgia	276,434	2012
Columbus-Phenix City Transportation Study (CPCTS) – Columbus, Georgia	275,840	2010
Greenville-Pickens Area Transportation Study (GPATS) – Greenville, South Carolina	710, 253	2014
Augusta Regional Transportation Study (ARTS) – Augusta, Georgia	511,686	2010

The CMP is a systemic process for managing traffic congestion that is federally required in urbanized areas with a population of over 200,000. On December 4, 2015, Public Law 114-94, the FAST Act was signed into law. The FAST Act funds transportation programs for fiscal years 2016 through 2020 and is the first long-term surface transportation authorization enacted in a decade that provides funding certainty for surface transportation. The FAST Act supports critical transportation projects to ease congestion and facilitate freight movement on major roads by establishing and funding new policies and programs.

The purpose of the CMP is to provide information on transportation system performance to planners. This information allows planners to use a data-driven process to identify projects related to the MPO's MTP and Transportation Improvement Program (TIP). Using performance data is important to ensure the MTP process is aligned with federal regulations. The eight elements of the process are built upon actions that are used to meet the minimum requirements of federal regulations. Though there is a prescribed process, these elements may be applied differently within individual CMP/MPO's inside a flexible framework. The intent of this flexibility is to allow MPOs to tailor a CMP approach that meets

their needs. Per the FHWA CMP Guidebook, there are eight elements of the congestion management process including:

1. **Develop Regional Objectives for Congestion Management** – First, it is important to consider, "What is the desired outcome?" and "What do we want to achieve?" It may not be feasible or desirable to try to eliminate all congestion, so it is important to define objectives for congestion management that achieve the desired outcome. Some MPOs also define congestion management principles, which shape how congestion is addressed from a policy perspective.

2. **Define CMP Network** – This action involves answering the question, "What components of the transportation system are the focus?" and involves defining both the geographic scope and system elements (e.g., freeways, major arterials, transit routes) that will be analyzed in the CMP.

3. **Develop Multimodal Performance Measures** – The CMP should address, "How do we define and measure congestion?" This action involves developing performance measures that will be used to measure congestion on both a regional and local scale. These performance measures should relate to, and support, regional objectives.

4. **Collect Data/Monitor System Performance** – After performance measures are defined, data should be collected and analyzed to determine, "How does the transportation system perform?" Data collection may be on-going and involve a wide range of data sources and partners.

5. **Analyze Congestion Problems and Needs** – Using data and analysis techniques, the CMP should address the questions, "What congestion problems are present in the region, or are anticipated?" and "What are the sources of unacceptable congestion?"

6. **Identify and Assess Strategies** – Working together with partners, the CMP should address the question, "What strategies are appropriate to mitigate congestion?" This action involves both identifying and assessing potential strategies and may include efforts conducted as part of MPOs' transportation plan, corridor studies, or project studies.

7. **Program and Implement Strategies** – This action involves answering the question, "How and when solutions will be implemented?" It typically involves including strategies in the MTP, determining funding sources, prioritizing strategies, allocating funding in the TIP, and ultimately, implementing these strategies.

8. **Evaluate Strategy Effectiveness** – Finally, efforts should be undertaken to assess, "What have we learned about implemented strategies?" This action may be tied closely to monitoring system performance under Action 4, noted above in this list of actions, and is designed to inform future decision making about the effectiveness of transportation strategies.

The execution of these elements will aid in more effective resource allocation, increased collaboration and coordination between partners and stakeholders in the ARTS MPO. Other benefits include, data driven decision making in the prioritization and implementation of regional objectives for congestion management.

2.1 Peer Metropolitan Planning Organizations

The four peer metropolitan planning organizations that will be analyzed are Savannah, Georgia; Columbus, Georgia; Greenville, South Carolina; and Columbia, South Carolina (Table 2). In this investigation each action in the congestion management process will analyzed for each of the four peer MPOs. Because each MPO has different jurisdictions, data collection sources, priorities, and networks, not all measures will be applicable in benchmarking MPO metrics nor will they fall under the same name. In the case that a metric is fulfilled under a category of a different organization or name, an asterisk will be placed after the qualifying checkmark.

Table 2: ARTS Peer Metropolitan Planning Organizations

Metropolitan Planning Organizations
Greenville-Pickens Area Transportation Study (GPATS)
Coastal Region (CORE) [Savannah]
The Central Midlands Council of Governments Columbia Area Transportation Study (COATS)
Columbus-Phenix City Transportation Study (CPCTS)

2.2 Develop Regional Objectives

CMPs include regional objectives, typically derived from their respective MTPs that determine what the region wants to achieve through the congestion management process. These are also aligned with national goals of safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays.

Though all peer MPOs referenced objectives like enhancing regional mobility and maintaining existing infrastructure, specific regional objectives are easier to implement and measure strategy effectiveness. MPOs such as CORE and GPATS reference approximately ten regional objectives that fall into categories of accessibility, mobility, and economic vitality through defining objectives that elicit more options for transportation. CPCTS and COATS have no more than three general objectives for the region. GPATS process of defining goals is superior, in that it categorizes each objective from guiding goals associated with their regional transportation plan. In this grouping, each objective is categorized by the following groups: Culture & Environment, Economic Vitality, Growth & Development, Mobility & Accessibility, Safety & Security, and System Preservation. A summary of each MPO's goals can be found in Table 3. In this update of the CMP, specific metrics for congestion in the ARTS planning area will established.

Table 3: MPO Regional Objectives

COATS
Enhance regional mobility
Increase transportation accessibility
Maintain existing infrastructure in a state-of-good repair
CORE
Develop congestion management measures.
Reduce non-recurring congestion duration.
Evaluate travel time reliability to the 95th percentile.
Consider the full range of congestion management strategies.
Improve the reliability and resiliency of the transportation network through the implementation of these strategies.
Consider low-cost, system efficiency and demand management solutions before capacity
Achieve acceptable approach Level of Service (LOS) D.
Preserve regional mobility through the implementation of alternative access improvements to enhance local mobility.
Implement sustainable development through the incorporation of mixed-use, pedestrian oriented design that helps to minimize trip length.
Promote multimodal connectivity through the implementation of transit, bicycle, and pedestrian enhancements.

CPCTS
Have a baseline target of Level of Service "C" or better on roads in our route network.
GPATS
Culture & Environment: Enhance the region's quality of life by preserving and promoting its valued places and natural assets
• Protect and enhance the natural and social environment by using context sensitive transportation strategies. • Promote consistency between transportation improvements, land use decisions, and economic development patterns.
Economic Vitality: Support regional economic vitality by making it easier to move people and freight within and through the region.
• Highlight transportation recommendations that enable global competitiveness, productivity, and efficiency. • Increase the accessibility and mobility of people and freight within the region and to other areas.
Growth & Development: Make traveling more efficient by coordinating transportation investments with land use decisions.
• Prepare for continued population growth by coordinating transportation strategies with land use initiatives to foster vibrant and livable communities.
Mobility & Accessibility: Provide a balanced transportation system that makes it easier to bike, walk, and take transit.
• Expand and maintain a network of bicycle, pedestrian, and transit facilities that connects homes, activity centers, and complementary amenities.
Safety & Security: Promote a safe and secure transportation system by reducing crashes, making travel reliable and predictable, and improving emergency response.
• Improve the safety of the transportation system for all user groups regardless of socioeconomic status or physical ability. • Increase the reliability, predictability, and efficiency of the transportation experience through system improvements and enhanced communication. • Improve safety and security by mitigating potential conflicts and delays at high-crash locations and rail crossing sites.
System Preservation: Extend the life of the transportation system and promote fiscal responsibility by emphasizing maintenance and operational efficiency.
• Identify and prioritize infrastructure preservation and rehabilitation projects such as pavement management and signal system upgrades. • Increase the use of innovative transportation technology to enhance the efficiency of the existing transportation system and to be better prepared for emerging vehicle technologies.

Best Practice

Define approximately ten, clear objectives that are in alignment with the MPOs latest MTP having goals that are heavily based upon stakeholder participation and an understanding of the needs and desires of

the public related to congestion. Clear objectives have the potential to be used as tools for selecting strategies, categorizing performance measures, and strategy monitoring and evaluation.

2.3 Define CMP Network

The purpose of the CMP is to monitor and relieve traffic congestion throughout the transportation planning area. As part of the CMP process, a roadway network needs to be defined for the planning area. Fundamentally, the CMP network must include those areas that meet the regionally identified definition of 'congested' and represent the area for data collection and monitoring activities. It is important that multimodal transportation elements are also key factors for addressing congestion on the CMP network.

Table 4 summarizes the network definition of the peer MPOs. CPCTS's definition of the network is thirty-eight roadway segments which includes intersections, speed limits, and functional classification. MPOs such as COATS, CORE, and GPATS included as part of their CMPs an extensive analysis of roadway systems, functional class, length of road, and jurisdictional boundaries for single occupancy vehicle (SOV), freight, transit services, pedestrian and bicycle infrastructure, among others, were considered in the development of the CMP networks. Because of differences of needs and jurisdictional boundaries, the definition of the MPO's network can vary. For example, COATS does not include interstates as a part of their CMP network because all performance monitoring, analysis, and funding for interstate improvement and congestion projects are directly programmed and implemented by the South Carolina Department of Transportation (SCDOT). Also, COATS does not include local roads as a part of their CMP. Other MPOs do not explicitly state whether local roads are included in their roadway network, however COATS and CORE mention that these local roads and collectors should be considered as potential bicycle, pedestrian, or transit corridors.

Table 4: MPO Network Components Definitions

	COATS	CORE	CPCTS	GPATS
Interstate	✓	✓	✓	✓
Arterials	✓	✓	✓	✓
Pedestrian	✓	✓		✓
Bicycle	✓	✓		✓
Transit	✓	✓	✓	✓
Freight		✓	✓	✓

Best Practice

Define and inventory segments of the transportation networks by classification, length, speed limits, and jurisdiction. Although the CMP has traditionally focused primarily on the road network, the CMP network should consider the transit, bicycle, and pedestrian modes as well as their interface with the highway network. Doing so can help take advantage of strategies that rely upon the other modes to reduce SOV travel.

2.4 Develop Multimodal Performance Measures

Performance measures are a critical component of the CMP as they aid in defining the quality of mobility for people and goods. They serve multiple, intersecting purposes which in the context of the CMP includes tracking progress toward meeting regional objectives, specifying locations with congestion issues, assessing strategies, programs and projects; and, to communicate system performance to the public, MPO member agencies, and decision-makers. Because levels of acceptable system performance are not the same across regions, performance measures should be personalized to regional needs and expectations that are jointly agreed upon by the local, state, and regional officials as well as key transportation operators in the MPOs jurisdiction.

Level of Service (LOS) performance measures are used at the regional and local level. A wide range of performance measures are available for measuring and monitoring system performance. The FHWA suggests that performance measures fall in four categories that measure congestion, mobility, accessibility, and efficiency. For many performance measures, however, considerable human and financial resources are required to collect and analyze the necessary data. Because some performance measures vary across MPOs, Table 5 on the following page highlights several local and regional performance measures that are commonly used, described using accessible language, and are derived from national and regional data sources. Table 5 was created based on GPATS's easy-to-follow organizational chart of performance measures found in their CMP. Due to different organizational methodologies in peer CMPs other performance measures used in their evaluations may not be listed here.

Table 5: Benchmarked Performance Measures Across MPOs

Performance Measures	COATS	CORE	CPCTS	GPATS
Safety				
Number of Fatalities		✓		✓
Fatality Rate				✓
Serious Injuries				✓
Serious Injury Rate				✓
Number of nonmotorized crashes				✓
Roadway Capacity				
Volume/Capacity Ratio	✓	✓	✓	✓
Over capacity roadway miles on CMP Network	✓	✓		✓
Reliable Travel Time				
Percent of person-miles traveled on interstate that are reliable	✓	✓	✓	✓
Percent of person-miles traveled on the non-interstate NHS that are reliable	✓	✓		✓
Goods Movement				
Truck Travel Time Reliability (TTTR) Index		✓	✓	✓
Vehicle Miles Traveled (VMT) at or Over Capacity on Designated Truck Routes		✓	✓	✓
Public Transit				
Percent of congested roadway centerline miles with transit service				✓
Transit passenger trips per revenue hour				✓
Transit average peak service frequency	✓			✓
Transit Annual Ridership	✓	✓		✓
Travel Demand Management (TDM)				
Percent of commuters using carpools or vanpools				✓
Non-CMP System Preservation				
Percentages of pavements, bridges, and transit assets	✓			✓

Best Practice

CMP Best Practice includes performance measures that are quantifiable, have professional credibility, and describe existing conditions that can identify problems and predict changes. Performance measures should be organized in key categories, as in Table 5. These key categories should correspond with the regional goals and objectives developed as a part of the CMP. These performance measures should also be calculated easily with existing field data and achieve consistent results. Most importantly, it is crucial to use performance measures that are “SMART”, i.e., Specific, Measurable, Agreed, Realistic, and Time-bound. Applying these characteristics to metrics upon multiple modes in various scales and settings are sure to promote accessibility and mobility of people and goods.

2.5 Collect Data / Monitor System Performance

The CMP is a compilation of data from several sources which are analyzed together to help determine areas of concern. Gathering data to monitor system performance is typically the element of the CMP that requires the largest amount of effort for MPO staff. After establishing performance measures that

will be used to evaluate system performance and a plan for collecting data, regions are ready to gather the data necessary to inform the CMP. On the following page, Table 6 benchmarks data sources and system monitoring.

Using Table 6 on the following page for data collection and system monitoring, there are other methodologies that CPCTS listed, such as the presence and evaluation of corridors in biannual reports, individual corridor studies, and intersection capacity studies.

MPOs such as CORE, GPATS, and COATS used combinations of monitoring activities, including:

- Roadway monitoring through annual LOS analysis based on traffic counts and other related data constantly collected throughout the region
- Monitoring crashes to identify potential non-recurring congestion
- Monitoring transit performance through various operating and capital plans (as available)
- Monitoring bicycle/pedestrian/trail facility data from local and national databases
- Monitoring significant freight corridors to address mobility needs of the goods movement providers

Best Practice

Ensure that data sources are continually updated to ensure that corridors are evaluated properly to address mobility needs of the MPO. In addition, the use of various data from national databases and regional affiliates that include focus on various modes will ensure that the MPO is conducting thorough and current analyses. These databases can provide insight into real-time speed, congestion, traffic conditions, and the impact of non-recurring congestion due to crashes, construction, or weather events, among others.

Table 6: Data Collection/Monitor System Performance

Data Source	Definition	COATS	CORE	CPCTS	GPATS
National Performance Management Research Data Set	FHWA has acquired a national data set of average passenger vehicle, freight vehicle, and combined freight and passenger vehicle travel times on the National Highway System (NHS). This data set is available to State Departments of Transportation and MPOs as a tool for performance measurement and updated monthly.		✓	✓	✓
AirSage Data	AirSage provides population analytics and movement pattern data, including real-time travel time data through the analysis of real-time mobile signals, GPS and other location data.				
HERE Data	HERE provides real-time traffic data that can be used to identify areas of both recurring and non-recurring traffic congestion. The I-95 Corridor Coalition uses HERE data and provides access to their member organizations.	✓	✓		
I-95 Coalition	Partnership of transportation agencies, toll authorities, public safety, and related organizations along the I-95 corridor, from the State of Maine to the State of Florida, with affiliate members in Canada. The Coalition provides a forum for key decision makers to address transportation management and operations issues of common interest. This volunteer, consensus-driven organization enables its myriad state, local and regional member agencies to work together to improve transportation system performance far more than they could working individually.	✓	✓		
State Department of Transportation Crash Data	Crash data is obtained from the electronic repository (relational database) of the state's crash reports.	✓	✓	✓	✓
Regional Area Transit Ridership Data	Ridership data based on day/time, route, bus number, operator, fare type, timeliness, etc. sourced from operating agency or others.	✓	✓	✓	✓
Traffic Counts	Collects traffic counts using primarily permanent and portable counting devices at stations throughout the MPO region. This can be compiled through local and state departments.	✓	✓	✓	
Non-Motorized Data	Includes summary of crashes injuries/fatalities, travel times, LOS, and/or volumes of both bicycle and pedestrian and other non-motorized forms of transportation.	✓	✓	✓	✓

Data Source	Definition	COATS	CORE	CPCTS	GPATS
Freight Bottleneck Data	Contains a bottleneck analysis where the most critical bottlenecks along the network were identified as well as other areas where congestion exists and where bottlenecks may occur with increased demand.		✓		✓
Origin and Destination Data	Origin-Destination studies are often used in transportation planning to determine the travel patterns (origin-destination matrix) of vehicles and goods in an area. Given these travel patterns, the impacts of alternative solutions to current and future transportation problems can be evaluated.		✓		
Travel Demand Model	A Travel demand model is a useful analytical tool for predicting future traffic congestion and provides the basis for project identification in the MPO's transportation plan and project traffic forecasts.		✓	✓	✓
National Transit Database (NTD)	Repository of data about the financial, operating and asset conditions of American transit agencies.				✓

2.6 Analyze Congestion Problems and Needs

Once collected, raw data must be processed to obtain meaningful measures of performance. The purpose is to identify specific locations with congestion problems, and to identify the sources of these problems. The level of effort for processing data into usable information for analysis varies with the complexity of the multimodal performance measures and data sources chosen.

CORE uses a strategy that highlights the road segment, direction of travel, time of day, distance of corridor, as well as average travel time, 95th percentile travel time, and buffer time. This is a detailed system to measure and identify congestion problems and needs in the region along interstates and arterials. In addition, twenty bottleneck locations were derived from Origin-Destination (O-D) data.

Across MPOs, data such as LOS, transit passengers per hour, freight network bottlenecks, were used to analyze congestion problems and needs. Problems and needs for non-motorized transportation were analyzed using pedestrian volumes and bicycle trips. MPOs (such as CORE) predict an increase in volumes for nonmotorized modes once implementation of better infrastructure/asset management of shoulders, curbs, and lanes are installed for future proposed and planned road projects.

Another robust approach to analyzing congestion problems and needs was exemplified by GPATS in phases of corridor selection based on recurring congestion technical analysis, such as LOS capacity analysis and intersections, stakeholder involvement, and non-recurring congestion technical analysis, including safety factors like crash location and frequency.

Best Practice

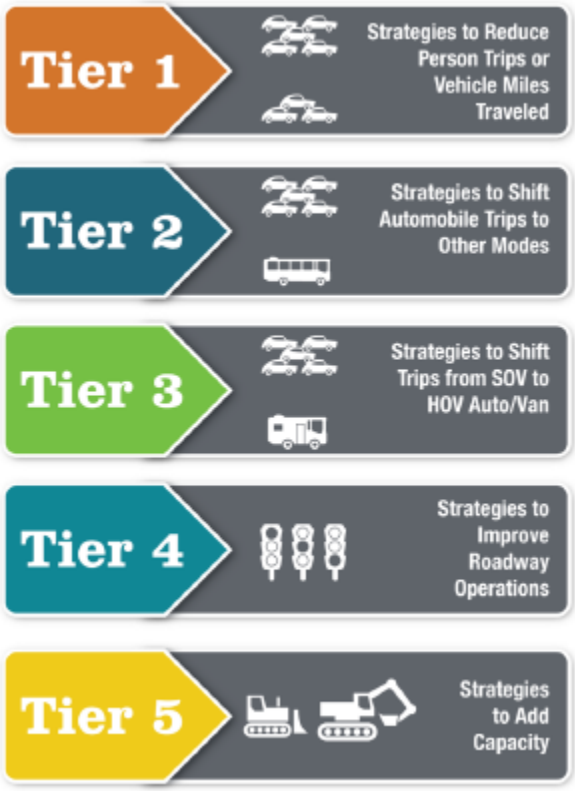
The development of a list of congested corridors and bottleneck locations using stakeholder input and data from the previous sections (such as arterial travel time, transit passengers per hour, freight network volumes, etc.) should be established to stage the next part of the process in strategy prioritization and assessment based upon the regional goals and objectives. These metrics should be analyzed in a matrix with a defined scoring system to determine congestion ranking. Data maintenance is important and should be done on an annual basis to establish trends of activity and to measure problems and needs along key corridors.

2.7 Identify and Assess Strategies

A primary component of the CMP process involves developing a toolbox of mitigation strategies that are consistent with federal guidelines and can be applied to the identified congested corridors and intersections. The toolbox is intended to provide a hierarchical methodology for congestion mitigation that begins with the most cost effective and efficient strategies (e.g. travel demand management strategies such as subsidized transit passes that shift travelers away from automobiles) and ends with the most costly and intrusive strategies (i.e. road widening for capacity improvement). Note that CMP guidelines do not specify that all possible strategies be analyzed for every location of congestion. Only those that could potentially mitigate congestion at the given location in a reasonable manner should be analyzed.

GPATS uses a diagram to highlight their toolbox of strategies which can be shown in Figure 3. This "toolbox of strategies" is categorized in multiple tiers and arranged so that the measures at the top have precedence over those at the bottom. These are also to support the congestion strategies for congested corridors and to help planners and policy makers effectively use these decisions in their congestion reduction strategies.

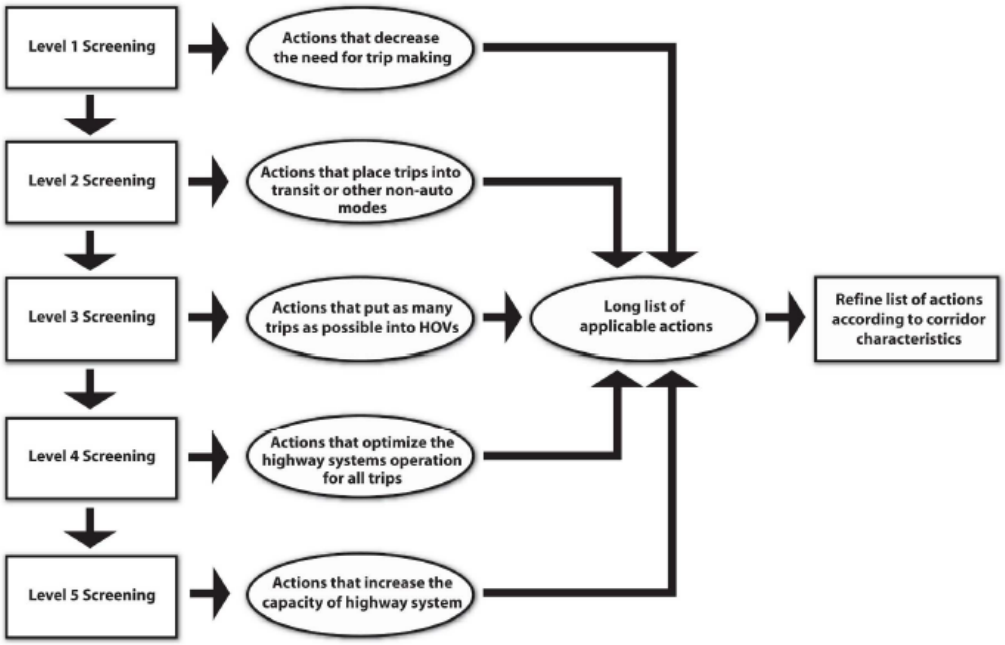
Figure 3: GPATS Methodology of Identifying and Assessing Strategies



COATS has five major levels of mitigation strategies listed below and found in Figure 4.

1) Decrease need for trip making (strategies at regional level vs. corridor level)
2) Shifting trips from automobiles to other modes
3) Increasing the use of High Occupancy Vehicles (HOV)
4) Enhancing operations on existing roadway facilities
5) Increasing roadway capacity through additional infrastructure (widening and new roads)

Figure 4: COATS Congestion Mitigation Strategies



In addition, COATS has developed a matrix that includes and defines congestion management strategies. In this matrix typical project applications, such as flex work schedules under the strategy of TDM, are listed and scoped for benefits of the strategy's application to the region. In the same example, a benefit of flex work schedules would be providing incentives or dis-incentives to shift travel from peak hours to off-peak hours or providing alternative mode and work choices. This application also improves air quality, lowers energy usage and emissions. The implementation needs for these strategies are also listed in this matrix and will be discussed in further detail in the next section.

CORE uses congestion management strategies to determine network use by short-, medium-, and long-term effectiveness, congestion type, and public acceptance. The toolboxes are tailored for use on congested and constricted corridors, freeways, and non-freeways. The strategies in these toolboxes are also categorized by their primary function: demand management, alternative mode promotion, traffic operations, and land use. An example of their toolbox of strategies can be seen in Table 7.

Table 7: CORE Congestion Management Strategies

Techniques for Fully Controlled Access Facilities (Freeways)	Currently In Use	Term Effectiveness	Congestion Type	Public Acceptance
Demand Management				
HOV Lanes	No	L	R	L
Variable Priced Lanes	No	L	R	L
Congestion Pricing High Occupancy Toll (HOT) Lanes	No	M	R	L
Bridge Tolling	N/A	L	R	L
Electronic Payment Systems	No	M	R	H
Alternative Mode Promotion				
Park-and-Ride Lot Improvements	No	S	R	H
Use of shoulders for Transit Vehicles During Peak Periods	No	M	R	H
Traffic Operations				
Imaging for Surveillance and Detection	Yes	S	N	H
Work Zone Management	No	S	N	H
Reversible Lanes or Movable Medians	Yes (Evacuation routes only)	M	RN	M
Spot Safety Improvements		S	N	H
Freeway Ramp Metering	No	M	RN	L
Variable Speed Limits	No	M	RN	M
Variable Message Signs (VMS)	Yes	S	RN	H
Land Use				
Transportation-Land Use Plans with Locals Governments	No	M	R	H

Symbol Legend:
Term Effectiveness: (**S**)hort, (**M**)id, (**L**)ong
Congestion Type: (**R**)ecurring, (**N**)on-Recurring, or Both(**RN**)
Public Acceptance: (**L**)ow, (**M**)edium, (**H**)igh

CPCTS has a list of twelve congestion management strategies, shown in Table 8 on the following page. For each class, groups of distinct strategies, such as ride-sharing programs and parking management, have been identified, as well as representative measures of effectiveness (MOEs) to assess the pre- or post-implementation effectiveness of a given strategy group.

Table 8: CPCTS Congestion Strategies

CPCTS Strategy Classes	
1. Transportation demand management (TDM) measures	7. Congestion pricing
2. Traffic operations improvements	8. Growth management
3. Measures to encourage high occupancy vehicle (HOV) use	9. Access management
4. Public transit capital improvements	10. Incident management
5. Public transit operational improvements	11. Intelligent Transportation Systems (ITS)
6. Measures to encourage the use of non-motorized modes	12. General purpose capacity expansion

Best Practice

Best practice incorporates multipronged mitigation strategies at the regional and policy level to coordinate with land use policies and strategies. Strategies that are organized in "top-down" approach follow FHWA's direction of prioritizing all available solutions of reducing trips and encouraging mode-shift before recommending projects that increase roadway capacity. The best practice is to target policies that promote public transit capital improvements and encourage the use of modes including but not limited to sidewalks, bicycle facilities, transit, park-and-rides, and vanpools. Information about the toolbox of strategies is best displayed using a matrix, table, or flow-diagram.

2.8 Program and Implement Strategies

CMP strategies occur on the system or regional, corridor, and project levels. They are continuously applied towards the performance measures defined by the CMP. COATS, CPCTS, and GPATS summarize the importance of the process in prioritizing projects for inclusion in TIP and in their MTPs. To enhance this section, COATS has appended implementation needs included in the assessment of strategies, as discussed in Section 3.6. There are projects that are being implemented and those that are still waiting to be programmed as funds allow. CORE strictly points out that CMP strategies for implementation occur on three levels: system or regional, corridor, and project. Regional-level implementation strategies occur through projects in the TIP; corridor level implementation strategies are more specific, such as pedestrian or operational improvements that can be assessed in studies and implemented through multiple funding sources. At the project level, CORE and GPATS prioritized project implementation by scoring elements that give weight to the relative congestion in corridors based on the CMP data. If the project is included in the TIP, those projects receive a higher prioritization. It should be noted that not every CMP strategy identified is funded or has been programmed as a project.

Best Practice

CMP strategies should be clearly categorized by system or regional, corridor, and project levels and should include location/corridor, status, time-frame, cost, and network affected as defined in Section 3.2. Resources should be explicitly set aside for funding congestion management projects. Funding sources should be heavily researched, sought, and cataloged to provide ample resources to mitigate congestion, maintain the region's transportation networks, and fund new projects that benefit multimodal transportation options.

2.9 Evaluate Strategy Effectiveness

The Congestion management process will examine the effectiveness of CMP strategies at both the regional level and corridor level by continuously applying the performance measures adopted as a part of this planning process. Monitoring and evaluation facilitates better decision making by transportation planners and engineers. Peer MPOs use two general approaches for evaluating congestion mitigation within their transportation planning areas. These include regional analysis of historic trends (system-level performance) and before and after conditions of project/program level implementation (strategy effectiveness). A summary of strategy effectiveness can be found in Tables 9-11, taken from the CORE CMP Report published March 2017. These tables have been included as a best practice example because they clearly indicate how performance measures have changed over time on congested facilities and how they are anticipated to perform in the future. A key performance measure included is the congestion index, which is the average segment speed divided by averages weighted speed limit and indicates how quickly traffic is traveling as a percentage of the posted speed limit. Lower numbers indicate higher levels of congestion, and an index of 1.0 would be free-flowing traffic.

Table 9: CMP Report Card Evaluating Effectiveness Part 1 (CORE CMP Report March 2017)

Rank	Road and Direction	Limits	Distance (Feet)	Peak Hour	GPS Data						
					Average Segment Speed	Average Weighted Speed Limit	Congestion Index	Average Segment Delay (sec)	Average Stop Delay (sec)	Control	2003 LOS
1	Waters Avenue - Northbound	Stephenson to DeRenne	5497.7	PM	11.3	35	0.32	251.2	111.7	Signal	F
			5497.7	MD	16.1	35	0.46	130.3	62.0	Signal	F
			5497.7	AM	18.7	35	0.53	109.4	49.7	Signal	F
2	Habersham Street - Southbound	Johnston to Stephenson	3189.1	PM	7.9	35	0.23	241.3	126.0	Cross Street	F
			3189.1	AM	17.5	35	0.50	66.7	44.3	Cross Street	D
3	White Bluff Road - Southbound	Eisenhower to Abercorn	2720.2	PM	9.2	40	0.23	179.3	129.3	Signal	F
			2720.2	AM	26.2	40	0.66	44.8	33.5	Signal	D
			2720.2	MD	23.5	40	0.59	44.1	29.3	Signal	D
4	Mall Boulevard - Westbound	Mall Way to Abercorn	889.8	PM	5.0	40	0.12	179.2	138.0	Signal	F
			889.8	AM	9.6	40	0.24	76.1	57.5	Signal	E
5	White Bluff Road - Northbound	Hampstead to DeRenne	1250.0	PM	4.3	35	0.12	177.4	132.7	Signal	F
			1250.0	MD	6.2	35	0.18	111.7	89.0	Signal	F
			1250.0	AM	8.2	35	0.23	91.2	69.8	Signal	F
6	Habersham Street - Northbound	Johnston to DeRenne	2430.1	PM	7.6	35	0.22	176.3	106.7	Cross Street	F
			2430.1	AM	13.8	35	0.39	82.6	67.7	Cross Street	E

Table 10: CMP Report Card Evaluating Effectiveness Part 2 (CORE CMP Report March 2017)

Rank	Road and Direction	2004 Observations	2004 Recommendations	Congestion Mitigation Process Actions 2004-2016	Travel Demand Model (TDM) Data			
					2010 Volume (One Way)		2010 LOS	CMP Actions
					Low	High		
1	Waters Avenue - Northbound	Canopy -Constrained Corridor; Corridor will improve with extension of Truman	Constrained Corridor - Improvements limited to Optimizing Signal Operations. Study next CMP, review in E-W Study	The opening of Truman Pkwy Phase IV impacts the traffic of this segment. The Annual Average Daily Traffic (AADT) has decreased from 2005 to 2015.	7600	8800	D-E	Completion of Truman Parkway
2	Habersham Street - Southbound	Currently under construction on Stephenson	Stephenson widening will help Habersham	Widening of Stephenson is completed, including additional turn lanes on Habersham. Congestion situation improved.	3500	4300	A-C	Additional Turn Lanes Completed
3	White Bluff Road - Southbound	Canopy -Constrained Corridor, Minor Approach	NB/SB left turns very light, consider restricting them, add NB Right turn overlap.	None	12000	12900	A-C	Signal Retiming, model anomalies
4	Mall Boulevard - Westbound	Planned Intersection TIP Excessive delays back through Mall Way	Consider change in lane use for shared dual left, study addition of NB right turn.	Intersection improvement project at Abercorn St/Mall Blvd has been completed to relieve some congestion.	7600	7600	A-C	Intersection Improvement Completed
5	White Bluff Road - Northbound	Canopy -Constrained Corridor, Minor Approach	Constrained Corridor - Improvements limited to Optimizing Signal Operations, study in E-W study	Signal synchronization project along DeRenne Ave is completed. Proposed Hampstead Connector will alleviate some congestion.	12600	14900	D	Signal Retiming, model anomalies, DeRenne Imps. Underway
6	Habersham Street - Northbound	Minor Approach to DeRenne	Cross Street Delay Expected, Study further in E-W study for improving DeRenne	Proposed DeRenne Widening may reduce congestion on Habersham.	3700	4400	D	Signal Retiming, model anomalies

Table 11: CMP Report Card Evaluating Effectiveness Part 3 (CORE CMP Report March 2017)

Rank	Road and Direction	Travel Demand Model (TDM Data)						CMP Recommendation Fulfilled?	TDM DATA		
		CMP Recommendation Fulfilled?	2015	2015 LOS	% Trucks	%APR Change	Major Freight Route?		2040 Volume (One Way)		2040 LOS
									Low	High	
1	Waters Avenue - Northbound	Yes	14,500	D	2.18	-8.81		Yes	7000	8900	C-E
2	Habersham Street - Southbound	Yes	8,580	C	2.08	0.59		Yes	4000	5000	A-C
3	White Bluff Road - Southbound	Yes	27,300	D	1.92	0		Yes	11800	13000	C-D
4	Mall Boulevard - Westbound	Yes	13,800	C	2.04	0		Yes	7800	7800	A-C
5	White Bluff Road - Northbound	Yes/In Progress	27,300	F	1.92	0		Yes/In Progress	9000	9000	A-C
6	Habersham Street - Northbound	Yes/In progress	8,580	D	2.08	0.59		Yes/In progress. Need to monitor once Hampstead and DeRenne Improvements Implemented	4300	4900	A-C

Peer MPOs recognize the need of tracking and consistently evaluating performance of corridors with identified congestion concerns. They also recognize the importance of coordination between the MTP, TIP, and the CMP to make sure that measures are being documented and that data is current. Of the peer MPOs, CORE developed a CMP report card which grades identified congested corridors and strategies from previous CMPs. This report card compares previous and current LOS and status of recommendations (whether it has been implemented or underway) of the chosen corridors.

Best Practice

After project implementation, evaluation will occur upon data collection using the same performance measures that were used to identify the project in previous steps. Creation of a CMP report card to measure effectiveness of strategies, existing and current will be undertaken. Application of the CMP report card should extend towards other networks, like transit and freight, to include metrics such as ridership, LOS, and volume and speed increases, respectively. Continued coordination between MTP, TIP, stakeholders and agencies is encouraged. The use and maintenance of data is vital to evaluation and reassessment of potential congestion areas to determine whether additional corridors should be added to this list. It is anticipated that each succeeding CMP will develop a report card outlining the outcome of the previous CMP.

2.10 Conclusion

A successful CMP is not an entity in itself, but a continual process providing a seamless link to the MPT and TIP processes. CMPs with organized, clearly defined elements, following each action of the FHWA's CMP Guidelines are more effectual to transportation planners, engineers, and policy makers. CMPs should be designed to meet the MPO's local needs and concerns while recognizing federal guidelines to implement strategies for congestion mitigation.

CMPs that define clear and themed objectives establish a solid foundation for the sequential elements outlined in the CMP. The defining of networks outside of the traditional NHS correspond with the FHWA's approach towards mitigating congestion using multimodal options and provide a variety of transportation options for constituents to navigate the region. The development of multimodal performance measures should incorporate various metrics derived from national, state, and local level data sources, especially for non-motorized transportation, to successfully monitor system performance and analyze congestion problems and needs.

When information is clearly organized in easy to read charts, tables, matrices, and diagrams, the CMP report is easier to grasp and understand for both the public and planners. This presentation strategy also makes the identification, assessment, programming, implementation, and evaluation of congestion mitigation strategies be more efficient. As part of this organization, clearly linking congestion mitigation strategies to regional goals and objectives will create a focused report that clearly articulates the purpose of each recommended strategy or project. Finally, creating an easy to understand CMP report card applied to roadway, freight, transit, and nonmotorized transportation will allow the public and other planners to see what strategies and projects are effective. By reviewing and revising the report card to reflect new information during subsequent CMP updates, strategies that have proven effective can be highlighted and applied to new congested facilities.

Maps and multiple analyses should be included in the appendix to facilitate report organization and create a document that is easy to read. With additional time and resources, MPO staff should inquire about the use of

multimedia in the CMP process to display congestion over time, before and after analysis of strategy implementation. A dashboard to help automate and visualize the CMP process can be created. This dashboard will assign values to output a prioritization and implementation plan for the ARTS MPO and aid in public consumption. This dashboard was developed as part of this CMP Update.

Overall, an organized CMP with several data sources, strategy methodologies, coordination with stakeholders, and multiple formats of data visualization will result in a robust and accessible report that will be easily understood and utilized by transportation planners, engineers, policy makers, and constituents. With increased access to information, data, and technology, the ARTS MPO will develop a CMP leading to project-oriented results that influence the environment, the local and regional areas, and the people who live, work and recreate there.

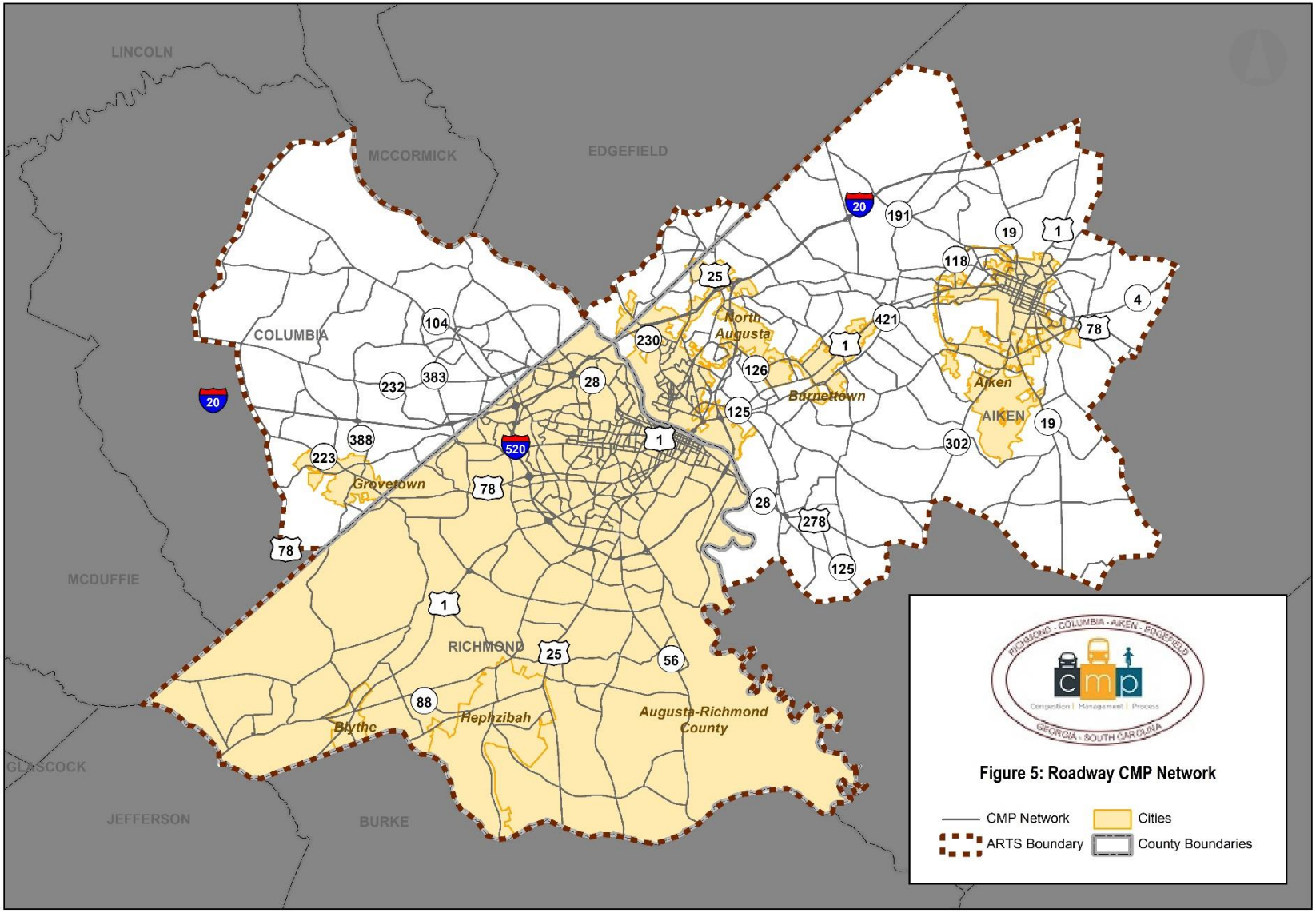
3. Definition of the CMP Network

Per federal guidance, the CMP network is a multi-modal system that is consistent with the 2019 ARTS Planning Area Boundary. The ARTS Planning area covers all of Augusta-Richmond County and parts of Columbia and Aiken Counties as well as a small portion of Edgefield County. The defined CMP network was established using the regional travel demand model as a base, with several additional factors as input. These factors included corridors analyzed in previous CMP updates, an examination of base (2010) and horizon year (2040) travel demand model output, ARTS staff and committee input, and the availability of data for monitoring system performance (e.g. HERE real-time travel information).

Beginning with the definition of the CMP network, the existing ARTS committees were engaged throughout the CMP update process and provided input and insight through regularly scheduled meetings and direct communication with the project management team (PMT), which was comprised of ARTS staff and the consultant team. The ARTS committees represented all levels of the planning process, with the Policy Committee guiding the overall direction of the update, the Technical Coordinating Committee reviewing and commenting on data and the technical process, and the Citizens Advisory Committee engaging on behalf of ARTS residents. All three committees are comprised of representatives from a diverse set of stakeholders and planning partners, including transit operators, bicycle and pedestrian advocates, and the freight community.

3.1 Roadway Network

The CMP roadway network generally consists of federal-aid eligible roadways including the interstate highways, state routes, and major roads. This roadway network is classified by GDOT and SCDOT based on the functionality of the roads into the following functional classes: interstates, freeways and expressways, principal arterials, minor arterials, major collectors, and minor collectors. Local streets are not included in the CMP network because they primarily provide access to adjacent land uses as opposed to mobility. Figure 5 on the following page shows the CMP roadway network.



Sources: *ARTS, GDOT, SCDOT, SCDNR* **Prepared by:** *VHB* **Date:** *March 2019*

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3.2 Transit Network

Augusta Public Transit (APT) is the public transit system for the City of Augusta and Richmond County, Georgia. The system is comprised of nine local bus routes that connect major activity centers within Richmond County including Downtown Augusta, Augusta University Medical Center, Augusta University's Summerville and Forest Hills campuses, Doctor's Hospital, Augusta Mall, Augusta Technical College, and Paine College. APT provides service six days a week, with the hours of operation generally from 6:30 AM to 9:00 PM Monday through Friday and 7:00 AM to 8:00 PM on Saturday. All of the bus routes are along the roadways included in the CMP network.

The Best Friend Express (BFE) transit is the public transportation provider for Aiken County, South Carolina. The transit system has three bus routes that serve key destinations including: downtown Aiken, Aiken County Judicial Center, Aiken Technical College, Aiken Regional Medical Centers, University of South Carolina-Aiken, Aiken County Government Center, Burnettown, North Augusta, and Downtown Augusta. Best Friend Express operates five days a week with hours of operations Monday through Friday from 7:00 AM to 7:00 PM. Figure 6 on the following page shows the nine APT routes and three Best Friend Express routes.

3.3 Freight Network

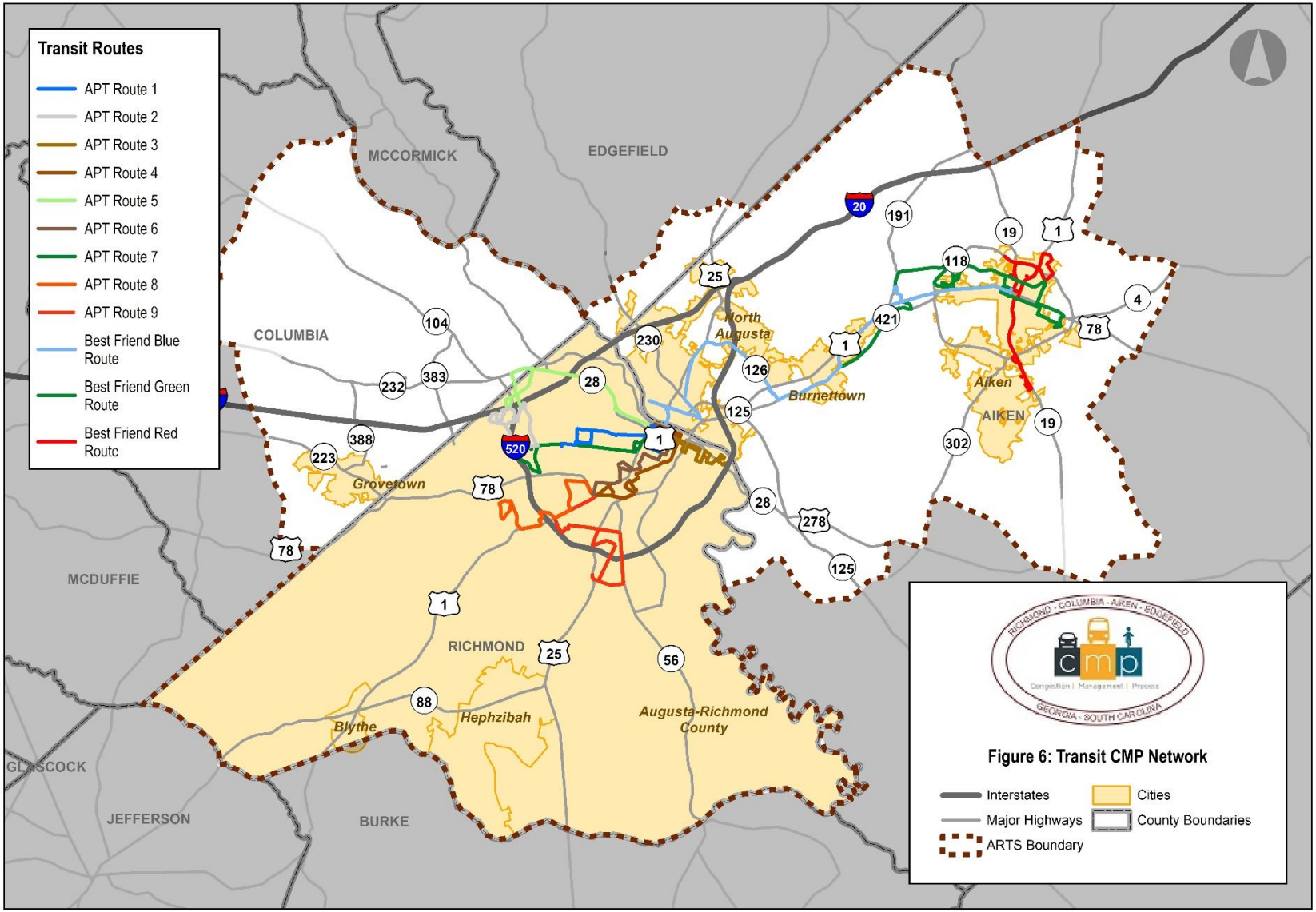
Based on the existing statewide freight plans from GDOT and SCDOT, the major freight routes within the ARTS Planning Area are the Interstate highways I-20 and I-520 as well as principal arterials of US 1 and US 25 in Georgia. SCDOT statewide freight plan designates Interstate highway, I-20 as a freight route in South Carolina within the ARTS Planning Area. Freight movements travelling through and serving businesses in the ARTS Planning Area also travel on other federal and state routes as well as minor arterials and major and minor collectors. As such, the ARTS CMP Update evaluates freight movement along the CMP roadway network.

3.4 Pedestrian and Bicycle Network

The pedestrian infrastructure within the ARTS planning area primarily located in and around the downtown areas of Augusta, Georgia, North Augusta, South Carolina, and Aiken, South Carolina along with the Augusta University Medical Center and Summerville campuses. Sidewalks are along most of the streets within the historic business districts of the respective downtown areas, in unincorporated communities along the SC 191 and SC 421 corridors, and throughout the Augusta University campuses.

The regional multimodal trail and paths are concentrated along the Savannah River in and near the downtown areas of Augusta and North Augusta. Augusta Riverwalk provides an approximately 2-mile off-road connection between the north side of Augusta to southern parts of the downtown area. The River Levee Trail are off-street multi-use paths that are approximately 2 miles north and south termini of the Augusta Riverwalk along the Savannah River levees. Augusta Canal Historic Trail is an off-street multi-use path that connects Augusta University Medical District to Augusta Canal Headgates and Locks in Columbia County along the Augusta Canal. The North Augusta Greenway connects the north side of North Augusta with the River Golf Club immediately south of the downtown area of North Augusta,

South Carolina. The Palmetto Parkway Trail is an off-street bicycle path parallel to the I-520 corridor from South Carolina State Route 33 to Atomic Road in South Carolina.



0 4.5 9 18 Miles

Sources: *ARTS, GDOT, SCDOT, SCDNR* **Prepared by:** *VHB* **Date:** *March 2019*

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4. Data Collection and System Performance Monitoring

Data collection and analysis is a fundamental step in the CMP that provides a foundation for monitoring system performance, analyzing congestion problems and needs, identifying and assessing congestion management strategies, programming and implementing strategies and evaluating the effectiveness of strategies. Before data collection begins, the CMP network needs to be defined because the geographic scope of data collection and types of data collected need to match the network being analyzed. The following section describes the CMP network definition methodology used for the CMP Update. This section addresses the Collect Data/Monitor System Performance element of the CMP.

Historically, ARTS has collected data for CMP Updates by driving the CMP corridors during peak hours and recording the travel times. This CMP Update introduces several new data collection methodologies to enhance the information available to planners and expand the scope of the CMP. Additionally, these new techniques will improve the ability of ARTS to monitor system performance between CMP Updates.

4.1 Data Collection

The purpose of the data collection is to identify and evaluate congestion on the roadway networks along with the evaluation of transit, freight, and pedestrian and bicycle networks. Data collected will support system and corridor level evaluations using the multi-modal performance measures developed as part of this CMP for monitoring the transportation system. As such, this element of the CMP is consistent with the federal guidelines on coverage of a multimodal transportation network within the ARTS Planning Area.

The data used in this CMP Update has been collected from the Augusta Regional Transportation Study (ARTS), Regional Integrated Transportation Information System (RITIS) for the HERE real-time data, the Georgia Electronic Accident Reporting System (GEARS) through the assistance of the Georgia Department of Transportation (GDOT) and the South Carolina Department of Transportation (SCDOT) and South Carolina Department of Natural Resources (SCDNR). The data used from the various sources provides the basis for defining the CMP network of interstates, arterial roadways, transit, and bicycle and pedestrian infrastructure.

The transit data collected was gathered from the Augusta Public Transit Department (APT) and the Lower Savannah Council of Governments (LSCOG). The transit data includes the nine APT local bus routes that serve the City of Augusta, Georgia, Richmond County, Georgia, and the three Best Friend Express (BFE) bus routes in Aiken County, South Carolina. The transit data includes the route frequency, hours of operation, days of operation, bus stops, and bus route alignments for APT and BFE.

As part of this 2018 CMP Update, ARTS has been accepted as an affiliate member of the I-95 Corridor Coalition's Vehicle Probe Project. As an affiliate member of the I-95 Corridor Coalition, ARTS can access HERE real-time travel time data. This data is used to measure congestion by calculating a Travel Time Index (TTI). TTI is the ratio of travel time in the peak period to the travel time at free-flow conditions. TTI

observed during the PM peak period was used to identify congested locations on the CMP network. A higher TTI indicates more congestion along a roadway segment, with a TTI of 1.0 or below indicating free flowing traffic.

The crash data has been gathered from GEARS and SCDOT. The data includes the years 2016, 2017, and through October 2018 within ARTS Planning Area in the states of Georgia and South Carolina. The data specifies the general crash locations, type of accidents, the number of injuries and fatalities associated with the crashes.

4.2 Monitor System Performance

Data collected for the CMP update forms the basis for establishing a snapshot of how the system is operating now as well as monitoring system performance over time. Specifically, the real-time travel time data can be used to monitor performance between CMP updates. The ARTS CMP monitoring plan consists of the following:

- Roadways are monitored through periodic reviews of the real-time travel data
- Key goods movement corridors are evaluated to address mobility needs of freight providers
- Crashes are monitored annually to identify potential non-recurring congestion
- Transit performance is monitored in coordination with APT and BFE through periodic meetings and updates
- Pedestrian and bicycle facilities are monitored as projects are completed throughout the region

This CMP Update includes the development of an on-line dashboard to facilitate system performance monitoring. This dashboard includes the real-time travel data, crash data, and other performance measures required by ARTS. A detailed technical memorandum including steps to update the data used in the dashboard as well as a user manual for the dashboard itself are included as part of this CMP update.

5. Traffic Congestion Problems and Needs

The purpose of the CMP is to identify projects and policies to address traffic congestion in the ARTS Planning Area. The first step in the project and policy selection process is to identify specific corridors and locations within the ARTS Planning Area. The following sections describe the congested corridor selection methodology, problems and needs, and identify planned and programmed transportation projects as well as other on-going studies.

The traffic congestion problems and needs identified through this step will be further analyzed based on the regional goals and objectives described in Section 6 and multi-modal performance measures detailed in Section 7. All this analyses will then feed into Section 8, which documents the identification and assessment of strategies to mitigate congestion.

5.1 Congested Corridor Selection Methodology

The congested corridor selection methodology builds on previous CMP Updates undertaken by the ARTS MPO. As a starting point for this CMP Update, the 53 CMP corridors (shown in Figure 7: CMP Corridors on page 38) identified in the most recent ARTS CMP Update were overlaid with existing 2018 TTI data derived from real-time travel data as well as forecasted 2040 TTI data from the regional travel demand model 2040 no-build network. After several iterations displaying the data in different ways and adjusting the TTI thresholds to match known existing conditions, all 53 of the previous corridors were carried forward into this update. Additionally, based on the 2040 no-build forecasts, no need for additional CMP corridors was identified. The following sections describe the TTI thresholds that were used to determine problems and needs using the existing 2018 real-time travel data.

5.1.1 Borderline Congested

Corridors that are not completely congested but have segments that experience recurring congestion along one or more segments. To be identified as borderline congested, for Columbia and Richmond Counties, the TTI of the roadway falls between 1.10 and 1.19 during the PM peak period. In Aiken County, the TTI of the roadway falls between 1.00 and 1.05 during the PM peak period.

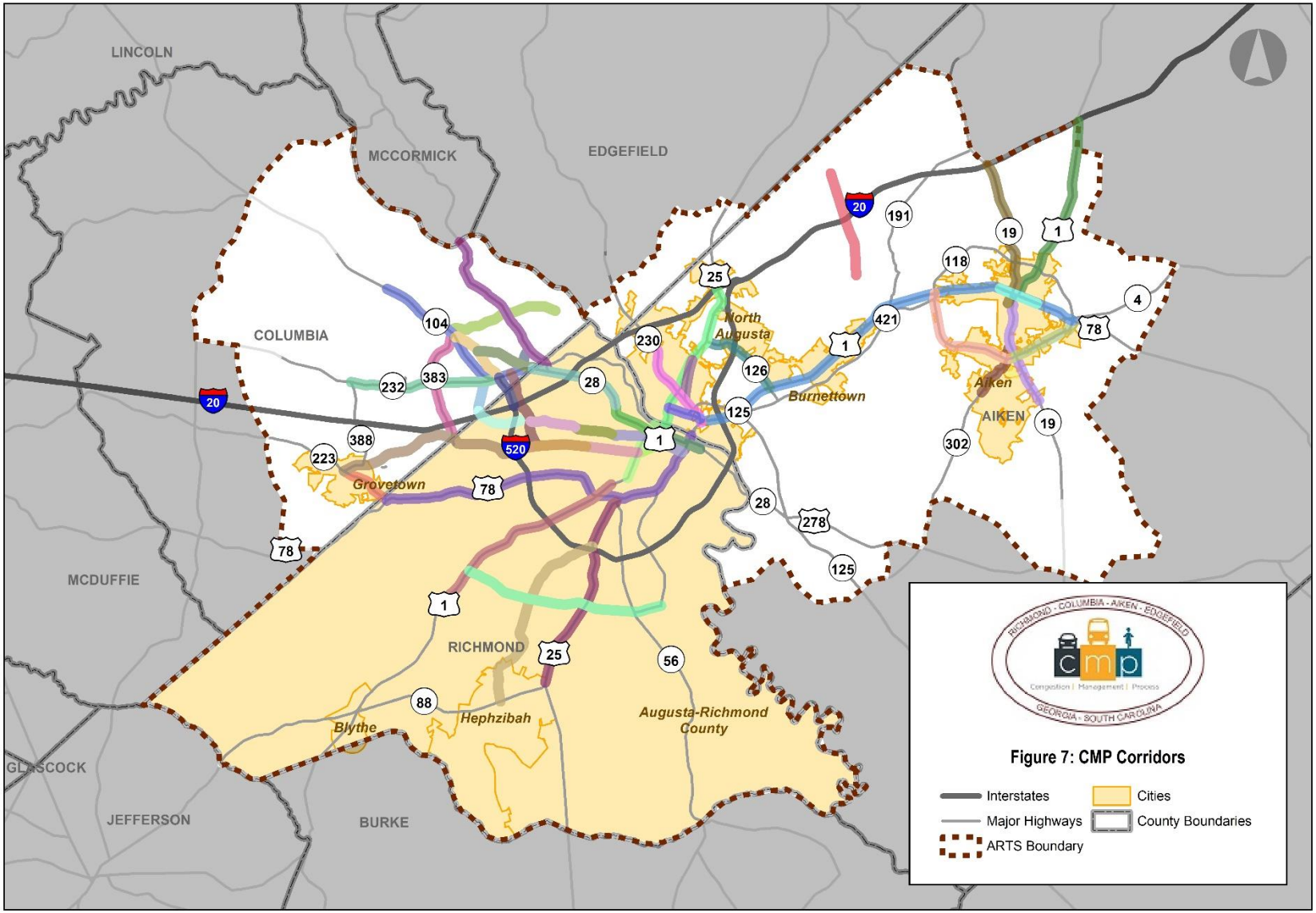
5.1.2 Marginally Congested

Corridors where recurring congestion occurs along multiple segments. To be classified as marginally congested, the TTI of the roadway is between 1.20 and 1.29 in Columbia and Richmond Counties during the PM peak period. In Aiken County, the roadway TTI is between 1.05 and 1.10 during the PM peak period.

5.1.3 Seriously congested

Corridors that have recurring congestion along most segments and where travelers experience the highest delays. To be identified as seriously congested in Columbia and Richmond counties, the roadway TTI is 1.30 or higher during the PM peak period. In Aiken County, the roadway TTI is 1.10 or higher during the PM peak period.

Figures 8 – 11 on the following pages show the TTI data that was used for identifying problems and needs based on the thresholds discussed above. Figure 8 is an overview of the ARTS Planning Area, while Figure 9 is a detailed view of the City of Aiken, Figure 10 is focused on the Richmond and Columbia County Line, and Figure 11is zoomed in on Downtown Augusta.



Miles
0 4.5 9 18

Sources: *ARTS, GDOT, SCDOT, SCDNR* **Prepared by:** *VHB* **Date:** *March 2019*

Augusta, GA Disclaimer: The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the consolidated government of Augusta, GA. Augusta, GA and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the Augusta-Richmond County Commission.

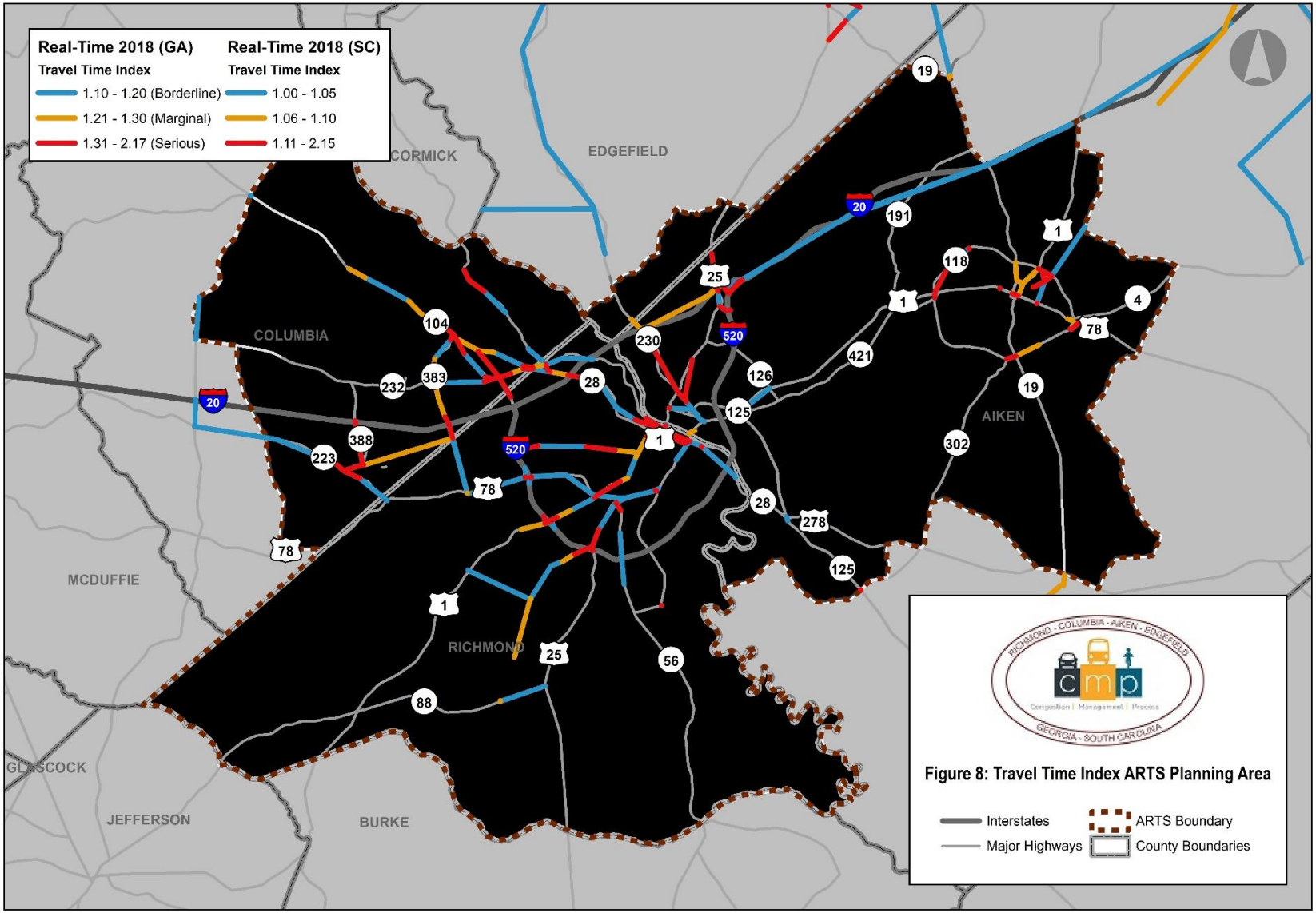


Figure 8: Travel Time Index ARTS Planning Area

Miles
0 4.5 9 18

Sources: *ARTS, GDOT, SCDOT, SCDNR* **Prepared by:** *VHB* **Date:** *March 2019*

Augusta, GA Disclaimer: The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the consolidated government of Augusta, GA. Augusta, GA and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the Augusta-Richmond County Commission.

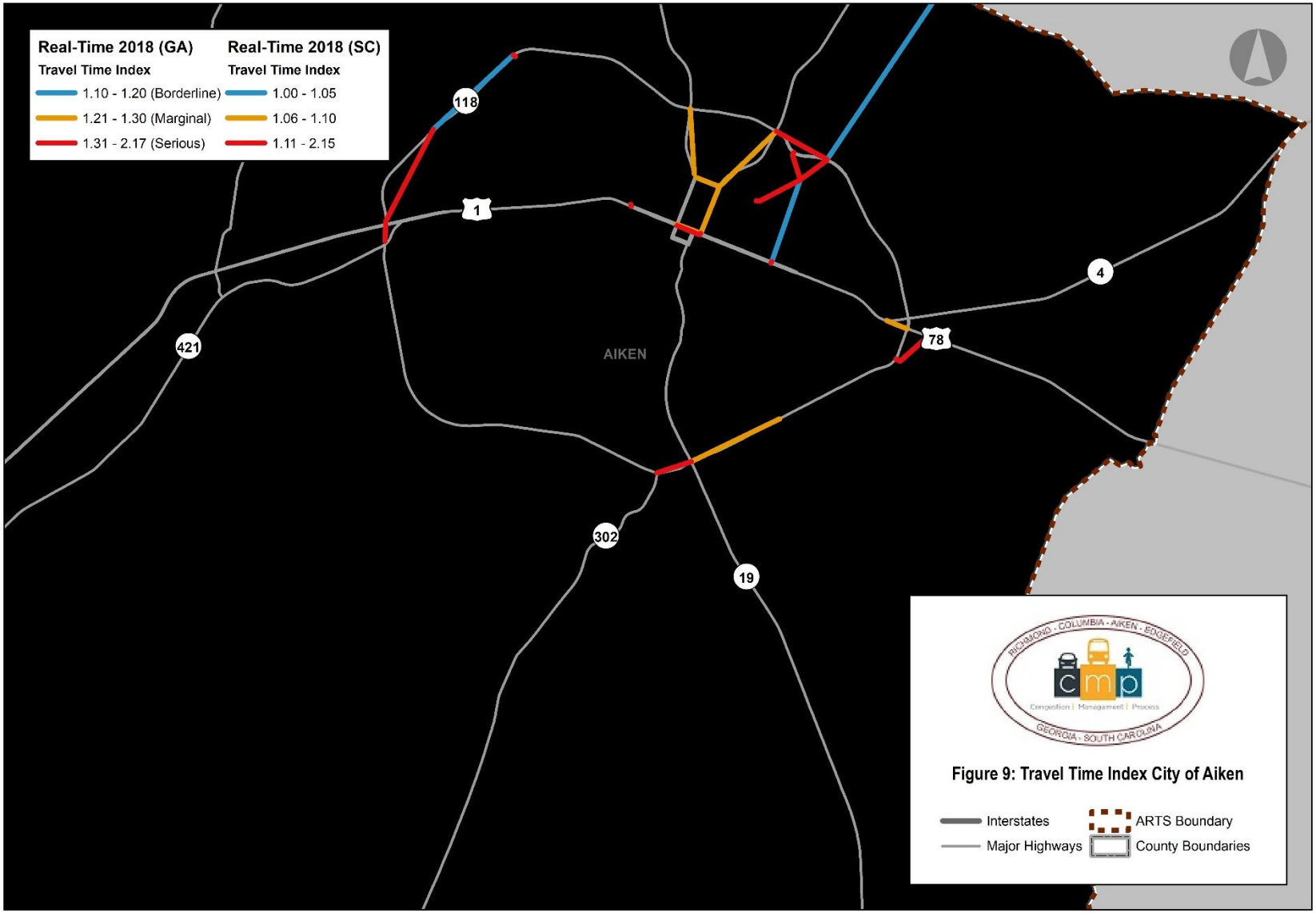


Figure 9: Travel Time Index City of Aiken

Miles
0 1 2 4

Sources: *ARTS, GDOT, SCDOT, SCDNR* ***Prepared by:*** *VHB* ***Date:****March 2019*

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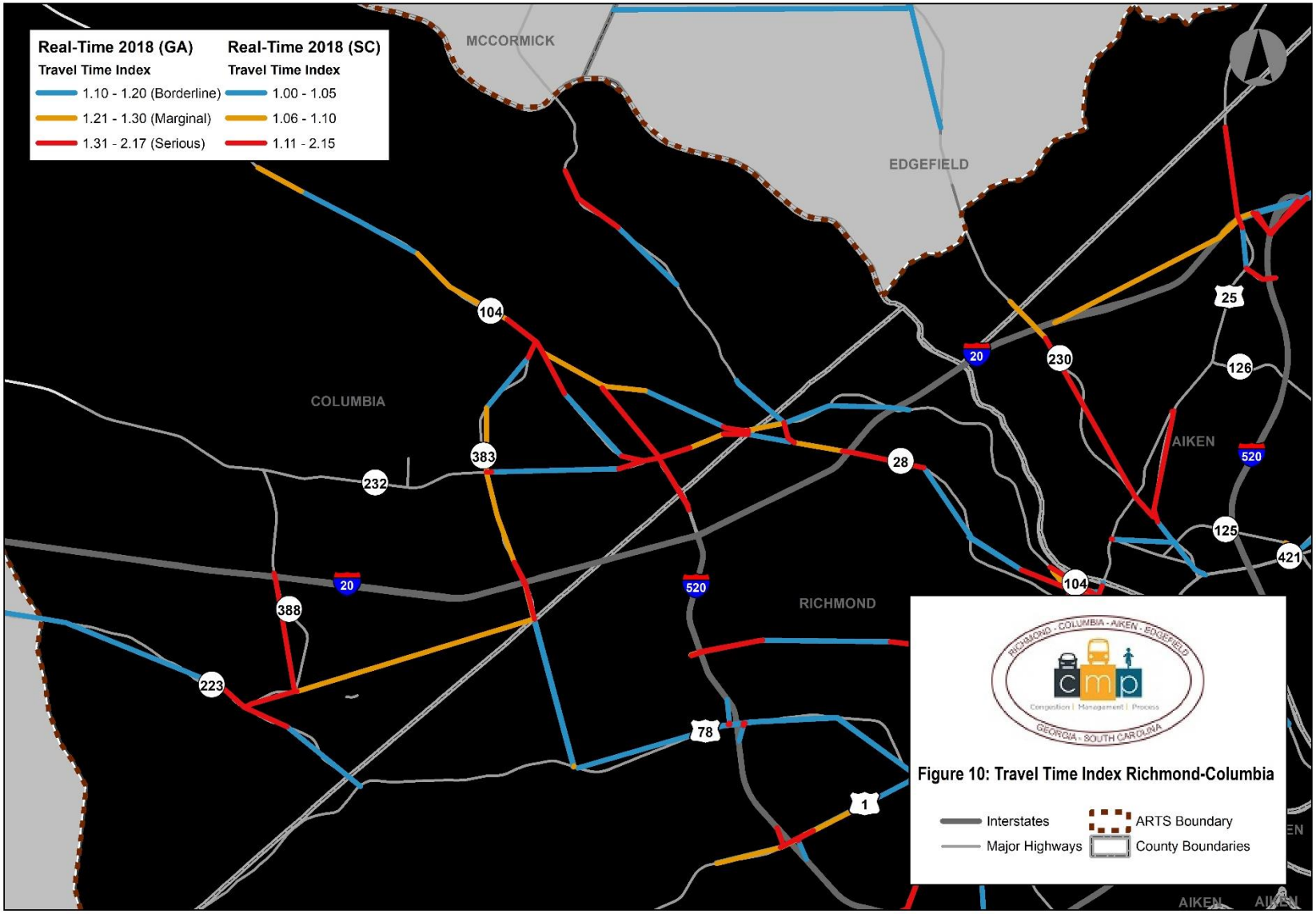


Figure 10: Travel Time Index Richmond-Columbia

0 1.5 3 6 Miles

Sources: *ARTS, GDOT, SCDOT, SCDNR* ***Prepared by:*** *VHB* ***Date:****March 2019*

Augusta, GA Disclaimer: The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the consolidated government of Augusta, GA. Augusta, GA and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the Augusta-Richmond County Commission.

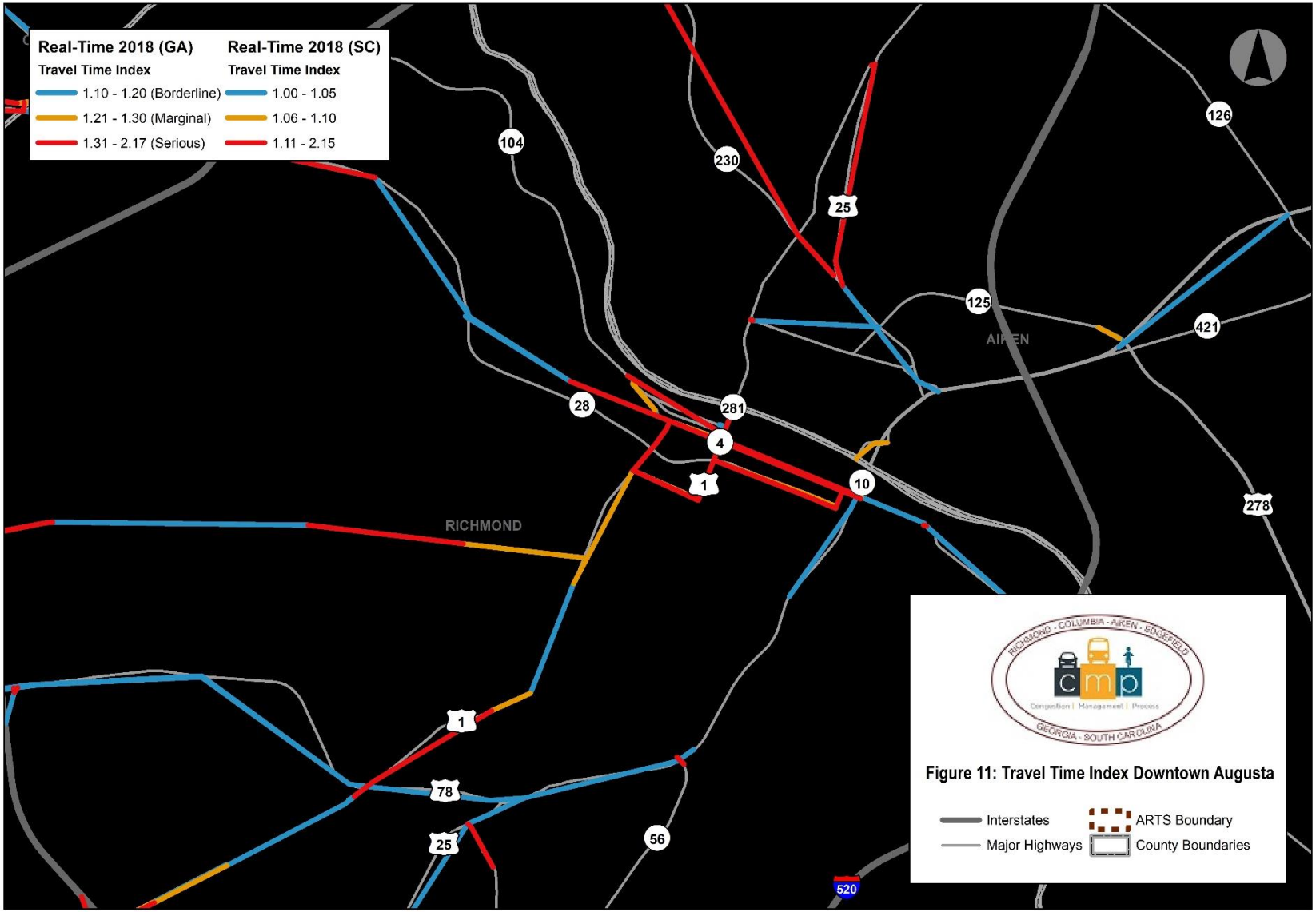


Figure 11: Travel Time Index Downtown Augusta

Miles
0 0.75 1.5 3

Sources: *ARTS, GDOT, SCDOT, SCDNR* ***Prepared by:*** *VHB* ***Date:****March 2019*

Augusta, GA Disclaimer: The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the consolidated government of Augusta, GA. Augusta, GA and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the Augusta-Richmond County Commission.

5.2 Problems and Needs

To identify problems and needs on the CMP network, the travel time thresholds identified by ARTS were applied to the 53 CMP corridors using the real-time travel data to identify which were borderline, marginally, or seriously congested. To determine corridors that are not currently congested, but may be congested in the future, a TTI threshold of 0.90 to 0.99 was applied. Corridors with a TTI in this range during the PM peak period were identified as at risk of congestion.

Most of the corridors experienced an increase in congestion levels between 2015 and 2018, although a few did show an improvement. Three corridors were identified as not-congested based on either the real-time travel data or archived Google Maps data. Those corridors were:

- SR 126 (Belvedere-Clearwater Road) between US 25 (Edgefield Road) and US 1
- Bettis Academy Road between Ascauga Lake Road and Fields Cemetery Road
- SR 302 (Silver Bluff Road) between SR 19 (Whiskey Road) and Savannah Drive

It should be noted that real-time travel data was not available for all corridors through the HERE dataset. In these cases, archived Google Maps traffic data was used, and a determination of the congestion level was manually made based on the traffic speed on a Wednesday at 5:30 PM. Additionally, the HERE data was thoroughly vetted by the ARTS staff and in rare cases appeared to not accurately represent observed existing conditions. For these cases, a manual determination of congestion status was made based on local knowledge.

Table 12 on the following pages shows the current performance of the 53 CMP corridors as well as their status in the most recent CMP Update completed in 2014. Corridors where HERE data was unavailable have “GOOGLE” in the Current Travel Time Index Field. Where observed existing conditions did not match the HERE data, “LOCAL” was entered in the Current TTI Field. Additionally, the travel demand model was also used and this is indicated by “TDM” in the Current TTI Field.

Table 12: Congestion Management Process Corridors Problems and Needs

ID	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	2014 CMP Status	CMP 2015 Survey Year
1	ATOMIC ROAD between BUENA VISTA AVE and SILVER BLUFF RD	1.01	BORDERLINE CONGESTED	NOT CONGESTED	2011
2	SR 126 (BELVEDERE-CLEARWATER RD) between US 25 (EDGEFIELD RD) and US 1	LOCAL/ TDM	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2011
3	BETTIS ACADEMY RD between ASCAUGA LAKE RD and FIELDS CEMETARY RD	LOCAL/ TDM	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2013
4	SR 125 (BUENA VISTA AVE) between MARTINTOWN RD and GEORGIA AVE	1.03	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2012
5	DOUGHERTY RD between SR 19 (WHISKEY RD) and SR 302 (SILVER BLUFF RD)	LOCAL/ TDM	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
6	US 25 (GEORGIA AVE/ EDGEFIELD RD) between SAVANNAH RIVER and I-20	1.00	AT RISK OF CONGESTION	BORDERLINE CONGESTED	2013
7	KNOX AVE between MARTINTOWN RD and GEORGIA AVE	1.15	SERIOUSLY CONGESTED	MARGINALLY CONGESTED	2013
8	SC 19 (LAURENS ST) between SOUTH BOUNDARY ST and I-20	1.05	MARGINALLY CONGESTED	AT RISK OF CONGESTION	2012
9	SR 230 (MARTINTOWN RD) between E. BUENA VISTA AVE and I -20	1.26	SERIOUSLY CONGESTED	MARGINALLY CONGESTED	2014
10	SR 302 (E. PINE LOG RD) between US 78 and SILVER BLUFF RD	1.13	SERIOUSLY CONGESTED	BORDERLINE CONGESTED	2013
11	US 78 (RICHLAND AVE) between BEAUFORT ST and VAUCLUSE RD	1.12	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014

ID	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	2014 CMP Status	CMP 2015 Survey Year
12	SC 118 (HITCHCOCK PKWY) between US 1/US 78 and SILVER BLUFF RD	LOCAL/ TDM	MARGINALLY CONGESTED	AT RISK OF CONGESTION	2012
13	SR 302 (SILVER BLUFF RD) between SR 19 (WHISKEY RD) and SAVANNAH DR	0.88	NOT CONGESTED	SERIOUSLY CONGESTED	2014
14	US 1 between RICHLAND AVE and I-20	1.08	MARGINALLY CONGESTED	AT RISK OF CONGESTION	2011
15	US 1/US 78 between MARTINTOWN RD and PINE LOG RD	1.01	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2011
16	SR 19 (WHISKEY RD) between RICHLAND AVE and POWDERHOUSE RD	LOCAL	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
17	I-20 between EUCHEE CREEK and COLUMBIA/RICHMOND COUNTY LINE	1.00	AT RISK OF CONGESTION	NOT CONGESTED	2011
18	BASTON RD between FURY'S FERRY RD and WASHINGTON RD	GOOGLE	MARGINALLY CONGESTED	SERIOUSLY CONGESTED	2010
19	BELAIR RD between WASHINGTON RD and WRIGHTSBORO RD	1.37	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
20	I-520/BOBBY JONES EXPRESSWAY between I-20 and WASHINGTON RD	1.48	SERIOUSLY CONGESTED	AT RISK OF CONGESTION	2012
21	SR 232 (COLUMBIA RD) between WASHINGTON RD and HEREFORD FARM RD	1.12	BORDERLINE CONGESTED	MARGINALLY CONGESTED	2012
22	EVANS-TO-LOCK RD between STEVENS CREEK RD and WASHINGTON RD	GOOGLE	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014

ID	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	2014 CMP Status	CMP 2015 Survey Year
23	FLOWING WELLS RD between WHEELER and WASHINGTON RD	GOOGLE	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
24	FURY'S FERRY RD between SAVANNAH RIVER and WASHINGTON RD	1.72	SERIOUSLY CONGESTED	BORDERLINE CONGESTED	2014
25	OLD EVANS RD between BOBBY JONES and WASHINGTON RD	1.39	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2012
26	RIVERWATCH PARKWAY between PLEASANT HOME ROAD and OLD EVANS RD	1.37	SERIOUSLY CONGESTED	MARGINALLY CONGESTED	2011
27	SR 223 (ROBINSON AVE) between WRIGHTSBORO RD and GORDON HWY	1.79	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
28	SR 104 (WASHINGTON RD) between HARDY MCMANUS and PLEASANT HOME RD	1.37	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2013
29	WRIGHTSBORO RD between BARTON CHAPEL RD and ROBINSON AVE	1.38	SERIOUSLY CONGESTED	MARGINALLY CONGESTED	2012
30	I-20 between RICHMOND COUNTY LINE and SR 104 (RIVER WATCH PARKWAY)	1.02	AT RISK OF CONGESTION	NOT CONGESTED	2011
31	I-520/BOBBY JONES EXPRESSWAY between I-20 and LANEY WALKER BLVD	1.02	AT RISK OF CONGESTION	NOT CONGESTED	2010
32	13TH ST/RA DENT BLVD between REYNOLDS ST and WRIGHTSBORO RD	1.44	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
33	15TH ST between REYNOLDS and MLK Jr. BLVD	1.69	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014

ID	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	2014 CMP Status	CMP 2015 Survey Year
34	SR 56 (MIKE PADGETT HWY) between LUMPKIN ROAD and SR 56 LOOP	1.14	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2011
35	DEANS BRIDGE RD between MLK BLVD and WILLIS FOREMAN RD	1.48	SERIOUSLY CONGESTED	AT RISK OF CONGESTION	2010
36	DOUG BARNARD PKWY/NEW SAVANNAH RD between GORDON HWY and TOBACCO RD	1.00	AT RISK OF CONGESTION	NO DATA	N/D
37	GREENE ST between E BOUNDARY ST and 12TH ST	1.66	SERIOUSLY CONGESTED	MARGINALLY CONGESTED	2013
38	GORDON HWY between SAVANNAH RIVER and SR 223	1.20	BORDERLINE CONGESTED	AT RISK OF CONGESTION	2011
39	JACKSON RD/ WALTON WAY EXT/DAVIS RD between WASHINGTON RD and WRIGHTSBORO RD	GOOGLE	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2013
40	JOHN C CALHOUN EXPY between WASHINGTON RD and 12TH ST	1.36	SERIOUSLY CONGESTED	AT RISK OF CONGESTION	2011
41	US 25 (PEACH ORCHARD RD) between TUBMAN HOME RD and SR 88	1.94	SERIOUSLY CONGESTED	AT RISK OF CONGESTION	2012
42	SR 104 (RIVERWATCH PARKWAY) between PLEASANT HOME ROAD and 15TH STREET	1.33	SERIOUSLY CONGESTED	NOT CONGESTED	2011
43	TOBACCO RD between DEANS BRIDGE RD and DOUG BARNARD PKWY	1.14	BORDERLINE CONGESTED	BORDERLINE CONGESTED	2013
44	WALTON WAY SEGMENT #1 between GORDON HWY and MILLEDGE RD	1.32	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2012

ID	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	2014 CMP Status	CMP 2015 Survey Year
45	WALTON WAY SEGMENT #2 between BRANSFORD RD and MILLEDGE RD	GOOGLE	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
46	WALTON WAY EXT between BRANSFORD RD and JACKSON RD	GOOGLE	AT RISK OF CONGESTION	AT RISK OF CONGESTION	2012
47	WASHINGTON RD between JOHN C CALHOUN EXPY and PLEASANT HOME RD	1.72	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
48	WHEELER RD between WALTON WAY EXT and FLOWING WELLS RD	GOOGLE	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2014
49	WINDSOR SPRING RD between PEACH ORCHARD RD and SR 88	1.85	SERIOUSLY CONGESTED	BORDERLINE CONGESTED	2012
50	WRIGHTSBORO RD SEGMENT 1 between BARTON CHAPEL RD and JACKSON RD	1.66	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2012
51	WRIGHTSBORO RD SEGMENT 2 between JACKSON RD and HIGHLAND AVE	1.20	BORDERLINE CONGESTED	BORDERLINE CONGESTED	2013
52	WRIGHTSBORO RD SEGMENT 3 between HIGHLAND AVE and FIFTEENTH ST	1.42	SERIOUSLY CONGESTED	SERIOUSLY CONGESTED	2013
53	SR 104 (RIVERSHOALS PARKWAY) between ALEXANDER DRIVE and I-20	LOCAL	SERIOUSLY CONGESTED	NOT INCLUDED	N/A

5.3 Programmed and Planned Improvements

Prior to recommending strategies to address the identified problems and needs, an understanding of programmed and planned improvements in the pipeline is necessary. This section provides an inventory of short-range projects as well as a brief overview of long-range projects and summarizes other recent plans and studies.

5.3.1 Transportation Improvement Program

The ARTS has adopted a Transportation Improvement Program (TIP) for the FY 2017-2022 that covers the ARTS Planning Area and includes improvements for the various modes of travel. Table 13 on the following pages summarizes the projects that are on CMP corridors.

5.3.2 Metropolitan Transportation Plan

In 2015, ARTS conducted the Transportation Vision 2040 Metropolitan Transportation Plan (MTP). The MTP is a regional transportation framework and policy guide for future transportation infrastructure and recommends multi-modal transportation capital improvements over the next twenty (20) years. The Augusta-Richmond GA and Aiken, SC Metro Area is projected to grow 39% in population and 52% in employment opportunities over the next twenty years. With the proposed growth, an estimated $1.5 billion worth of transportation improvements in infrastructure are planned in Richmond and Columbia counties in Georgia and Aiken and Edgefield counties in South Carolina. The recommended transportation improvements include: highways/roads, traffic safety and maintenance, traffic signal operations, bridge, freight and railroad, public transit, pedestrian and bike paths.

Table 13: Fiscal Year 2017 – 2022 Transportation Improvement Program Projects

GDOT PI#/ ARTS ID	County	Project Name	From	To	Short Description	CMP Corridor ID
0008349	Columbia	SR 232 (Columbia Road)	William Few Parkway	Old Belair Road	2 to 4 lanes	21
0008356	Richmond	SR 4/US 1 (Dean's Bridge Road)	Meadowbrook Drive	Tobacco Road	4 to 6 lanes	35
00083555	Richmond	US 25/SR 121 (Peach Orchard Road)	Tobacco Road	Brown Road	4 to 6 lanes	41
0008348	Columbia	Wrightsboro Road	SR 388 (Horizon South Parkway)	SR 383 (Jimmie Dyess Parkway)	2 to 4 lanes	29
0013248	Columbia/ Richmond	Gordon Highway/SR 10	Old Louisville Road	SR 223	2 to 4 lanes	27
ARTS_R-25	Richmond	Doug Barnard Parkway Widening	Tobacco Road	Mike Padgett Highway	2 to 4 lanes	36
0011408	Richmond	15th Street Pedestrian Improvement Project	John C Calhoun Expressway	Central Avenue	Operational and pedestrian improvements	33

GDOT PI#/ ARTS ID	County	Project Name	From	To	Short Description	CMP Corridor ID
LR-82	Richmond	SR 56 (Mike Padgett Highway) at Dixon Airline Road Safety Improvements	SR 56 (Mike Padgett Highway)	Dixon Airline Road	Deceleration lanes, widen lane widths, and bridge, improve signage, evaluate need for signalized traffic control	34
LR-83	Richmond	SR at Marvin Griffin Road Safety Improvements	SR 56 (Mike Padgett Highway)	Marvin Griffin Road	Widen turn radii, improve road signage, improve detector gaps, widen throat	34
LR-84	Richmond	SR 56 at Apple Valley Drive Safety Improvements	SR 56 (Mike Padgett Highway)	Apple Valley Drive	Decrease concrete island or increase turning radii, increase throat, construct new access, add street lighting	34

GDOT PI#/ ARTS ID	County	Project Name	From	To	Short Description	CMP Corridor ID
LR-85	Richmond	SR 56 at Old Waynesboro Road Safety Improvements	SR 56 (Mike Padgett Highway)	Old Waynesboro Road	Widen lane widths, lower speed limit	34
LR-87	Richmond	Norfolk Southern Doug Barnard Parkway Rail Crossing Safety Improvements	Doug Barnard Parkway	Norfolk Southern Railroad	Correct hump, move pavement markings	36
LR-88	Richmond	CSX at 15th Street Rail Crossing Safety Improvement	15th Street	CSX Railroad	Install W10-2 and W10-1 and develop signal plan	33
BP_1	Richmond	15th Street Bike Lanes	John C Calhoun Expressway	Broad Street	Striped bike lanes on 15th Street	33
BP_3	Columbia	North Belair Road Bike Lanes	Columbia Road	Town Park Lane	Striped bike lanes on on North Belair Road	19
BP_4	Columbia	Wrightsboro Road Paved Shoulders	Jimmie Dyess Parkway	Lewiston Road	Shared shoulder	29

GDOT PI#/ ARTS ID	County	Project Name	From	To	Short Description	CMP Corridor ID
BP_15	Columbia	Old Evans Road Striped Bike Lanes	Washington Road South	Washington Road North	Striped Bike lane	25
	Aiken	Edgefield Highway (SC 19)	SC 118 (University Parkway)	S-153 Shiloh Church Road	2 to 4 lanes	8
	Aiken	Aiken-Augusta Highway	Savannah River	I-520 (Palmetto Parkway)	Interchange, operational improvements	9, 15
	Aiken	Dougherty Road	Silver Bluff Road	Whiskey Road	Landscape median, sidewalks	5
	Aiken	Georgia/Knox Avenue and Five Notch/Bradyville Road	Georgia/Knox Avenue	Five Notch/Bradyville Road	Realignment, turn lanes	6,7
	Aiken/ Richmond	I-20 Bridge over Augusta Canal and Savannah River	Georgia	South Carolina	4 to 6 lanes	17

5.3.3 Other Studies

Several other studies have been conducted or previously completed impacting corridors or areas within the ARTS Planning Area. This section summarizes key studies relevant to the CMP Update.

In 2012, ARTS conducted and completed the Augusta Regional Transportation Study Bicycle and Pedestrian Plan. The ARTS Bicycle and Pedestrian Plan focused on the recommendations of programs such as Safe Routes to School, Car-Free Street Events, Weekend Walkabouts, and Bike Month Activities periodically or throughout the year. The other program recommendations include: the creation of a regional bicycle and pedestrian committee, regional plan for bicycle and pedestrian collision reduction, annual data collection program for off-street and on-street infrastructure counts and inventory, professional programs for employees and law enforcement, and a dedicated funding source. The policy recommendations include: a Complete Streets policy, assessment of the block size and street connectivity, sidewalk ordinance, and bicycle parking ordinance for several jurisdictions within the ARTS area.

Aiken County, South Carolina, in partnership with ARTS, completed the Aiken County Urbanized Area Bicycle & Pedestrian Plan in July of 2012. The purpose of the study was to improve the bicycling and pedestrian environment in Aiken County. Recommendations included programs, policies, and projects. Key program recommendations included education and enforcement, encouragement, and on-going evaluation including safety and periodic bicycle and pedestrian counts. Policy recommendations include a Complete Streets Policy, bicycle parking, and pedestrian facility requirements within the context of development ordinances. Project recommendations include the cities of Aiken, Burnettown, and North Augusta, as well as key corridors in Aiken County. The plan proposes 30 miles of bicycle lanes, six miles of roadways with shared-lane markings, 48 miles of bicycle routes, 198 miles of paved shoulders, and 73 miles of greenways and multi-use paths, for a total of 355 miles of bicycle projects.

In 2018, the Aiken County, South Carolina government along with the regional partnership with SCDOT and ARTS conducted the Whiskey Road Corridor Study. The study sought to coordinate multimodal design improvements to Whiskey Road, which is a critical link between the City of Aiken, the Town of New Ellenton, and Savannah River Nuclear Site, in South Carolina. Whiskey Road is a main artery that serves a highly developed commercial area and carries between 15,000 - 20,000 vehicles daily. The Whiskey Road Corridor Study provides a future vision policy guide that improves safety, traffic congestion, access management, storm water drainage, and land use along the corridor.

The Augusta Regional Advanced Transportation Management System (ATMS) Master Plan was completed in 2002. The ATMS Master Plan outlined a phased, 20-year plan for: 1) Implementing an Intelligent Transportation System (ITS) in the Augusta region; 2) the creation of regional transportation control centers in Augusta and Aiken; 3) The strategic placement of field equipment (e.g., fiber optic cable, traffic signal controller upgrades, CCTV cameras, radar speed / volume detectors, and dynamic message signs) throughout the ARTS area; and, 4) The rapid deployment of the GDOT Highway Emergency Response Operators (HERO) and SCDOT State Highway Emergency Program (SHEP) units on area freeways and interstates. While this plan was completed almost two decades ago, the infrastructure built as a result of it can be useful in supporting CMP strategies.

6. Review and Refine Goals and Objectives

Developing regional objectives is an important element in the eight-step CMP. Regional goals and objectives provide a starting point for the CMP. Goals are statements of purpose that represent a desired outcome and assist in communicating the focus of the planning process to the public. In turn, objectives are intermediate results that must be accomplished to reach a goal. In the context of the CMP, objectives specifically define what the region wants to achieve regarding congestion management. Additionally, objectives provide a foundation for developing multimodal performance measures and identifying and assessing strategies. Congestion management objectives are intended to serve as a connection between the CMP and the MTP. Additionally, they are an essential part of an objectives-driven performance-based planning approach.

Best Practice

Define up to ten clear objectives in alignment with the metropolitan planning organization's latest metropolitan transportation plan goals. Clear objectives are used as tools for developing performance measures, selecting congestion mitigation strategies and strategy monitoring and evaluation.

Because of limited funding available for transportation improvements, eradicating traffic congestion is not likely to be achievable. However, goals and objectives assist the region in setting priorities while addressing congestion and are essential as part of an objectives-driven performance based planning approach.

The CMP is an integrated part of the ARTS regional planning process. As part of the performance-based approach to planning and programming activities that were established in 2012 by Moving Ahead for Progress in the 21st Century (MAP-21) Act and continued by the Fixing America's Surface Transportation (FAST) Act, state departments of transportation and MPOs are required to use performance measures to document expectations for future performance. Performance measures used by MPOs are expected to align with national and state goals. As such, national, state, and the ARTS 2040 MTP goals were reviewed and informed the development of the CMP goals and objectives.

The following sections describe the national, state, and MPO goals which informed the 'Develop Regional Objectives' element of the CMP.

6.1 National Goals

As part of a performance-based planning process, the USDOT has developed seven national goals that are shown in **Error! Reference source not found.**1. The national goals address the entirety of the transportation system, while the CMP is focused specifically on congestion. Therefore, **Error! Reference source not found.**2 includes a column showing which national goals are relevant to the CMP as a starting point for developing CMP goals and objectives that are consistent with the national transportation planning process and requirements.

Figure 12: National Transportation Goals

U.S. Department of Transportation	DOES THIS RELATE DIRECTLY TO THE CMP?
Safety	✓
Infrastructure Condition	✓
Congestion Reduction	✓
System Reliability	✓
Freight Movement and Economic Vitality	✓
Environmental Sustainability	
Reduced Project Delivery Delays	

6.2 State Goals

The FAST Act requires states to adopt goals that are consistent with the national goals. Figure 13shows the GDOT and SCDOT goals and calls out the ones most relevant to the CMP. The CMP goals and objectives will be consistent with the statewide planning processes.

Figure 13: Georgia and South Carolina State Transportation Goals

Georgia Department of Transportation	DOES THIS RELATE DIRECTLY TO THE CMP?
Invest in safety for Georgians and GDOT employees	✓
Efficiently take care of what we have	✓
Invest to improve reliability, congestion, and connectivity	✓
Recruit, train, and retain a quality workforce	
Deliver all projects on time and on budget	

South Carolina Department of Transportation	DOES THIS RELATE DIRECTLY TO THE CMP?
Improve safety programs and outcomes in our high-risk areas	✓
Maintain and preserve our existing transportation infrastructure	✓
Improve SCDOT program delivery to increase the efficiency and reliability of our road and bridge network	✓
Provide a safe and productive work environment for SCDOT employees	
Earn public trust through transparency, improved communications, and audit compliance	

6.3 ARTS Metropolitan Transportation Plan Goals

To guide the CMP, goals need to be established to facilitate the monitoring of congestion and improving the mobility of persons and goods in the ARTS MPO region. These goals were developed utilizing the following ARTS 2040 MTP goals, which were developed as part of the 2015 update to the ARTS plan:

- **Goal 1:** Develop a transportation system integrated with planned land use
- **Goal 2:** Develop a transportation system that is financially and politically feasible and has broad support
- **Goal 3:** Develop a transportation system that will allow effective mobility throughout the region and provide efficient movement of persons and goods
- **Goal 4:** Develop a transportation system that will enhance the economic, social, and environmental fabric of the area, using resources wisely while minimizing adverse impacts
- **Goal 5:** Promote efficient land use and development patterns to improve safety and economic vitality to meet existing and future multimodal transportation needs
- **Goal 6:** Increase the safety and security of the transportation system for motorized and non-motorized users
- **Goal 7:** Continue to develop a multimodal transportation network that utilizes strategies for addressing congestion management and air quality issues in the ARTS region

6.4 ARTS Congestion Management Process Goals and Objectives

The CMP goals are presented below were developed by the ARTS PMT and will be used as a tool for selecting objectives and subsequent strategies and performance measures for monitoring and evaluating the CMP network.

- **Goal 1:** Encourage alternative modes of transportation such as transit, bicycle and pedestrian to enhance mobility and improve air quality
- **Goal 2:** Promote a safe and secure transportation system by reducing crashes, increasing travel reliability and predictability, and improving emergency response
- **Goal 3:** Maximize the life of the existing transportation system infrastructure by promoting fiscal responsibility through an emphasis on maintenance and operational efficiency
- **Goal 4:** Create a transportation system that efficiently moves people and goods in support of local and regional economic development

For each goal, more specific objectives were developed to indicate the intended outcomes. These objectives are shown in Table 14 below. These objectives were used to develop individual performance measures which can be employed to evaluate the effectiveness of the individual components of the CMP as well as the overall efficiency of the CMP.

Table 14:ARTS Congestion Management Process Goals and Objectives

Goal	Objective
Goal 1 - Encourage alternative modes of transportation such as transit, bicycle and pedestrian to enhance mobility and increase air quality	Expand and maintain a network of bicycle, pedestrian, and transit facilities that connects homes, activity centers, and complementary amenities.
	Provide a transportation system that promotes the safe and efficient movement of all user groups.
	Support a fully integrated multimodal network that advances the concept of complete streets.
Goal 2 - Promote a safe and secure transportation system by reducing crashes, increasing travel reliability and predictability, and improving emergency response.	Improve transportation system safety and security by alleviating potential conflicts and delays at high-crash locations and rail crossing sites.
	Improve the safety of the transportation system for all user groups.
	Increase the reliability, predictability, and efficiency of the transportation experience through system improvements and enhanced communication.
Goal 3 – Maximize the life of the existing transportation system infrastructure by promoting fiscal responsibility through an emphasis on maintenance and operational efficiency.	Identify and prioritize infrastructure preservation and rehabilitation projects such as pavement management and signal system upgrades.
	Use innovative transportation technology to enhance the efficiency of the existing transportation system and to be better prepared for emerging vehicle technologies.
	Increase the lifespan of existing infrastructure and ensure the optimal use of transportation facilities.
Goal 4 - Create a transportation system that efficiently moves people and goods in support of local and regional economic development	Increase the accessibility and mobility of people and freight within the region and to other areas.
	Highlight transportation recommendations that enable global competitiveness, productivity, and efficiency.

The CMP objectives are consistent with the ARTS MPO's MTP goals, as well as state and national planning processes and requirements. These objectives address the multimodal nature of the transportation network and address both recurring and non-recurring congestion. The transportation system changes as projects are delivered and opened to traffic. Additionally, changes in land use and development patterns as well as shifting employment centers influence travel patterns on the network. Recognizing that congestion will change, the CMP goals and objectives should be reviewed during future CMP updates and refined as necessary to reflect changes in regional priorities and transportation conditions.

7. Develop Multimodal Performance Measures

In 2012, with the passage of the Moving Ahead for Progress in the 21st Century Act (MAP-21), performance-based planning and programming (PBPP) become a fundamental part of statewide and metropolitan planning processes to incorporate a more comprehensive approach to decision-making especially with the Congestion Management Process (CMP). Under the current Fixing America's Surface Transportation Act (FAST Act PBPP concept has remained the foundation of statewide and regional transportation prioritization. The Federal Highway Administration (FHWA) is responsible for the development and enforcement of the performance-based measures to be implemented at state and metropolitan levels.

Best Practice

Performance-based planning and programming is now a fundamental part of statewide and metropolitan planning and helps connect the CMP directly with the Metropolitan Transportation Plan.

The impetus of the PBPP originates from the performance management approach. Most transportation agencies have used the performance management approach over the past three decades to achieve the desired outcomes of transportation decision making. PBPP also allows more transparency and accountability of the processes to the public. PBPP methodology follows the 3Cs (cooperative, continuing, and comprehensive) process that brings together other agencies, stakeholders, and the public in the composition of programs and applications by transportation agencies. PBPP is also used in the development of MTPs. PBPP provides a framework for more effective metropolitan transportation plans. PBPP applies performance principles to the transportation system policy and investment decisions providing a link between management and long-range decisions to a transportation system to achieve desired performance outcomes for a multimodal transportation system. The CMP performance measures are a key input to PBPP.

This section addresses the 'Develop Multimodal Performance Measures' element of the CMP.

7.1 Performance Measures Methodology

Performance measures are a major component of the CMP and are used to monitor the CMP network. The use of performance measures in monitoring system performance is described in detail in Section 10 Monitoring and Performance Reporting Process. The FHWA has identified a template for the CMP multimodal performance measures that:

- Describe existing conditions, identify problem locations, predict changes, and report and track on progress towards achieving those regional objective targets
- Establish performance targets that includes quantifiable data that is simple to present and interpret
- Develop performance-based plans for safety and asset management

- Are applicable to multiple modes and creates a performance-based approach to planning and programming
- Help to communicate system performance through visualizations to elected officials, metropolitan planning organization (MPO) member agencies, and the public

In conjunction with the FHWA guidance and a review of best practices, a list of candidate performance measures was developed. ARTS then narrowed the candidate list down to final performance measures that best met local needs and data collection abilities. The applicability of the performance measures identified at the regional, county and corridor levels is discussed in the following section. The measures are related to and categorized by the individual goals and objectives of the CMP in the following section.

7.2 Performance Measures

The ARTS multimodal performance measures are within alignment with four goals and the objectives of the CMP described in the previous section. Table 15 on the following pages is organized by the four goals. The table lists each performance measure, identifies the data sources and types used for calculating the measure and notes its applicability at the regional, county, or corridor levels.

Table 15: Multimodal Performance Measures

GOAL 1: Encourage alternative modes of transportation such as transit, bicycle, and pedestrian to enhance mobility and increase air quality.

Objectives:

1. Expand and maintain a network of bicycle, pedestrian, and transit facilities that connects homes, activity centers, and complementary amenities.

2. Provide a transportation system that promotes the safe and efficient movement of freight within and through the ARTS region.

3. Support a fully integrated multimodal network that advances the concept of Complete Streets.

ID	Performance Measures	Data Provider(s)	Data Source/Type	Scope of Measure		
				Regional	County	Corridor
1	Incorporation of Complete Streets principles in roadway projects	GDOT/SCDOT/MPO/Counties/Local Jurisdictions	Project Review - Yes/No and Number			X
2	Incorporation of land use recommendations in projects that are aligned with local Comprehensive Plans	MPO/Counties/Local Jurisdictions	Local Plan Review - Yes/No and Number			X

ID	Performance Measures	Data Provider(s)	Data Source/Type	Scope of Measure		
				Regional	County	Corridor
3	Track the level of emissions to increase air quality	GDOT/SCDOT	Air Quality Modeling	X		
4	Miles of state routes that accommodate bicycles by having a designated bike lane	GDOT/SCDOT	DOT road centerline file with road characteristics attributes	X	X	
5	Transit ridership by route	Transit agency	National Transit Database		X	X
6	Transit weekday boardings in the AM and PM peaks by route	Transit agency	National Transit Database		X	X
7	Number of alternative fuel vehicles registered in the region	County	License tag databases	X		

GOAL 2: Promote a safe and secure transportation system by reducing crashes, increasing travel reliability and predictability, and improving emergency response.

Objectives:

1. Improve transportation system safety and security by alleviating potential conflicts and delays at high-crash locations and rail crossing sites.

2. Improve the safety of the transportation system for all user groups.

3. Increase the reliability, predictability, and efficiency of the transportation experience through system improvements and enhanced communication.

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
8	Number and rate of crashes (injury and fatal) region-wide and on mobility corridors	GDOT/SCDOT/FHWA	Georgia Electronic Accident Reporting System (GEARS), SC Accident Reporting System, Fatality Analysis Reporting Systems (FARS) and Traffic Analysis and Data Application (TADA)	X	X	X

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
9	Percentage of roadway miles at a certain Travel Time Index (TTI) region-wide and on mobility corridors	FHWA	Travel Demand Model	X	X	X
10	Roadway peak hour Travel Time Index data on mobility corridors	FHWA	HERE Data	X	X	X
11	Coordination of governmental agencies to address incident clearance	GDOT/SCDOT/MPO	Yes/No	X		

GOAL 3: Maximize the life of the existing transportation system infrastructure by promoting fiscal responsibility through an emphasis on maintenance and operational efficiency.

Objectives:

1. Identify and prioritize infrastructure preservation and rehabilitation projects such as pavement management and signal system upgrades.

2. Use innovative transportation technology to enhance the efficiency of the existing transportation system and to be better prepared for emerging vehicle technologies.

3. Increase the lifespan of existing infrastructure and ensure the optimal use of transportation facilities.

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
12	Percentage of NHS Bridges in Good and Poor condition as a percent of the total bridge deck area	GDOT/SCDOT	Bridge inventory system	X	X	X
13	Percentage of pavement in Good and Poor condition on mobility corridors	GDOT/SCDOT	Pavement management system	X	X	X

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
14	Percentage of state routes meeting DOT maintenance standards	GDOT/SCDOT	Maintenance system	X	X	
15	Number of new and upgraded signal systems per year region-wide and on mobility corridors	GDOT/SCDOT/MPO/Counties/Local Jurisdictions	Signal maintenance program	X	X	X
16	Average age of transit fleet (in years)	Transit Agency	National Transit Database	X	X	

GOAL 4: Create a transportation system that efficiently moves people and goods in support of local and regional economic development.

Objectives:

1. Increase the accessibility and mobility of people and freight within the region and to other areas.

2. Highlight transportation recommendations that enable global competitiveness, productivity, and efficiency.

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
17	Percentage of roadway miles at a certain Travel Time Index (TTI) region-wide and on mobility corridors	FHWA	Travel Demand Model	X	X	X
18	Truck Reliability Index	FHWA/GDOT/SCDOT	National Performance Management Research Data Set (NMPRDS) or statewide truck travel time dataset	X	X	X
19	Interstate AM peak hour average speed - region-wide	FHWA/GDOT/SCDOT NMPRDS or statewide truck travel time dataset	HERE Data	X	X	X

ID	Performance Measures	Data Sources	Data Type	Scope of Measure		
				Regional	County	Corridor
20	Interstate PM peak hour average speed - region-wide	FHWA/GDOT/SCDOT NMPRDS or statewide truck travel time dataset	HERE Data	X	X	X
21	Regional projects that enhance connections with other GA/SC/Southeast/US cities	GDOT/SCDOT/MPO	Project Review - Yes/No and Number	X	X	X

8 Review and Update Existing CMP Strategies

The review and update of existing CMP strategies consisted of two steps. First, the existing ARTS CMP strategies were reviewed and updated as appropriate to reflect changing conditions and state of the practice since the previous CMP update. Second, the CMP strategies were evaluated for appropriateness for each of the CMP corridors.

This section addresses the 'Identify and Assess Strategies' element of the CMP.

8.1 Develop Multimodal Congestion Management Strategies

Based on a best practices review, FHWA guidance, and the regional objectives, ARTS assessed the toolbox of congestion management strategies used in previous CMP Updates and identified potential new strategies. The strategies toolbox was organized into four hierarchical tiers based on findings from the best practices review and FHWA guidance. The tiers are:

1. Demand management
2. Traffic operations
3. Public Transportation
4. Road Capacity

The strategies in the top tier, demand management, take precedence over those further down. This approach follows transportation best practices and FHWA's direction to consider options to manage travel demand, improve operations, and enhance alternative modes prior to recommending roadway capacity increases. Additionally, the tiered approach aligns with the CMP goals to encourage alternative modes of transportation and maximizing the life of the transportation system by promoting fiscal responsibility through an emphasis on maintenance and operational efficiency. Table 16 on the following pages lists the strategies by tier. In addition to the overall strategy, specific examples of more detailed actions are included in the table.

Table 16: ARTS CMP Strategies by Tier

ARTS CMP Strategies by Tier: Demand Management	
1) Travel Demand Management (TDM)	Programs that encourage alternative modes including bike, pedestrian, transit, and carpooling
	Pedestrian and bicycle facility improvements that promote non-motorized travel
2) Arterial Management	Optimize timing of traffic signals
	Access management
3) Freight Management (New)	Geometric improvements to roads and intersections
	Goods movement management including identification of truck routes and bottlenecks
4) Intelligent Transportation Systems	Active traffic management including adaptive signal control, signal priority, and fiber optics
5) Growth Management Strategies	Development policies that support transit-oriented designs for corridors
	Land use controls and zoning policies to encourage mixed use development in proximity to transit stops and employment centers
	MPO oversight / review for regional scale developments
6) Job Access (New)	Development policies that support transit-oriented designs for corridors and communities involving homes, jobsites and, shops
	Park and ride facilities, ride matching services, and carpool/vanpool incentive programs
	Telecommuting / flexible work hour programs

ARTS CMP Strategies by Tier: Traffic Operations	
7) Traffic Operations	Traffic signalization and control
	Intersection and street improvements
	Roundabout construction
	Bottleneck removal
8) Work Zone / Special Event Management / Traveler Information	Variable Message Signs (VMS)
	Variable speed limits
	511 Traveler Information
	Highway Advisory Radio (HAR)
9) Access Management	Movable median barriers to add capacity during peak periods
	Add center turn lanes
10) Incident Management	Detection of incidents
	Faster anticipatory responses to traffic incidents
	Service Patrols

ARTS CMP Strategies by Tier: Public Transportation	
11) Build or Expand Transit Systems	Commuter-orientated transit service (express)
	Transit park and ride facilities
	Universal fare system
12) Public Transit Operational Improvements	Realign transit service schedules and stop locations
	Provide real-time information on transit schedules and arrivals using vehicle location data
	Bus-only shoulder lanes

ARTS CMP Strategies by Tier: Roadway Capacity	
13) Build or Widen Roadways and Freeways	Add travel lanes on major freeways and streets (including truck climbing lanes on grades)
	Close gaps in the street network
	Add center lanes
14) Build or Widen Bikeways and Walkways	Bicycle amenities at transit stations and other trip destinations
	New bikeways / sidewalks and close gaps in existing facilities
	Street crossings including marking, timing and signalization
	Develop and adopt Complete Streets guidelines

8.2 Strategy Matrix

The strategy matrix is used to address recurring congestion on the CMP corridors. The strategy matrix was developed using the current TTI data and knowledge of local conditions to identify the appropriateness of specific strategies for each of the CMP corridors. Each corridor was evaluated, and a rating was assigned. A rating of "Y" for yes indicates that a specific strategy is appropriate for the corridor, while a rating of "N" for no indicates the strategy is not considered appropriate at this time. Table 17 on the following pages lists the CMP corridors, the current TTI, current congestion status, and the appropriateness of CMP strategies. The numbers under the Congestion Management Process Strategies heading correspond to the strategies described in 16 on the previous page.

Table 17: 2018 CMP Strategy Matrix by Corridor

ID	County	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	Congestion Management Process Strategies													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	AIKEN	ATOMIC ROAD between BUENA VISTA AVE and SILVER BLUFF RD	1.01	BORDERLINE CONGESTED	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
2	AIKEN	SR 126 (BELVEDERE-CLEARWATER RD) between US 25 (EDGEFIELD RD) and US 1	GOOGLE	NOT CONGESTED	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
3	AIKEN	BETTIS ACADEMY RD between ASCAUGA LAKE RD and FIELDS CEMETARY RD	GOOGLE	NOT CONGESTED	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
4	AIKEN	SR 125 (BUENA VISTA AVE) between MARTINTOWN RD and GEORGIA AVE	1.03	BORDERLINE CONGESTED	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
5	AIKEN	DOUGHERTY RD between SR 19 (WHISKEY RD) and SR 302 (SILVER BLUFF RD)	GOOGLE	MARGINALLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
6	AIKEN	US 25 (GEORGIA AVE/ EDGEFIELD RD) between SAVANNAH RIVER and I-20	1.00	AT RISK OF CONGESTION	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
7	AIKEN	KNOX AVE between MARTINTOWN RD and GEORGIA AVE	1.15	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
8	AIKEN	SC 19 (LAURENS ST) between SOUTH BOUNDARY ST and I-20	1.05	MARGINALLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
9	AIKEN	SR 230 (MARTINTOWN RD) between E. BUENA VISTA AVE and I -20	1.26	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
10	AIKEN	SR 302 (E. PINE LOG RD) between US 78 and SILVER BLUFF RD	1.13	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
11	AIKEN	US 78 (RICHLAND AVE) between BEAUFORT ST and VAUCLUSE RD	1.12	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
12	AIKEN	SC 118 (HITCHCOCK PKWY) between US 1/US 78 and SILVER BLUFF RD	0.95	AT RISK OF CONGESTION	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
13	AIKEN	SR 302 (SILVER BLUFF RD) between SR 19 (WHISKEY RD) and SAVANNAH DR	0.88	NOT CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
14	AIKEN	US 1 between RICHLAND AVE and I-20	1.08	MARGINALLY CONGESTED	Y	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
15	AIKEN	US 1/US 78 between MARTINTOWN RD and PINE LOG RD	1.01	BORDERLINE CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
16	AIKEN	SR 19 (WHISKEY RD) between RICHLAND AVE and POWDERHOUSE RD	LOCAL	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y

ID	County	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	Congestion Management Process Strategies													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
17	COLUMBIA	I-20 between EUCHEE CREEK and COLUMBIA/RICHMOND COUNTY LINE	1.00	AT RISK OF CONGESTION	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
18	COLUMBIA	BASTON RD between FURY'S FERRY RD and WASHINGTON RD	GOOGLE	MARGINALLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
19	COLUMBIA	BELAIR RD between WASHINGTON RD and WRIGHTSBORO RD (INCLUDING I-20 RAMPS)	1.37	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
20	COLUMBIA	I-520/BOBBY JONES EXPRESSWAY between I-20 and WASHINGTON RD	1.48	SERIOUSLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
21	COLUMBIA	SR 232 (COLUMBIA RD) between WASHINGTON RD and HEREFORD FARM RD	1.12	BORDERLINE CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
22	COLUMBIA	EVANS-TO-LOCKS RD between STEVENS CREEK RD and WASHINGTON RD	GOOGLE	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
23	COLUMBIA	FLOWING WELLS RD between WHEELER and WASHINGTON RD	GOOGLE	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
24	COLUMBIA	FURY'S FERRY RD between SAVANNAH RIVER and WASHINGTON RD	1.72	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
25	COLUMBIA	OLD EVANS RD between BOBBY JONES and WASHINGTON RD	1.39	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
26	COLUMBIA	RIVERWATCH PARKWAY between PLEASANT HOME ROAD and OLD EVANS RD	1.37	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
27	COLUMBIA	SR 223 (ROBINSON AVE) between WRIGHTSBORO RD and GORDON HWY	1.79	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
28	COLUMBIA	SR 104 (WASHINGTON RD) between HARDY MCMANUS and PLEASANT HOME RD	1.37	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y
29	COLUMBIA	WRIGHTSBORO RD between BARTON CHAPEL RD and ROBINSON AVE	1.38	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	Y
30	RICHMOND	I-20 between RICHMOND COUNTY LINE and SR 104 (RIVER WATCH PARKWAY)	1.02	AT RISK OF CONGESTION	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
31	RICHMOND	I-520/BOBBY JONES EXPRESSWAY between I-20 and LANEY WALKER BLVD	1.02	AT RISK OF CONGESTION	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
32	RICHMOND	13TH ST/RA DENT BLVD between REYNOLDS ST and WRIGHTSBORO RD	1.44	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
33	RICHMOND	15TH ST between REYNOLDS and MLK Jr. BLVD	1.69	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

ID	County	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	Congestion Management Process Strategies													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
34	RICHMOND	SR 56 (MIKE PADGETT HWY) between LUMPKIN ROAD and SR 56 LOOP	1.14	BORDERLINE CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
35	RICHMOND	DEANS BRIDGE RD between MLK BLVD and WILLIS FOREMAN RD	1.48	SERIOUSLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
36	RICHMOND	DOUG BARNARD PKWY/NEW SAVANNAH RD between GORDON HWY and TOBACCO RD	1.00	NOT CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
37	RICHMOND	GREENE ST between E BOUNDARY ST and 12TH ST	1.66	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
38	RICHMOND	GORDON HWY between SAVANNAH RIVER and SR 223	1.20	BORDERLINE CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39	RICHMOND	JACKSON RD/ WALTON WAY EXT/DAVIS RD between WASHINGTON RD and WRIGHTSBORO RD	GOOGLE	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40	RICHMOND	JOHN C CALHOUN EXPY between WASHINGTON RD and 12TH ST	1.36	SERIOUSLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
41	RICHMOND	US 25 (PEACH ORCHARD RD) between TUBMAN HOME RD and SR 88	1.94	SERIOUSLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
42	RICHMOND	SR 104 (RIVERWATCH PARKWAY) between PLEASANT HOME ROAD and 15TH STREET	1.33	SERIOUSLY CONGESTED	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
43	RICHMOND	TOBACCO RD between DEANS BRIDGE RD and DOUG BARNARD PKWY	1.14	BORDERLINE CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
44	RICHMOND	WALTON WAY SEGMENT #1 between GORDON HWY and MILLEDGE RD	1.32	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
45	RICHMOND	WALTON WAY SEGMENT #2 between BRANSFORD RD and MILLEDGE RD	GOOGLE	SERIOUSLY CONGESTED	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46	RICHMOND	WALTON WAY EXT between BRANSFORD RD and JACKSON RD	GOOGLE	AT RISK OF CONGESTION	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
47	RICHMOND	WASHINGTON RD between JOHN C CALHOUN EXPY and PLEASANT HOME RD	1.72	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
48	RICHMOND	WHEELER RD between WALTON WAY EXT and FLOWING WELLS RD	GOOGLE	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
49	RICHMOND	WINDSOR SPRING RD between PEACH ORCHARD RD and SR 88	1.85	SERIOUSLY CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
50	RICHMOND	WRIGHTSBORO RD SEGMENT 1 between BARTON CHAPEL RD and JACKSON RD	1.66	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

ID	County	Congestion Management Process Corridor	Current Travel Time Index (2018)	Current Congestion Status	Congestion Management Process Strategies													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
51	RICHMOND	WRIGHTSBORO RD SEGMENT 2 between JACKSON RD and HIGHLAND AVE	1.20	BORDERLINE CONGESTED	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
52	RICHMOND	WRIGHTSBORO RD SEGMENT 3 between HIGHLAND AVE and FIFTEENTH ST	1.42	SERIOUSLY CONGESTED	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
53	RICHMOND	SR 104 (RIVERWATCH PARKWAY) between ALEXANDER DRIVE and I-20	1.04	SERIOUSLY CONGESTED	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y

9 Performance Monitoring Dashboard Implementation

This section documents the data collection and system performance monitoring process. The following sections detail the steps and data collection notes along with calculations used to determine and identify performance measures used in the CMP System Performance Monitoring and Evaluation. This section includes the data collection sources and contact information allowing future updates to be performed following the same data collection methodology. Immediately following, Section 10 details the calculation of performance measures and the required Enhance, Transform, and Load (ETL) processes to prepare the data for use in the ARTS dashboard.

9.1 Data Collection

In preparation for the CMP System Performance Monitoring Evaluation a variety of data from varying sources were collected. The collection of data included geographic boundaries, crash location information, probe vehicle data, transit locations, and additional information. The following sections detail the collection process and source data contact information. Section 9.1.1 displays the master table that was used to collect these various data sources. Section 9.1.2 provides details on the data collection source and notes for retrieval of the data.

9.1.1 Data Collection Source Table

At the start of the ARTS CMP process a series of data sources were identified for potential collection. Each data source was evaluated for availability of collection across the ARTS district with each data noted about the coverage that was available, for example if the data was only available in one county, one state, or available across the entirety of the ARTS District. The following table (Table 18) represents a snapshot of the data that was reviewed for inclusion and collection, along with the status of that data whether it was successfully identified and obtained.

Yes data found
Partial data found
Data unavailable

ARTS Data Collection Source Table

	Georgia	Augusta-Richmond, GA	County: Columbia, GA	South Carolina	County: Aiken, SC	County: Edgefield, SC	Used in ARTS Dashboard
Data for Dashboard							
HERE Traffic Probe Data - RITIS							*
Crashes							*
General Area Information							
Roadway Network							*
Intersections							
City Boundaries							
ARTS Boundary							*
County Boundaries from US Census - Countrywide							*
RailRoad Crossings							
Military Bases							
Annual Traffic Crash and Intersection Report							*
Data Available from ARTS							
Bus Facilities							
Bus Stops							
Pedestrian Signals							
Signalized Intersections							
Sidewalks							
Bus Routes							
Driveways							
Building and Entrance features							
Traffic Volumes							
AADT							
AADTT							
Level of Service (LOS)							
Roadway Info							
Route ID, Beginning and Ending MP							
Speed Limits							
Function Type							
Surface Type							
Average Lane Width							
Shoulder Width							
Shoulder Type							
Barrier							
Median Type							
NHS Type							
Number of Lanes							

9.1.2 Data Collection Source and Retrieval Information

This section provides specifics on each data source including the necessary steps required for retrieval of data.

DATASET: HERE Traffic Probe Data – RITIS

The HERE Traffic Probe Data is available from the RITIS Probe Data Analytics Suite at the following website: https://pda.ritis.org/suite/. ARTS is a partner agency with the RITIS I-95 Corridor Coalition and has been given access to the Probe Data Analytics Suite for data download. To create a new account, use the following weblink: https://www.ritis.org/register/ when contacting for access, please reference affiliation with ARTS.

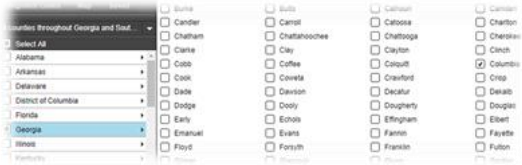
**Please Note that the HERE data is subject to Licensing and rules about distribution. The HERE data in the raw format while available for partnering agencies to use is not allowed to be shared or distributed. Please refer to the website for details.*

For use in the analysis and ARTS Dashboard a variety of data meeting specific time ranges and criteria were identified. Once signed into the Probe Data Analytics Suite select the "Massive Data Downloader", then proceed through each of the three data collections to retrieve data for the AM Peak, PM Peak, and 24-Hour Profile.

AM and PM Peak:

Please proceed through the following steps to retrieve the AM and PM Peak Data from RITIS

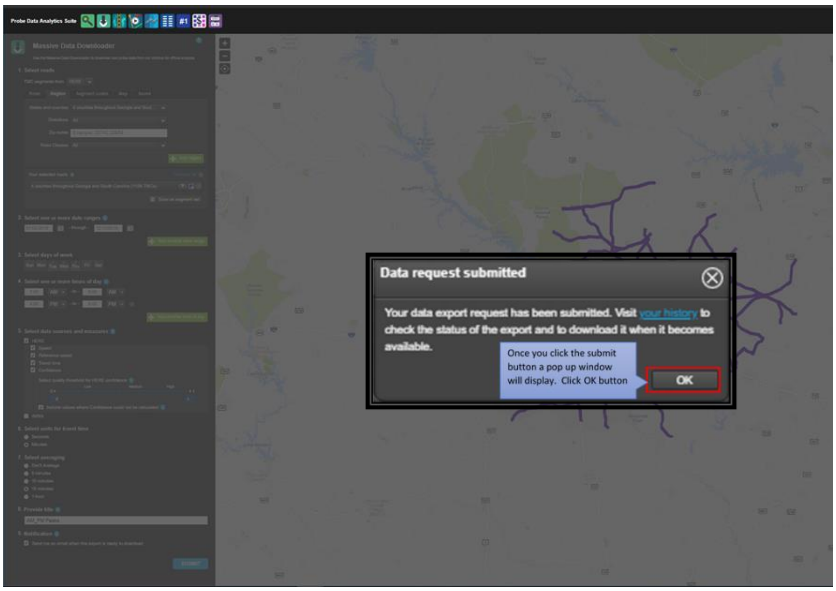
Question 1:
Select TMC Segments from **HERE**
Click the REGION Tab
Go to States and Counties
Hover over your state and move to the right where the counties display.
Select the counties

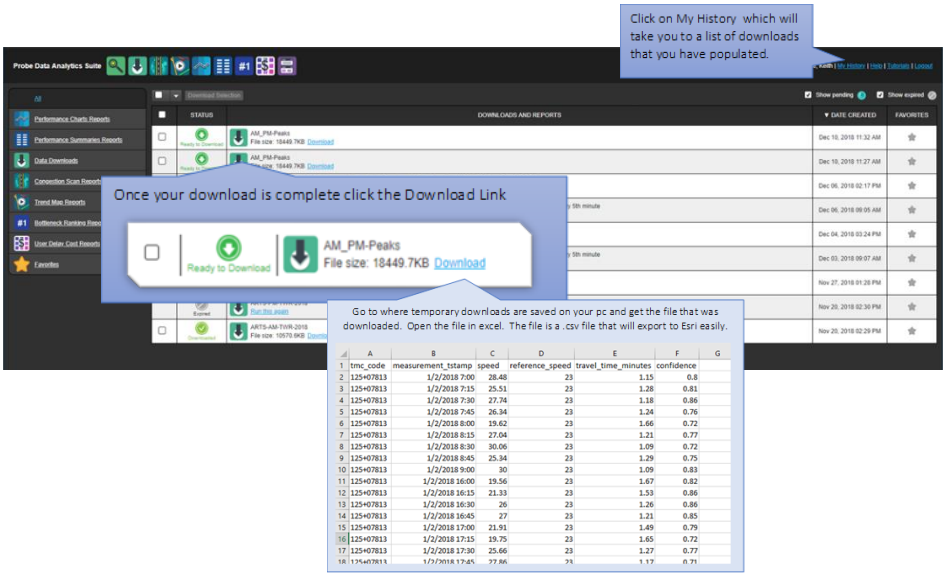


Click out of the county display
Click Add region button
A map of the region you selected will populate.

Question 2:
2018 full year is chosen as the date range for the data
Question 3:
Tuesday, Wednesday and Thursday
Question 4:
Specific peak times were chosen
7:00am to 9:00am
4:00pm to 6:00pm
Question 5:
Selected data sources and measures are
HERE by speed, reference speed, travel time and confidence
Question 6:
Travel time: Choose Minutes
Question 7:
Averaging by 15 min
Question 8:
Key in the name of your csv file: we chose AM_PM Peaks
Question 9:
Place a checkmark so that you get notified once the data has been downloaded
Final Step:
Click SUBMIT button

After clicking “Submit”, the user will be notified the request has been submitted for completion.





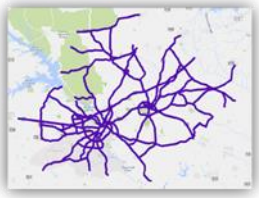
	A	B	C	D	E	F
1	tmc_code	measurement_tstamp	speed	reference_speed	travel_time_minutes	confidence
2	125+07813	1/2/2018 7:00	28.48	23	1.15	0.8
3	125+07813	1/2/2018 7:15	25.51	23	1.28	0.81
4	125+07813	1/2/2018 7:30	27.74	23	1.18	0.86
5	125+07813	1/2/2018 7:45	26.34	23	1.24	0.76
6	125+07813	1/2/2018 8:00	19.62	23	1.66	0.72
7	125+07813	1/2/2018 8:15	27.04	23	1.21	0.77
8	125+07813	1/2/2018 8:30	30.06	23	1.09	0.72
9	125+07813	1/2/2018 8:45	25.34	23	1.29	0.75
10	125+07813	1/2/2018 9:00	30	23	1.09	0.83
11	125+07813	1/2/2018 16:00	19.56	23	1.67	0.82
12	125+07813	1/2/2018 16:15	21.33	23	1.53	0.86
13	125+07813	1/2/2018 16:30	26	23	1.26	0.86
14	125+07813	1/2/2018 16:45	27	23	1.21	0.85
15	125+07813	1/2/2018 17:00	21.91	23	1.49	0.79
16	125+07813	1/2/2018 17:15	19.75	23	1.65	0.72
17	125+07813	1/2/2018 17:30	25.66	23	1.27	0.77
18	125+07813	1/2/2018 17:45	27.86	23	1.17	0.71

24 Hour Profile:

This section downloads the 24 Hour Profile used to display the 24 Hour Speed profile within the ARTS Dashboard.

Question 1:
Select TMC Segments from **HERE**
Click the REGION Tab
Go to States and Counties
Hover over your state and move to the right where the counties display.
Select the counties

Click out of the county display
Click Add region button
A map of the region you selected will populate.



Question 2:
2018 full year is chosen as the date range for the data
Question 3:
Tuesday, Wednesday and Thursday
Question 4:
Specific peak times were chosen
24 Hours. Leave the defaulted time as is
Question 5:
Selected data sources and measures are
HERE by speed, reference speed, travel time and confidence
Question 6:
Travel time: Choose Minutes
Question 7:
Averaging by 1 Hour
Question 8:
Key in the name of your csv file: we chose ARTS_24HR_1HR_Breakdown
Question 9:
Place a checkmark so that you get notified once the data has been downloaded
Final Step:
Click SUBMIT button

	A	B	C	D	E	F
1	tmc_code	measurement_tstamp	speed	reference_speed	travel_time_seconds	confidence
2	125+07813	1/2/2018 0:00	28.49	23	68.73	0.7
3	125+07813	1/2/2018 1:00	29	23	67.52	0.69
4	125+07813	1/2/2018 2:00	31.4	23	62.36	0.72
5	125+07813	1/2/2018 3:00	26.14	23	74.92	0.7
6	125+07813	1/2/2018 4:00	29	23	67.52	0.69
7	125+07813	1/2/2018 5:00	29.15	23	67.17	0.71
8	125+07813	1/2/2018 6:00	27.15	23	72.13	0.77
9	125+07813	1/2/2018 7:00	26.97	23	72.61	0.81
10	125+07813	1/2/2018 8:00	24.9	23	78.65	0.74
11	125+07813	1/2/2018 9:00	30.19	23	64.85	0.78
12	125+07813	1/2/2018 10:00	23.34	23	83.91	0.76
13	125+07813	1/2/2018 11:00	23.88	23	82.01	0.84
14	125+07813	1/2/2018 12:00	18.78	23	104.24	0.71
15	125+07813	1/2/2018 13:00	19.91	23	98.32	0.74
16	125+07813	1/2/2018 14:00	25.37	23	77.18	0.8
17	125+07813	1/2/2018 15:00	22.93	23	85.41	0.82
18	125+07813	1/2/2018 16:00	21.76	23	89.99	0.85

For additional details on the characteristics and metadata of the HERE Probe Data Please refer to the following website: https://pda.ritis.org/suite/help/#data-types/vendor/here or view the main metadata below:

Speed — The current estimated harmonic mean speed for the roadway segment in miles per hour.

Reference Speed — The calculated "free flow" mean speed for the roadway segment in miles per hour. This attribute is calculated based upon the 85th-percentile point of the observed speeds on that segment for all time periods, which establishes a reliable proxy for the speed of traffic at free-flow for that segment.

Travel Time — Time it will take to drive along the roadway segment (Distance Traveled / Speed).

Confidence — This is a simple confidence factor.

- Between 0.7 and 1.0 (including 1.0) — high confidence, based on real-time data for that specific segment
- Between 0.5 and 0.7 (including 0.7) — medium confidence, based on a combination of historic and real-time data
- Between 0.0 and 0.5 (including 0.5) — lower confidence, based primarily on road reference speeds

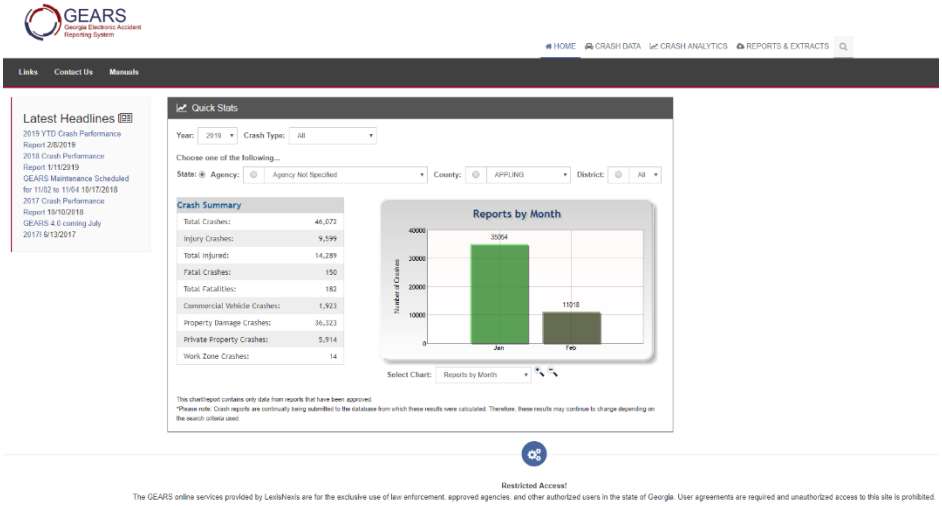
These fields are associated with each (Traffic Message Channel) TMC segment:

- datasource - the data set this record comes from. This field is only included in Massive Data Downloader exports when choosing to merge the data sets into a single CSV file.
- tmc - the unique 9-digit value identifying the TMC segment.
- road - the route number or common name of the roadway
- direction - the overall direction of the roadway
- intersection - the cross street and/or interchange associated with the TMC segment
- state - the postal abbreviation of the state to which the TMC Segment is assigned
- miles - the length of the TMC segment
- road_order - a numerical value indicating in what order the TMC segment would be encountered when traveling downstream relative to the other TMC segments on the same road
- start_latitude - the latitude of the beginning of the TMC segment
- start_longitude - the longitude of the beginning of the TMC segment
- end_latitude - the latitude of the end of the TMC segment
- end_longitude - the longitude of the end of the TMC segment
- tmclinear - a reference to the "Linear TMC" that includes the TMC Segment. Typically, several TMC Segments are part of a Linear TMC, which usually represents a road corridor through a single county. The purpose of this column is to provide assistance for filtering and locating TMC Segments and simplifying the process of linking consecutive TMC Segments.
- type - the type of tmc code. "P1" is the typical TMC Code. "P3" indicates national, state, and county boundaries, rest areas, toll plazas, major bridges, etc. "P4" is for ramps.
- country - the country in which the TMC segment is located

DATASET: Crash Data

Crash data for the ARTS District was collected from two primary sources for each of the two states.

GDOT GEARS Program: The Georgia Electronic Accident Reporting System (GEARS) program available from GDOT provides access to historic crash information and other metrics. The GEARS system can be accessed through the following website:

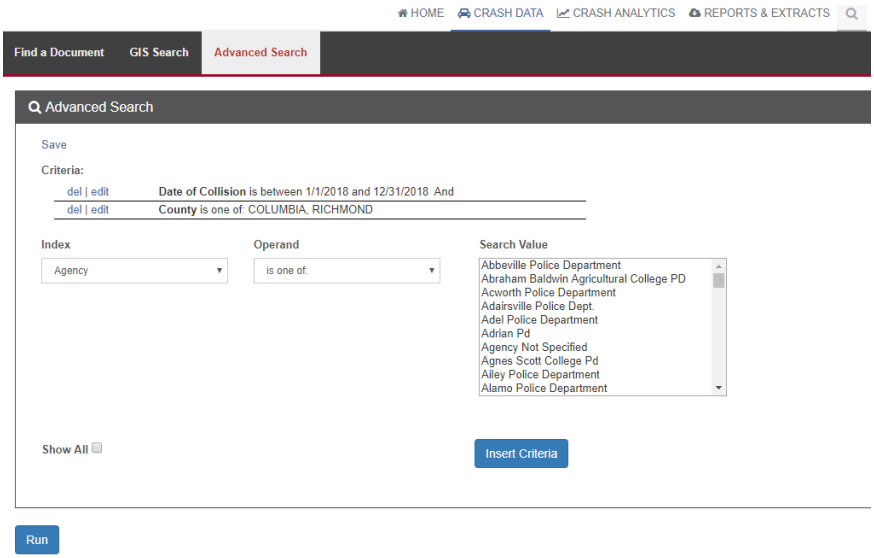


https://www.gearsportal.com/Pages/Public/Home.aspx

Access to the GEARS website requires registration and a secure sign in. To complete or request access send an email to the following gears.support@lexisnexisrisk.com

After receiving access to the GEARS System, proceed to the https://www.gearsportal.com/Pages/Public/Home.aspx website and sign in. This will open the GEARS portal where data can be downloaded.

Selecting the "CRASH DATA" option from the webpage will open a searchable area, use the "Advanced Search" option to perform larger data detailed queries. The queries can be built upon to retrieve the desired information. For the ARTS Dashboard crash data was collected by year over the geography of the two ARTS counties for Georgia, see image on the following page.



Running this process produces a series of informational statistics and provides the various export options available for data download. For the ARTS Dashboard it is necessary to download at a minimum the "Export Results to Excel" option. Please refer to Section 10.1 for further instructions on preparing or working with this data for update to the ARTS Dashboard.

SCDOT Safety:

Crash data for the State of South Carolina was requested and retrieved from SCDOT – Traffic Engineering Safety department. A request was made to this office to receive the crash data for the stated time period and was provided in an Microsoft Excel spreadsheet containing Latitude and Longitude coordinates of the crash along with additional attributes. Please refer to Section 10.1 for further instructions on preparing or working with this data for update to the ARTS Dashboard.

DATASET: Roadway Network

A detailed roadway network file was collected to identify various attributes available within the roadway file. The collection was broken between the two states.

Georgia: The file was made available from GDOT and can be found at the following location: http://www.dot.ga.gov/DS/Data A 2017 Under the "Reports, Guides, & Data" section within the "Downloads" tab a Geodatabase is available for download that contains a wide variety of information and can be found at the following: http://www.dot.ga.gov/DriveSmart/Data/Documents/Road_Inventory_2017_Geodatabase.zip

South Carolina: SCDOT provides a website in which both current and historical data can be downloaded. The website is available at the following location: http://info2.scdot.org/sites/GIS/SitePages/GISFiles.aspx?MapType=Shape

DATASET: Intersections

Collection of a point file representing the latitude and longitude of intersections was attempted across the ARTS District. A file covering the complete ARTS District was unavailable during the collection process. This data was not critical for the update of the CMP.

DATASET: City Boundaries

The jurisdictional representation of city boundaries was reviewed for inclusion in the CMP update process. A source file representing city limits within the Georgia ARTS District was identified.

City limits were not included as a critical layer for the CMP analysis, the ARTS Boundary was used to serve as the main geographic boundary separator used for analysis in the CMP update process and ARTS Dashboard.

DATASET: ARTS Boundaries

The jurisdictional boundary representing the ARTS District was shared by the ARTS GIS team. The ARTS GIS team are the custodians of this dataset and all requests should be directed to the them.

DATASET: County Boundaries

County boundaries were obtained from the U.S. Census Bureau to represent counties across state lines. To obtain county boundaries please proceed to the following website: https://www.census.gov/geo/maps-data/data/tiger.html or directly from the US Census FTP website located at: ftp://ftp2.census.gov/geo/tiger/TIGER2018/COUNTY/tl_2018_us_county.zip

DATASET: Railroad Crossings

Railroad crossings were identified as available from the Bureau of Transportation Statistics (BTS). This data can be downloaded across the ARTS District and are provided from the source with several criteria available. Visit the following web link to learn more and explore the data: https://www.bts.gov/product/state-transportation-statistics This data was not critical for the update of the CMP.

DATASET: Military Bases

Military Installations, Ranges, and Training Areas are available for download from the following website: https://catalog.data.gov/dataset/military-installations-ranges-and-training-areas

This file is maintained and compiled by the Department of Defense (DoD). This data was not critical for the update of the CMP.

DATASET: Annual Traffic Crash and Intersection Report

The Annual Traffic Crash and Intersection Report was collected as part of this effort to provide crash information from the previous year. This report is created and maintained by ARTS.

DATASET: Bus Facilities, Bus Stops, Pedestrian Signals, Signalized Intersections, Sidewalks, Bus Routes, Driveways, Building and Entrance Features

Several datasets were collected directly from the ARTS District. These various datasets are maintained by the ARTS GIS team and this group can provide the information.

DATASET: Annual Average Daily Traffic (AADT), Average Annual Daily Truck Traffic (AADTT), and Level of Service (LOS)

These three datasets representing roadway traffic volume were not available or could not be fully sourced at the time of data collection across the ARTS District. Some elements were able to be identified and alternatives datasets were used in the CMP Update and review.

DATASET: Route ID, Beginning and Ending Mileage Point (MP)

This data was made available for both GDOT and SCDOT. The GDOT latest update file was 2016 and SCDOT file was 2017. This data can be found at the following:

Georgia: The file was made available from GDOT and can be found at the following location: http://www.dot.ga.gov/DS/Data A 2017 Under the "Reports, Guides & Data" section within the "Downloads" tab a Geodatabase is available for download that contains a wide variety of information and can be found at the following: http://www.dot.ga.gov/DriveSmart/Data/Documents/Road_Inventory_2017_Geodatabase.zip

South Carolina: SCDOT provides a website in which both current and historical data can be downloaded. The website is available at the following location: http://info2.scdot.org/sites/GIS/SitePages/GISFiles.aspx?MapType=Shape

DATASET: Speed Limits

A comprehensive speed limit file of all roadways in the ARTS District was unavailable. This data was available in part for the South Carolina portion of the ARTS planning area but could not be located for the Georgia state portion. Speed limit data was not required as part of this project as the Probe Data Analytics System contained the average speed and free flow speed information for each TMC segment.

DATASET: Function Type, Surface Type, Average Lane Width, Shoulder Width, Shoulder Type, Barrier, Median Type, NHS Type, Number of Lanes

Additional roadway characteristic information collection was performed for the above listed items. However, the data was unavailable for the complete ARTS planning area. Several of these datasets were available on the Georgia side of the ARTS planning area.

GDOT files and information can be found at the following location: http://www.dot.ga.gov/DS/Data Under the "Reports, Guides & Data" section within the "Downloads" tab, a 2017 Geodatabase is available for download that contains a wide variety of information and can be found at the following: http://www.dot.ga.gov/DriveSmart/Data/Documents/Road_Inventory_2017_Geodatabase.zip

10 Monitoring and Performance Reporting Process

Performance measures are a major component of the Congestion Management Process (CMP). The performance measures defined in this section have been used to complete previous Tasks of the CMP update and contain the information that is used for display and analysis within the ARTS Dashboard. The following sections provide a guide to the calculation of performance measures (Section 10.1) and the necessary format and data structure needed for inclusion in the ARTS Dashboard (Section 10.2).

Section 10.1 includes a series of step by instructions completed in ArcGIS Pro (Dataset: HERE Probe Data) and ArcGIS Desktop (Dataset: Crash). The general steps for performance measure calculation are the same in either program. The two different examples were used to provide a guided walkthrough in both ArcGIS platforms to allow ARTS staff the maximum flexibility in completing these steps.

10.1 Calculation of Performance Measures and Data Extract Transfer and Load (ETL) Processes

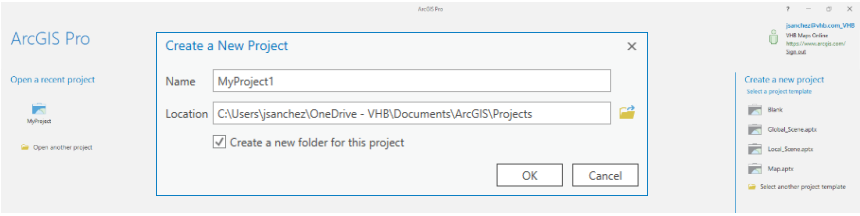
DATASET: HERE Probe Data

The following will assist in guiding a user through the process of analyzing the HERE Probe Data. While the dashboard is available through ArcGIS Online, the instructions in this section require the user to have ArcGIS installed on their personal computer and requires knowledge of GIS and familiarity with ArcGIS.

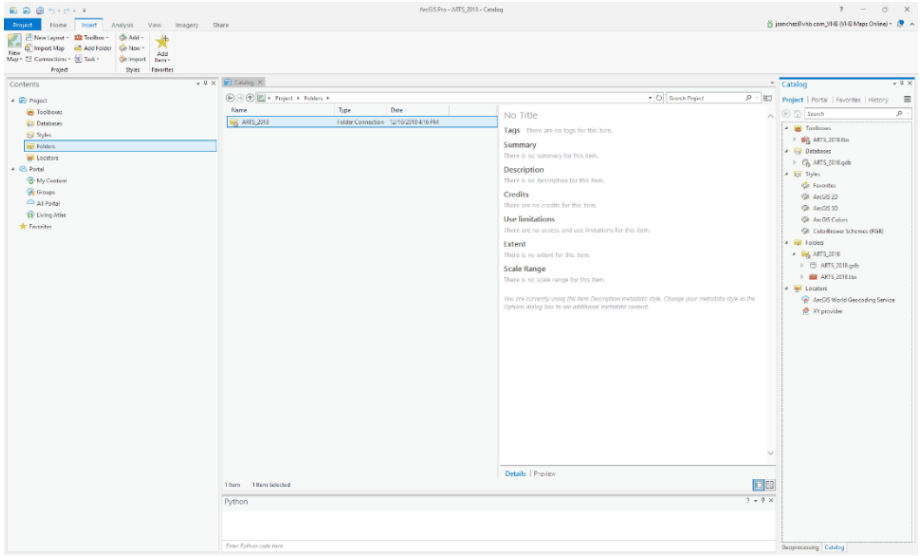
STEP 1 – Create a New Project in ArcGIS Pro

Start a project in ArcGis Pro by following these steps:

1. Open ArcGis Pro
2. Click a blank project



3. "Create a New Project" window appears
4. Enter "Name"
5. Enter Project "Location"
6. Click OK button

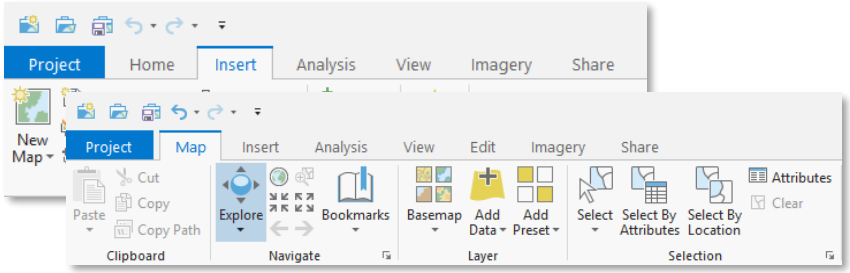


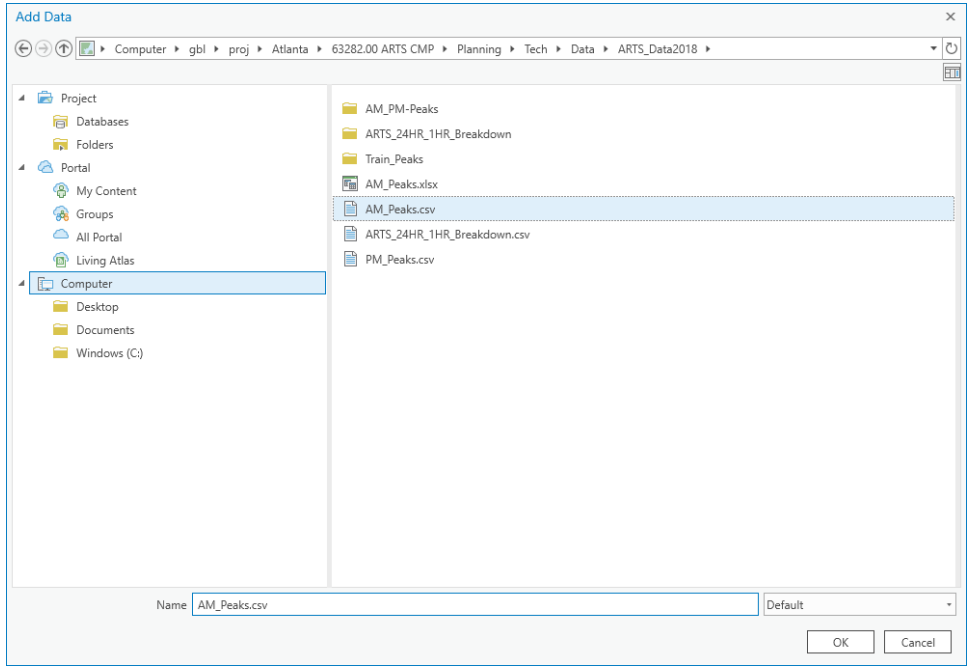
STEP 2 – Add .csv Data Files

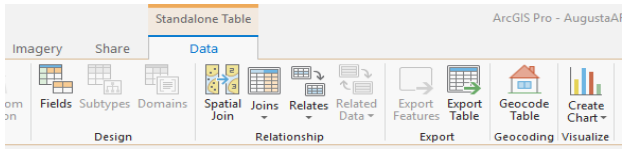
Now that a project has been created, add the .csv files that will be used for the calculations

1. Click “Insert” tab
2. Click New Map icon
3. Click Add Data Icon
4. Add Data window displays
5. Click file(s) to be added *(AM, PM & 24hour .csv files)*
6. Click OK button

All files will display in the “Contents Screen” (left side panel) under the “Standalone Tables”





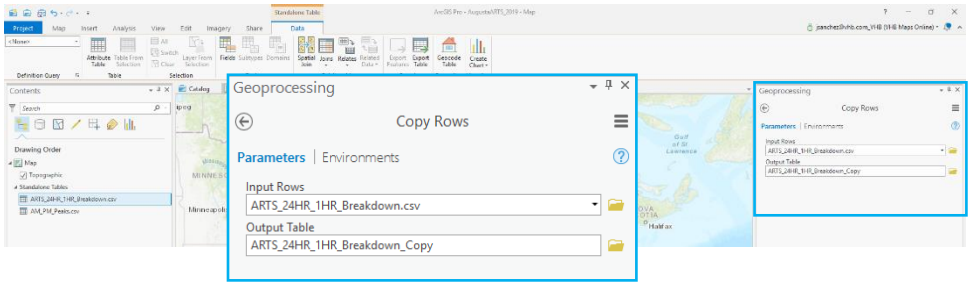


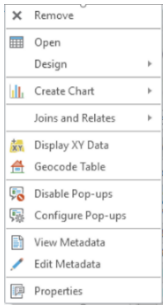
STEP 3 – Create Table

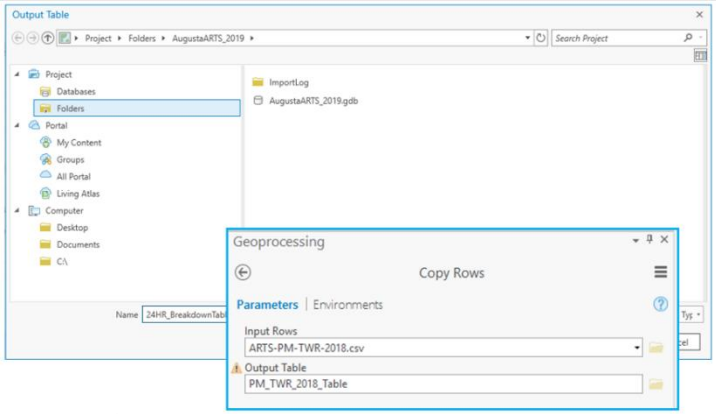
Transform the .csv files to tables

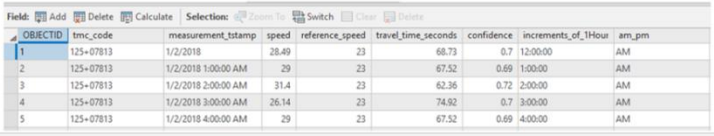
1. Click Data Tab
2. Click Export Table
3. Populates the "Geoprocessing Screen" (on the left)
4. "Input Rows": Displays the Name of the file that will be converted into a table *(AM, PM & 24hour .csv files)*
5. "Output Table": Displays a default Name of the table (can be changed)
6. Click the folder icon (right side) To change name and location
7. A window will display
8. Type in the "Name" of the table
9. Click Save button
10. Click Run button (bottom right side)
11. The table will appear on the left "Contents" screen
12. Click Right on the table name to Open the table

When a table is created it will add an OBJECTID field. If the grid displays the OBJECTID field then it was successful.









OBJECTID	tmc_code	measurement_tstamp	speed	reference_speed	travel_time_seconds	confidence	increments_of_1Hour	am_pm
1	125+07813	1/2/2018	28.49	23	68.73	0.7	12:00:00	AM
2	125+07813	1/2/2018 1:00:00 AM	29	23	67.52	0.69	1:00:00	AM
3	125+07813	1/2/2018 2:00:00 AM	31.4	23	62.36	0.72	2:00:00	AM
4	125+07813	1/2/2018 3:00:00 AM	26.14	23	74.92	0.7	3:00:00	AM
5	125+07813	1/2/2018 4:00:00 AM	29	23	67.52	0.69	4:00:00	AM

STEP 4 – Summary Statistics Table

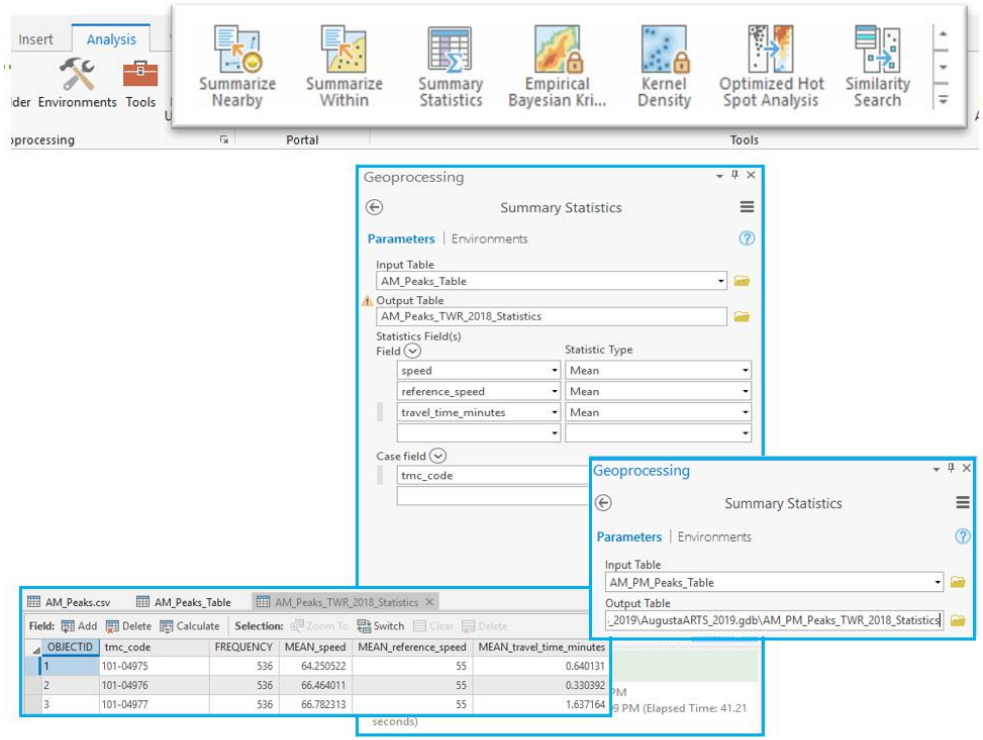
The statistics table averages out the speed, reference speed and travel time seconds fields by tmc code.

1. Click Analysis Tab
2. Click the dropdown arrow
3. Click Summary Statistics
4. Input Table: Click dropdown arrow
5. Click table name to calculate *(AM &PM table files)*
6. Output Table: Default name will populate

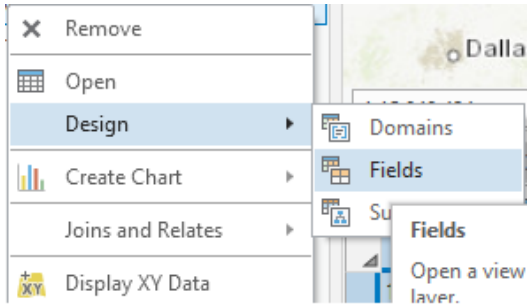
Field:	Statistic Type:
speed	Mean
reference_speed	Mean
travel_time_seconds	Mean

Case Field:
tmc_code

7. Click Run button

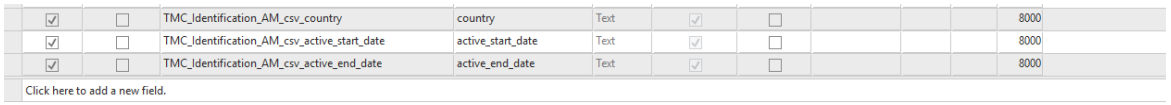


STEP 5 – Adding Fields to Statistics Table



The statistics table averages out the speed, reference speed and travel time seconds fields by tmc code.

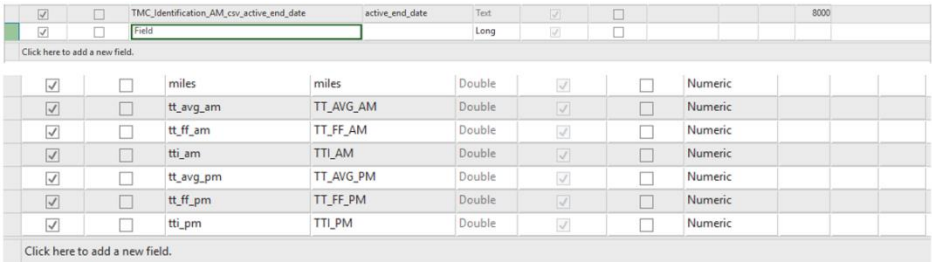
1. Click Right (mouse) on statistics file *(AM, PM table files)*
2. Click Design
3. Click Fields
4. The following grid will display
5. Click "Click here to add a new field" (located bottom of the grid)



6. Add new fields to the table (change AM to PM for the PM table)

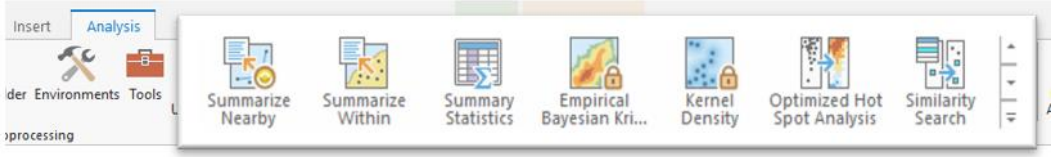
miles	Miles	Double
tt_avg_am	TT_AVG_AM	Double
tt_ff_am	TT_FF_AM	Double
tti_am	TTI_ AM	Double

7. Click Save Icon (top of screen)



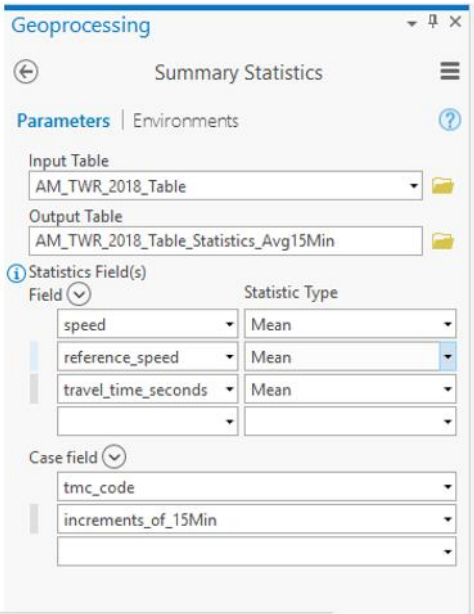
STEP 6 – Calculating the Average 15 Minutes Table

The Average Minutes table separates by 15 increments.



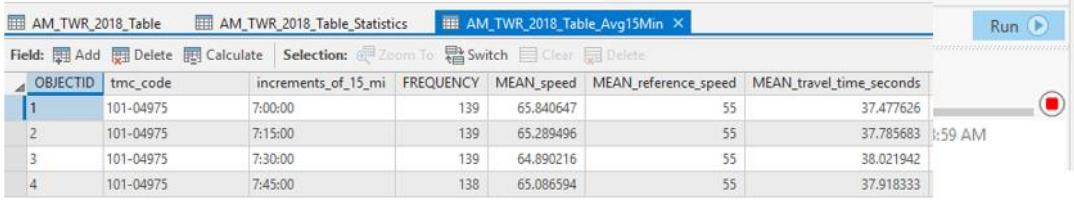
Analysis Tab

1. Click Analysis Tab
2. Click the down arrow
3. Click Summary Statistics
4. Input Table: Click dropdown arrow
5. Click table name to calculate *(AM, PM table files)*
6. Output Table: Default name will populate



Field:	Statistic Type:
speed	Mean
reference_speed	Mean
travel_time_seconds	Mean

Case Field:
tmc_code
increments_of_15_min



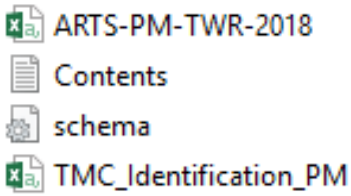
OBJECTID	tmc_code	increments_of_15_mi	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds
1	101-04975	7:00:00	139	65.840647	55	37.477626
2	101-04975	7:15:00	139	65.289496	55	37.785683
3	101-04975	7:30:00	139	64.890216	55	38.021942
4	101-04975	7:45:00	138	65.086594	55	37.918333

7. Click Run button

STEP 7 – Add Join

After adding the fields, the user will add the TMC_Identification_PM file to the Statistics table.

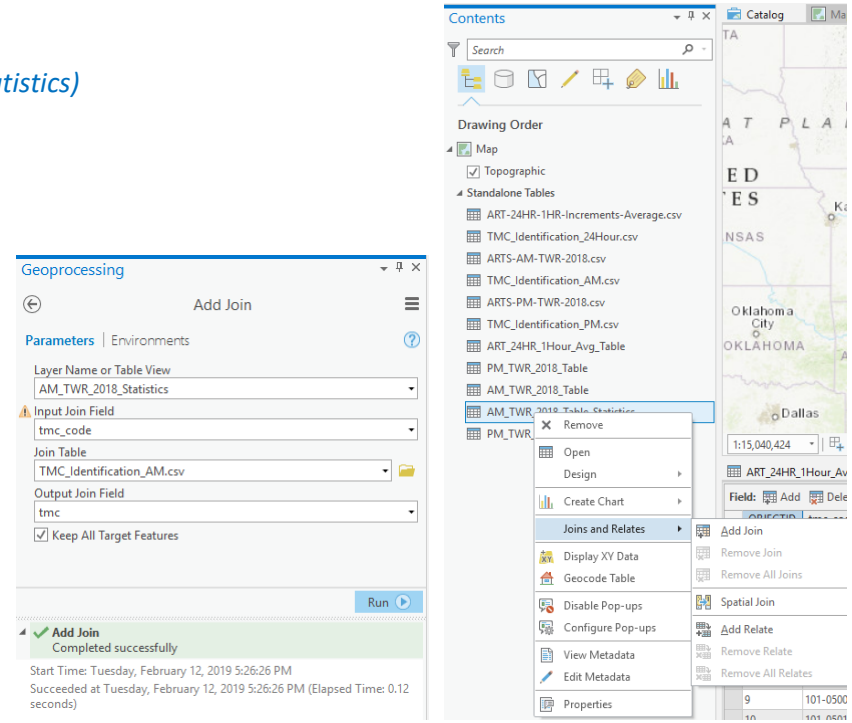
Select the file that will be the new joined table



1. AM_TWR_2018_Statistics
2. PM_TWR_2018_ Statistics

   ADD the Join

3. Click on the file *(**AM**_TWR_2018_Statistics & **PM**_TWR_2018_ Statistics)*
4. Click Right (mouse)
5. Click Joins and Relates
6. Click Add Join
7. Add Join Screen will populate on right side



Layer Name or Table View:

8. AM_TWR_2018_Statistics
9. PM_TWR_2018_ Statistics
10. Click the Input Join Field drop down
11. Select tmc_code field
12. Click the Join Table drop down
13. Select *TMC_Identification_AM.csv* & *TMC_Identification_PM.csv*
14. Click the Output Join Field dropdown
15. Select tmc field

16. Click Run
17. The added fields from the TMC .csv file will display in the updated table

AM_TWR_2018_Statistics

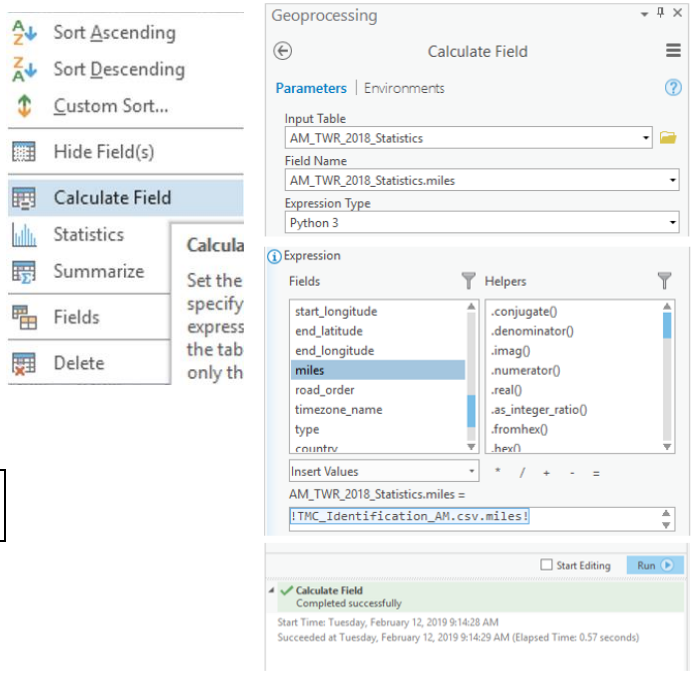
Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete

OBJECTID	tmc_code	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds	miles	tmc	road	direction	intersection
1	101-04975	1247	65.199366	55	37.868003	<Null>	101-04975	I-20	EASTBOUND	GEORGIA/SO
2	101-04976	1247	66.377883	55	19.940048	<Null>	101-04976	I-20	EASTBOUND	GA-104/RIVE
3	101-04977	1247	67.271291	55	97.053737	<Null>	101-04977	I-20	EASTBOUND	GA-28/WASH

STEP 8 – Miles – Travel Time Increments (TTI)

Calculate the Miles field to calculate the miles

1. Right Click on the field name
2. Click Calculate Field



Field:	Helpers:
miles	n/a

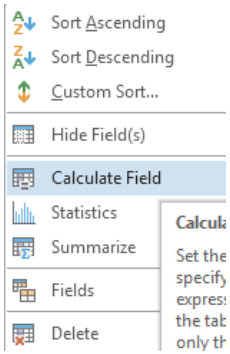
Type in the formula for calculations	miles	!TMC_Identification_AM.csv.miles!
Code Block	n/a	

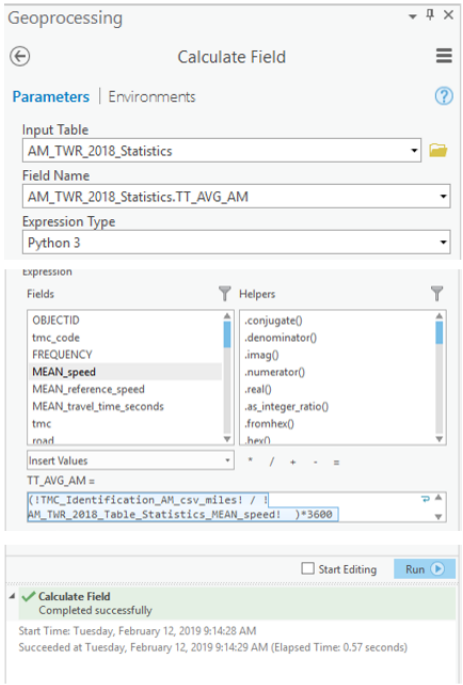
3. Click Run button

STEP 9 – TT_AVG_AM – Travel Time Increments (TTI)

Calculate the Travel Time Average to display avg in added average travel time field

1. Right Click on the field name
2. Click Calculate Field





Field:	Helpers:
miles	n/a
Mean_ speed	n/a

Type in the formula for calculations	TT_AVG_AM:	(!TMC_Identification_AM.csv.miles! / !AM_TWR_2018_Statistics.MEAN_speed!)

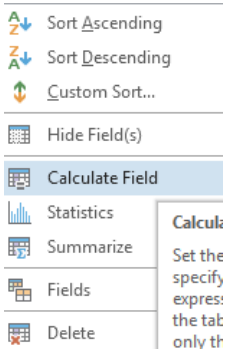
Code Block:	n/a

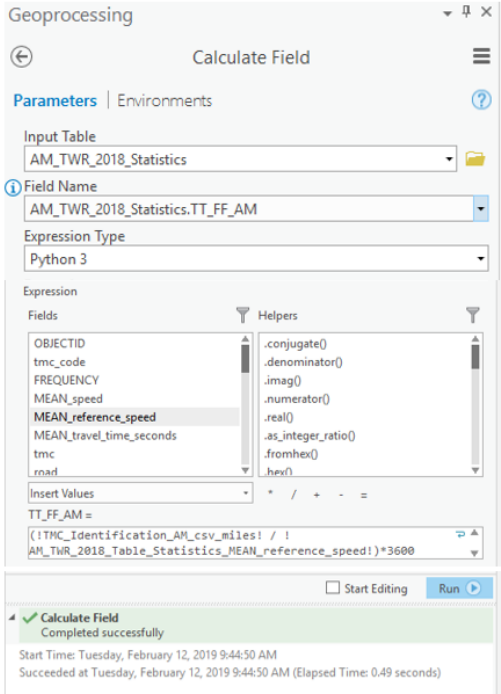
3. Click Run button

STEP 10 – TT_FF_AM – Travel Time Increments (TTI)

Calculate the Travel Time Free Flow to display avg in added average travel time free flow field

1. Right Click on the field name
2. Click Calculate Field





Field:	**Helpers:**
Miles	n/a
Mean_reference_speed	n/a

Type in the formula for calculations	TT_FF_AM	(!TMC_Identification_AM.csv.miles! / !AM_TWR_2018_Statistics.MEAN_reference_speed!)

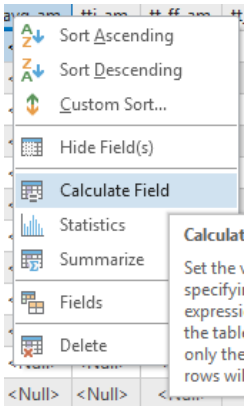
Code Block:	n/a

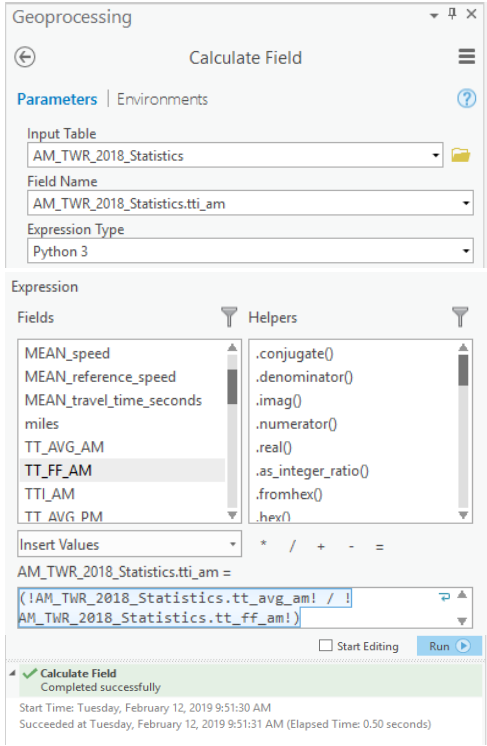
3. Click Run button

STEP 11 – TTI_AM – Travel Time Increments (TTI)

Calculate the Travel Time to display avg in added average travel time field

1. Right Click on the field name
2. Click Calculate Field





Field:	Helpers:
tt_avg_am	n/a
tt_ff_am	n/a

Type in the formula for calculations	**TTI_AM:**	(!AM_TWR_2018_Statistics.tt_avg_am! / !AM_TWR_2018_Statistics.tt_ff_am!)

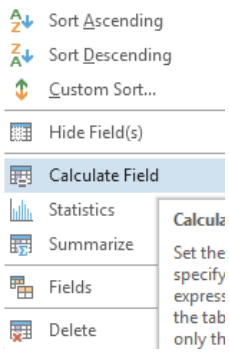
Code Block:	n/a

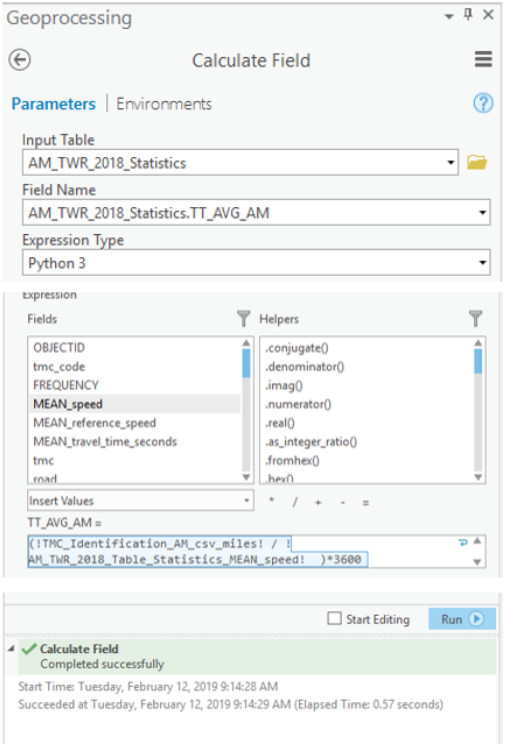
3. Click Run button

STEP 12 – TT_AVG_PM – Travel Time Increments (TTI)

Calculate the Travel Time to display avg in added average travel time field

1. Right Click on the field name
2. Click Calculate Field





Field:	Helpers:
miles	n/a
Mean_ speed	n/a

Type in the formula for calculations	TT_AVG_PM:	(!TMC_Identification_PM_csv_miles! / !PM_TWR_2018_Table_Statistics_MEAN_speed!)*3600

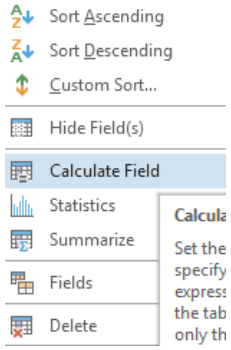
Code Block:	n/a

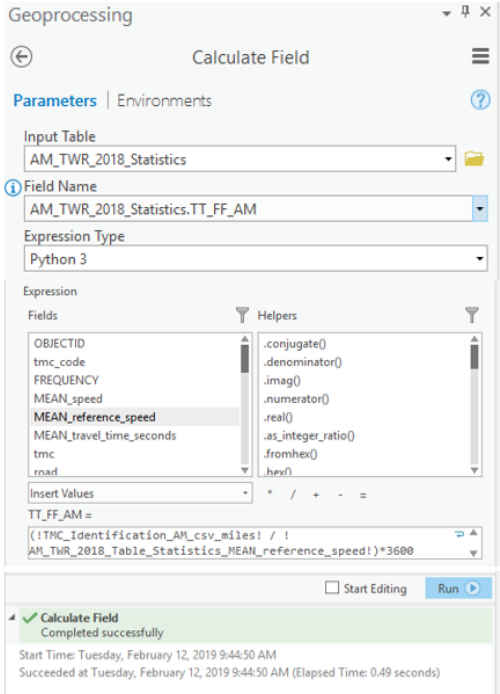
3. Click Run button

STEP 13 – TT_FF_PM – Travel Time Increments (TTI)

Calculate the Travel Time Free Flow to display avg in added average travel time free flow field

1. Right Click on the field name
2. Click Calculate Field





Field:	**Helpers:**
Miles	n/a
Mean_reference_speed	n/a

Type in the formula for calculations	**TT_FF_AM:**	(!TMC_Identification_PM_csv_miles! / !PM_TWR_2018_Table_Statistics_MEAN_reference_speed!)*3600

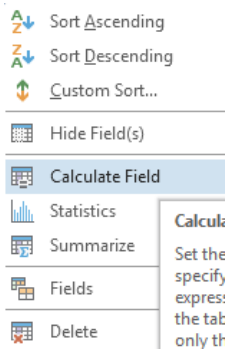
Code Block:	n/a

3. Click Run button

STEP 14 – TTI_PM – Travel Time Increments (TTI)

Calculate the Travel Time to display avg in added average travel time field

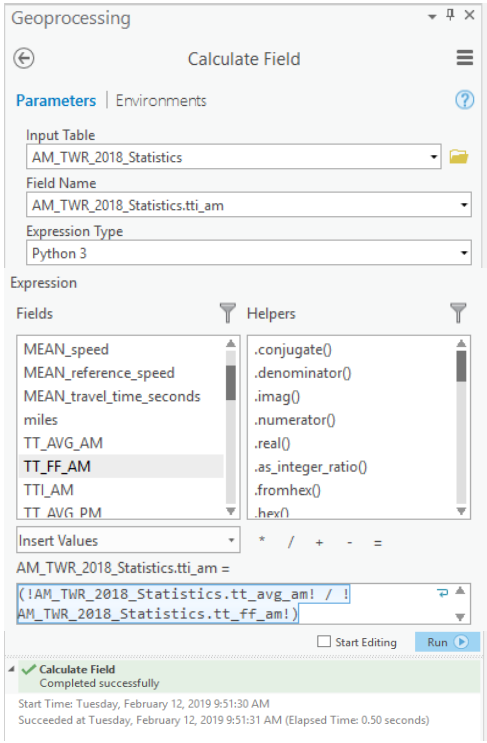
1. Right Click on the field name
2. Click Calculate Field



Field:	Helpers:
tt_avg_pm	n/a
tt_ff_pm	n/a

Type in the formula for calculations	TTI_PM:	!TT_AVG_PM! / !TT_FF_PM!

Code Block:	n/a



3. Click Run button

STEP 15 – 24 Hour Statistics Table

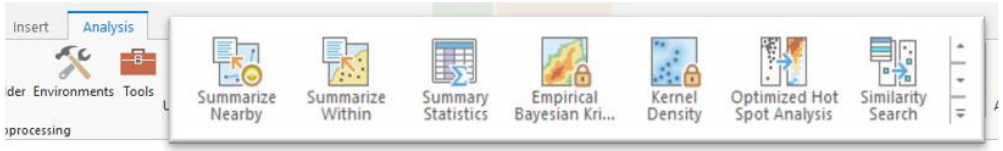
The statistics table averages out the speed, reference speed and travel time seconds fields by tmc code.

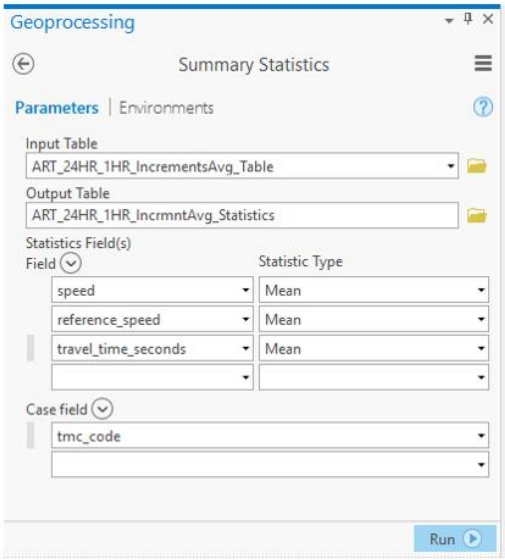
1. Click Analysis Tab
2. Click the down arrow
3. Click Summary Statistics
4. Input Table: Click dropdown arrow
5. Click table name to calculate *(24 hour table files)*
6. Output Table: Default name will populate

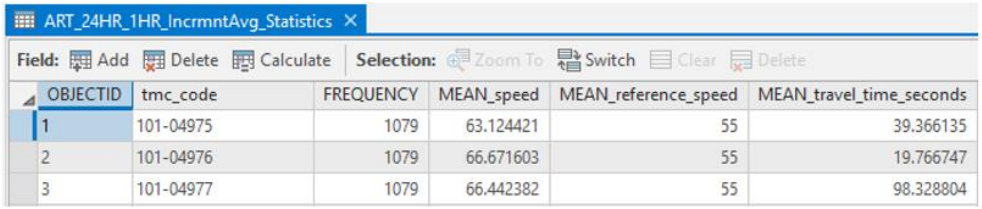
Field:	**Statistic Type:**
speed	Mean
reference_speed	Mean
travel_time_seconds	Mean

Case Field:
tmc_code

7. Click Run button

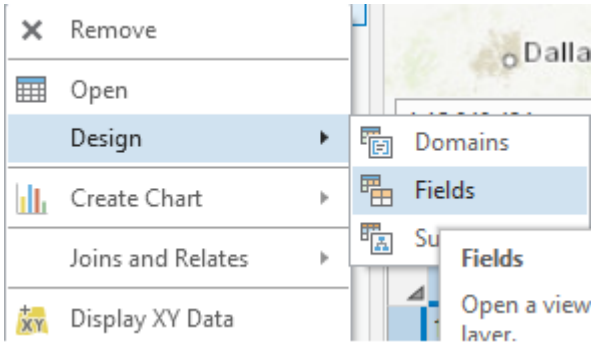






OBJECTID	tmc_code	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds
1	101-04975	1079	63.124421	55	39.366135
2	101-04976	1079	66.671603	55	19.766747
3	101-04977	1079	66.442382	55	98.328804

STEP 16 – Adding fields to the 24-Hour Statistics Table



Add the following fields to the table

1. Click Right (mouse) on statistics file
2. Click Design
3. Click Fields
4. The following grid will display

Current Layer: ART_24HR_1HR_Statistics

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
☑	☑	OBJECTID	OBJECTID	Object ID		☐	Numeric			
☑	☐	tmc_code	tmc_code	Text	☑	☐				8000
☑	☐	FREQUENCY	FREQUENCY	Long	☑	☐	Numeric			
☑	☐	MEAN_speed	MEAN_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_reference_speed	MEAN_reference_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_travel_time_seconds	MEAN_travel_time_seconds	Double	☑	☐	Numeric			

Click here to add a new field.

5. Click the “Click here to add a new field” (located at the bottom of the grid)
6. Add New fields

Visible	ReadOnly	Field Name	Alias (This is what displays on screen)	Data Type	Allow Null	Highlight	Number Format	Domain	Default	Length
Click to add check mark	Leave empty	miles	Miles	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tt_avg	TT_AVG	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tt_ff	TT_FF	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tti	TTI	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty

7. Click Save Icon (on top)
8. The following grid will display with the new fields

Fields: ART_24HR_1HR_Statistics

Current Layer: ART_24HR_1HR_Statistics

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
☑	☑	OBJECTID	OBJECTID	Object ID		☐	Numeric			
☑	☐	tmc_code	tmc_code	Text	☑	☐				8000
☑	☐	FREQUENCY	FREQUENCY	Long	☑	☐	Numeric			
☑	☐	MEAN_speed	MEAN_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_reference_speed	MEAN_reference_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_travel_time_seconds	MEAN_travel_time_seconds	Double	☑	☐	Numeric			
☑	☐	miles	Miles	Double	☑	☐	Numeric			
☑	☐	tt_avg	TT_AVG	Double	☑	☐	Numeric			
☑	☐	tt_ff	TT_FF	Double	☑	☐	Numeric			
☑	☐	tti	TTI	Double	☑	☐	Numeric			

Click here to add a new field.

9. Click Right (mouse) on the Statistics table to display the new table fields

ART_24HR_1HR_Statistics

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete

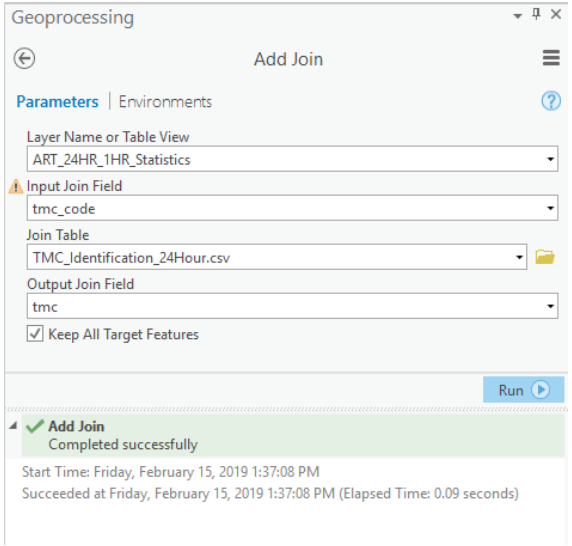
OBJECTID	tmc_code	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds	Miles	TT_AVG	TT_FF	TTI
1	101-04975	1079	63.124421	55	39.366135	<Null>	<Null>	<Null>	<Null>
2	101-04976	1079	66.671603	55	19.766747	<Null>	<Null>	<Null>	<Null>
3	101-04977	1079	66.442382	55	98.328804	<Null>	<Null>	<Null>	<Null>
4	101-04978	1079	67.502743	55	19.430584	<Null>	<Null>	<Null>	<Null>
5	101-04979	1079	67.409833	61	37.665449	<Null>	<Null>	<Null>	<Null>

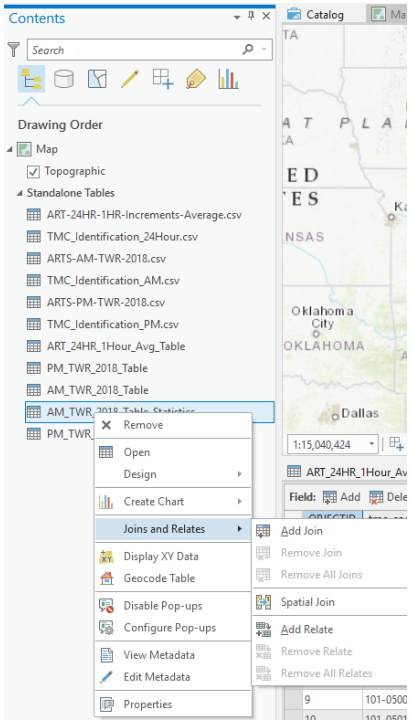
STEP 17 – Add Join Table to Statistics Table

Add Join to Statistics table

1. Click on the file ART_24HR_1HR_Statistics
2. Click Right (mouse)
3. Click Joins and Relates
4. Click Add Join
5. Add Join Screen will populate on right side
6. Layer Name or Table View:

   ART_24HR_1HR_Statistics
7. Click the Input Join Field drop down
8. Select tmc_code field
9. Click the Join Table dropdown
10. Select *TMC_Identification_24Hour.csv*
11. Click the Output Join Field dropdown
12. Select tmc field
13. Click Run
14. The following grid will populate with the added fields from the TMC .csv file





Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete

tmc_code	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds	Miles	TT_AVG	TT_FF	TTI	tmc	road	direction	intersection	state
101-04975	45	63.022444	55	39.191556	<Null>	<Null>	<Null>	<Null>	101-04975	I-20	EASTBOUND	GEORGIA/SOUTH CA...	GA
101-04976	45	66.531111	55	19.699333	<Null>	<Null>	<Null>	<Null>	101-04976	I-20	EASTBOUND	GA-104/RIVER WATC...	GA
101-04977	45	66.091556	55	98.362	<Null>	<Null>	<Null>	<Null>	101-04977	I-20	EASTBOUND	GA-28/WASHINGTO...	GA

STEP 18 – Miles – Travel Time Increments (TTI)

Calculate the Miles field to calculate the miles

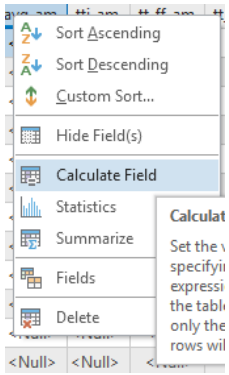
1. Right Click on the field name
2. Click Calculate Field

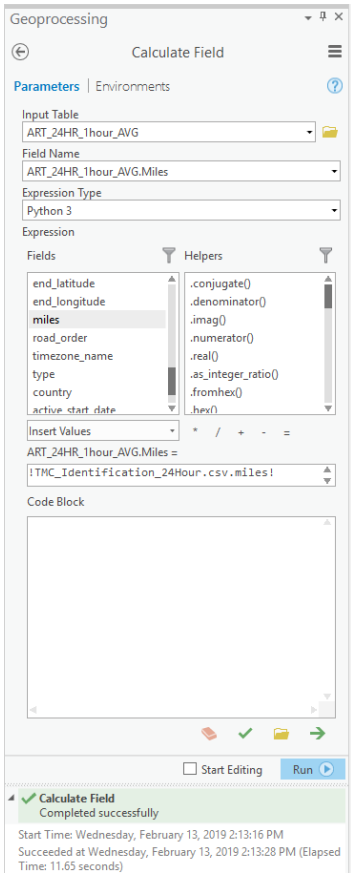
Field:	Helpers:
miles	n/a

Type in the formula for calculations	Miles	!TMC_Identification_24Hour.csv.miles!

Code Block:	n/a

3. Click Run button

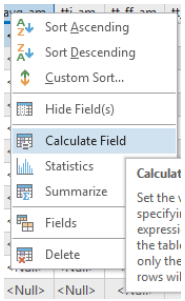




STEP 19 – TT_AVG – Travel Time Increments (TTI)

Calculate the Travel Time Average to display avg in added average travel time field

1. Right Click on the field name
2. Click Calculate Field

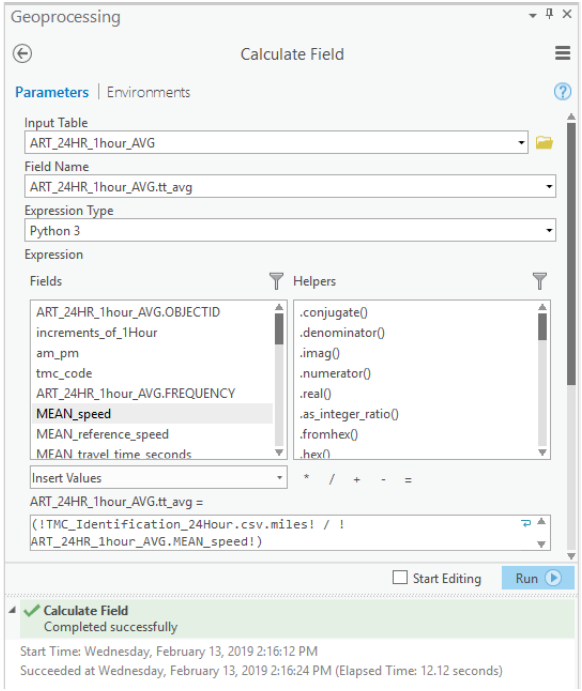


Field:	Helpers:
miles	n/a
Mean_ speed	n/a

Type in the formula for calculations	TT_AVG	(!TMC_Identification_24Hour.csv.miles! / !ART_24HR_1hour_AVG.MEAN_speed!)

Code Block:	n/a

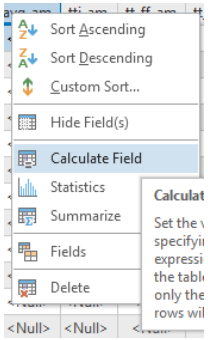
3. Click Run button

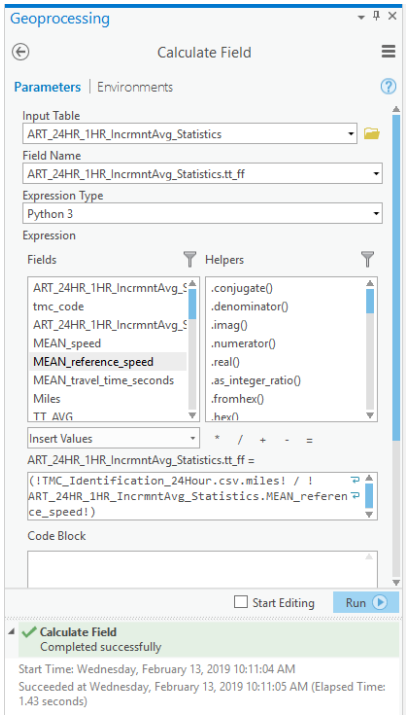


STEP 20 – TT_FF– Travel Time Increments (TTI)

Calculate the Travel Time Free Flow to display avg in added average travel time free flow field

1. Right Click on the field name
2. Click Calculate Field





Field:	Helpers:
Miles	n/a
Mean_reference_speed	n/a

Type in the formula for calculations	TT_FF	(!TMC_Identification_24Hour.csv.miles! / !ART_24HR_1hour_AVG.MEAN_reference_speed!)

Code Block:	n/a

3. Click Run button

STEP 21 – TTI – Travel Time Increments (TTI)

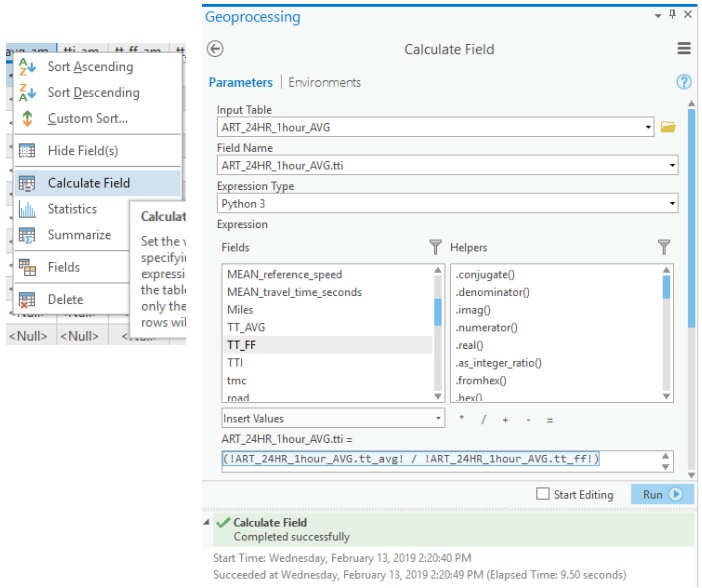
Calculate the Travel Time to display avg in added average travel time field

1. Right Click on the field name
2. Click Calculate Field

Field:	Helpers:
tt_avg_am	n/a
tt_ff_am	n/a

Type in the formula for calculations	TTI	(!ART_24HR_1hour_AVG.tt_avg! / !ART_24HR_1hour_AVG.tt_ff!)

Code Block:	n/a

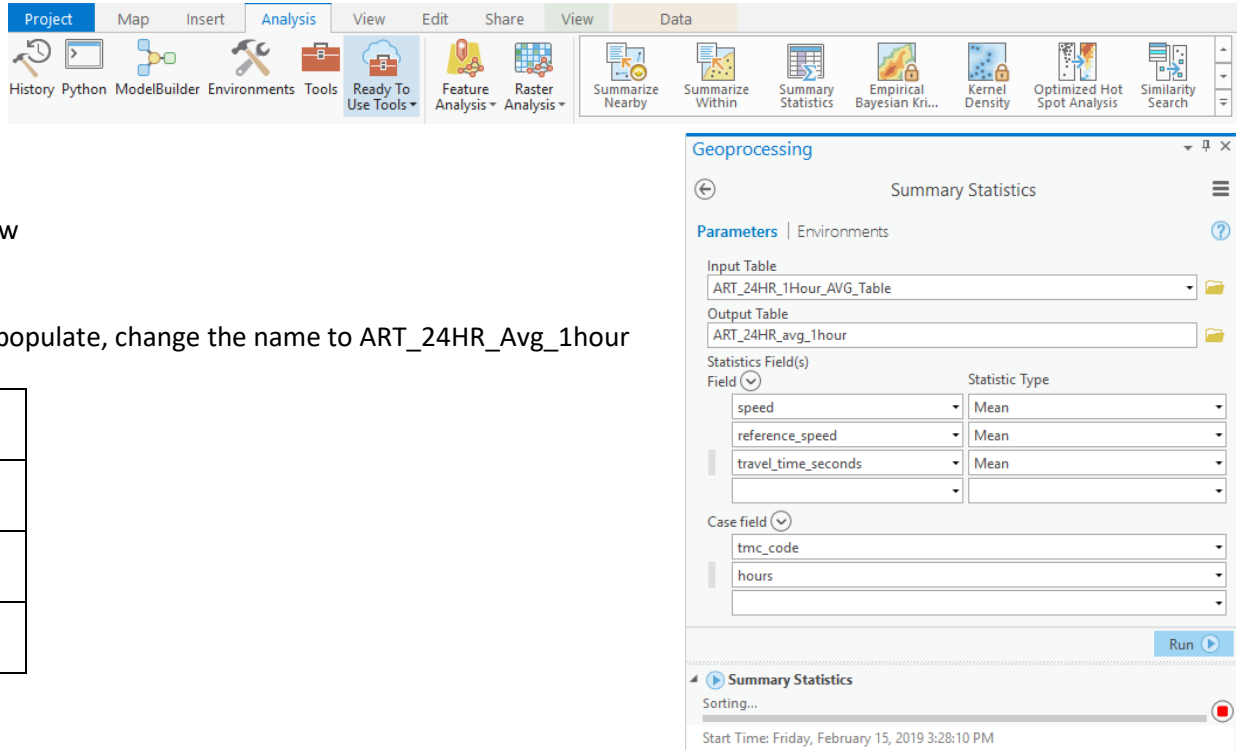


3. Click Run button

STEP 22 – Average 1 Hour / 24 Hour Table

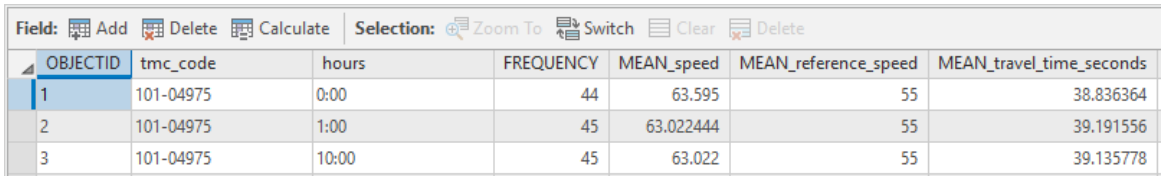
Increments of 1-hour average

1. Click Analysis Tab
2. Click the down arrow
3. Click Summary Statistics
4. Input Table: Click dropdown arrow
5. Click table name to calculate
6. Output Table: Default name will populate, change the name to ART_24HR_Avg_1hour



Field:	Statistic Type:
speed	Mean
reference_speed	Mean
travel_time_seconds	Mean

Case Field:
tmc_code
hours



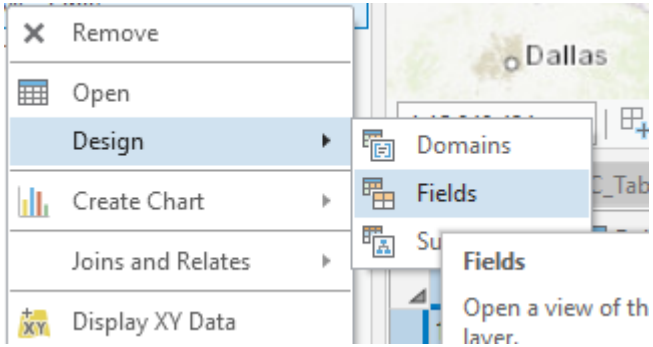
OBJECTID	tmc_code	hours	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds
1	101-04975	0:00	44	63.595	55	38.836364
2	101-04975	1:00	45	63.022444	55	39.191556
3	101-04975	10:00	45	63.022	55	39.135778

7. Click Run
8. Grid will display the averages when complete

STEP 23 – Add fields to 1 Hour Avg Table ART_24HR_Avg_1hour

One Hour Avg table

1. Click Right (mouse) on statistics file
2. Click Design
3. Click Fields
4. The following grid will display



Current Layer: ART_24HR_avg_1hour

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
☑	☑	OBJECTID	OBJECTID	Object ID	☐	☐	Numeric			
☑	☐	tmc_code	tmc_code	Text	☑	☐				
☑	☐	hours	hours	Text	☑	☐				
☑	☐	FREQUENCY	FREQUENCY	Long	☑	☐	Nu			
☑	☐	MEAN_speed	MEAN_speed	Double	☑	☐	Nu			
☑	☐	MEAN_reference_speed	MEAN_reference_speed	Double	☑	☐	Nu			
☑	☐	MEAN_travel_time_seconds	MEAN_travel_time_seconds	Double	☑	☐	Nu			

Click here to add a new field.

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
☑	☑	OBJECTID	OBJECTID	Object ID	☐	☐	Numeric			
☑	☐	tmc_code	tmc_code	Text	☑	☐				8000
☑	☐	hours	hours	Text	☑	☐				8000
☑	☐	FREQUENCY	FREQUENCY	Long	☑	☐	Numeric			
☑	☐	MEAN_speed	MEAN_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_reference_speed	MEAN_reference_speed	Double	☑	☐	Numeric			
☑	☐	MEAN_travel_time_seconds	MEAN_travel_time_seconds	Double	☑	☐	Numeric			
☑	☐	miles	Miles	Double	☑	☐	Numeric			
☑	☐	tt_avg	TT_AVG	Double	☑	☐	Numeric			
☑	☐	tt_ff	TT_FF	Double	☑	☐	Numeric			
☑	☐	tti	TTI	Double	☑	☐	Numeric			

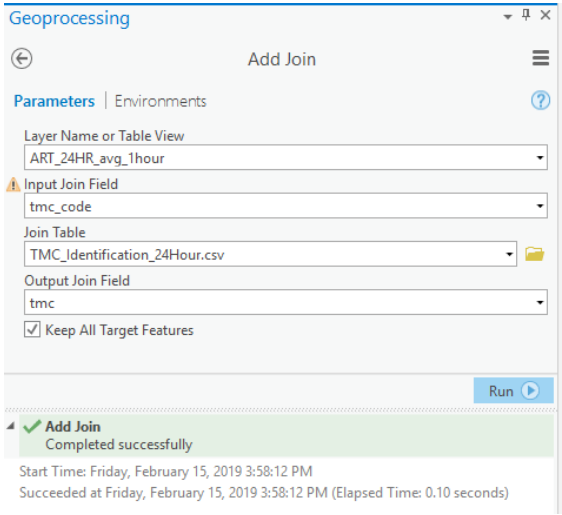
5. Click the "Click here to add a new field" (located at the bottom of the grid)
6. Click Save Icon (on top)

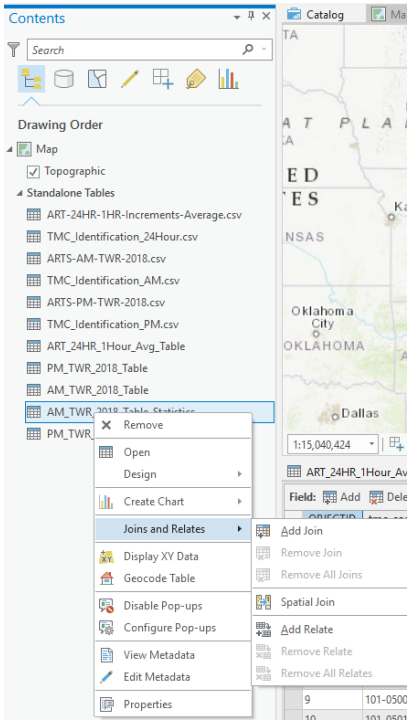
Visible	ReadOnly	Field Name	Alias (This is what displays on screen)	Data Type	Allow Null	Highlight	Number Format	Domain	Default	Length
Click to add check mark	Leave empty	miles	**Miles**	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tt_avg	**TT_AVG**	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tt_ff	**TT_FF**	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty
Click to add check mark	Leave empty	tti	**TTI**	Double	Click to add check mark	Leave empty	Leave Empty	Leave Empty	Leave Empty	Leave Empty

STEP 24 – Add Join Table to 1 Hour Avg Table

Add fields to Statistics table

1. Click on the file ART_24HR_Avg_1hour
2. Click Right (mouse)
3. Click Joins and Relates
4. Click Add Join
5. Add Join Screen will populate on right side
6. Layer Name or Table View:
7. ART_24HR_1HR_IncrmntAvg_Statistics
8. Click the Input Join Field drop down
9. Select tmc_code field
10. Click the Join Table drop down
11. Select *TMC_Identification_24Hour.csv*
12. Click the Output Join Field dropdown
13. Select tmc field
14. Click Run
15. The following grid will populate with the added fields from the TMC .csv file





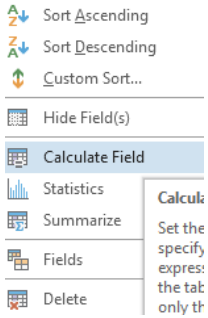
Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete

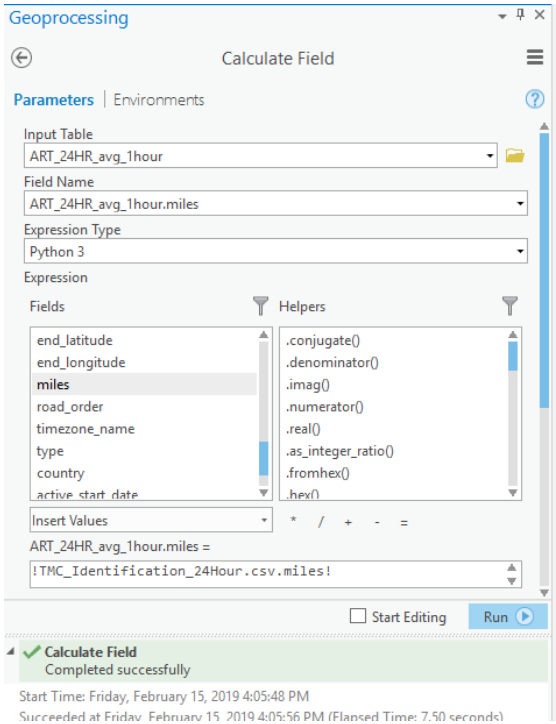
tmc_code	FREQUENCY	MEAN_speed	MEAN_reference_speed	MEAN_travel_time_seconds	Miles	TT_AVG	TT_FF	TTI	tmc	road	direction	intersection	state
101-04975	45	63.022444	55	39.191556	<Null>	<Null>	<Null>	<Null>	101-04975	I-20	EASTBOUND	GEORGIA/SOUTH CA...	GA
101-04976	45	66.531111	55	19.699333	<Null>	<Null>	<Null>	<Null>	101-04976	I-20	EASTBOUND	GA-104/RIVER WATC...	GA
101-04977	45	66.091556	55	98.362	<Null>	<Null>	<Null>	<Null>	101-04977	I-20	EASTBOUND	GA-28/WASHINGTO...	GA

STEP 25 – Miles – Travel Time Increments (TTI)

Calculate the Miles field to calculate the miles

1. Right Click on the field name
2. Click Calculate Field
3. Choose miles and enter the fields to calculate





Field:	Helpers:
miles	n/a

Type in the formula for calculations	Miles	!TMC_Identification_24Hour.csv.miles!

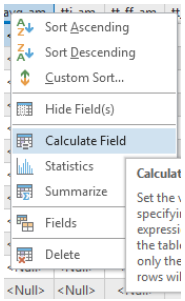
Code Block:	n/a

4. Click Run button

STEP 26 – TT_AVG – Travel Time Increments (TTI)

Calculate the Travel Time Average to display avg in added average travel time field

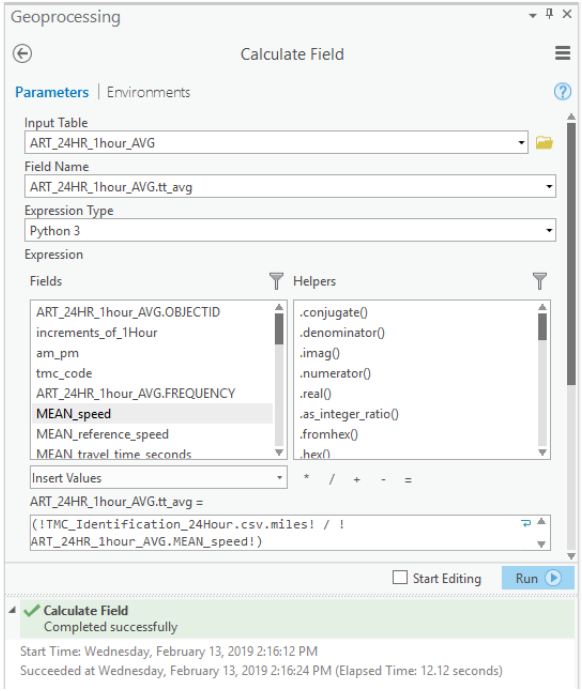
1. Right Click on the field name
2. Click Calculate Field
3. Choose miles and enter the fields to calculate



Field:	Helpers:
miles	n/a
Mean_ speed	n/a

Type in the formula for calculations	TT_AVG	(!TMC_Identification_24Hour.csv.miles! / !ART_24HR_1hour_AVG.MEAN_speed!)

Code Block:	n/a

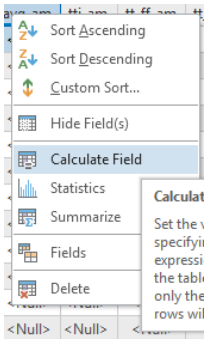


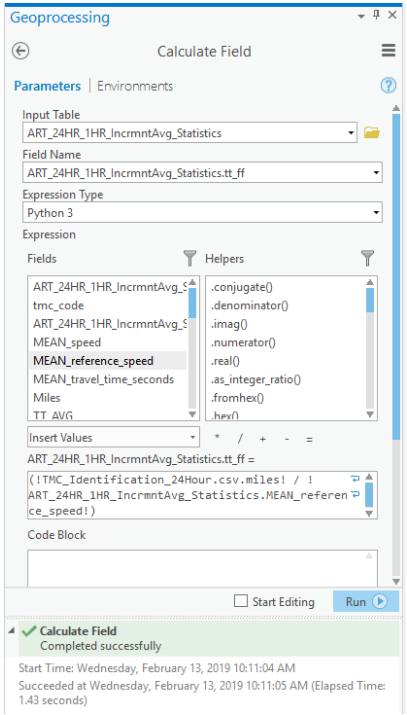
4. Click Run button

STEP 27 – TT_FF – Travel Time Increments (TTI)

Calculate the Travel Time Free Flow to display avg in added average travel time free flow field

1. Right Click on the field name
2. Click Calculate Field
3. Choose miles and enter the fields to calculate





Field:	**Helpers:**
Miles	n/a
Mean_reference_speed	n/a

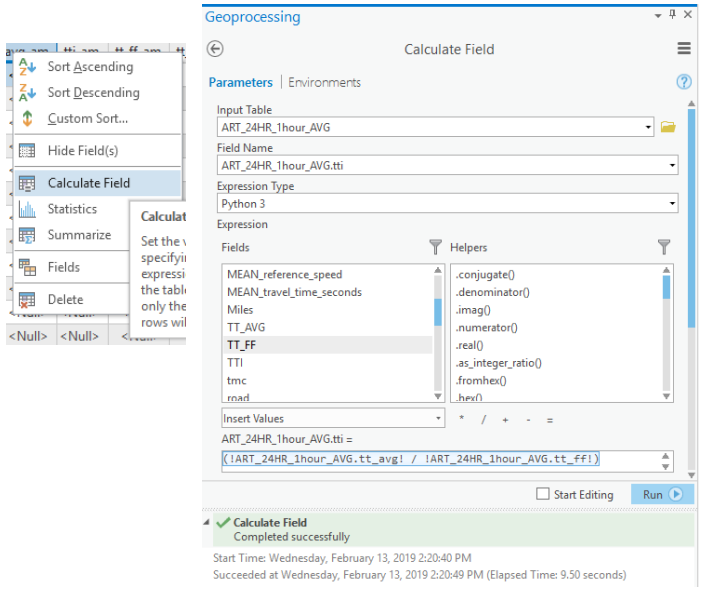
Type in the formula for calculations	**TT_FF**	(!TMC_Identification_24Hour.csv.miles! / !ART_24HR_1hour_AVG.MEAN_reference_speed!)

Code Block:	n/a

4. Click Run button

STEP 28 – TTI – Travel Time Increments (TTI)

Calculate the Travel Time to display avg in added average travel time field



1. Right Click on the field name
2. Click Calculate Field
3. Choose miles and enter the fields to calculate

Field:	Helpers:
tt_avg_am	n/a
tt_ff_am	n/a

Type in the formula for calculations	TTI	(!ART_24HR_1hour_AVG.tt_avg! / !ART_24HR_1hour_AVG.tt_ff!)

Code Block:	n/a

4. Click Run button

Field	Condition	Values
Increments_of_1Hour	Is Equal to	2:00

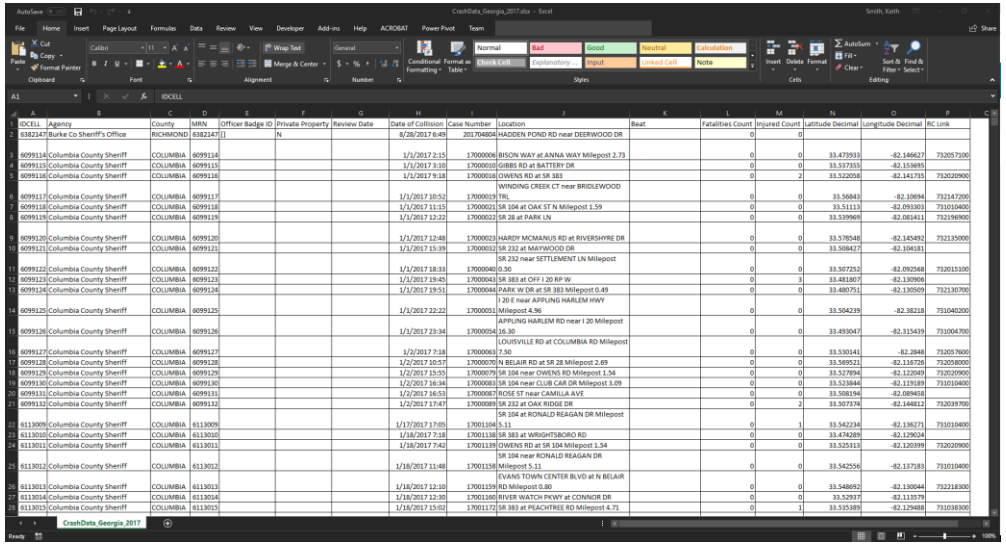
DATASET: Crash Data

STEP 1 – Crash Data Verification

The Crash Data was received from two separate sources, GDOT GEARS and SCDOT. This section will provide a step by step guide for combining the data into a single output file to be used on the ARTS Dashboard.

Data received from GDOT Gears and SCDOT were received in Microsoft Excel (.xlsx) format documents. Both files contain a series of attribute fields and include fields representing latitude and longitude. The latitude and longitude fields will be used to display the crash data on the map.

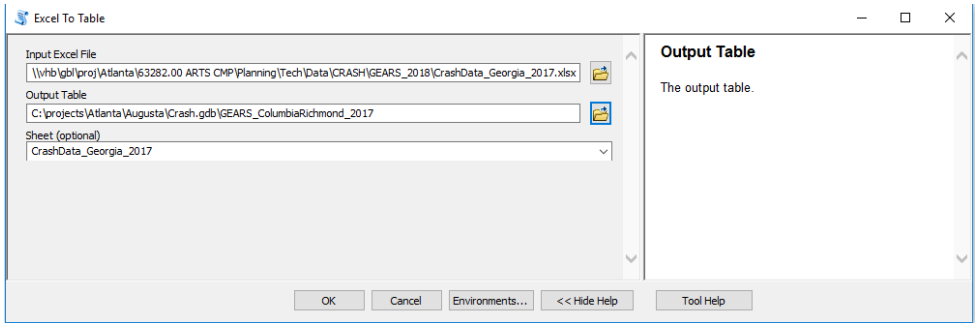
This data can be loaded into ArcGIS and mapped. Open the received the excel files and verify that the needed fields and attributes appear as desired.



IDCELL	Agency	County	MRN	Officer Badge ID	Private Property	Review Date	Date of Collision	Case Number	Location	Beat	Fatalities Count	Injured Count	Latitude Decimal	Longitude Decimal	RC Link
6382147	Burke Co Sheriff's Office	RICHMOND	6382147	[]	N		8/28/2017 6:49	201704804	HADDEN POND RD near DEERWOOD DR		0	0			
6099114	Columbia County Sheriff	COLUMBIA	6099114				1/1/2017 2:15	17000006	BISON WAY at ANNA WAY Milepost 2.73		0	0	33.473933	-82.146627	732057100
6099115	Columbia County Sheriff	COLUMBIA	6099115				1/1/2017 3:10	17000010	GIBBS RD at BATTERY DR		0	0	33.537355	-82.153695	
6099116	Columbia County Sheriff	COLUMBIA	6099116				1/1/2017 9:18	17000016	OWENS RD at SR 383		0	2	33.522058	-82.141735	732020900
6099117	Columbia County Sheriff	COLUMBIA	6099117				1/1/2017 10:52	17000019	WINDING CREEK CT near BRIDLEWOOD TRL		0	0	33.56843	-82.106934	732147200
6099118	Columbia County Sheriff	COLUMBIA	6099118				1/1/2017 11:15	17000021	SR 104 at OAK ST N Milepost 1.59		0	0	33.51113	-82.093303	731010400
6099119	Columbia County Sheriff	COLUMBIA	6099119				1/1/2017 12:22	17000022	SR 28 at PARK LN		0	0	33.539969	-82.081411	732196900
6099120	Columbia County Sheriff	COLUMBIA	6099120				1/1/2017 12:48	17000023	HARDY MCMANUS RD at RIVERSHYRE DR		0	0	33.578548	-82.145492	732135000
6099121	Columbia County Sheriff	COLUMBIA	6099121				1/1/2017 15:39	17000032	SR 232 at MAYWOOD DR		0	0	33.508427	-82.104181	
6099122	Columbia County Sheriff	COLUMBIA	6099122				1/1/2017 18:33	17000040	SR 232 near SETTLEMENT LN Milepost 0.50		0	0	33.507252	-82.092568	732015100
6099123	Columbia County Sheriff	COLUMBIA	6099123				1/1/2017 19:45	17000043	SR 383 at OFF I 20 RP W		0	3	33.481807	-82.130906	
6099124	Columbia County Sheriff	COLUMBIA	6099124				1/1/2017 19:51	17000044	PARK W DR at SR 383 Milepost 0.49		0	0	33.480751	-82.130509	732130700
6099125	Columbia County Sheriff	COLUMBIA	6099125				1/1/2017 22:22	17000051	I 20 E near APPLING HARLEM HWY Milepost 4.96		0	0	33.504239	-82.38218	731040200
6099126	Columbia County Sheriff	COLUMBIA	6099126				1/1/2017 23:34	17000054	APPLING HARLEM RD near I 20 Milepost 16.30		0	0	33.493047	-82.315439	731004700
6099127	Columbia County Sheriff	COLUMBIA	6099127				1/2/2017 7:18	17000063	LOUISVILLE RD at COLUMBIA RD Milepost 7.50		0	0	33.530141	-82.2848	732057600
6099128	Columbia County Sheriff	COLUMBIA	6099128				1/2/2017 10:57	17000070	N BELAIR RD at SR 28 Milepost 2.69		0	0	33.569521	-82.116726	732058000
6099129	Columbia County Sheriff	COLUMBIA	6099129				1/2/2017 15:55	17000079	SR 104 near OWENS RD Milepost 1.54		0	0	33.527894	-82.122049	732020900
6099130	Columbia County Sheriff	COLUMBIA	6099130				1/2/2017 16:34	17000083	SR 104 near CLUB CAR DR Milepost 3.09		0	0	33.523844	-82.119189	731010400
6099131	Columbia County Sheriff	COLUMBIA	6099131				1/2/2017 16:53	17000087	ROSE ST near CAMILLA AVE		0	0	33.508194	-82.089458	
6099132	Columbia County Sheriff	COLUMBIA	6099132				1/2/2017 17:47	17000089	SR 232 at OAK RIDGE DR		0	2	33.507374	-82.144812	732039700
6113009	Columbia County Sheriff	COLUMBIA	6113009				1/17/2017 17:05	17001104	SR 104 at RONALD REAGAN DR Milepost 5.11		0	1	33.542234	-82.136271	731010400
6113010	Columbia County Sheriff	COLUMBIA	6113010				1/18/2017 7:18	17001138	SR 383 at WRIGHTSBORO RD		0	0	33.474289	-82.129024	
6113011	Columbia County Sheriff	COLUMBIA	6113011				1/18/2017 7:42	17001139	OWENS RD at SR 104 Milepost 1.54		0	0	33.525313	-82.120399	732020900
6113012	Columbia County Sheriff	COLUMBIA	6113012				1/18/2017 11:48	17001158	SR 104 near RONALD REAGAN DR Milepost 5.11		0	0	33.542556	-82.137183	731010400
6113013	Columbia County Sheriff	COLUMBIA	6113013				1/18/2017 12:10	17001159	EVANS TOWN CENTER BLVD at N BELAIR RD Milepost 0.80		0	0	33.548692	-82.130044	732218300
6113014	Columbia County Sheriff	COLUMBIA	6113014				1/18/2017 12:30	17001160	RIVER WATCH PKWY at CONNOR DR		0	0	33.52937	-82.113579	
6113015	Columbia County Sheriff	COLUMBIA	6113015				1/18/2017 15:02	17001172	SR 383 at PEACHTREE RD Milepost 4.71		0	1	33.535389	-82.129488	731038300

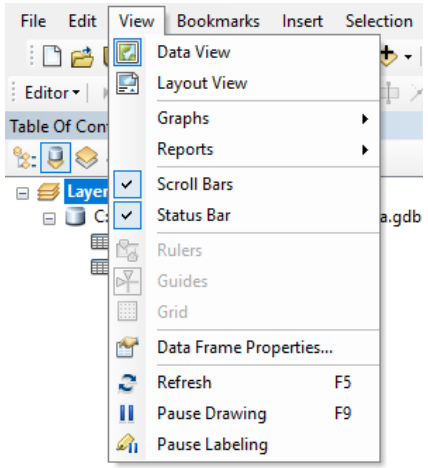
STEP 2 – Crash data into ArcGIS

Open ArcGIS Desktop. To allow ArcGIS to best handle the tables of data for mapping use the "Excel to Table" use the search tool option to open the tool. This tool will allow for an Excel table to be exported into a file geodatabase as feature table. Name the tables as desired for both crashes received from GDOT and SCDOT. For the purposes of the dashboard, no additional fields were removed or deleted prior to this step. Choose "Yes" at the end of the process to add the files to the open ArcMap.



STEP 3 – ArcMap Projection

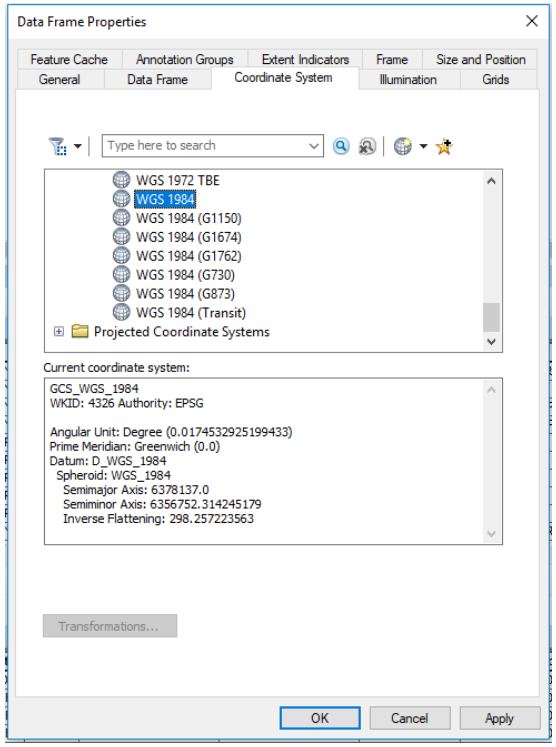
Prior to mapping the XY data, the .mxd needs to be set to the appropriate projection to allow these points to be displayed properly.



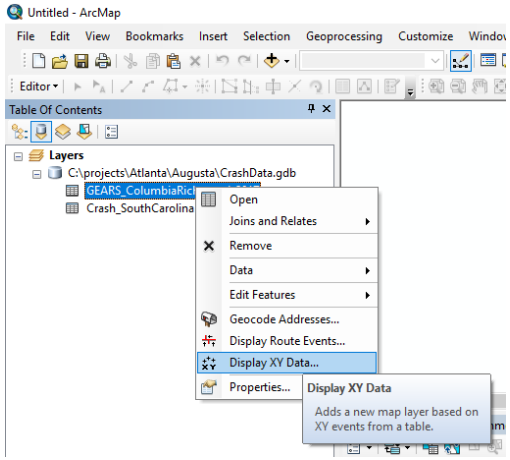
Under "View" Select "Data Frame Properties", then open the tab "Coordinate System". To map X,Y select the following project.

This will allow the user to select the coordinate system to allow the XY points to be properly mapped. Select "WGS 1984" under the Geographic Coordinate System option.

Click OK

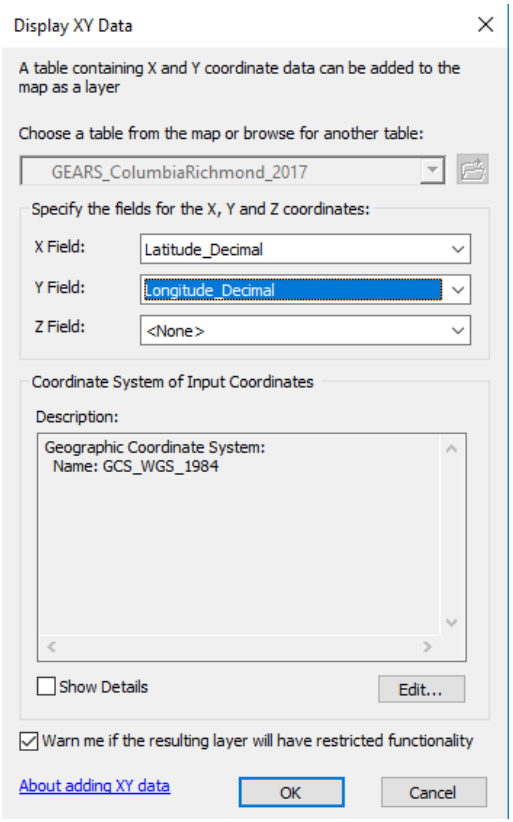


STEP 4 – Map Crash data

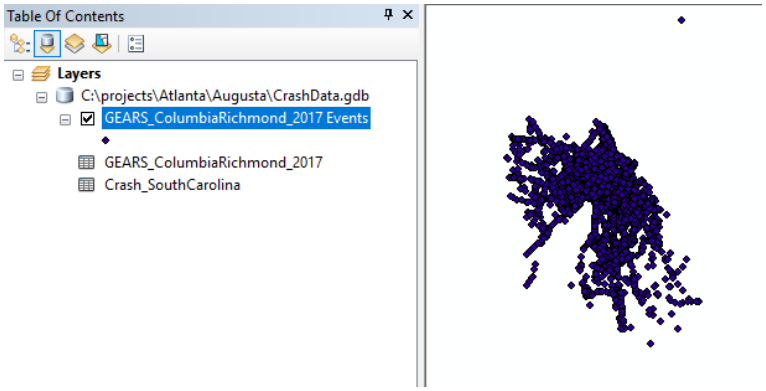


After the feature table has been created and added to the map, right click on the table and select the option to "Display XY" data.

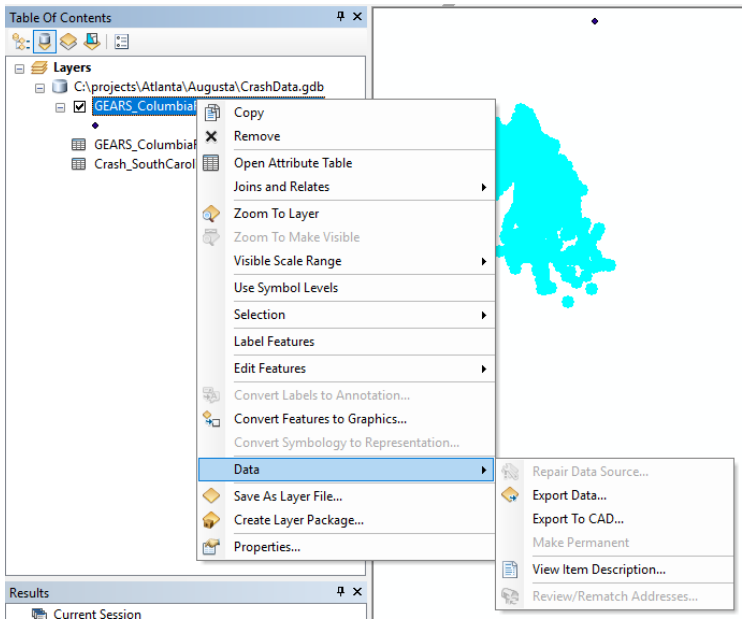
This will open the "Display XY Data" window (right). Select the appropriate X and Y fields. Note that X – Latitude; Y – Longitude.



This will map the crashes as an events table added to the Map Exchange Document (MXD). Please note that the created events layer is temporary and will need to be exported to make permanent. Prior to export of this feature, review the output. Crash points which have not been mapped properly will appear to be located outside of the county area.



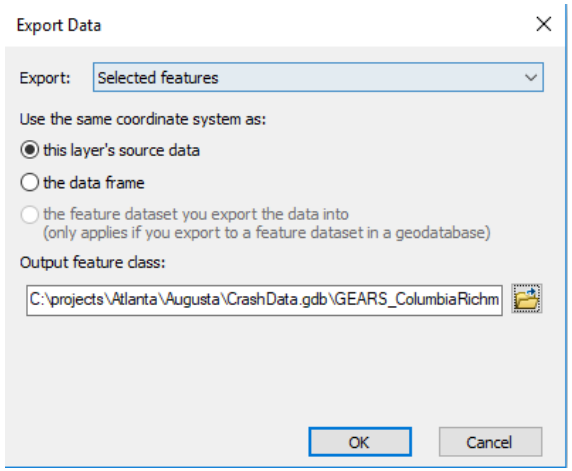
It is recommended that only crashes within the geographic area be selected and included. This can be done by selecting by the geographic area or using the "Select Features". Once the crash data that is desired has been selected that data is exported to a new feature class. Right click on the events layer, select "Data" and the "Export Data" option.



Select the desired output location of the feature class and choose "OK".

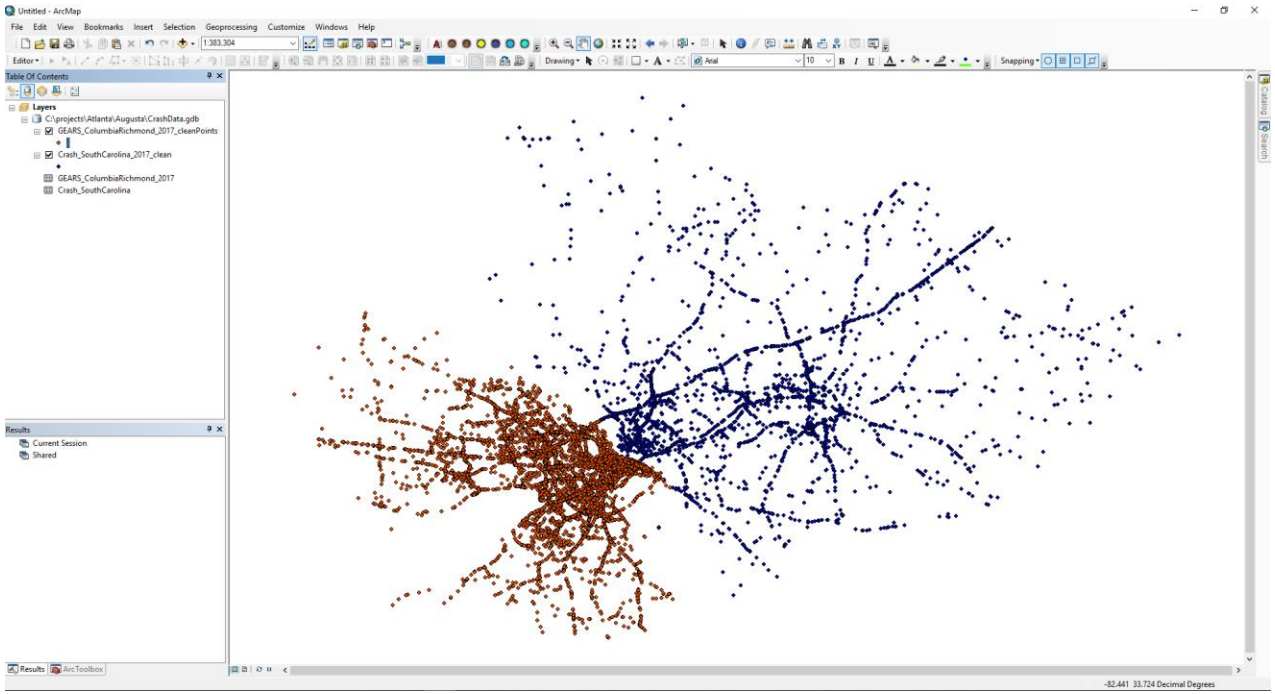
This will export the selected crash events to a feature class.

Perform the same steps for all crash data to create tables for each of the data sources.



STEP 5 – Merge Crash data

These two different crash data tables now can be merged into a single table to represent crashes across the four-county area.

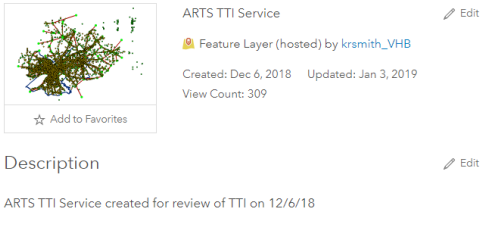


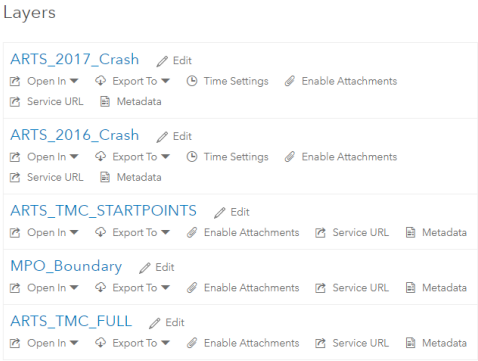
Use the "Merge" Tool to combine the two different data sources into a single output. It is important to note that this step does not normalize the fields between the two sources. This only combines the points into a single output file.

3.2 Data Dashboard Deployment

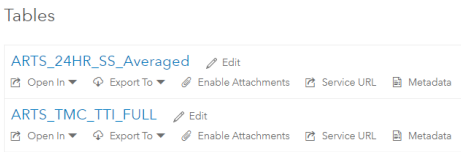
The ARTS Dashboard uses the ArcGIS platform combined with the VHB Data Fusion Center (DFC) to provide data access, this section details the necessary data structure and requirements to provide an update to the ARTS Dashboard. Please note that in order for the ARTS Dashboard to properly update the data structure and fields must be followed exactly as described in this section. VHB will perform the update and publishing of the service to the ESRI ArcGIS environment.

ARTS Dashboard Service: An ArcGIS Rest Service provides the main support for the data displayed in the ARTS Dashboard along with additional web Application Programming Interfaces (APIs) that interact with the VHB DFC. The ARTS Dashboard service contains the following items





- Crash Data 2017: X,Y Mapped Data representing Crash Point Locations for 2017 combined for both Georgia and South Carolina
- Crash Data 2016: X,Y Mapped Data representing Crash Point Locations for 2016 combined for both Georgia and South Carolina
- ARTS TMC Start Points: TMC X,Y Points representing the start of HERE TMC segments
- ARTS Boundary: Jurisdictional Boundary of the ARTS District
- ARTS TMC Full: Polyline feature representing the TMC Segment



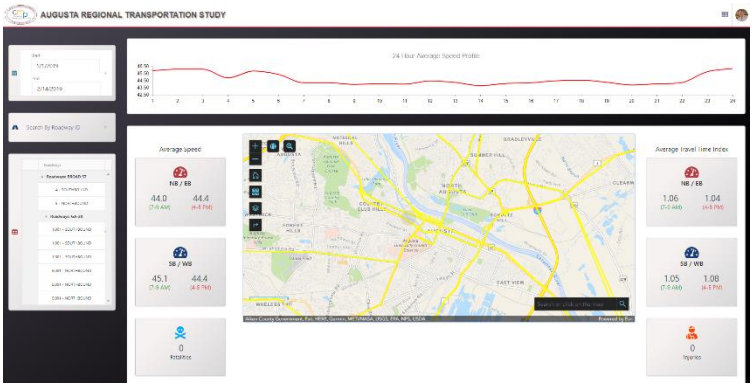
- ARTS_24HR_SS_Averaged (Table): Table containing the 24 Speed profile data for each segment within the ARTS Area
- ARTS_TMC_TTI_FULL (Table): Table containing

Following the steps in this section will prepare the data with required ETL steps and procedures to allow the data and information in the ARTS Dashboard to be updated. Data field structure is required to follow a specific format for each of the different data within the service to enable the ARTS Dashboard to be updated with minimal changes.

Summary of data required to update the Dashboard:

- Crash Data for most recent year, combined into single output feature class
- ARTS District (If Change Applied)
- Updated 24 Hours Average Table
- Updated TMC TTI Full Table
- Updated TMC Full polyline feature class

11 CMP System Performance Monitoring Evaluation - ARTS Dashboard – User Guide



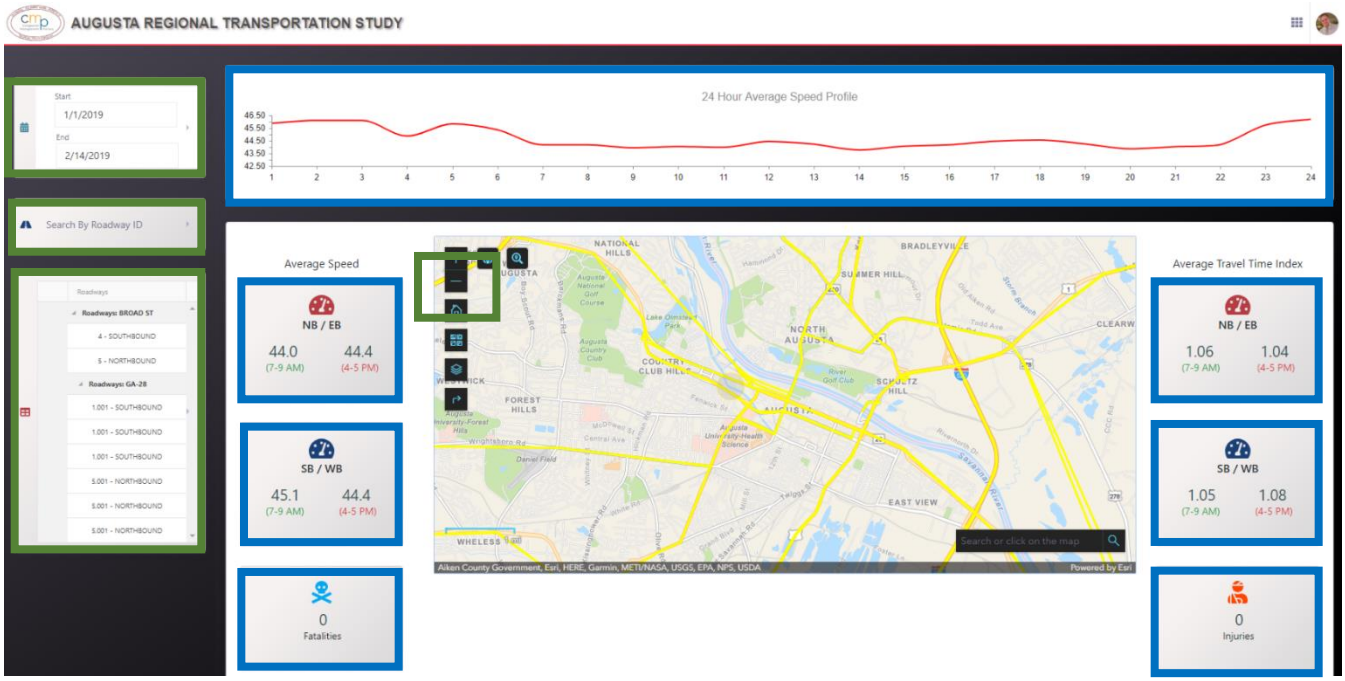
The ARTS CMP Dashboard is built using the ArcGIS Online platform and VHB's Data Fusion Center (DFC). This interactive dashboard provides planners, executive leadership, and other ARTS stakeholders the opportunity to view performance measurements and other metrics within the ARTS planning area. This section provides a user guide for the dashboard and tools.

The ARTS Dashboard can be access through the following website: https://projectapps.vhb.com/orlando/augustaTSV2.0/index.html

*(*Please note this may change prior to final release)*

Upon first arrival at the ARTS Dashboard the user is prompted to sign in with an ArcGIS Online account. ARTS has a number of ArcGIS Online accounts available. For access to an account please contact the ARTS GIS/IT Team.

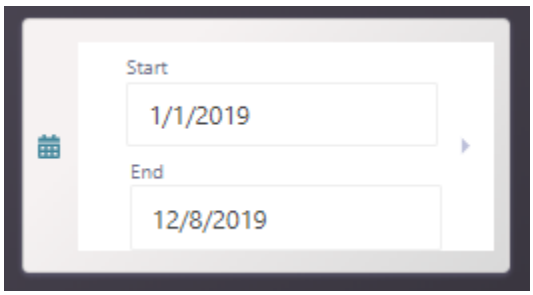
After signing in to the ARTS Dashboard the dashboard will open to the main page. Please refer to the items below for an explanation of each section of the dashboard.


AUGUSTA REGIONAL TRANSPORTATION STUDY
Start
1/1/2019
End
2/14/2019
Search By Roadway ID
24 Hour Average Speed Profile
Average Speed
NB / EB
44.0
(7-9 AM)
44.4
(4-5 PM)
SB / WB
45.1
(7-9 AM)
44.4
(4-5 PM)
0
Fatalities
Average Travel Time Index
NB / EB
1.06
(7-9 AM)
1.04
(4-5 PM)
SB / WB
1.05
(7-9 AM)
1.08
(4-5 PM)
0
Injuries
Search or click on the map
Aiken County Government, Esri, HERE, Garmin, METI/NASA, USGS, EPA, NPS, USDA
Powered by Esri

The ARTS dashboard contains a series for charts depicting performance metrics and tools for selecting roadway segments throughout the ARTS District. In the image above, Performance Metrics are in the Blue boxes and the Search Options are within Green Boxes. Below is an explanation of the various tools and performance metric charts and graphs.

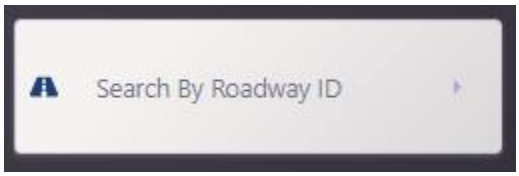
Search Options

Each of the search options within the ARTS Dashboard are designed to filter for the chosen selection. Making a selection will automatically update the performance measures on the ARTS Dashboard.

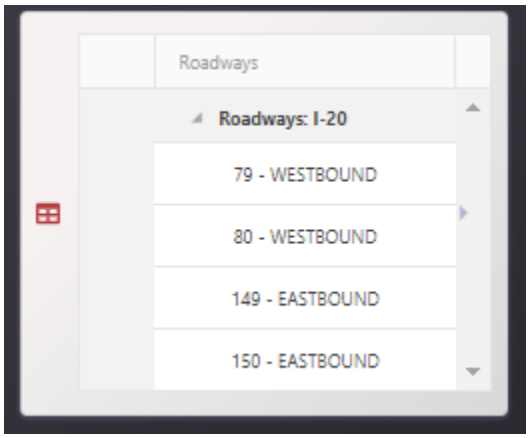


Date Selector – Not Enabled for Variation at this Time

The Date Selector for the ARTS Dashboard is currently not enabled for selection. The date displayed represents the range of data used to determine the TTI and other performance metrics on the ARTS Dashboard.



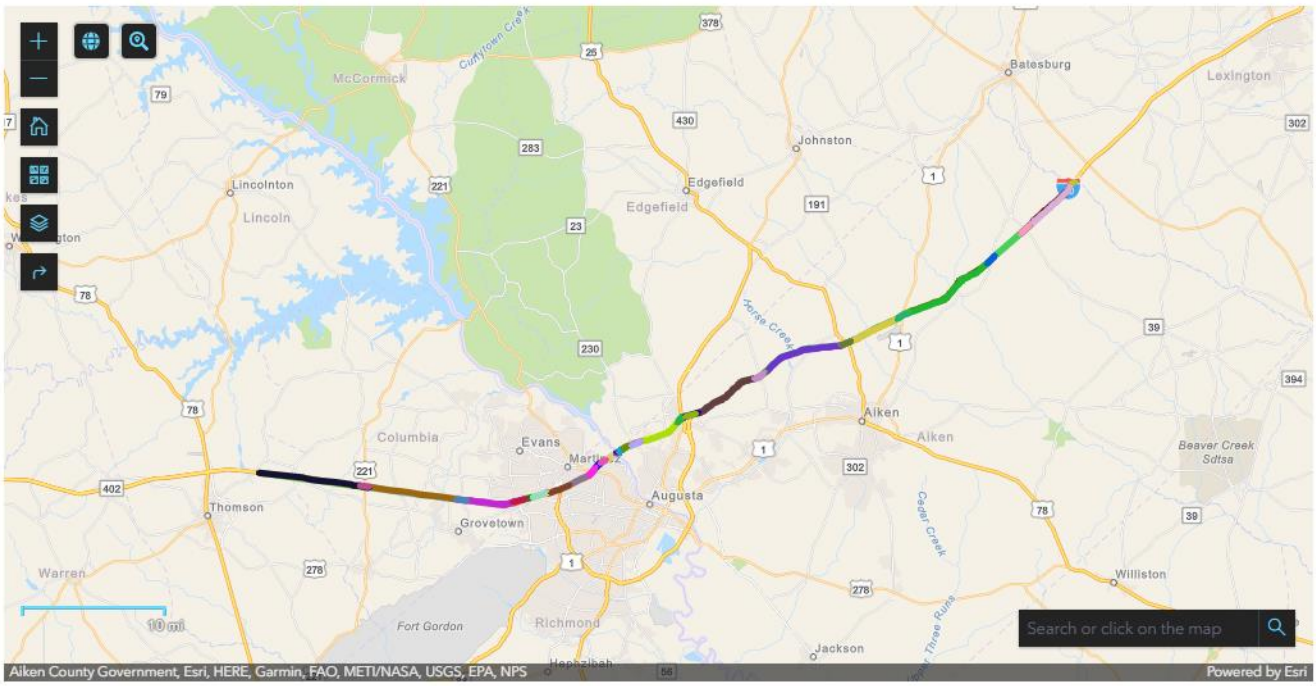
Search by Roadway ID - Allows users to type a roadway and select from the dropdown list the roadway or corridor of interest. Selecting the roadway from the list will select that entire roadway or corridor



Select Roadway and Corridor – The roadway selector option allows users to select an entire roadway or corridor by clicking the roadway name or to select a specific TMC by selecting a value from the list.

Selection of the Roadway (Roadways: I20) in the example on left will select that entire corridor and update the performance metrics accordingly. Selection of a specific TMC segment will change the performance metrics to only that specific TMC segment.

Map Search – The map will display the selected Corridor and roadway segments. Within the map are a series of tools and selection options that can be used to view additional information and to further refine the selection options.



Each of the tools on the map will be furthered explored below.

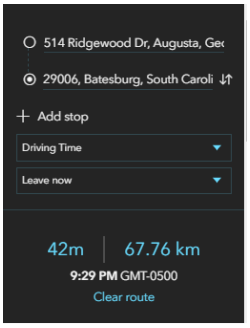
The + and – allow the user to perform a controlled zoom.

The HOME button will return the view to the full ARTS District.

Basemap selector will change the background map. Options include Streets, Aerials, and Grayscale, among others.

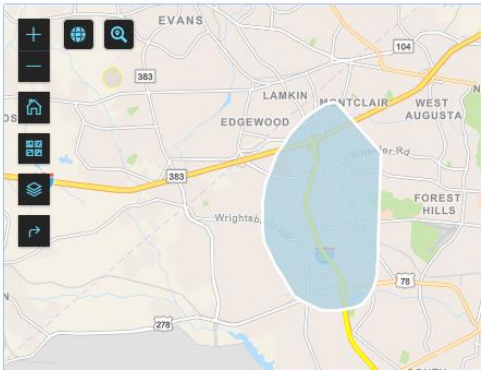
Layers List provide options to turn on and off additional layers within the map.

The Route and Direction Tool uses the ESRI service to provide an estimate of distance and travel time from locations on the map. Please note this uses an expected algorithm to determine directions, distance, and drive times.



Reset View will release the selection on the map that made by clicking on a selected group of roadways. This will return all roads to being eligible for selection and the ability to hover.

Select Segments By Polygon, allows users to draw a selection area around segments for analysis. This tool can select multiple corridors and roadways with the combined performance metrics being displayed on the map.

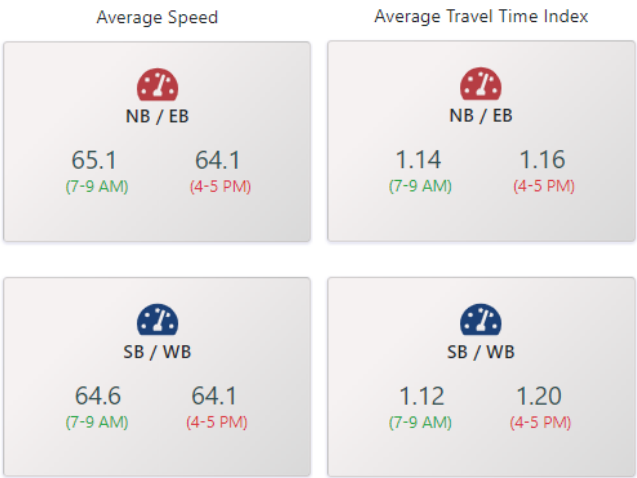


The tool can be used to further refine a selection across a roadway. Using the other search options to first select a series of segments across the corridor this tool can refine that selection, allowing the user to group multiple segments into the desired are for review.

Performance Metrics

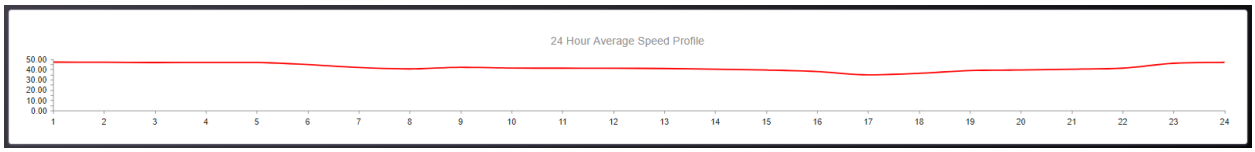
Each of the performance metrics represent a different performance measurement.

Average Speed and Average Travel Time Index – Represents the average speed and Travel Time Index across the selected roadways and corridors. Metrics are based on the collected years' worth of data. Represented are both North/East and South/West directions of the roadway and corridor. The AM and PM peaks are available for metrics on the roadways and corridors across the ARTS District.



Fatalities and Injuries represent the count for the number of each metric along the selected corridor or segment.

24 Hour Average Speed Profile displays the average speed per hour over the corridor or selected roadway segment.



Additionally, there is a "Create Report" located at the top of the ARTS Dashboard that can be used to print a report containing the selected roadways, performance measurements, and a list of crashes along the selected roadways and corridors.