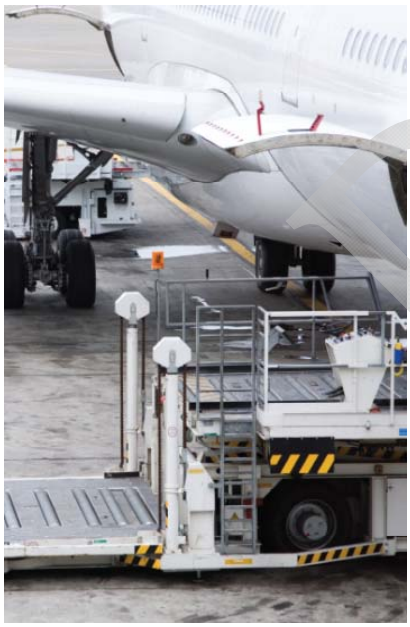
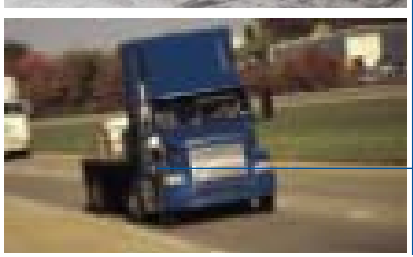
CORE
COASTAL REGION MPO





Technical Memorandum

FREIGHT NEEDS ASSESSMENT

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1. INTRODUCTION

1.1 Background and Purpose

The Coastal Region Metropolitan Planning Organization (CORE MPO) Freight Transportation Plan provides a road map for enhancing freight mobility within and outside of the boundaries of the study area (Savannah MSA – Chatham, Bryan and Effingham Counties) in an effort to improve the area's economic competitiveness. Freight movement within, to/from, and through the region can have a significant impact on Savannah metropolitan area's economic competitiveness and transportation network. The federal transportation reauthorization bill, the Moving Ahead for Progress in the 21st Century Act (MAP-21), empowers the State of Georgia to improve the condition and performance of its freight system. Therefore, the CORE MPO Freight Transportation Plan includes this Freight Needs Assessment to evaluate significant freight system trends, needs, and issues in order to help identify freight investment strategies for the Savannah region.

1.2 Methodology

The Freight Needs Assessment is not meant to be a detailed project-level analysis but more of a system-level summary. The analysis considers available data to understand and evaluate the freight movement conditions and needs in the Savannah region. Qualitative and quantitative analysis is based on existing conditions, including but not limited to:

- Commodity flow (i.e., directional flow, volume, and value);
- Traffic operations of roadway network (i.e., level of service and volume to capacity ratio);
- Safety (i.e., accident locations and crash rates at rail crossings and intersections);
- Land use designations;
- Linkage between freight activities and economic activities; and
- Average shipment distance by mode on the multimodal network systems.

Other plans, studies, and databases from state, local and regional sources were also used in this analysis, including:

- Georgia Freight and Logistics Plan, GDOT (2011);
- Georgia in Perspective, Governor's Office of Budget and Planning (2013);
- World Port Source, www.worldportsource.com;
- Georgia Ports Authority, www.gaports.com;
- FltPlan, www.fltplan.com; and,
- Savannah / Hilton Head International Airport website, www.savannahairport.com.

A freight growth forecast was also derived to estimate future volume flows of freight, demands, trends, and characteristics. These forecasts by mode were used to identify freight deficiencies, which are locations where the freight system is in need of improvement based on the forecasted

freight demand. The freight growth is based on local information via establishment surveys and the disaggregation of FAF data, as described in the following sub-section.

1.3 Data Sources for FAF Disaggregation

The lack of locally available data makes necessary the consideration of other data sources such as the Freight Analysis Framework (FAF). However, the FAF is not reflective of movements at a county level. In FAF's existing format, the study area is part of a greater zone consisting of Bryan, Chatham, Effingham, Liberty, and Long Counties. To draw meaningful conclusions using FAF, it is necessary to disaggregate the FAF from Savannah FAF zone to freight districts. These districts are a collection of Traffic Analysis Zones (TAZs) from the CORE MPO travel demand model. Disaggregation is based on the relationships between commodity flow (i.e., quantity of goods produced and consumed in an industry) and employment by industry. Industry-specific employment was used as an indicator variable for consumption or production within an industry. The following subsections describe the primary inputs to this process.

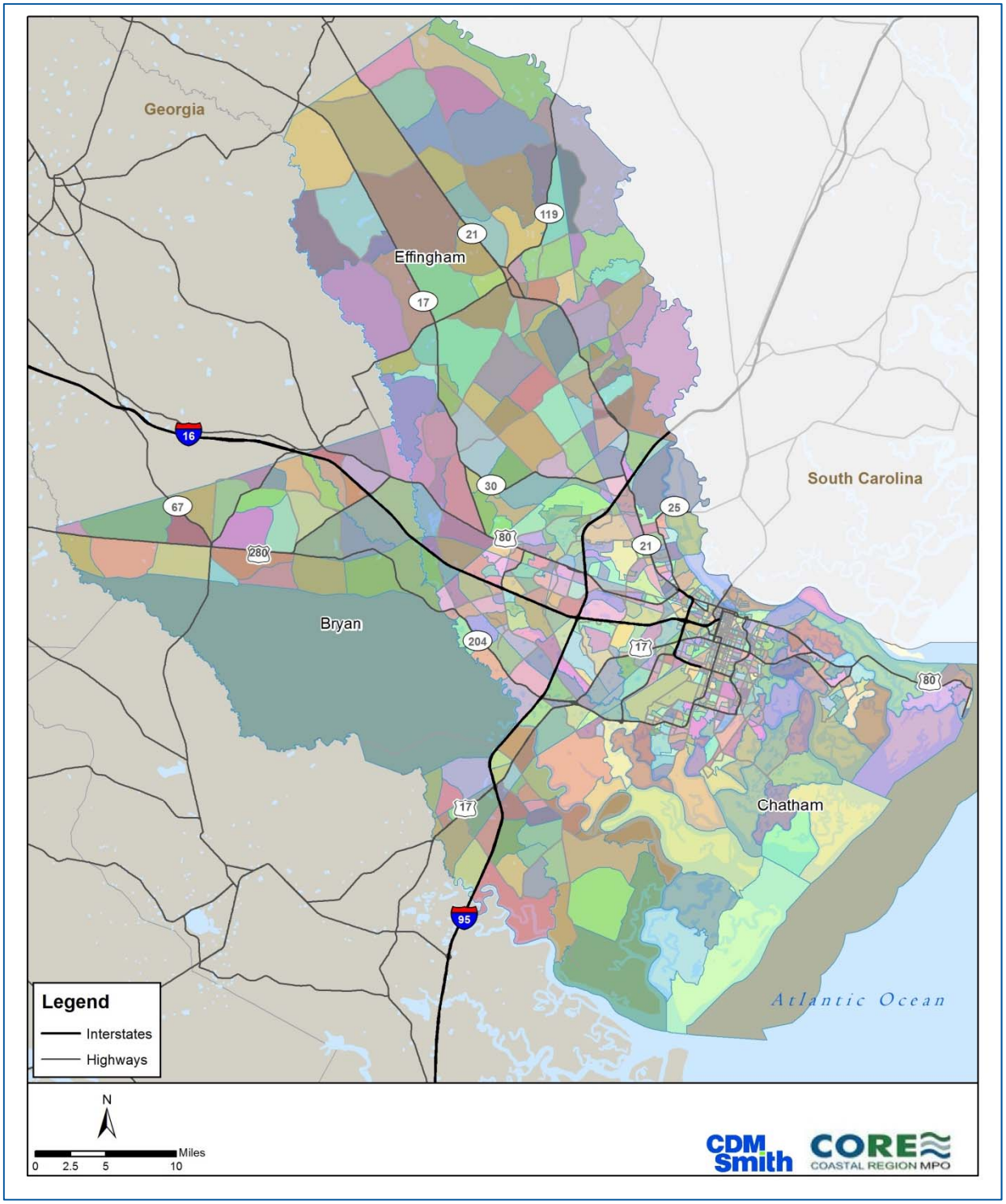
1.3.1 Zonal Data

As previously mentioned, the geographic portion of the FAF disaggregation used TAZs from the travel demand model. The TAZs have employment data as part of the socioeconomic attributes of the model. These TAZs were aggregated into common areas, which were referred to as freight districts. The freight districts have common industry types and employment characteristics, as well as some geographic boundaries. The freight districts were limited by a political boundary, major roadways such as interstates, or physical features such as rivers. Clustering smaller TAZs would increase the reliability of the disaggregation and its eventual results.

The CORE MPO travel demand model has 796 internal TAZs populated by the 2010 base year socioeconomic data. The model area includes Chatham, Effingham, and Bryan Counties. **Figure 1-1** illustrates the model TAZs.

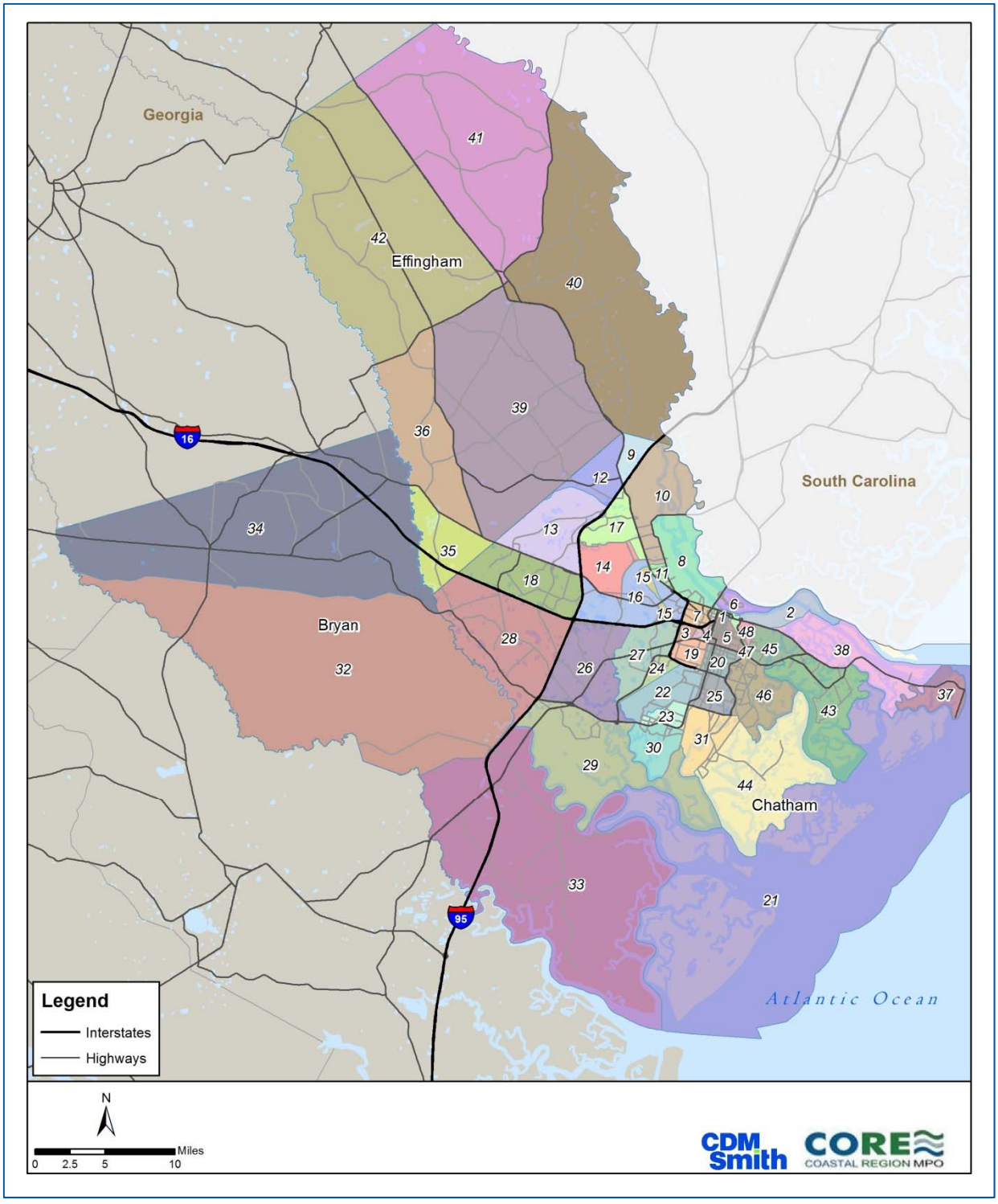
After aggregating the TAZs, the FAF disaggregation used 42 freight districts in the analysis. **Figure 1-2** illustrates the freight districts. After aggregating the TAZs with input from the CORE MPO staff, the FAF disaggregation will have 48 freight districts in the study area. However, the federal CSA Boundary for Savannah contains all of Bryan, Chatham, and Effingham Counties, along with small portions of Liberty and Long Counties. **Figure 1-3** shows the freight districts of the study area as well as the portions of Long and Liberty Counties in the Savannah CSA. These districts—the 48 freight districts for the three-county study area and the two additional counties—will be used in the analysis and reflected in Section 3.

Figure 1-1: CORE MPO Travel Demand Model Traffic Analysis Zones



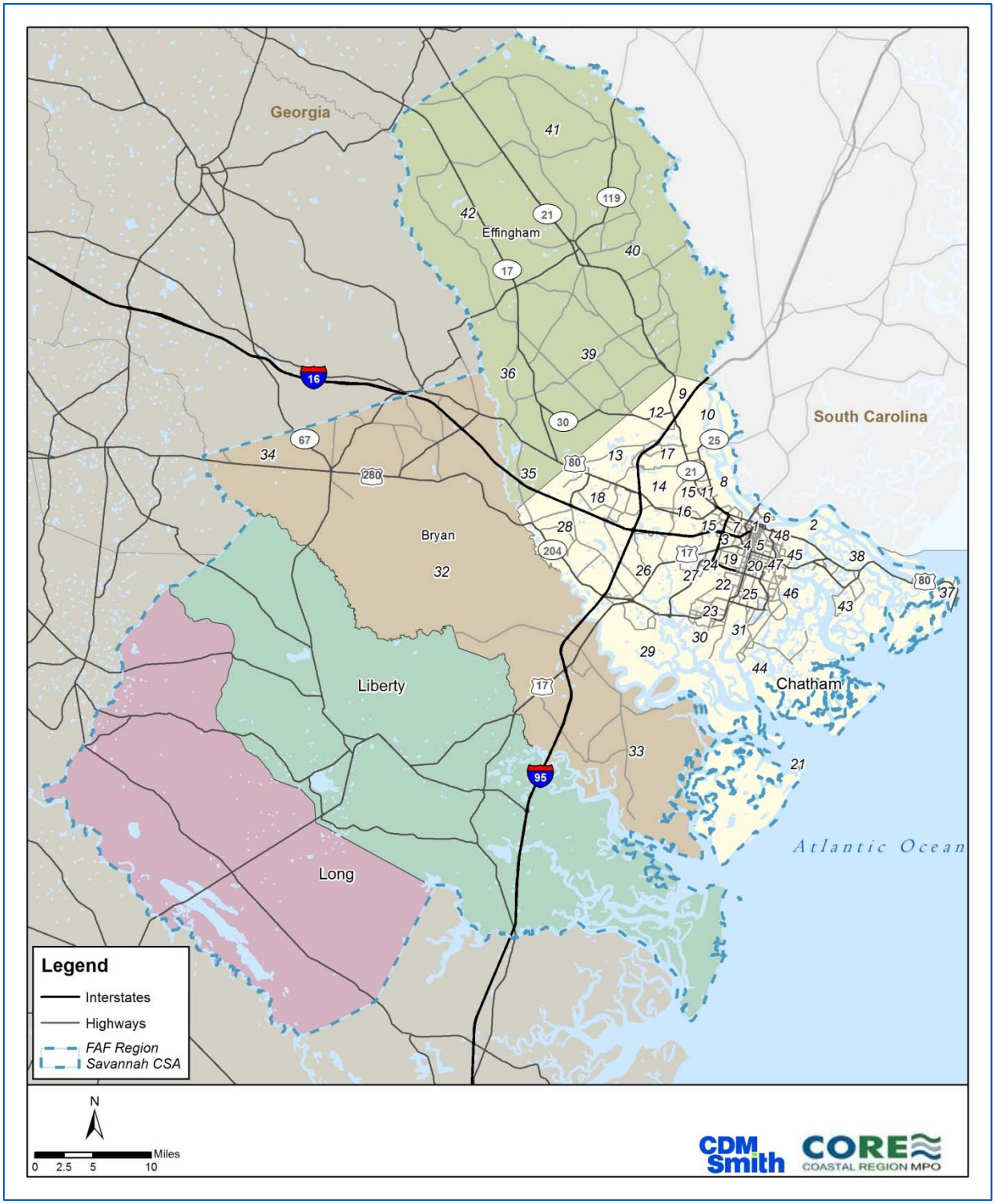
Source: CORE MPO

Figure 1-2: Freight Districts of the Study Area



Source: CDM Smith

Figure 1-3: FAF Disaggregated CSA Analysis Zones

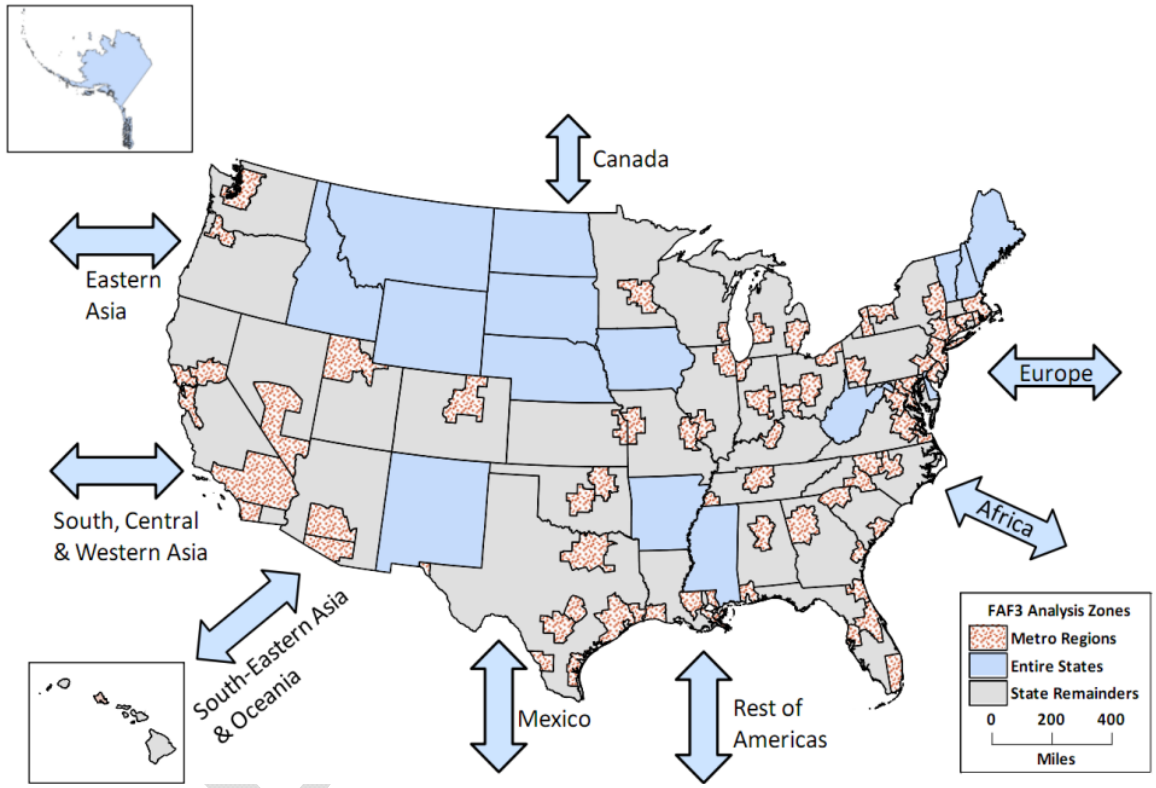


Source: CDM Smith

1.3.2 FAF Data

The FAF is a Federal Highway Administration (FHWA) database to help users understand how the movement of freight affects the transportation system and where problems with the transportation system could affect the flow of freight. The FAF Version 3 (FAF3) provides freight flow information for tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for 2007 (baseline year), 2011, and forecast through 2040 in five-year increments. The analysis zones consist of 123 domestic areas that are divided into metro regions, state remainders and entire states. Metro regions consist of 74 metropolitan areas. The state remainders represent each of the state's territory outside of the metropolitan areas. Entire states are the 16 regions that do not have a metropolitan region. **Figure 1-4** shows the analysis zones used in the FAF3.

Figure 1-4: Analysis Zones Used in FAF3



Source: Freight Analysis Framework, http://faf.ornl.gov/fafweb/Default.aspx

One of the FAF3 metro regions is Savannah CSA, which will be used in the disaggregation process and relate to all other regions throughout the nation. The FAF3 data currently shows a heavy truck influence in the Savannah metro area for 2011. The imports from 2011 data included coal not-elsewhere-classified (n.e.c.), crude petroleum and fuel oils. In contrast, exports included nonmetallic minerals, newsprint/paper and meat/seafood. Truck transportation was the heaviest used mode for both imports and exports. **Table 1-1** and **Table 1-2** show the kilotons (KTons) and millions of dollars (in the 2007 base year) for each domestic mode as the freight enters, exits, and

stays within the Savannah metro region for the various years. **Table 1-3** shows the percent change between the previous two tables by mode for tonnage and value.

Table 1-1: 2011 Mode Values

2011	Into Savannah FAF Region		Out Of Savannah FAF Region		Internal	
	KTons	$M	KTons	$M	KTons	$M
Truck	37,663.7	38,794.5	42,243.3	64,684.1	16,691.6	15,878.6
Rail	7,731.6	3,110.3	2,926.4	2,025.4	646.2	289.4
Water	3,008.8	2,396.5	7.0	4.0	5.2	0.7
Air	2.2	489.9	3.8	1,090.7	-	2.0
Multiple modes & other	15,504.8	15,313.3	11,421.9	12,883.4	9,016.3	4,478.1

Source: Freight Analysis Framework, http://faf.ornl.gov/fafweb/Default.aspx

Table 1-2: 2040 Mode Values

2040	Into Savannah FAF Region		Out Of Savannah FAF Region		Internal	
	KTons	$M	KTons	$M	KTons	$M
Truck	85,123.1	103,822.2	89,371.6	170,871.0	31,256.2	36,468.0
Rail	11,516.8	6,042.2	5,866.8	5,866.5	1,426.5	613.3
Water	2,354.5	1,868.1	20.8	4.5	15.4	2.2
Air	6.5	1,335.3	11.8	3,416.7	5,054.8	5,305.0
Multiple modes & other	35,883.6	46,514.0	26,936.9	38,534.2	15,679.2	6,132.0

Source: Freight Analysis Framework, http://faf.ornl.gov/fafweb/Default.aspx

Table 1-3: Percent Change between 2011 and 2040

2040/2011	Into Savannah FAF Region		Out Of Savannah FAF Region		Internal	
	KTons	$M	KTons	$M	KTons	$M
Truck	126.0%	167.6%	111.6%	164.2%	87.3%	129.7%
Rail	49.0%	94.3%	100.5%	189.6%	120.8%	111.9%
Water	-21.7%	-22.0%	197.1%	12.5%	196.2%	214.3%
Air	195.5%	172.6%	210.5%	213.3%	-	-
Multiple modes & other	131.4%	203.7%	135.8%	199.1%	73.9%	36.9%

1.3.3 LEHD and CBP Data

The Longitudinal Employer Household Dynamics (LEHD) database is the result of a partnership between the U.S. Census Bureau and States to provide high quality local labor market information and to improve the Census Bureau's economic and demographic data programs. The LEHD summarizes employment for specific industry types by race, gender, and age; however, it is only available at the census block and the 2 digit North American Incorporation Census State (NAICS) code level.

The County Business Patterns (CBP) is a publicly available database that provides employment data by county by NAICS industry. The CBP is available at 3 digit NAICS but does not go below the county level. Therefore, given the need to disaggregate the FAF database to the Freight District level (which is smaller than the county level), it was necessary to obtain the 3 digit NAICS at the FAF district level.

Essentially, employment data by industry was used to estimate the commodity flows (i.e., freight tonnage) to and from a FAF3 region.

1.4 Content Organization

This technical memorandum is divided into several sections:

- Section 2 describes the existing conditions of the freight transportation system, including profile of the freight infrastructure by mode, intermodal connectivity, major freight generators or activity centers, and land use characteristics and compatibility. Roadways and its intermodal connections with other modes (i.e., railroads, airports, and railways) was a primary focus because national trends indicate a continued growth in moving freight via large trucks. The freight corridors and facilities were also assessed in terms of their roles in future freight and economic growth.
- Section 3 describes the results of the FAF disaggregation and the forecast of future freight demand.
- Section 4 identifies significant trends and issues impacting the regional freight system. Such freight needs include new and expanded roadways to provide more congestion relief and capacity for freight and commuter travel; other infrastructure enhancements, such as pavement improvement; operational strategies to improve mobility conditions and facilitate goods movement; separated grade crossings to relieve traffic bottlenecks and safety hazards; and policy and funding opportunities.
- Section 5 summarizes the next planning steps and the proposed implementation of recommended performance measures to ensure the freight network would adequately serve freight movements.

2. REGIONAL MULTIMODAL FREIGHT OVERVIEW

2.1 Highway System Profile

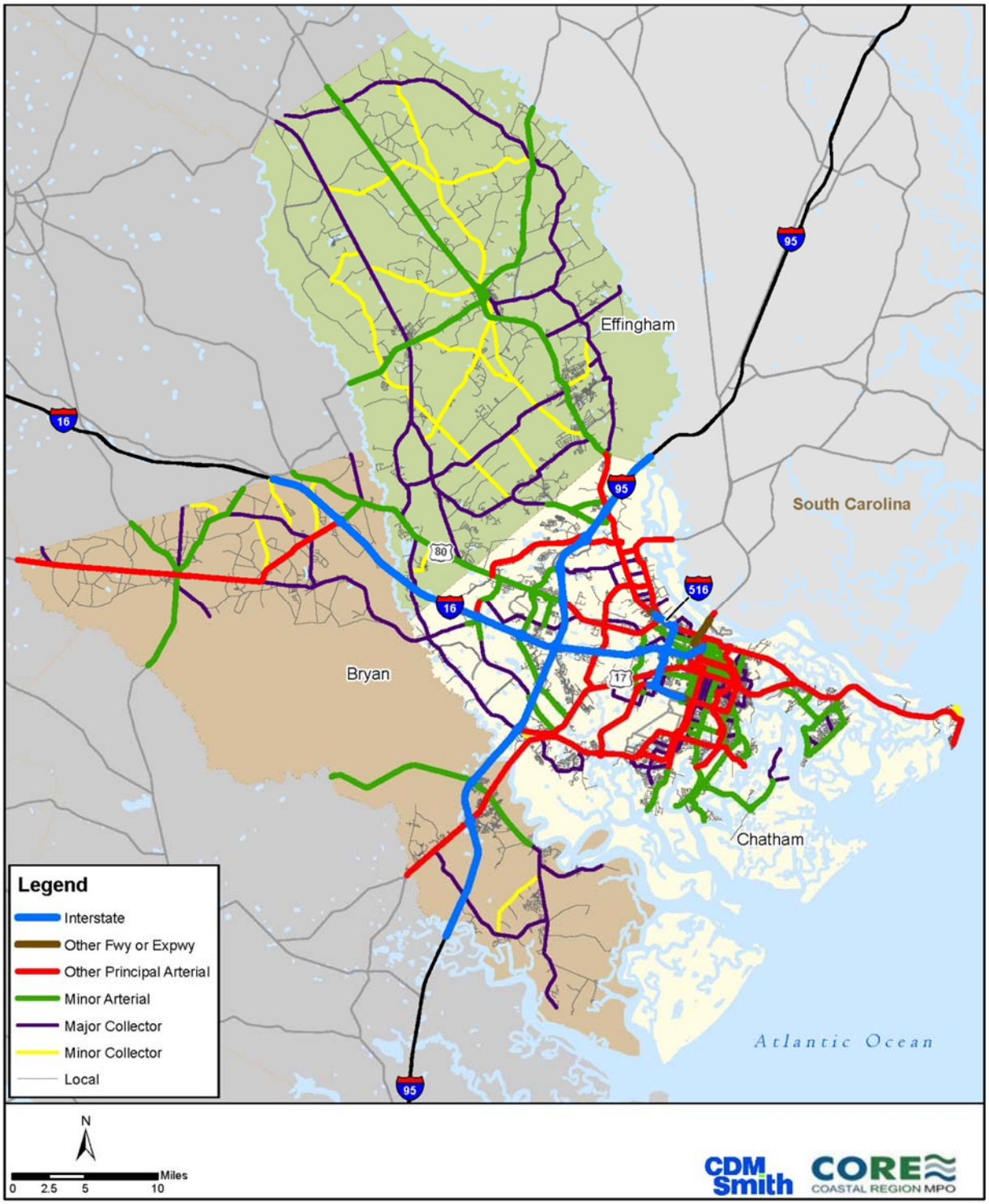
2.1.1 Roadway Network

Highway functional classification and associated characteristics may be used as a predictor of truck usage. As a whole, the intended use and vehicle design will guide features that may induce commercial operator usage. **Figure 2-1** depicts the roadway functional classification in the CORE MPO Freight Transportation Plan Phase II study area, which consists of over 1,600 total miles of roadways across all functional classes on state and county routes. On state routes, rural minor arterials and urbanized principal arterials have the highest mileage. For county routes, rural local and urbanized local are the top two in mileage. The small urban roadways are only located in Bryan County. Rural areas have 1,144 total miles across all functional classes. Urbanized areas have 483 total miles while small urban miles comprise the smallest segment with 33 miles. **Table 2-1** shows the total state- and county-maintained roadway miles within the study area by functional class.

As shown in **Figure 2-2**, 68.9 percent of roads in the study area are located in rural areas, while 29.1 percent are located in urbanized areas and the remaining 2 percent are located in small urban areas.

Figure 2-3 shows the percent of roadway miles by functional class across all area types. Local roads make up over half of the miles in the study area at 58.0 percent (964 miles). Therefore, the majority of truck traffic in the area is concentrated on less than half of the road miles in the area. Most trucks will travel on the 71 miles of interstate and 312 miles of arterial roads in the area, which represent 4.3 percent and 18.8 percent of the total system, respectively. Collector roads total 314 miles, or 18.9 percent.

Figure 2-1: Functional Classification



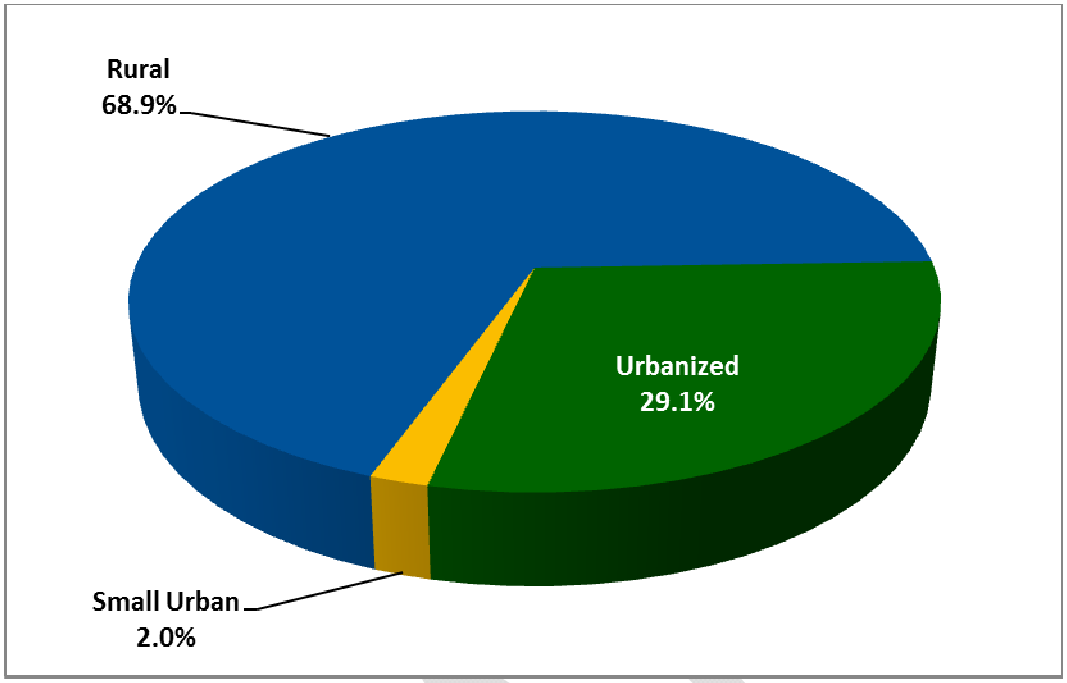
Source: CDM Smith

Table 2-1: Miles by Functional Class in the Study Area, 2012

Functional Class	Miles				Total		
	State Route		County Route		Miles		Percent
Rural Interstates	25.18	228.70	-	915.74	25.18	1,144.44	68.9%
Rural Principal Arterials	34.51		-		34.51		
Rural Minor Arterials	89.41		-		89.41		
Rural Major Collectors	79.60		104.08		183.68		
Rural Minor Collectors	-		103.09		103.09		
Rural Local	-		708.57		708.57		
Urbanized Interstate	37.51	141.43	-	342.01	37.51	483.44	29.1%
Urbanized Freeway	3.44		-		3.44		
Urbanized Principal Arterial	81.55		34.16		115.71		
Urbanized Minor Arterial	16.54		47.02		63.56		
Urbanized Collector	2.39		22.89		25.28		
Urbanized Local	-		237.94		237.94		
Small Urban Interstate	4.70	13.71	-	19.57	4.70	33.28	2.0%
Small Urban Freeway	-		-		-		
Small Urban Principal Arterial	3.94		-		3.94		
Small Urban Minor Arterial	5.07		-		5.07		
Small Urban Collector	-		2.49		2.49		
Small Urban Local	-		17.08		17.08		
Total		383.84		1,277.32		1,661.16	100.0%

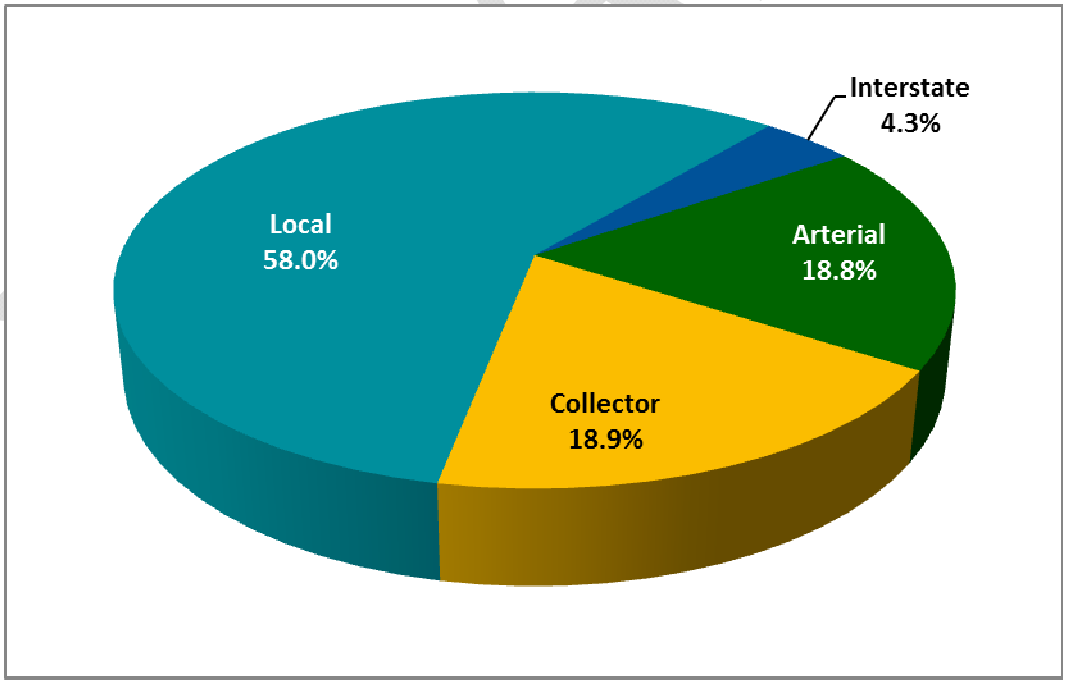
Source: Office of Transportation Data, Georgia Department of Transportation, 445 Series Report, 2012

Figure 2-2: Percent of Roadway Miles by Area Type in the Study Area



Source: Office of Transportation Data, Georgia Department of Transportation, 445 Series Report, 2012

Figure 2-3: Percent of Roadway Miles by Functional Class in the Study Area



Source: Office of Transportation Data, Georgia Department of Transportation, 445 Series Report, 2012

The posted speed limit for interstates and other limited access roads in the state is noted in **Table 2-2**. The average truck percentage and AADT for the top 20 roadways in the study area are stated in **Table 2-3**. Truck percentages range from 2 to 22 percent in the study area. There are no continuous count stations in Effingham County; thus, no data was available for truck traffic in this county. The highest truck volume occurred on I-95 in Chatham County.

Table 2-2: Speed Limits in Georgia

State	Rural Interstates		Urban Interstates		Other Limited Access Roads	
	Cars *(mph)*	Trucks *(mph)*	Cars *(mph)*	Trucks *(mph)*	Cars *(mph)*	Trucks *(mph)*
Georgia	70	70	55	55	65	65

Source: GHSA, http://www.ghsa.org/html/stateinfo/laws/speedlimit_laws.html, February 12, 2013

Table 2-3: Average Truck Percentages and AADT for Top 20 Roadways in the Study Area

County	Location	Avg. Truck %	AADT *(all)*	AADTT *(truck)*
Chatham	I-95 near SR26 & I-16	15.9	67,810	10,782
Chatham	I-95 at SR21 at the SC state line SB	20.3	45,740	9,285
Bryan	I-16 at MP 141.2 West of SR 30 (Exit 143)	21	23,020	4,834
Chatham	I-16 near SR17 & I-95	12.4	37,620	4,665
Chatham	I-16 at SR307/ Dean Forest Rd	7.9	57,080	4,509
Chatham	I-16 at CR781 & SR21/Lynes Memorial Pkwy (I-516)	7	57,170	4,002
Chatham	I-516 at SR21	8.2	32,320	2,650
Chatham	SR21 at US80 at MP 16.9	7.6	29,800	2,265
Chatham	I-516 at US17	4.2	53,850	2,262
Chatham	I-516 at SR25 ALT	6.6	33,350	2,201
Chatham	I-516 at SR21	3.4	56,000	1,904
Bryan	SR 25 near Daniel Siding Rd CR85 & I-95	8	23,460	1,877
Chatham	I-16 near Gwinnett St/CS1504 & Montgomery St/CS1505	4	20,130	805
Chatham	Abercorn St at SR204	2.2	36,010	792
Chatham	CR787/Island Expwy near Runaway Pt Rd & Victory Dr	3.3	20,920	690
Bryan	SR 144 at MP 8.9	4.7	12,660	595
Chatham	SR204 at MP 7.8	7.1	6,460	459
Chatham	CR680/Louisville near Lathrop & Telfair	13.3	2,860	380
Chatham	Garden City at SR21 Spur	33.3	1,030	343
Chatham	CS091807/Habersham near Stevenson & DeRenne	1.6	9,310	149

Source: GDOT, http://www.dot.ga.gov/informationcenter/statistics/TrafficData/Documents/ATRTrafficDataReports/2011_TruckPercByLocation.pdf

2.1.2 Pavement Condition

Pavement conditions directly translate into the speeds at which trucks can operate, influence driver fatigue, and affect levels of cargo damage related to vibration and jarring motions. It is therefore critical that this study consider existing pavement conditions. Currently, the Georgia Department of Transportation (GDOT) uses the Pavement Condition Evaluation System (PACES) to evaluate pavement conditions and roadway deficiencies on the state highway system.

As shown in **Table 2-4**, acceptable pavement conditions are rated greater than 70. The roadways within the study area are generally acceptable. Roadway sections with ratings of 75 and below get referred back to the district and general office for local consideration and conditions check/verification.

Table 2-4: PACES Scale

Scale	Result
Above 70	Acceptable. May warrant minor treatment types.
70 and below	Resurface Roadway
50 and below	Reconstruct Roadway
*75 and below**	*Rated by District and General Office*

Source: GDOT, http://www.pavementpreservation.org/wp-content/uploads/presentations/Georgia%20Pavement%20Preservation.pdf

As shown in **Table 2-5**, the majority of the study area's roadways in their respective functional class have acceptable pavement conditions. For instance, although 66.3 percent of interstate roadways are acceptable, 33.3 percent require resurfacing. In addition, some state-maintained roadways (minor arterial and major collector) require resurfacing maintenance. Complete road reconstruction is also needed for approximately 40.6 percent of local roadways because the pavement condition has deteriorated beyond a certain point that resurfacing will not solve the issues alone.

Table 2-5: PACES Results by Functional Class

Functional Class	Pavement Condition		
	Acceptable	Resurface	Reconstruct
Interstate	66.3%	33.3%	0.4%
Principal Arterial	83.9%	12.2%	4.0%
Minor Arterial	49.9%	40.8%	9.3%
Major Collector	44.9%	37.9%	17.2%
Urban/Minor Collector	47.8%	32.7%	19.4%
Local	43.3%	16.1%	40.6%

Source: GDOT, 2014

As shown in **Table 2-6**, approximately half of the roads in the study area are in acceptable condition. Effingham County has 51.9 percent of roadways in acceptable condition, followed by Chatham County with 47.2 percent and Bryan County with 41.6 percent. Over 20 percent of the road miles in the study area need some resurfacing, led by Chatham County with 23.3 percent. If current trends continue, it is anticipated that more roads will need reconstruction as the PACES

rating drops below 50. Currently, almost 31 percent of roads in the area need reconstructive projects to improve pavement conditions, led by Bryan County with 39.6 percent. The study area requires some attention to pavement, but most of this is at the county level as state-maintained roads are in better overall condition. Most of the reconstruction need is for local roads (40.6 percent in the study area).

Table 2-6: PACES Results by County

County	Pavement Condition		
	Acceptable	Resurface	Reconstruct
Bryan	41.6%	18.8%	39.6%
Chatham	47.2%	23.3%	29.5%
Effingham	51.9%	20.1%	28.0%

Source: GDOT, 2014

When GDOT establishes the annual Roadway Rehabilitation Program, the following would occur:

- Each district submits priorities to state maintenance office. The priorities are based on PACES Rating, AADT, Safety History and Skid Test. District Maintenance Assistant and State Maintenance Liaison establish the District's Priorities that are advanced.
- State maintenance office reviews each district's list and establishes a state wide priority listing. The priorities are based on available funding as well as the criteria used at the district level.

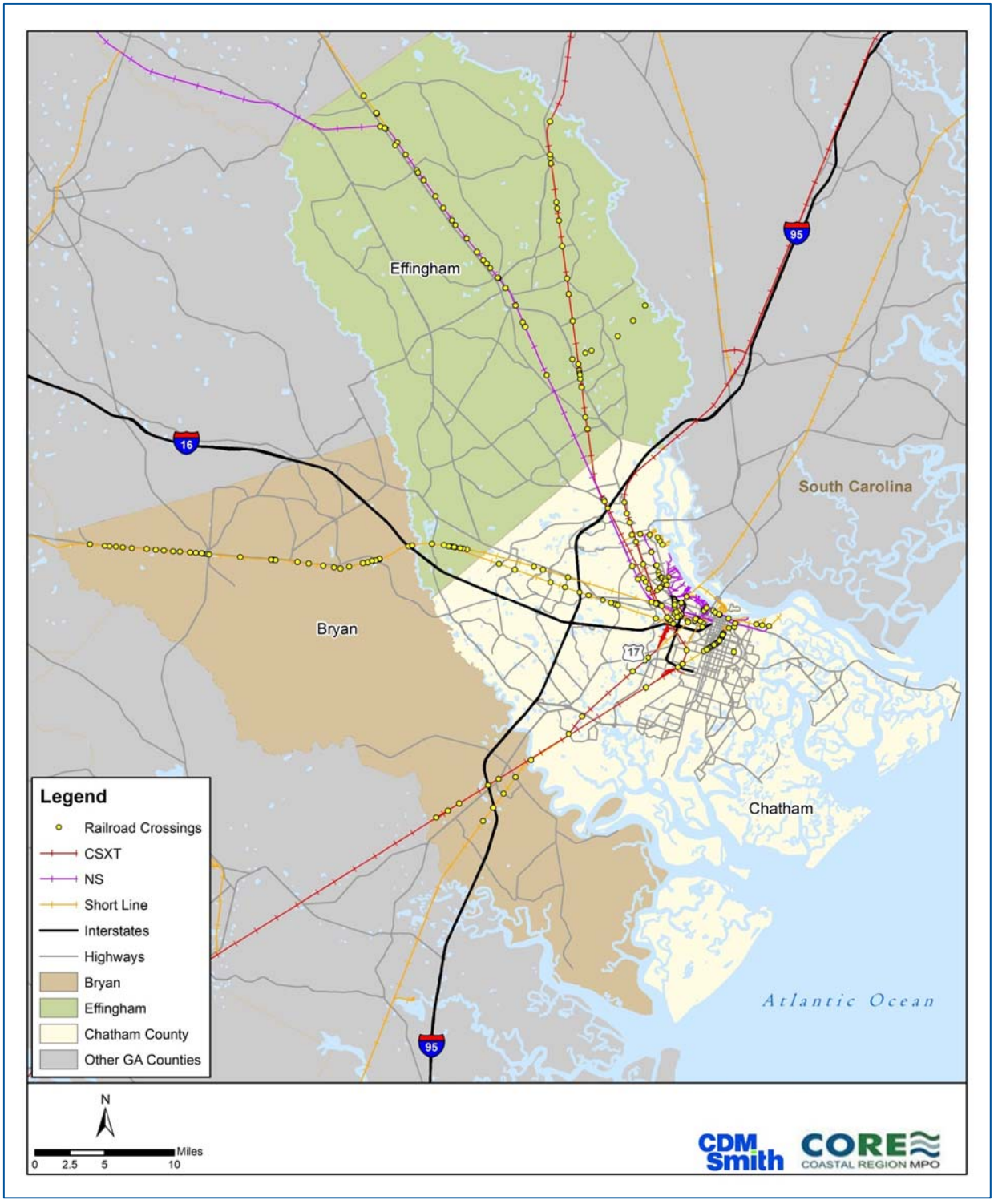
For interstates or other state routes with major distresses, the state maintenance office requests detailed pavement and/or base evaluation from the Office of Materials and Research, Pavement Design Section.

2.1.3 Railroad Crossings

The presence of railroad crossings (i.e., at-grade) on roadways presents potential safety and/or operational concerns to commercial motor vehicles (CMVs) utilizing such roadways. Grade separation refers to a crossing in which the roadway and rail are at different elevations. It poses a concern of clearance versus an actual interaction between the train and CMVs. The ability for CMVs to travel across a raised track, to fully exit the path of a potential train before reaching a stop bar, or have the line of sight to identify warning signalizations are three leading causes of CMV and train related accidents. CMV operators, resulting from the types of cargo being transported, may be required to come to a complete stop before proceeding across an at-grade crossing. This has the potential to adversely affect the flow of CMV and passenger vehicles.

There are a total of 317 at-grade crossings located within the study area. According to the Federal Railroad Association (FRA) and National Transportation Atlas Database (NTAD) there are 49 at-grade crossings in Bryan County, 199 in Chatham County and 69 in Effingham County. These crossings occur for both Class I and Class III railroads. **Figure 2-4** displays the locations of railroad crossings in the study area.

Figure 2-4: Rail Crossings in the Study Area



Source: NTAD (National Transportation Atlas Database) 2012

2.1.4 Bridges

There are two physical characteristics of bridges located on or spanning the roadway that impact a CMV operator's route: Vertical Minimum Clearance and Weight-Load Restrictions. Vertical Minimum Clearance is the distance from the road surface to the lowest point on the overhead obstruction [bridge] within the confines of the travel lane. The larger class 8 CMV, which includes interstate tractor-trailer combinations used for pick-up and delivery, has an operating height of 13 feet and 6 inches. Interstate design standards have a minimum vertical clearance standard of 15 feet. Other functional classes may not define clearance standards or include structures built prior to standards being introduced. This same consideration will be necessary when reviewing the potential for restrictions to rail operations.

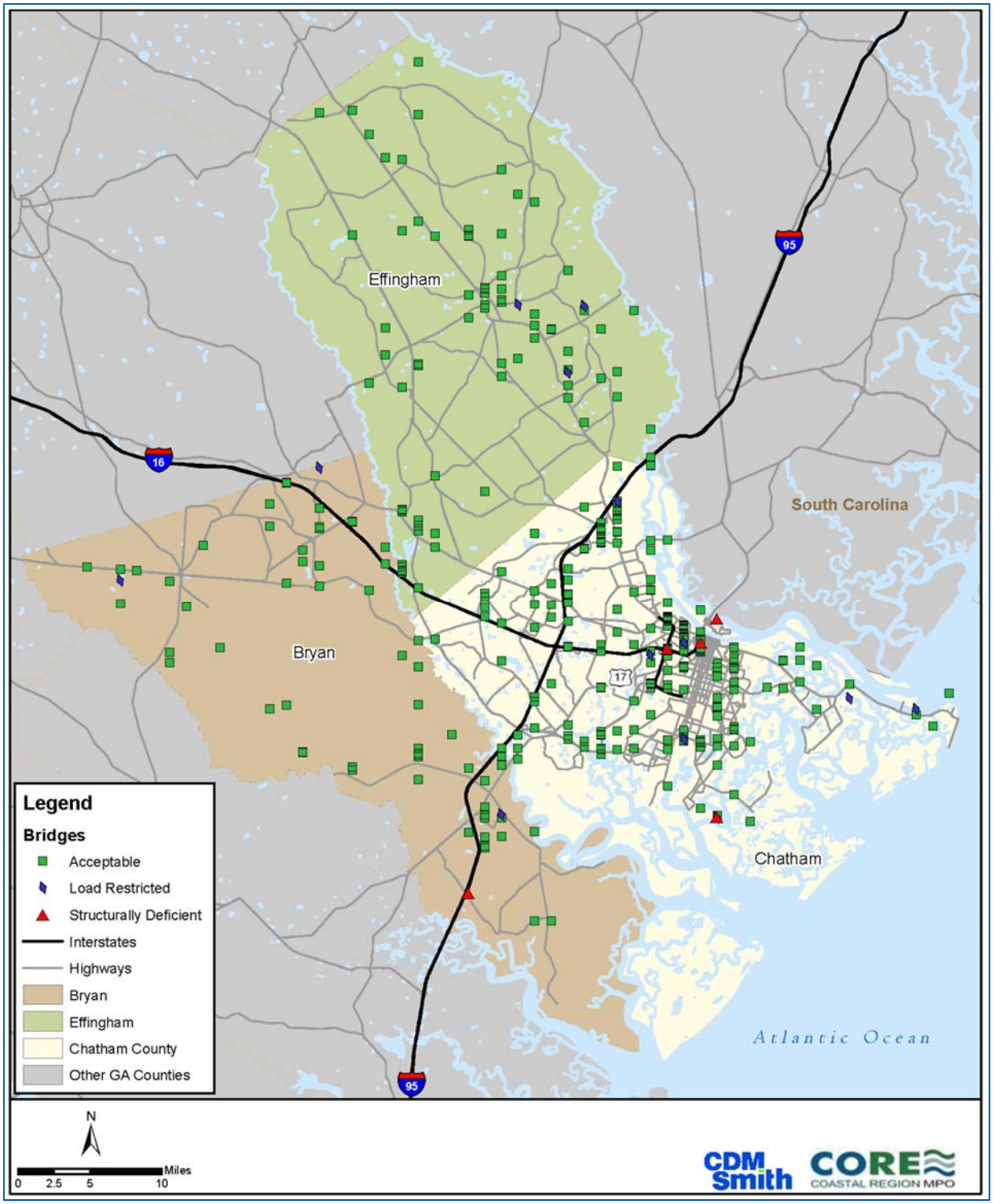
A bridge with fatigue damage may restrict what vehicle types and weights may cross it safely. A bridge is "load posted" when its capacity to carry heavy loads is diminished. **Table 2-7** lists all bridges in the study area by count, deck area, and status across counties. There are 377 bridges which have over 6,596,000 square feet of deck area in the three-county area. The status of these bridges are described as structurally deficient (SD) or functionally obsolete (FO). A bridge with a "posted for load" posting has a weight limit capacity. All SD bridges are posted, but not all posted structures are SD. Overall, there are five SD bridges in the area. The GDOT is primarily focusing on improving the SD bridges. **Figure 2-5** shows the placement of all bridges, along with the load restricted structures.

Table 2-7: Bridges Status

Name	State	Count	Area (sq ft)	Status	Posting
Bryan	Georgia	65	803,704.2	-	Open
Bryan	Georgia	3	11,240.1	-	Posted for Load
Bryan	Georgia	1	13,181.8	SD	Posted for Load
Bryan	Georgia	5	88,343.5	FO	Open
Chatham	Georgia	197	4,456,976.3	-	Open
Chatham	Georgia	1	1,489.4	-	Load Recommendation (not legal)
Chatham	Georgia	5	78,083.9	-	Posted for Load
Chatham	Georgia	3	122,416.3	SD	Open
Chatham	Georgia	1	3,025.2	SD	Posted for Load
Chatham	Georgia	22	552,997.1	FO	Open
Chatham	Georgia	1	3,347.1	FO	Posted for Load
Effingham	Georgia	68	433,258.9	-	Open
Effingham	Georgia	2	12,308.5	FO	Open
Effingham	Georgia	3	16,062.1	FO	Posted for Load

Source: Georgia NBI File Submittal, bridge data as of Dec 31, 2012

Figure 2-5: Bridge Inventory in the Study Area



Source: Georgia NBI File Submittal

2.2 Air Cargo System Profile

Air cargo consists of mail products and freight commodities. There are numerous entities which are participants in this mode (e.g., freight forwarders, deferred air carriers, etc.). The physical carriage of goods in this mode occurs on dedicated, cargo configured aircraft or in the "belly" or luggage compartments of passenger aircraft. With the transition to regional jets to service smaller markets such as Savannah, major airlines and their regional partners have reduced the overall available space for air cargo. Increased requirements to satisfy elevated security for this cargo type has also decreased the amount of cargo by limiting the number of acceptable shippers at smaller airports. This reduction has shifted cargo to other modes or to consolidators or freight forwarders who transport these shipments to larger airports via ground transportation. A third factor in the reduction of air cargo volumes are economic conditions. As the asset costs such as aircraft, fuel, and terminals outweigh those of other modes, the cost to shippers is extremely high. As economic pressures influence transportation budgets, many former air customers shift to less costly but slower transportation modes by modifying the needs of their individual supply chains.

According to data from the Freight Analysis Framework Version 3 (FAF3), in 2011 there were over five Ktons of freight traveling to and from the study area by air which totaled over $1.5 billion in market value. Additional freight movements are discussed in Task 2.1 (Existing and Future Freight Movement) and Task 2.3 (Freight Forecasting) memoranda.

While many airports in Georgia can accommodate air cargo activity to a certain degree, there is one airport in the Savannah metropolitan area that has significant air cargo, the Savannah / Hilton Head International Airport. The other airports are military (Hunter) and/or privatively owned. **Figure 2-9** shows the locations of the airports in the study area.

2.2.1 Facilities

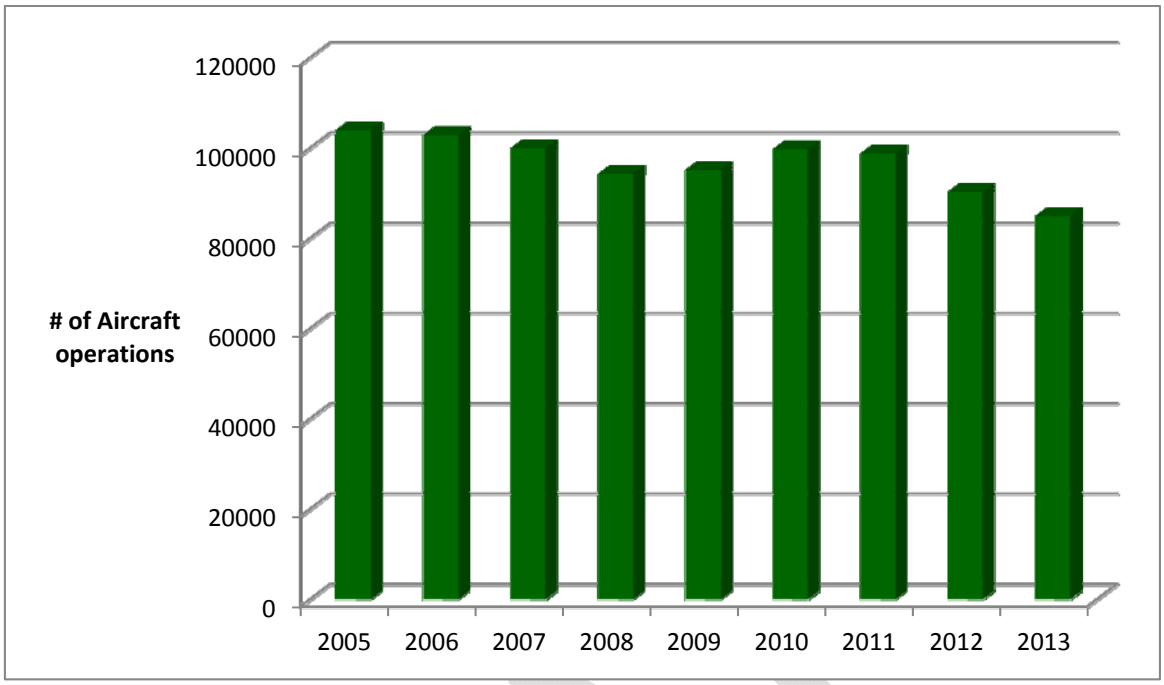
The Savannah / Hilton Head International Airport (SAV) services a growing number of passenger and cargo interests for individuals in Georgia and South Carolina. One of six identified airports within the study area, SAV handles measureable air cargo. However, SAV has experienced a decrease in aircraft traffic. The use of the airport for cargo transport has leveled off the last few years following the economic downturn of 2009, as shown in **Figure 2-6** and **Figure 2-7**.

SAV operates with two active runways, four designations, at 7,002 feet and at 9,351 feet in length. Designating air cargo capacities, based on runway lengths, does not provide sufficient information to identify aircraft types and cargo volumes. These are subject to additional factors of mean air temperature, altitude, aircraft weight (empty and loaded), and other performance based metrics. The intent of this project is to focus on air cargo tonnage (e.g., freight volume and value), not aircraft operations.

A private U.S. Army Air Field in Chatham County, the Hunter Army Airfield (AAF) has one asphalt runway of 11.375 feet in length. This is a restricted field with no commercial air service.

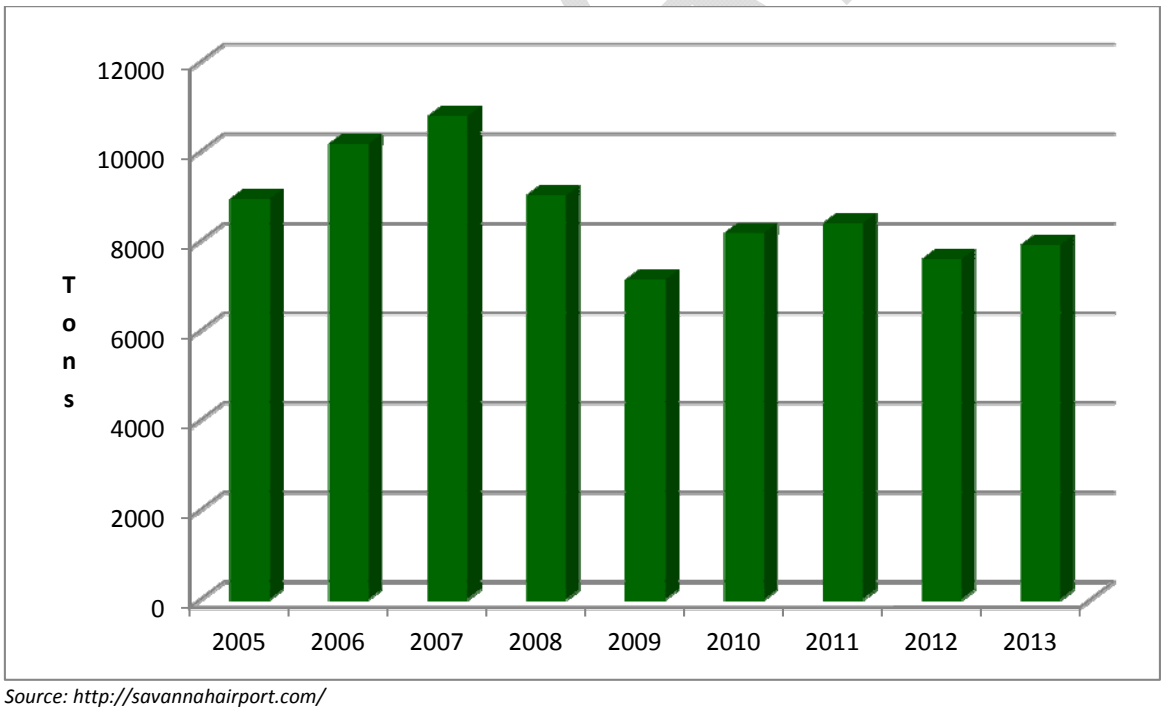
A privately owned airfield in Chatham County, Hodges Air Park has one turf surfaced at 2,640 feet in length. There are no tower, repair or service facilities. There is no commercial service available.

Figure 2-6: Aircraft Operations



Source: http://savannahairport.com/

Figure 2-7: Air Cargo



Source: http://savannahairport.com/

A privately owned airfield in Effingham County, Swaids Field has one turf surfaced at 3,000 feet in length. There is no commercial service available.

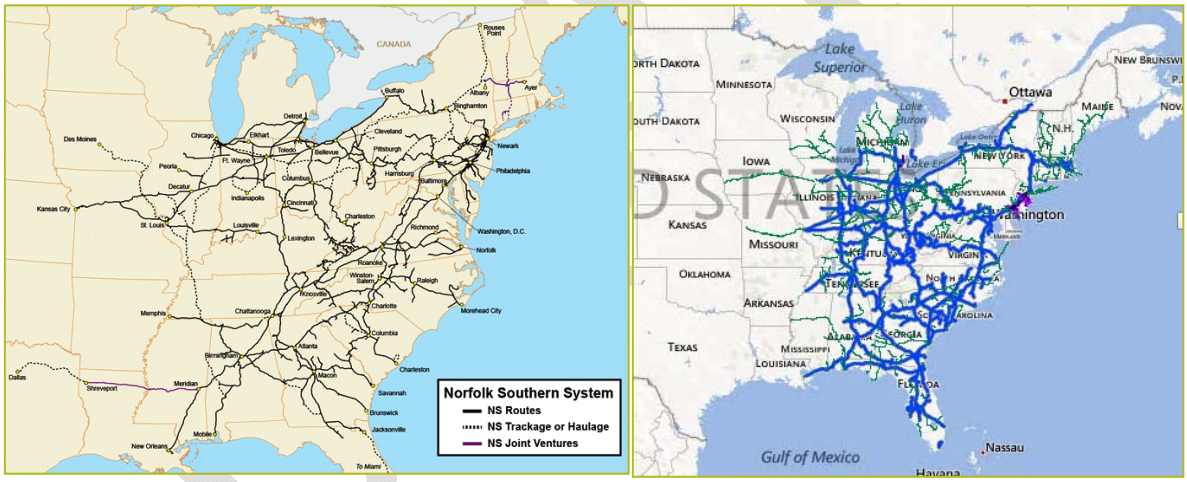
A privately owned airfield in Effingham County, Briggs Field has one turf surfaced at 2,300 feet in length. There is no commercial service available.

A privately owned airfield in Effingham County, Briar Patch has one turf surfaced at 2,600 feet in length. There is no commercial service available.

2.3 Rail System Profile

Rail is a major component of freight movement in Georgia. According to the Freight Analysis Framework (FAF) data, 11,300 Ktons moved in and out of the Savannah metropolitan area, almost 8 percent of all freight movements in the area for 2011. Railroad systems are classified as Class I, II, or III based on the operating revenues of the rail line. There are two Class I railroads in operation in Georgia, CSX and Norfolk Southern (NS), and they have over 2000 miles of rail track way in the state. Each operates exclusively east of the Mississippi River. Illustrations of the individual coverage or service areas are presented in **Figure 2-8**. The CSX line provides north and south directional access to the study area. NS only offers direct access to the north.

Figure 2-8: Coverage Areas for NS and CSX



Source: www.nscorp.com, www.csx.com, February 27, 2013

There are 220 miles of Class I track in the Savannah metropolitan region. CSX has approximately 130 miles of track in the three-county area while NS owns almost 90 miles. The main concentration of track occurs in the north side and west side of Savannah within Chatham County. This occurs because the rail providers have rail spurs and yards in the area primarily to accommodate the loading and unloading of freight from the port terminals.

Additionally, there are three Class III, or short line, railroads in the area totaling nearly 196 miles of track. The three Class III railroads in operation include Savannah Port Terminal Railroad (SAPT), Golden Isles Terminal Railroad (GITM), and Georgia Central Railway, LP (GC). These short line railroads connect the Class I railroads to commodity shippers and receivers and each plays a vital role in moving freight throughout the state. **Figure 2-9** is a visual display of all rail activity in the study area.

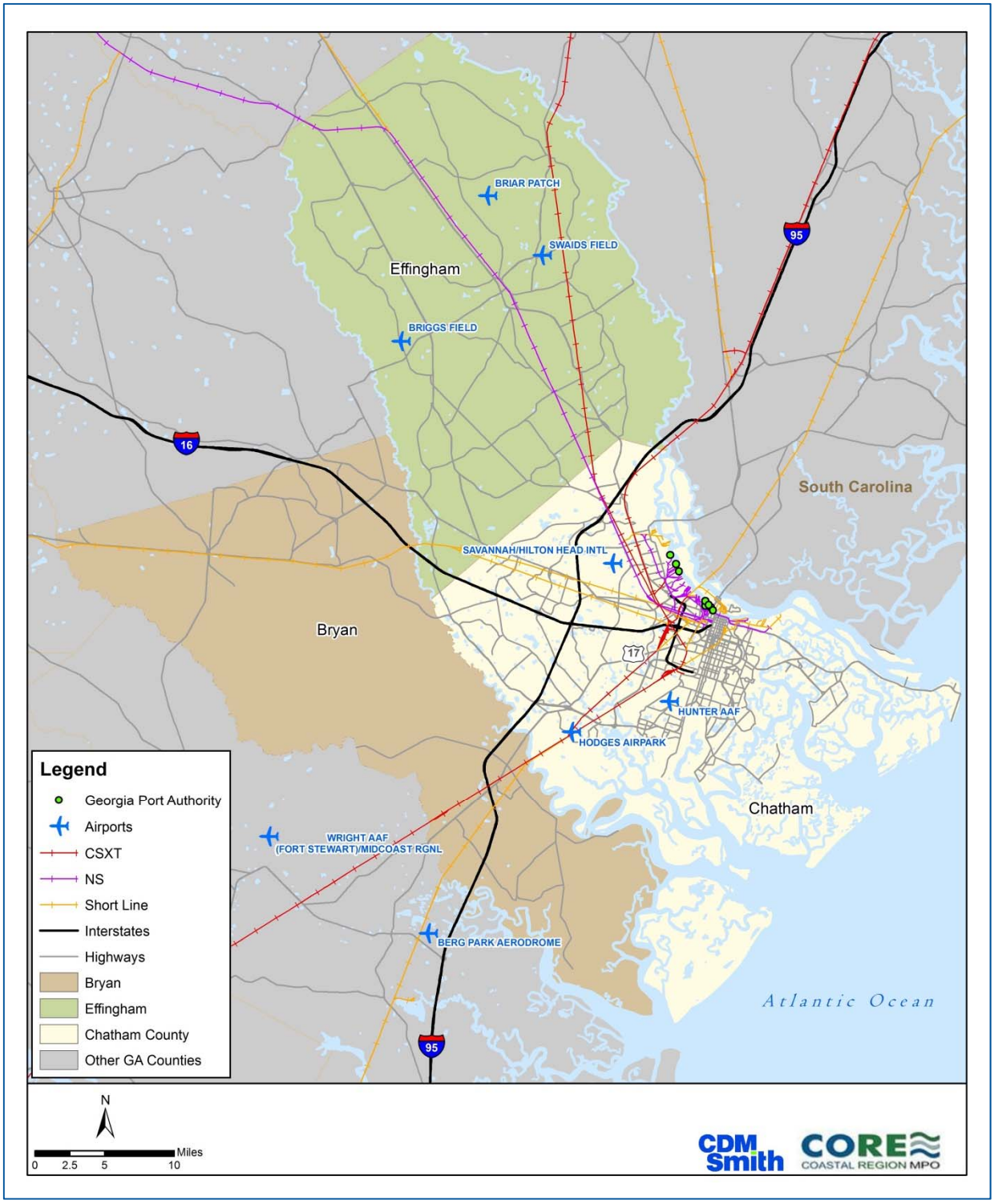
Each of the short lines provides a valuable service to the Class I network and overall freight network. The 18 miles of the Savannah Port Terminal Railroad handles 26,000 annual carloads of freight and operates in the Georgia Ports Authority's Garden City terminal. The 13 miles of the Golden Isles Terminal Railroad handles 10,000 annual carloads of freight and operates in the Colonel Island Bulk and Auto Processing terminal. The 171 miles of the Georgia Central Railway handles 1.3 million tons of freight and 15,000 carloads of freight and interchanges with NS and CSX. **Table 2-8** shows the different commodities that each of the railroads handle. Further commodity information can be found in Task 2.1 (Existing and Future Freight Movement) and Task 2.3 (Freight Forecasting) memoranda.

Table 2-8: Short Line Commodities

Commodity	Georgia Central	Golden Isles	Savannah Port
Automobiles		X	
Coal	X		
Chemicals	X	X	X
Farm & Food Products	X	X	
Forest	X		
Stone	X		
Plastics	X		
Paper	X		X
Intermodal			X
Machinery			X

Source: Genesse & Wyoming, Inc., http://www.gwrr.com

Figure 2-9: Airport, Rail and Port Locations in the Study Area



2.4 Maritime Transport System Profile

Ocean and inland water transport provide access to markets overseas and is a low cost solution via barge and short sea shipping around the state and the continent. With the globalization of the supply chain over the previous decades, the ability to transport materials and goods between continents has increased. This movement is characterized by the increasing utilization of containerization. With this method as a standard, intermodal connectivity between ocean and landside transport decreases cost and increases speed across the entire supply chain. The use of inland waterway and short sea shipping, a transport method having been in decline within the U.S., has experienced a minor renaissance with recent innovations and capital investment. Although continuing declines in investment in maintenance occur (e.g., Savannah River depths from Savannah to Augusta), other regions have experienced an increasing use of waterways, once the sole means of goods transport (e.g., Mississippi, Alabama).

The Federal Navigation Channel provides deep draft vessel passage from the ocean trade routes to the Port of Savannah. Current navigable depths provide 42 feet at mean low tide.

The Port of Savannah handles multiple commodity types through employment of Ro-Ro (roll-on, roll-off), break-bulk, container, and reefer (refrigerated) operations. This port is ranked four nationally as one of the top container ports by port calls and vessel types. **Table 2-9** shows the vessel calls and the capacity of these calls. Two terminal locations perform these services, both of which are owned and operated by the Georgia Ports Authority: Garden City Terminal and Ocean Terminal.

Table 2-9: Vessel Calls and Capacity, 2011

Port	Number of Vessel Calls	Capacity of Calls
Savannah	2,219	112,557

Source: http://www.navigationdatacenter.us/

Physical aspects of the port's main channels are summarized in **Table 2-10**. Both of the port's terminals have the same dimensions and even with expansions will still be relatively the same in depth. The Port of Savannah has direct access to cities throughout the Southeast and Midwest of the U.S. and is a key transportation link for Georgia's waterborne freight.

Table 2-10: Terminal Physical Aspects

Terminal	Depth (feet)	Width (feet)
Garden City	42	500
Ocean	42	500

Source: Georgia Ports Authority

There is warehousing space available in both of the terminals. As a result of investing in refrigerated container units by the Georgia Ports Authority, approximately 38 percent of the poultry in the U.S. moves through this port. Additional export information can be found in Task 2.1 (Existing and Future Freight Movement) and Task 2.3 (Freight Forecasting) memoranda.

2.4.1 Facilities

Garden City Terminal

The Garden City Terminal is the newer of the two facilities offering container services across 486 hectares. This is the fourth largest container port in the U.S. by size.

Channel width is 500 feet with a depth of 42 feet. Future dredging operations are planned to deepen the channel to 48 feet. Specific characteristics of the terminal include:

- Warehousing space is 4 million square feet
- Outdoor, paved container storage space is 175 hectares
- 37 interchange lanes with 25 pre-check lanes at three gates
  - Specific lanes are equipped with scales, over-height sensing devices
  - Gate Operations :
    - Operating Hours of Gate 3:
      0700 -1800 Monday, Tuesday, Wednesday and Thursday
      0700 – 1700 Friday
    - Operating Hours of Gate 4:
      0700 -1800 Monday through Friday
      0800 – 1200 x 1300 - 1700 Saturday
    - Operating Rules:
      Gates 3 and 4 are for containerized transactions only
      Commercial vans and loose freight should be directed to Gates 1 or 5
      Bob-tail trucks should enter through Gate 1 or Gate 5 and proceed to the internal kiosk for pick-up ticket processing
      Bob-tail trucks should exit through Gate 1 or Gate 5
- Container crane equipment
  - Five have 16 container reach lengths and 48.1 metric ton lift capacity
  - Six have 18 container reach and 71 metric ton lift
  - 11 have 22 container reach and 71 metric ton lift
- Current capacity for the terminal is 2.6 million twenty foot equivalencies (TEUs)
- Intermodal Container Facility has unrestricted double stack
- Serviced by NS and CSX
- Immediate access to I-95 and I-16

Ocean Terminal

The Ocean Terminal provides break bulk as an alternative to ship non-containerized goods and Ro-Ro services, handles wood products, steel, farm equipment, heavy-lift cargo, and automobiles.

Operational highlights include:

- 10 berths
- 139,000 square meters of covered storage
  - Side warehouse rail sidings
- 34 hectares of open storage and 26.7 hectares of paved storage
- Crane equipment
  - Two gantry cranes
  - One container crane
- Two intermodal container transfer facilities
  - Mason ICTF has six working rail tracks and three storage tracks
  - Chatham ICTF has three working and one storage
- Provides access to I-95 and I-16

2.5 Connectivity to Intermodal System Profile

The Savannah metropolitan region is able to transport goods throughout the Midwest and Northeast via truck, rail and port. There is direct access to I-95 and I-16 where major cities can be reached within two days. The Port of Savannah has intermodal connections through truck and rail access, such as rail connections with CSX and NS transporting freight to Atlanta, Birmingham, Charlotte, Memphis and Orlando.

Cordele Intermodal Services located near I-75 provides rail access to the Port of Savannah. Using intermodal services reduces total costs and CO_2 emissions, and allows quick delivery by avoiding highway delays. Cordele offers a private fleet of trucks and chassis as well as a 40-acre container yard with expansion planned in the future. Tax credits are available if the Cordele uses the Port of Savannah.

CenterPoint Intermodal Center in Savannah, Georgia is located within five miles of the Port of Savannah. CenterPoint offers rail access to NS, as well as NS Dillard Yard, an intermodal center that has storage capabilities.

3. FUTURE FREIGHT DEMAND

3.1 Projected Commodity Flow

The results of the disaggregation are a series of tables showing the commodity flow into and out of each FAF freight district by truck, rail, water, and air by commodity for 2011 and 2040.

3.1.1 Truck Imports/Exports

Truck transportation represents the largest mode share for freight to and from the FAF Disaggregated CSA boundary area. **Table 3-1** and **Table 3-2** examine the study area's economy, showing the top 10 commodities for imports and exports that occur within the area boundary via truck movement. Total import tons increase from 37,663.7 KTons to 85,123.1 KTons using truck as the domestic mode choice. Nonmetallic Minerals remains the largest import (by tonnage) to use truck. From 2011 to 2040, it increases in its share of total import from 12.0 percent to 23.8 percent. It may suggest for developing industries since other commodities continue to grow in total tonnage as well.

Total export tons increase from 42,243.3 KTons in 2011 to 89,371.6 KTons in 2040 using truck as the domestic mode choice. Coal and petroleum products are the largest export (by tonnage) to use truck in 2011, as shown in **Table 3-1**. However it only increases from 5,059.9 KTons to 8,824.9 KTons between 2011 and 2040. This commodity is outpaced by the rise of "other foodstuffs" (such as dairy products, sugar, oils, and coffee), which increases from 1,244.8 to 9,656.9 KTons, and "nonmetal mineral products" (such as ceramic and glass products) which increases from 1,835.4 to 9,312.0 KTons between 2011 and 2040.

Table 3-1: Top 10 Commodity by Tonnage by Truck (2011)

Import			Export		
Commodity	KTons	% of total	Commodity	KTons	% of total
Nonmetallic minerals	4,489.8	12.0%	Coal-n.e.c.	5,059.9	20.7%
Logs	3,678.5	9.8%	Mixed freight	3,238.9	13.2%
Nonmetal min. prods.	3,525.2	9.4%	Nonmetal min. prods.	1,835.4	7.5%
Waste/scrap	2,981.8	8.0%	Other foodstuffs	1,244.8	5.1%
Newsprint/paper	2,631.6	7.0%	Machinery	1,098.1	4.5%
Fertilizers	2,393.5	6.4%	Waste/scrap	1,077.6	4.4%
Gasoline	2,280.6	6.1%	Fuel oils	959.3	3.9%
Fuel oils	1,543.4	4.1%	Nonmetallic minerals	932.1	3.8%
Basic chemicals	1,275.1	3.4%	Newsprint/paper	919.2	3.8%
Coal-N.E.C.	1,158.0	3.1%	Base metals	804.9	3.3%

Table 3-2: Top 10 Commodity by Tonnage by Truck (2040)

Import			Export		
Commodity	KTons	% of total	Commodity	KTons	% of total
Nonmetallic minerals	20,032.4	23.8%	Other foodstuffs	9,656.9	10.9%
Nonmetal min. prods.	7,854.3	9.3%	Nonmetal min. prods.	9,312.0	10.5%
Newsprint/paper	6,998.0	8.3%	Coal-n.e.c.	8,824.9	10.0%
Waste/scrap	6,109.0	7.3%	Mixed freight	8,603.4	9.7%
Logs	3,932.8	4.7%	Nonmetallic minerals	5,578.0	6.3%
Meat/seafood	3,393.8	4.0%	Machinery	5,044.1	5.7%
Plastics/rubber	3,228.9	3.8%	Newsprint/paper	4,539.7	5.1%
Gasoline	3,075.8	3.7%	Waste/scrap	3,891.1	4.4%
Basic chemicals	2,852.3	3.4%	Chemical prods.	3,399.1	3.8%
Fertilizers	2,386.2	2.8%	Furniture	3,390.7	3.8%

Table 3-3 and **Table 3-4** show tonnage of the goods by origin and destination. Exports travel from the study area and imports travel to the study area. The freight districts are shown as origin and destination pairings to allow for a finer level of detail within the study area. Refer back to **Figure 1-2** for an illustration of the freight districts.

Table 3-3: Top 10 Export Trade Partners by Tonnage by Truck (2011)

Origin	Destination	KTons
Freight District 08	Atlanta, GA	801.7
Freight District 16	Houston, TX	491.3
Freight District 16	Atlanta, GA	432.9
Freight District 16	State of Georgia	397.0
Freight District 08	State of Georgia	391.7
Freight District 14	Houston, TX	385.6
Freight District 10	Atlanta, GA	362.4
Freight District 10	Houston, TX	351.9
Liberty County	State of Georgia	350.6
Freight District 10	State of Georgia	338.0

Table 3-4: Top 10 Import Trade Partners by Tonnage by Truck (2011)

Origin	Destination	KTons
Atlanta, GA	Liberty County	577.6
State of Georgia	Liberty County	488.0
Newark, NJ (New York)	Liberty County	417.4
State of Georgia	Freight District 10	369.4
State of Georgia	Freight District 16	344.7
State of South Carolina	Liberty County	297.4
State of South Carolina	Freight District 18	249.9
State of Georgia	Freight District 14	225.9
Atlanta, GA	Freight District 16	206.8
Newark, NJ (New York)	Freight District 14	183.7

Perhaps most notable in **Table 3-3** is the common origin of Districts 08, 10, and 16 along with the common destinations of Atlanta and the rest of Georgia as major freight destinations for trucks. As we will discuss later, Freight District 08 is home to the port activities in the study area. This pairing likely reflects the offloading of freight through the port onto truck for domestic delivery. This table begins to highlight a heavy movement from the Savannah region via I-16 WB and potentially I-95 SB.

Liberty County, part of the original FAF Savannah CSA metropolitan region, was disaggregated as part of the process to make sure tonnages were properly associated with the county and not the freight districts. As shown in **Table 3-5**, Liberty County is a major destination for some truck movements from Atlanta, the rest of Georgia, South Carolina, and Newark.

Table 3-5: Top 10 Internal Trade Partners by Tonnage by Truck (2011)

Origin	Destination	KTons
Liberty County	Liberty County	277.8
Freight District 08	Liberty County	237.7
Freight District 16	Freight District 10	183.7
Freight District 16	Freight District 16	175.4
Freight District 08	Freight District 16	165.2
Freight District 08	Freight District 10	156.7
Freight District 10	Freight District 10	147.2
Freight District 18	Liberty County	146.9
Freight District 10	Freight District 16	145.1
Freight District 14	Freight District 10	139.1

Part of this freight equation includes internal movements for the study area. **Table 3-5** reflects the freight carried by trucks that originates in the study area, but is also delivered in the study area. There are some intra-county and even intra-district pairings in this table. Some will originate from Freight District 08, home to the port activities in the study area, and terminate within the area as well.

Tables 3-6 through **Table 3-8** show the growth and change in trade partners in 2040. Perhaps most notable in **Table 3-6** is the common origin of Districts 08, 10, and 16 (as mentioned in 2011 also) along with the common destinations of Atlanta and the rest of Georgia as major freight destinations for trucks. Important items to note here are:

1) The increase of port movement to Atlanta, from 801.7 KTons in 2011 to 2,413.2 KTons in 2040, and

2) The rise of Houston, TX as an export trade partner in future years.

The major imports for the study area will increasingly originate from the north in Newark, NJ metropolitan region (**Table 3-7**). Trucks will take I-95 into the study area. This could reflect not only a potential need on the roadway aspect of this movement, but also an opportunity for the Port of Savannah as much of this freight may be originating from the Port of New York/New Jersey and be trucked down the coast.

Table 3-6: Top 10 Export Trade Partners by Tonnage by Truck (2040)

Origin	Destination	KTons
Freight District 08	Atlanta, GA	2,413.2
Freight District 16	Houston, TX	942.6
Freight District 16	Atlanta, GA	801.8
Freight District 14	Houston, TX	746.2
Freight District 08	State of Georgia	695.0
Freight District 10	Atlanta, GA	687.7
Freight District 10	Houston, TX	681.7
Liberty County	Atlanta, GA	623.6
Liberty County	State of Georgia	611.4
Freight District 14	Atlanta, GA	593.7

Table 3-7: Top 10 Import Trade Partners by Tonnage by Truck (2040)

Origin	Destination	KTons
Newark, NJ (New York)	Liberty County	3,654.8
Newark, NJ (New York)	Freight District 14	1,557.2
Newark, NJ (New York)	Freight District 16	1,467.3
Newark, NJ (New York)	Freight District 10	1,169.7
Atlanta, GA	Liberty County	937.5
Newark, NJ (New York)	Freight District 22	866.8
Newark, NJ (New York)	Freight District 08	864.8
Newark, NJ (New York)	Freight District 40	790.1
State of Georgia	Liberty County	748.2
State of Georgia	Freight District 10	680.3

Table 3-8: Top 10 Internal Trade Partners by Tonnage by Truck (2040)

Origin	Destination	KTons
Liberty County	Liberty County	566.2
Freight District 08	Liberty County	535.4
Freight District 08	Freight District 16	338.6
Freight District 16	Freight District 10	313.0
Freight District 16	Freight District 16	312.8
Freight District 08	Freight District 10	307.3
Freight District 18	Liberty County	299.8
Freight District 16	Liberty County	269.3
Freight District 10	Liberty County	259.7
Freight District 10	Freight District 16	259.4

Table 3-8 reflects the freight carried by trucks that originates in the study area, but is also delivered in the study area. Pairings for 2040 is similar to 2011. This table does reflect the potential growth of Liberty County in the region as it becomes a destination for five of the top 10 locations, including the top pairing originating from Liberty County and ending in Liberty County also. The top commodities (by tonnage) that originate or end up in Liberty County mainly include nonmetallic minerals, chemicals, fertilizers, and waste and scrap.

Figure 3-1 and **Figure 3-2** show the truck tons into and out of the study area for 2011.

3.1.2 Rail Imports/Exports

Truck transportation represents the largest mode share for freight to and from the study area. However, rail transportation provides another important mode. **Table 3-9** and **Table 3-10** examine the study area's economy by showing the top five commodities for imports and exports that occur via rail movement. Total import tons increase from 7,731.6 KTons (2011) to 11,516.8 KTons (2040) using rail as the domestic mode choice. Fertilizers and Newsprint/paper supplies are the top two commodities imported in both years. **Table 3-9** shows 2,681.8 KTons of Fertilizers were moved in 2011, accounting for 34.7 percent of the total. While the 2040 tonnage for Fertilizers remains similar (2,787.0 KTons), the share decreases to 24.3 percent. From 2011 to 2040, newsprint and paper supplies double in tonnage from 1,464.5 KTons in 2011 to 2,861.7 KTons in 2040. This increases the mode share to 24.9 percent.

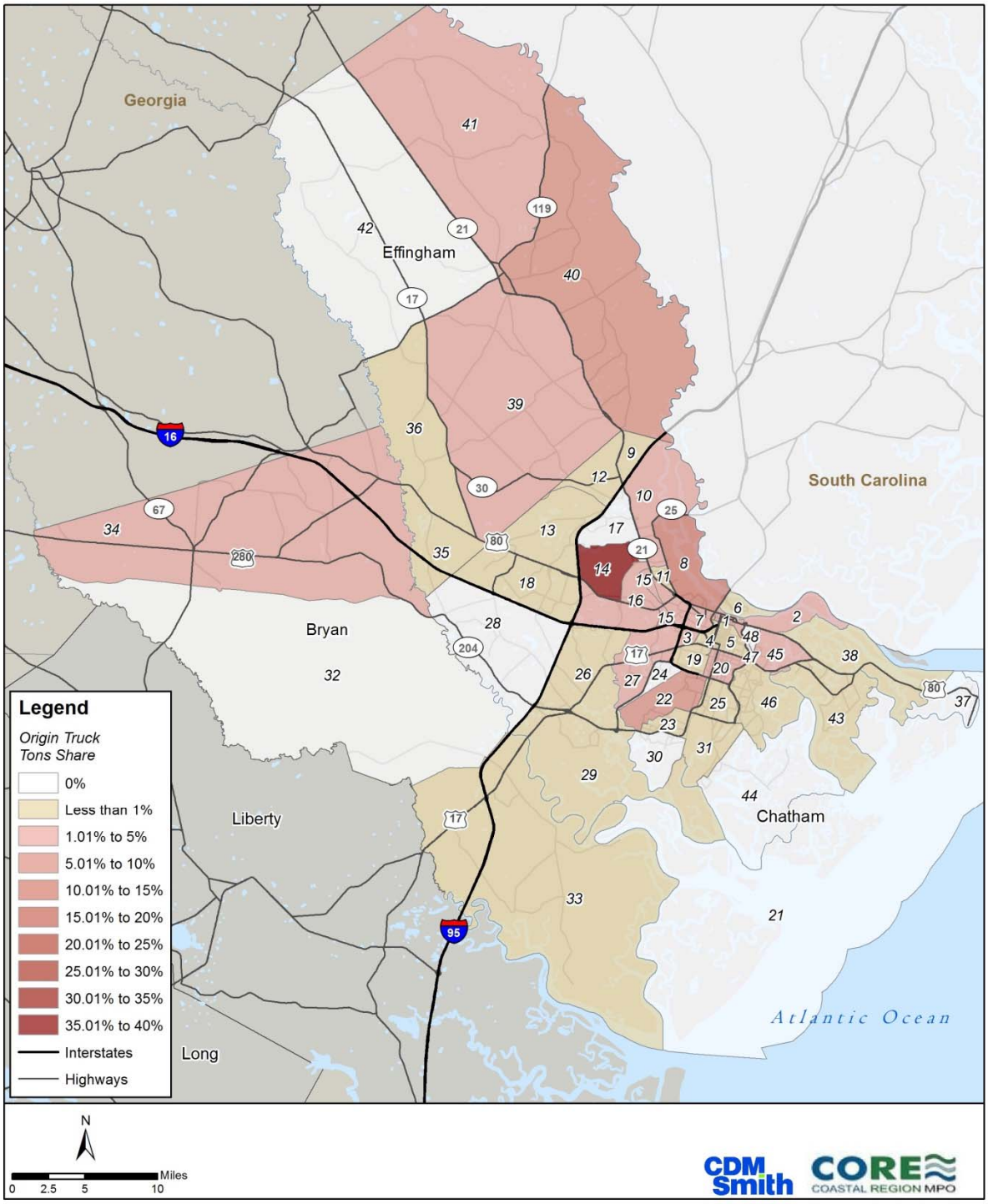
Table 3-9: Top 5 Commodity by Tonnage by Rail (2011)

Import			Export		
Commodity	KTons	% of total	Commodity	KTons	% of total
Fertilizers	2,681.8	34.7%	Newsprint/paper	796.7	27.3%
Newsprint/paper	1,464.5	19.0%	Coal-n.e.c.	581.7	19.9%
Nonmetallic minerals	814.9	10.6%	Basic chemicals	362.3	12.4%
Gravel	723.2	9.4%	Other foodstuffs	305.4	10.5%
Basic chemicals	557.5	7.2%	Nonmetallic minerals	239.9	8.2%

Table 3-10: Top 5 Commodity by Tonnage by Rail (2040)

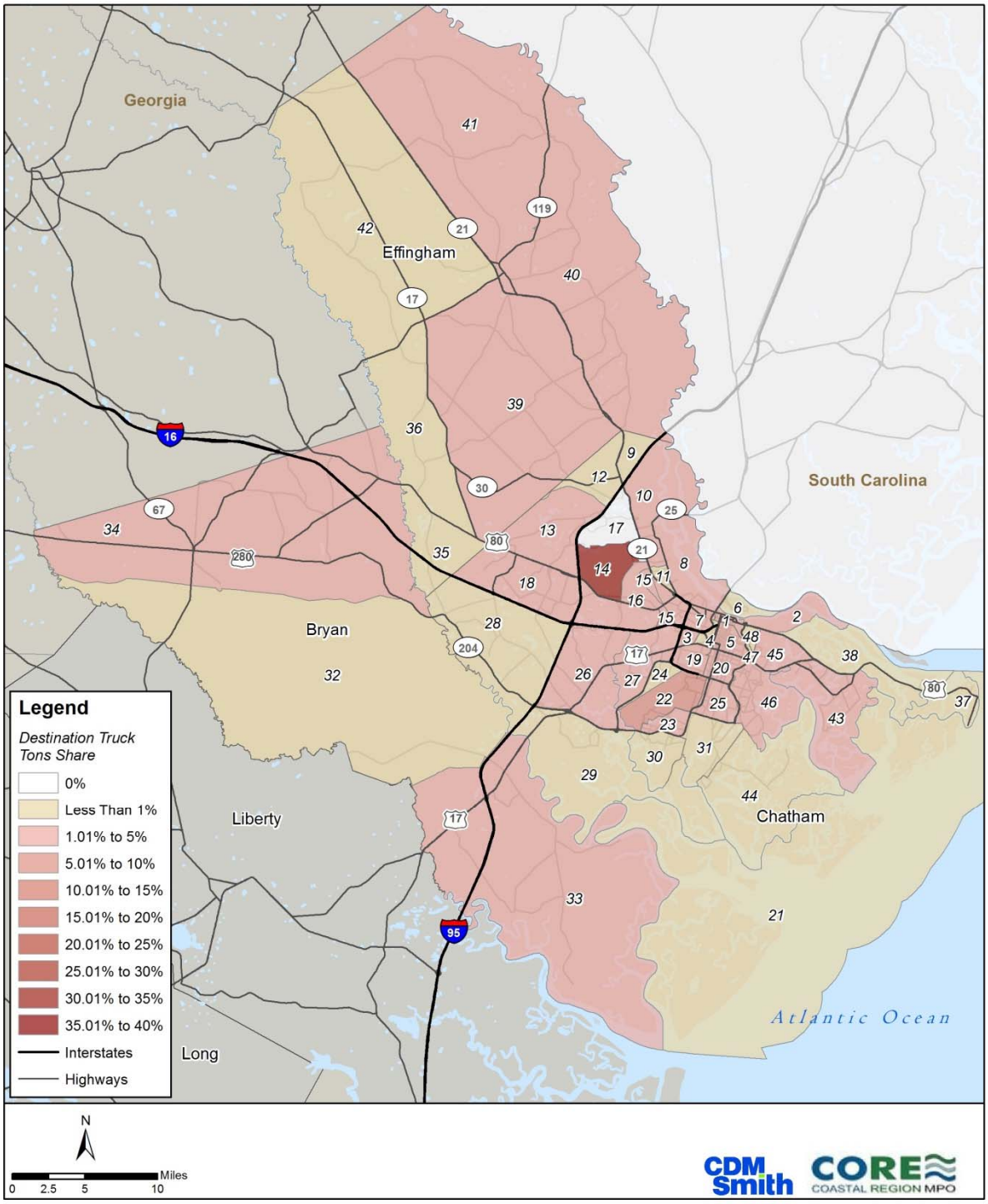
Import			Export		
Commodity	KTons	% of total	Commodity	KTons	% of total
Newsprint/paper	2,861.7	24.9%	Other foodstuffs	1,574.1	26.9%
Fertilizers	2,787.0	24.3%	Newsprint/paper	1,293.0	22.1%
Gravel	1,239.0	10.8%	Basic chemicals	734.7	12.5%
Nonmetallic minerals	1,229.4	10.7%	Nonmetallic minerals	704.4	12.0%
Basic chemicals	715.5	6.2%	Chemical prods.	242.8	4.1%

Figure 3-1: Truck Tons from the Study Area (2011)



Source: CDM Smith

Figure 3-2: Truck Tons to the Study Area (2011)



Source: CDM Smith

Total export tons increase from 2,926.4 KTons in 2011 to 5,866.8 KTons in 2040 using rail as the domestic mode choice. Newsprint/paper is the largest export commodity (by tonnage) to use rail in 2011. However it only increases from 796.7 KTons to 1,293.0 KTons between 2011 and 2040. This commodity is outpaced by the rise of "other foodstuffs" (such as dairy products, sugar, oils, and coffee), which increases from 305.4 to 1,574.1 KTons between 2011 and 2040. This is a similar occurrence to projected exports for truck in **Table 3-2**.

Table 3-11 and **Table 3-12** show tonnage of the goods by origin and destination. Exports travel from the study area and imports travel to the study area. The freight districts are shown as origin and destination pairings to allow for a finer level of detail within the study area. Refer back to **Figure 1-2** for an illustration of the freight districts.

Table 3-11: Top 10 Export Trade Partners by Tonnage by Rail (2011)

Origin	Destination	KTons
Freight District 08	Atlanta, GA	211.1
Freight District 22	Atlanta, GA	183.1
Freight District 16	Atlanta, GA	124.7
Freight District 08	Houston, TX	81.3
Freight District 22	Houston, TX	80.3
Freight District 08	Minneapolis, MN	80.1
Freight District 22	Minneapolis, MN	74.2
Freight District 08	State of Georgia	54.7
Freight District 16	Houston, TX	54.1
Freight District 27	Atlanta, GA	51.3

Table 3-12: Top 10 Import Trade Partners by Tonnage by Rail (2011)

Origin	Destination	KTons
Baton Rouge, LA	Freight District 16	653.0
Baton Rouge, LA	Freight District 22	651.5
Baton Rouge, LA	Freight District 08	619.2
New Orleans, LA	Freight District 22	325.2
State of Virginia	Freight District 16	320.3
New Orleans, LA	Freight District 16	314.5
New Orleans, LA	Freight District 08	310.4
State of Georgia	Freight District 22	289.6
State of Georgia	Freight District 08	285.5
State of Florida	Freight District 22	259.5

Perhaps most notable in **Table 3-11** is the common origin of Districts 08, 16, and 22 along with the common destinations of Atlanta and Houston as freight destinations for rail. As mentioned previously, Freight District 08 is home to the port activities in the study area. This pairing likely reflects the offloading of freight through the port onto rail for domestic delivery. Likewise, **Table 3-12** shows similar origins of Baton Rouge, New Orleans, and Georgia (non-Atlanta) that are

moving freight to the study area via rail. Many of these imported goods are going to the same Freight Districts of 08, 16, and 22.

Table 3-13 shows only the top five pairings from freight district to freight district since the distance within the region is not great enough to make rail a viable mode for intra-study area movements. Most of the internal movements are between the yard areas of Freight District 02, 16, and 22, along with the port-based Freight District 08. District 02 contains warehouse and industry plants, such as BASF and Conoco-Phillips, which produce tons of freight for distribution, mainly by rail.

Table 3-13: Top 5 Internal Trade Partners by Tonnage by Rail (2011)

Origin	Destination	KTons
Freight District 02	Freight District 08	111.7
Freight District 02	Freight District 22	110.6
Freight District 08	Freight District 22	80.0
Freight District 08	Freight District 08	78.4
Freight District 02	Freight District 16	76.4

Table 3-14 shows the projected 2040 top export pairings for rail freight movements. While the origins are similar to 2011, as shown in **Table 3-11**, the destinations change slightly with the rise of Tennessee as a top destination for the study area's freight. The overall export growth in all pairings is reflected evenly.

Table 3-14: Top 10 Export Trade Partners by Tonnage by Rail (2040)

Origin	Destination	KTons
Freight District 08	Atlanta, GA	288.9
Freight District 22	Atlanta, GA	193.1
Freight District 08	Houston, TX	186.8
Freight District 22	Houston, TX	185.2
Freight District 08	State of Tennessee	166.6
Freight District 22	State of Tennessee	165.2
Freight District 08	Minneapolis, MN	139.0
Freight District 16	Atlanta, GA	132.7
Freight District 22	Minneapolis, MN	131.6
Freight District 16	Houston, TX	125.0

Table 3-15 shows the projected 2040 top import pairings for rail freight movements. This table is very similar to **Table 3-12** in both pairings and tonnage. Most notable here though is the growth of rail freight out of Virginia and moving into the study area, specifically to Freight District 16. In 2040, 602.0 KTons will move by rail from Virginia to the study area. This almost doubles the 320.3 KTons in 2011.

Table 3-15: Top 10 Import Trade Partners by Tonnage by Rail (2040)

Origin	Destination	KTons
Baton Rouge, LA	Freight District 16	672.6
Baton Rouge, LA	Freight District 22	667.6
Baton Rouge, LA	Freight District 08	633.5
State of Virginia	Freight District 16	602.0
State of Georgia	Freight District 22	399.5
State of Georgia	Freight District 08	391.5
New Orleans, LA	Freight District 22	348.6
New Orleans, LA	Freight District 16	335.7
New Orleans, LA	Freight District 08	331.9
State of Georgia	Freight District 16	283.3

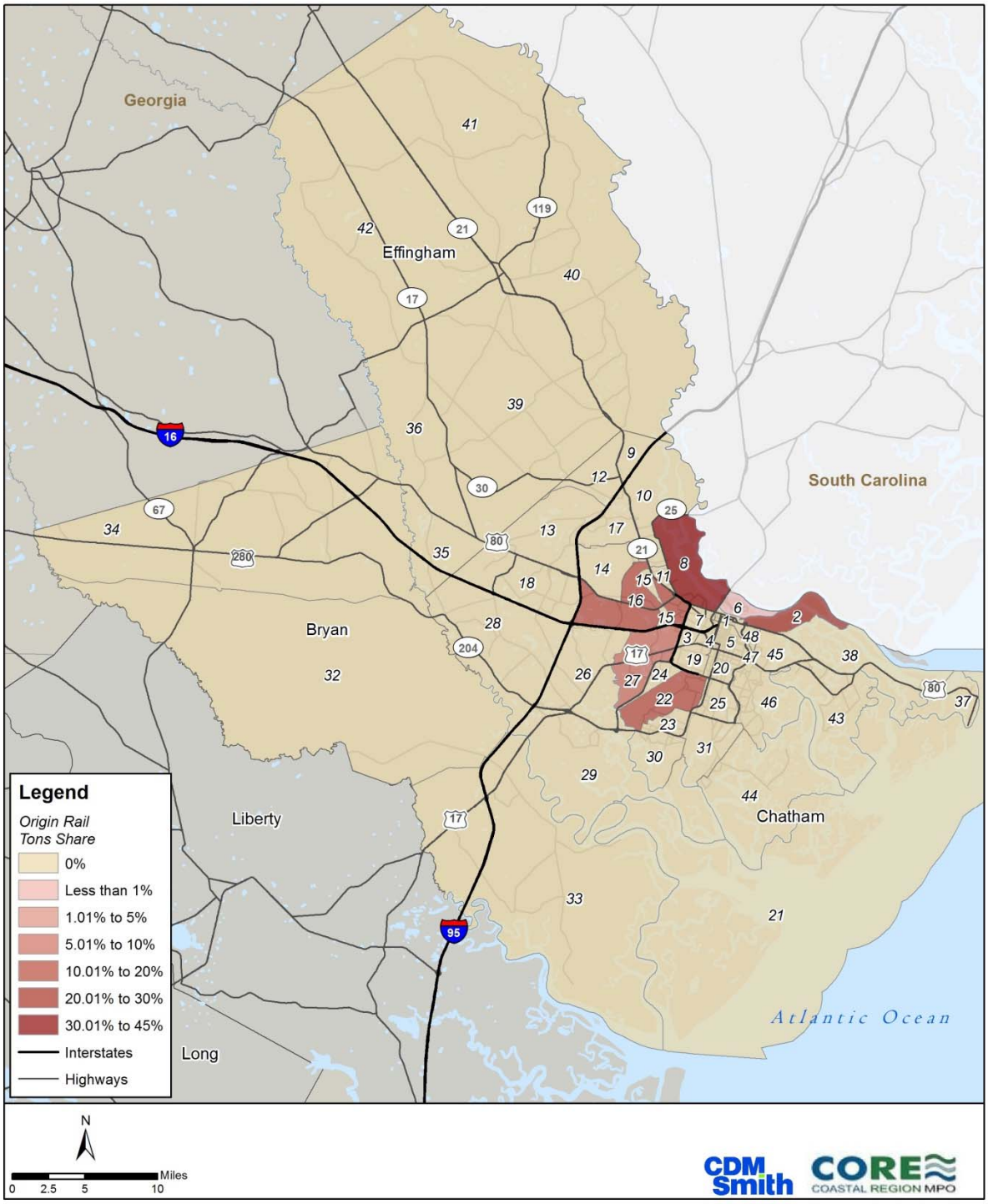
Table 3-16 shows only the top 5 pairings of rail freight movements for 2040 between freight districts.

Table 3-16: Top 5 Internal Trade Partners by Tonnage by Rail (2040)

Origin	Destination	KTons
Freight District 02	Freight District 08	222.5
Freight District 02	Freight District 22	220.7
Freight District 08	Freight District 22	194.7
Freight District 08	Freight District 08	188.1
Freight District 02	Freight District 16	152.8

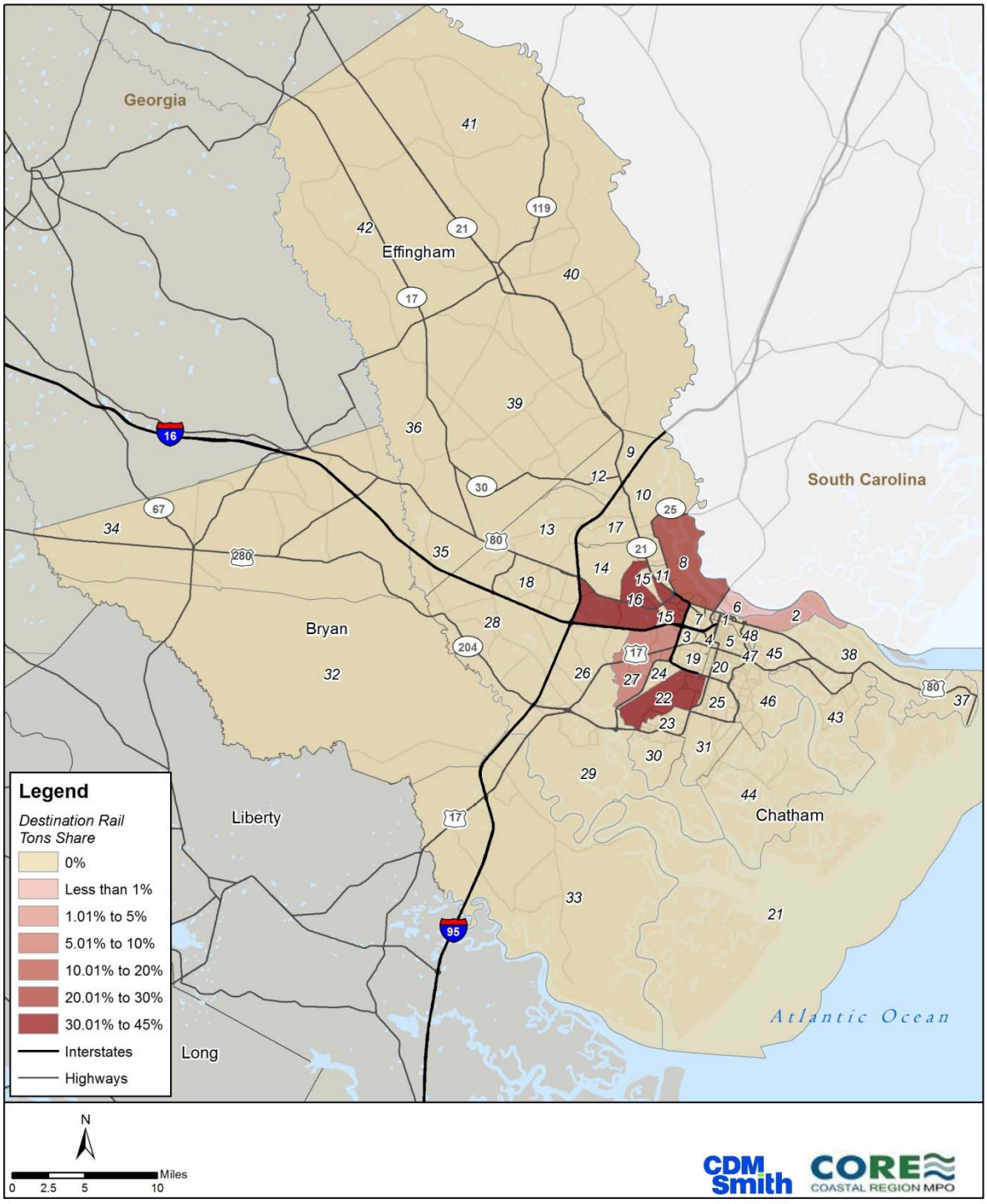
Figure 3-3 and **Figure 3-4** show the rail tons into and out of the study area for 2011.

Figure 3-3: Rail Tons from the Study Area (2011)



Source: CDM Smith

Figure 3-4: Rail Tons to the Study Area (2011)



Source: CDM Smith

3.1.3 Water Imports/Exports

Waterborne freight in Savannah is a major economic engine for not only the study area, but also the State of Georgia. Savannah's port is a top five port nationally for capacity and freight movement. For this study, all water activity is located within Freight District 8, which is the location of all port terminals.

For 2011, 31,561.6 KTons of freight came into the Port of Savannah while 19,238.6 KTons shipped out of the port to other destinations, as shown in **Table 3-17**. The major import (approximately 40 percent) is Coal (SCTG #19) via North and South American markets, as well as Africa. The principal exports from Savannah are nonmetallic materials and Newsprint/paper at 33 and 24 percent respectively of all exports. In 2040, the international imports are expected to be surpassed by the exports in the study area. Total import tons are expected to be 70,097.0 KTons while exports are projected to reach 67,997.5 KTons. Principal commodities are the same, but Furniture is an emerging import while waste/scrap is a growing export commodity group.

Table 3-17 : Total Water movement by tonnage, 2011 and 2040

Freight Movement		2011	2040	Total Change	Annual Growth
International	Import	28,560.8	67,742.5	137.19%	3.02%
	Export	19,231.7	67,976.7	253.46%	4.45%
Domestic	Import	3,000.8	2,354.5	-21.54%	-0.83%
	Export	7.0	20.8	197.14%	3.85%
Total	Import	31,561.6	70,097.0	122.10%	2.79%
	Export	19,238.6	67,997.5	253.44%	4.45%

The vast majority of this tonnage was international freight movements coming into the port and moving out via other modes once it is off loaded domestically. For this study, these international tons are captured in the truck and rail movements domestically. Domestic water movements are actual pairings between two U.S. locations of the origins and destinations.

Overall, the port growth is projected to increase three percent annually on imports and approximately 4.5 percent on exports. This is driven by the port's international movements to foreign markets, but it is important to note the decrease in domestic imports to the port.

Domestic imports to the Port of Savannah's terminal locations in the study area totaled slightly over 3,000 KTons in 2011. The largest domestic imports include coal shipments from Beaumont, TX (Port of Beaumont) and Delaware (likely the Port of Wilmington). However, each of these origin-destination pairings is projected to decrease out to 2040, as shown in **Table 3-18**. The port does project a small increase in domestic imports of paper products from Florida (12 KTons).

Table 3-18 : Top Domestic Port Origins

Origin	Top Commodities Shipped	2011	2040
Beaumont, TX	Coal and petroleum products	2,350.9	2,083.2
State of Delaware	Coal and petroleum products	585.6	172.8
State of Florida	Pulp, newsprint, paper, and paperboard	48.1	60.1

Domestic exports from the port are smaller in scale. Freight is primarily moved out of the port to other local areas (via barge perhaps). The major export destination is Honolulu, HI. Coal and petroleum products are shipped out of the port and carried west. In 2011, this movement totaled only 0.12 KTons. This shows that the vast majority of exports are staying in the Georgia area. Most of these exports are nonmetallic minerals (at an estimate 5.3 KTons in 2011) and nonmetallic mineral products (1.3 KTons in 2011).

These commodity groups and trade partners are projected to continue through 2040. Exports of nonmetallic minerals are projected to increase to 17.5 KTons, more than triple the tonnage amount of 2011. Nonmetallic mineral products will double in export amount to 2.6 KTons by 2040.

3.1.4 Air Imports/Exports

The Savannah/Hilton Head International Airport (SAV) is the center for commuter air travel in the Coastal Empire of Georgia, the Golden Isles and South Carolina's Low Country. It is also a major air freight destination for the study area. The physical carriage of goods in this mode occurs on dedicated, cargo configured aircraft or in the "belly" or luggage compartments of passenger aircraft. Aside from the five commuter carriers that service the airport, the SAV has small firms and major industry providers (such as FedEx and DHL) who serve the airport too. For this study, all air cargo activity is located within Freight District 14, which is the location of the airport.

For 2011, 4.1 KTons of air cargo came into the study area while 5.8 KTons flew out of the airport to other destinations, as shown in **Table 3-19**. Compared to other modes, air products are typically time sensitive, smaller, lighter and more expensive than the "bulk" items. This explains the small tonnages and the commodity mix.

Table 3-19 : Total Air Movement by Tonnage, 2011 and 2040

Freight Movement		2011	2040	Total Change	annual growth
International	Import	1.9	6.0	215.79%	4.08%
	Export	2.0	8.2	310.00%	4.91%
Domestic	Import	2.2	6.5	195.45%	3.81%
	Export	3.8	11.8	210.53%	3.98%
Total	Import	4.1	12.5	204.88%	3.93%
	Export	5.8	20.0	244.83%	4.34%

Domestic air cargo has many pairings between the other U.S. airports. The large import region for air freight is Pennsylvania, while the greatest export partner in 2011 was Massachusetts. This commodity to Massachusetts was Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes and accounted for one-third of the export tonnage.

The principal international import is other agricultural products, which are items such as vegetables and nuts and fresh cut flowers, at 0.8 KTons. The international export is machinery, such as pumps and refrigeration units, at 0.6 KTons.

At the Savannah / Hilton Head International Airport, cargo transport is mixed between FedEx who handles 95 percent of the cargo using Boeing 727's five days a week to the FedEx hub in Memphis, TN. The remaining five percent is carried by Delta in the belly of passenger aircraft. The Savannah / Hilton Head International Airport staff reported that there is also limited feeder service on smaller general aviation aircraft contracted by UPS and ABX.

For 2040, 12.5 KTons of air cargo come into the study area while 20.0 KTons flow out of the airport to other destinations. This is an annual growth rate of 3.9 percent for imports and 4.3 percent for exports. This pace is similar to the port and other modes.

Domestic air cargo grow at a slower pace (both import and export below four percent). However, 6.5 KTons in imported air freight and 11.8 export KTons in 2040 reflect a growing importance of SAV in the marketplace. The large import region for air freight is still projected to be Pennsylvania. The export partner projected for savannah in 2040 will be Massachusetts as Base Metal freight is projected to increase to 4.8 KTons.

The international market has a promising future growth potential in SAV. Growth rates for imports and exports will increase annually above four percent with agricultural products and machinery projected to remain the top commodities.

4. FREIGHT TRENDS, NEEDS, ISSUES, AND DEFICIENCIES

4.1 Freight Infrastructure

4.1.1 Rail System

Deficiencies exist in the rail infrastructure, such as substandard weight limits and vertical clearances. Through research for the area, needs were determined and validated in the Georgia Statewide Freight & Logistics Plan. One of the short lines needs to be upgraded in order to carry 286,000 pounds, the same as the Class I rail lines. Jointly with improving the weight limits, increasing the vertical clearances to current standards - 22 feet and 6 inches - would allow the rail system to accommodate stacked containers. The vertical improvement projects include both Class I and short lines but pose challenges with roadway obstructions such as bridges. Improvements could be made to the actual track in order to accommodate additional rail traffic. Double tracking allows for increased traffic, shorter delays, and mixes of types of rail to work together.

4.1.2 Air Cargo

Congestion has been the leading issues in air cargo service, according to the Georgia Statewide Freight and Logistics Plan and Savannah / Hilton Head International Airport Commission reports. Therefore, infrastructure in and around the airport needs to be improved to help this effort. The roadway from the Savannah / Hilton Head International Airport to the Port of Savannah experiences traffic congestion, such as those on SR 307. This will be a continuing problem with truck traffic projected to increase from the port to the airport. The Port of Savannah has aided congestion relief in this area by completing the "Last Mile Project" or Jimmy DeLoach Connector that connects the port to the interstate system. Although the capacity at the airport is sufficient to handle additional cargo increases, there is a need to lengthen the runways.

4.1.3 Maritime Transport System

As capacity is expected to increase, the Georgia Ports Authority is planning for growth through port expansions. For example, the Savannah Harbor Expansion Project (SHEP) involves the deepening of 32 miles of the Savannah channel to 47 and 48 feet for both of the terminals. This project also includes new infrastructure and equipment such as enlarging the Kings Island Turning Basin or additional super post-panamax cranes. The Georgia Ports Authority has begun implementing this project. This project would allow the Port of Savannah to accommodate the larger ships that may pass through the new Panama Canal.

Existing infrastructure needs to be improved for both rail and truck. Rail connectivity is vital to the success of the Port of Savannah since two major Class I railroads are connected to the port. For trucking services, as stacked containers continue to get larger, the port will have to find a way to deal with their storage and have them ready for transport.

The relationship between transportation connections to port needs to be improved. State and federal funding can improve linkages with highways and rail. In general, the Port of Savannah is underutilized. Some contributing factors could be that the port has a constrained schedule for trucks to pick up containers and loads, and that the dedicated overland routes to move heavy loads from the port are limited. Investments to the port can lead to an inclusive freight strategy. Overall, maintaining and improving the communication between all agencies will aide in gaining further perspectives and improving agency response time to ongoing port issues.

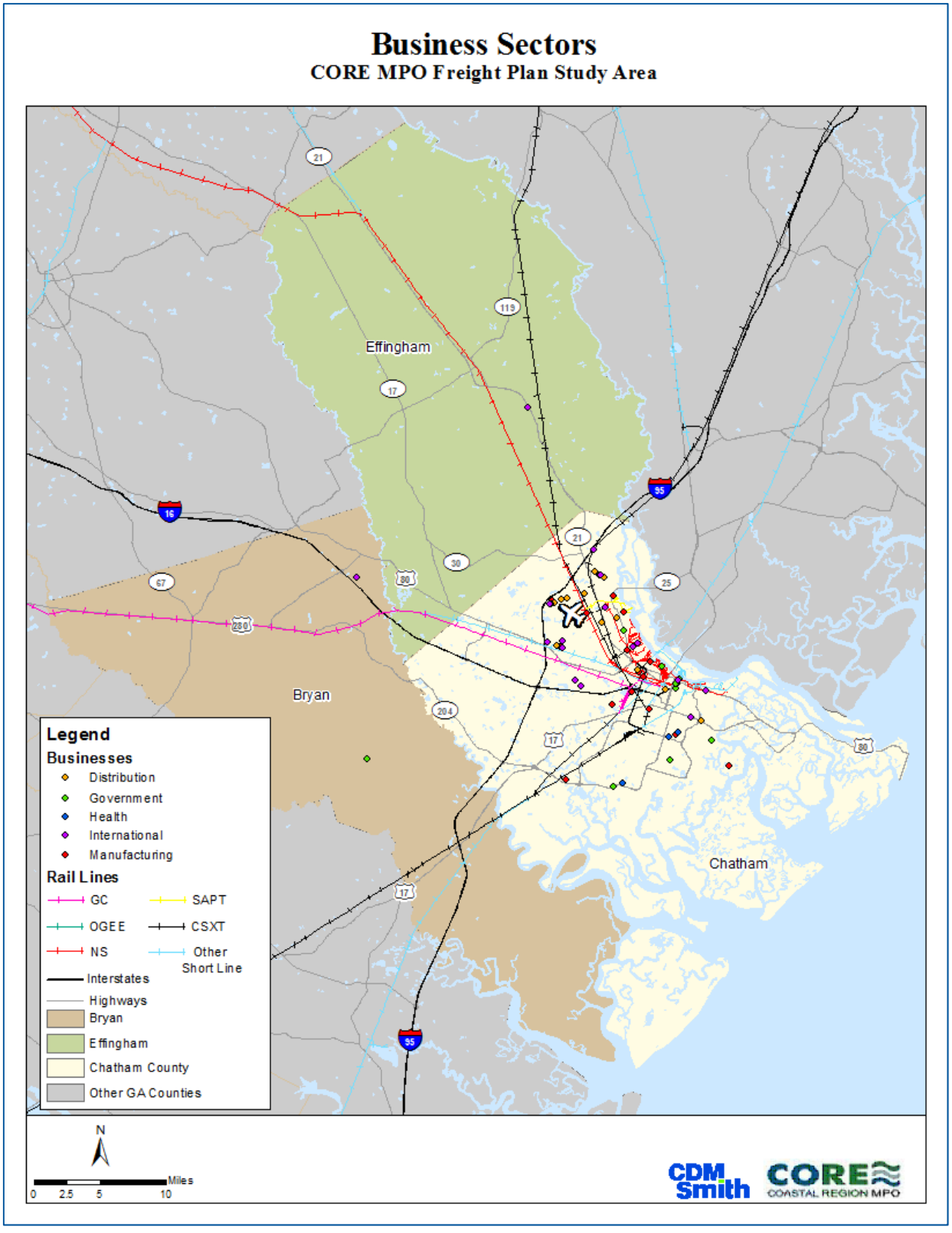
4.2 Freight Generators

The need for modal availability and access are determined by the presence of local freight generators and driven by their specific supply chain needs. These generators are comprised of the various types of businesses which could be present in a region. These businesses in turn can be categorized within business sectors, each reflecting a particular commodity, production volume, customer designated service or coverage area, and cost structure. All of these considerations contribute to the modal preference present in their supply chains.

Supply chain modal needs vary with the commodity type. In illustration, a business sector catering to the high technology field, e.g. computers, medical devices, will be influenced by the high value of their inbound parts and outbound finished goods. Since all or part of these have very high carrying costs or have the capacity to capture a large percentage of a company's cash holdings until the product is sold, speed and reliability of transportation becomes a dominant concern. The servicing transportation mode in this instance may be air cargo, where high levels of reliability and speed are the dominant characteristics, when compared to other modes.

Recognizing the need to associate modal availability and access with business sector supply chain needs, this section will identify the significant freight generators within the study area. These generators are categorized within five business sectors: Distribution, Government, Healthcare, Manufacturing, and International. **Figure 4-1** illustrates those identified generators across all five sectors. Each sector will be discussed in detail in subsequent sections.

Figure 4-1: Business Sectors



4.2.1 Distribution

Inclusive of several distinct categories, the distribution sector is generally defined as including finished goods warehouses, parts or sub-assembly distribution centers, and transload facilities. This latter category exists to transfer goods between ocean going containers and the other modes equipment, e.g. trailers, aircraft cargo containers. Transloading capacity will continue to increase in coastal areas as container owners restrict inland transport of the physical container to locations immediately adjacent to the port.

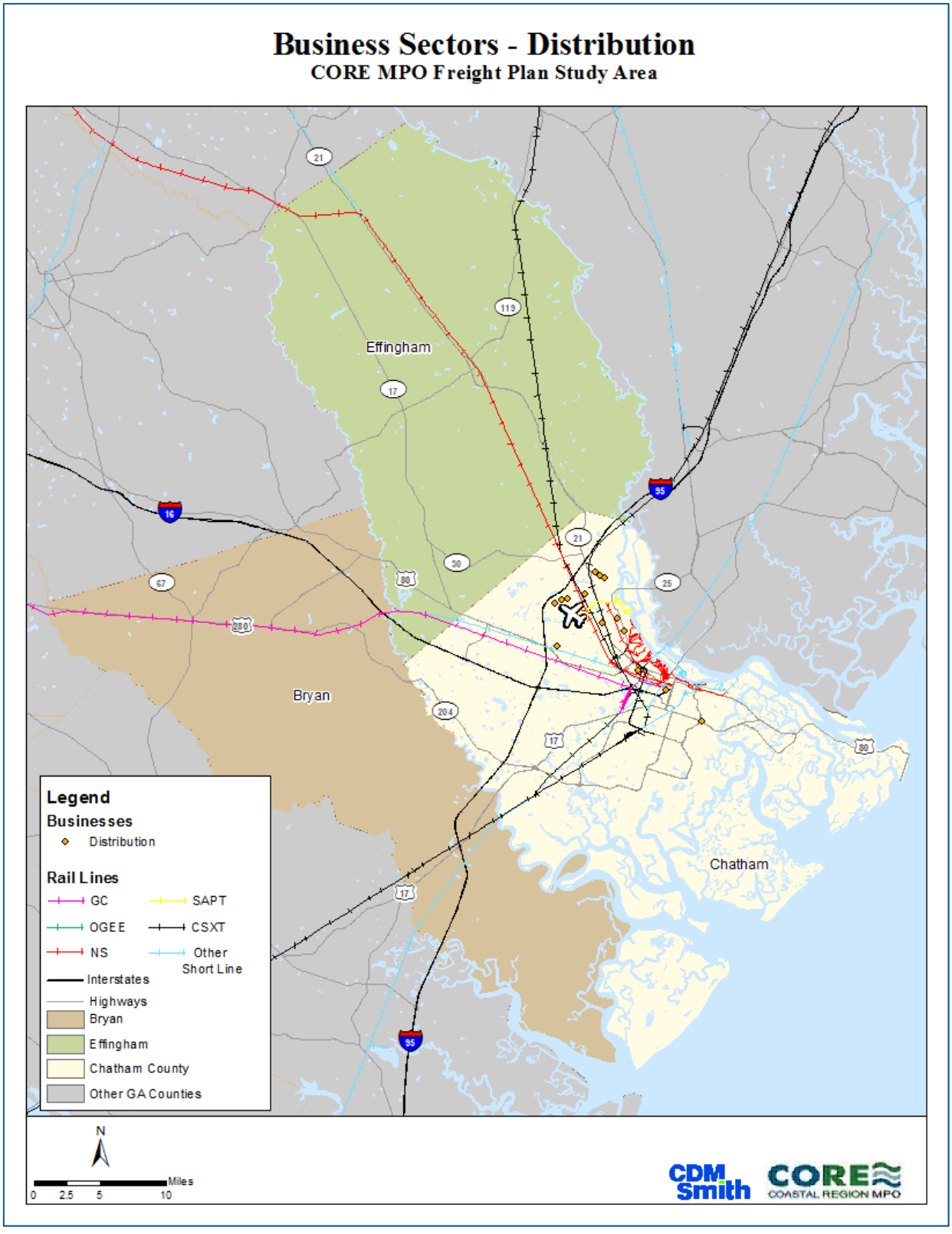
There are nine companies operating distribution facilities in the study area with employee counts of over 100 as reported in October 2011. The major companies are listed in **Table 4-1** and their locations are shown in **Figure 4-2**. Many of these locations are between the port and the interstate facilitating access to other markets.

Table 4-1: Distribution Companies with 100+ Employees

Company	Product/Service	Employment
The Home Depot	Home improvement supplies	440
Dollar Tree Stores	Assundry product distribution	229
Coca-Cola Bottling Company United	Soft drink/water bottling warehouse	211
Target	Assundry import center	160
Pier 1 Imports	Household goods	150
Schneider	Warehousing, distribution, export packaging	150
CalCartage	Warehousing for K-Mart	140

Source: CDM Smith, www.seda.org, February 27, 2013

Figure 4-2: Business Sector Distribution



4.2.2 Government and Military

Government, more specifically educational facilities, and military installations generate a significant volume of goods at an inbound and outbound level. Text books, general supplies for schools and the variety of goods, e.g. food products to military hardware, are necessary to sustain operations on a daily and annual basis.

Significant employers, with employment counts of 500 or more, are listed in **Table 4-2** and identified by specific or "central office" locations in **Figure 4-3**.

Table 4-2: Government/Military Organizations with More than 500 employees

Company	Product/Service	Employment
Ft. Stewart/Hunter Army Airfield	Civilian personnel	4,719
Savannah-Chatham County Board of Education	Public schools	4,600
City of Savannah	Government	2,500
Savannah College of Art & Design	Education	1,750
Chatham County	Government	1,500
Georgia Ports Authority	Ship terminal operation	973
Armstrong Atlantic State University	Education	613
US Army Corp of Engineers	Civil Engineering	600
Savannah State University	Education	527

4.2.3 Healthcare

Large healthcare centers require small to medium volumes of goods on a continuous and regular basis. These generators do not generally employ large vehicles or transport methods. Though this is the case, the continuous flow of goods and the immediate need of many of those trips require consideration in a discussion of freight transportation systems.

The significant healthcare employers are listed in **Table 4-3** and identified by specific location in **Figure 4-4**.

Table 4-3: Significant Healthcare Employers

Company
Memorial Health University Medical Center
St Joseph Hospital Campus
Candler Hospital Campus

Source: CDM Smith, www.seda.org, February 27, 2013

Figure 4-3: Government /Military

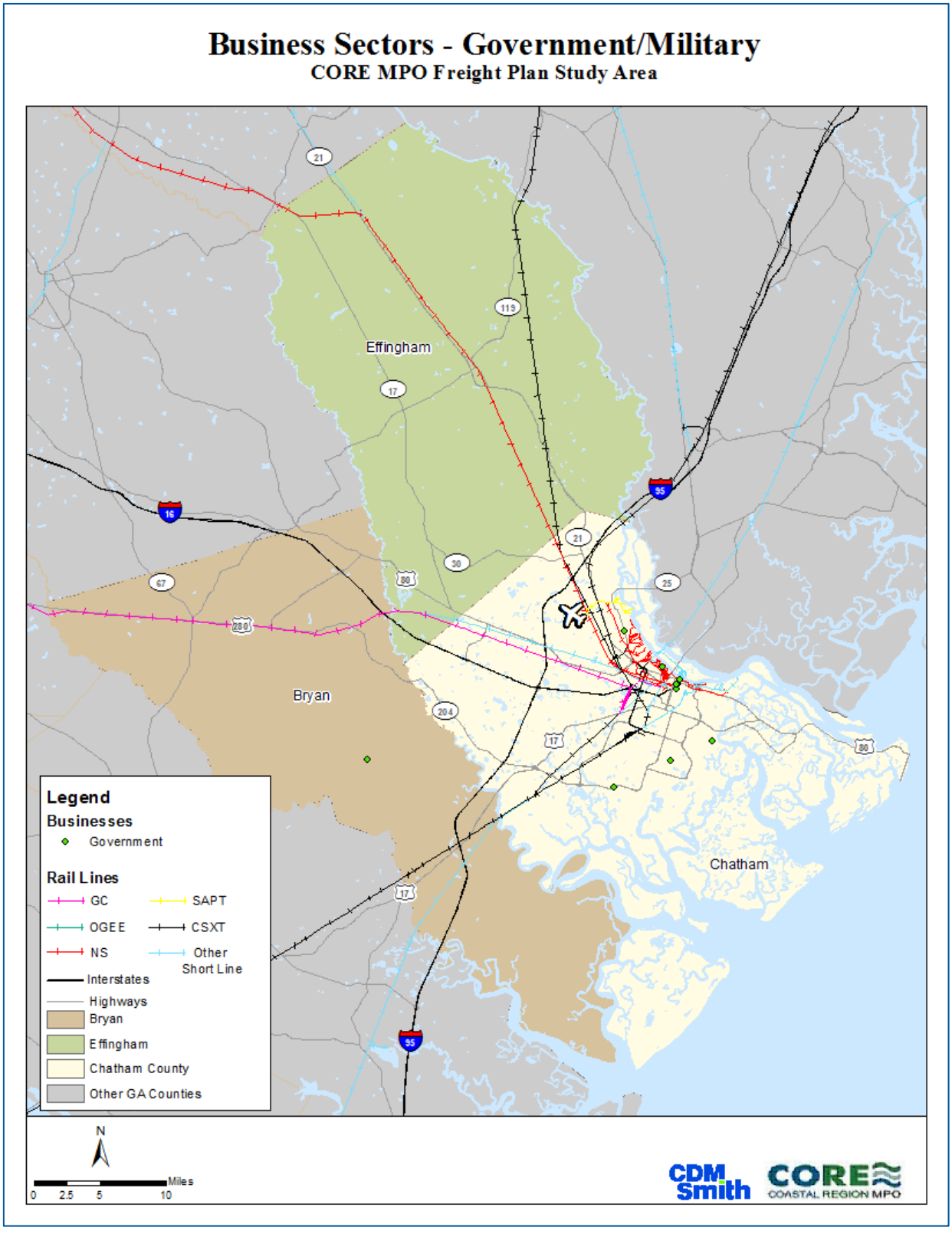
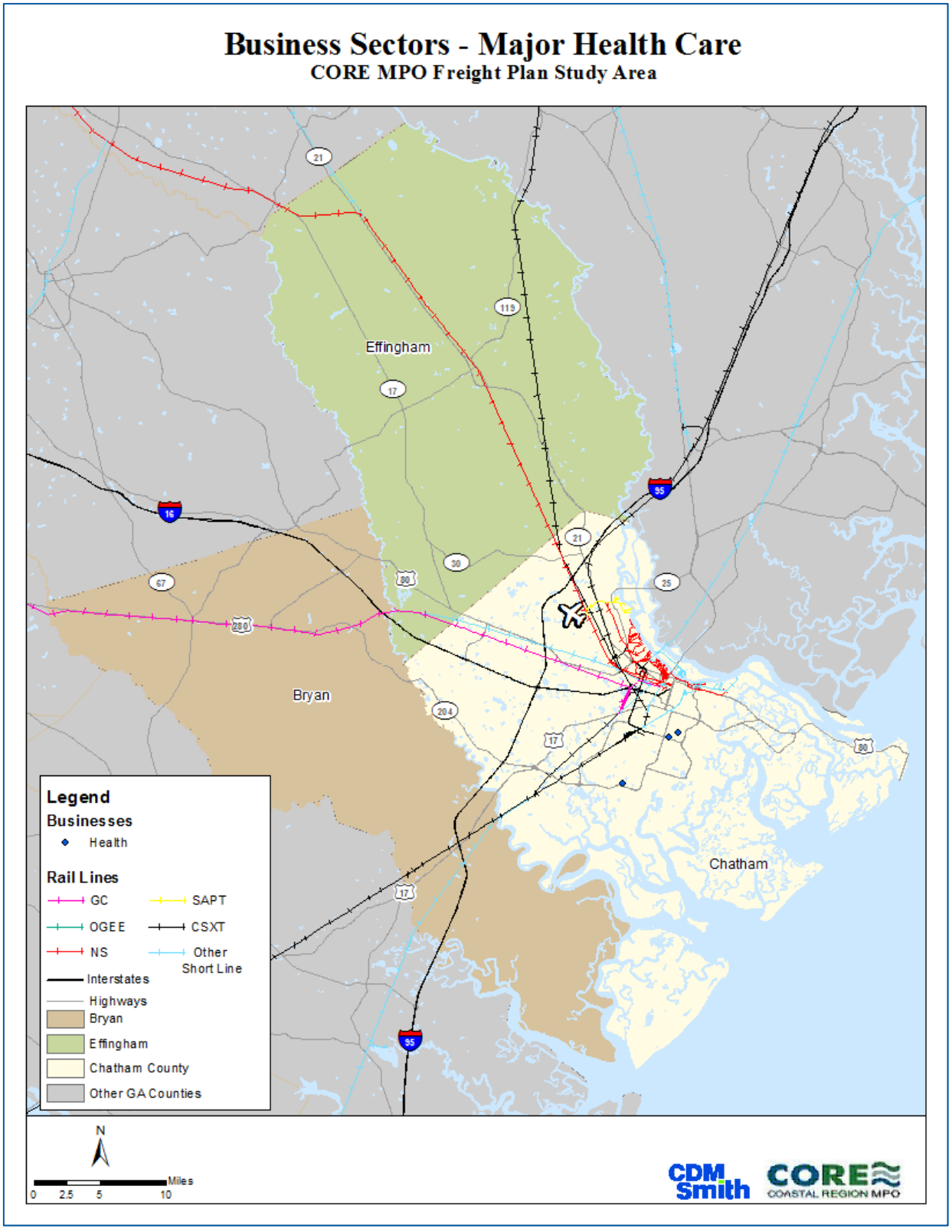


Figure 4-4: Healthcare Locations



4.2.4 International

The increasing importance of international business in the local economy generates the need for goods from professional sustainment, e.g. office supplies, to the potential for import-export activities. As this sector continues to increase, identification of those freight generators is germane to a continuing effort of analysis.

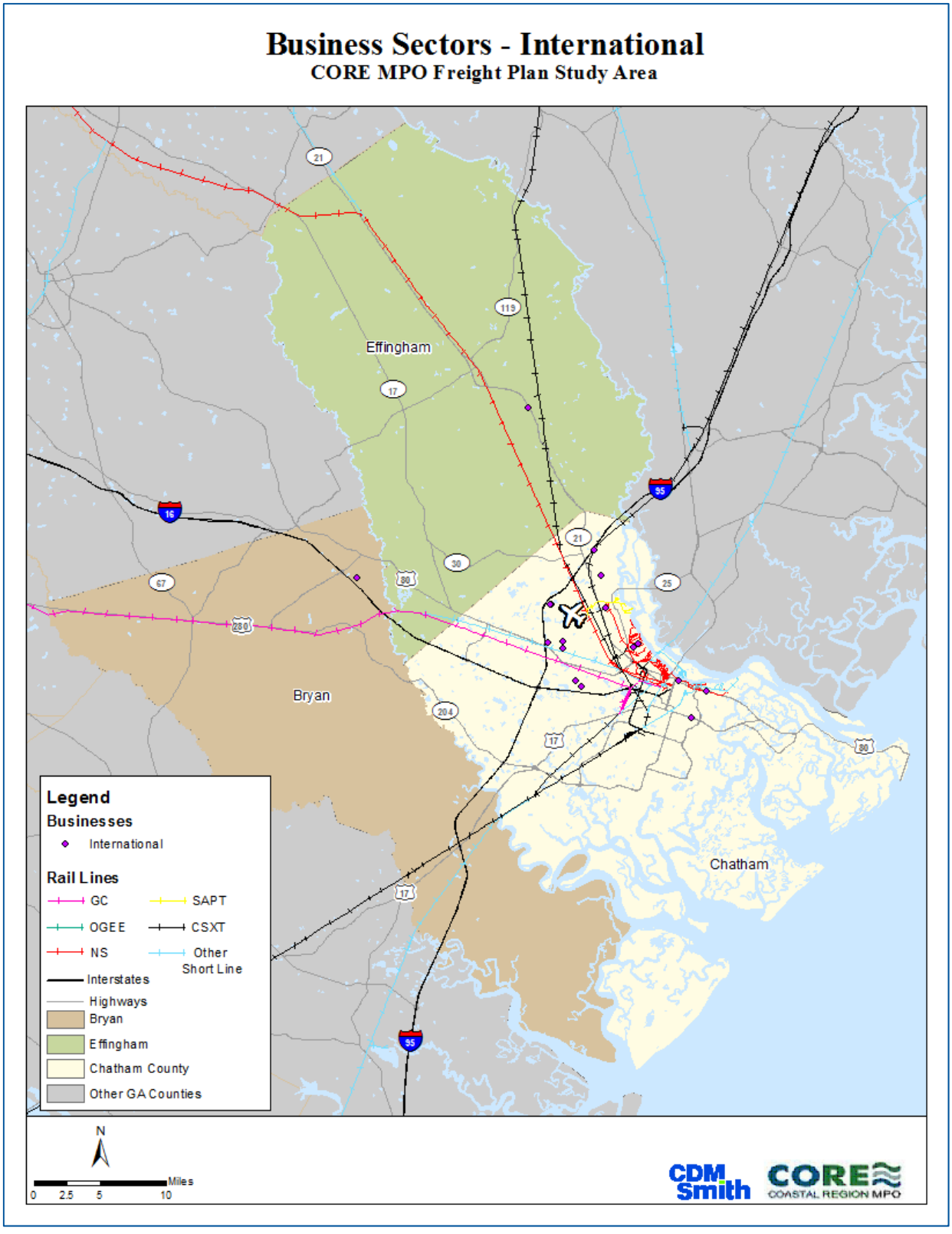
Significant international employers are listed in **Table 4-4** and identified by specific location in **Figure 4-5**.

Table 4-4: Significant International Employers

COMPANY	Country	Description
BASF	Germany	Chemical- Manufacturer
Coby Electronics	China	Electronics - Warehousing
DIRTT	Canada	Movable internal walls-Manufacturer
Douglas Brothers of Georgia	Canada	Fabricated Structural Metal Manufacturer
EFACEC	Portugal	Power Transformer - Manufacturer
EMD Chemicals	Germany	Chemical- Manufacturer
Fuji Vegetable Oil Co.	Japan	Vegetable Oil Manufacturer
IKEA	Sweden	Commodity & Merchandise-Warehousing
JCB, Inc.	UK	Excavating Equipment-Manufacturer
Kerry Ingredients & Flavours	Ireland	Food Processing
Lummus Corporation	Switzerland	Cotton Ginning Equipment-Manufacturer
Maersk Sealand	Denmark	Public Finance Activities
Mitsubishi Power Systems	Japan	Gas Turbine Manufacturer
Mitsui-Soko	Japan	Electronics - Warehousing
Nippon Express USA, Inc.	Japan	Freight Forwarding
Noritake Co., Inc.	Japan	Warehousing & Storage
Oracal USA	Germany	Adhesive Film - Manufacturer
Vopak	Netherlands	Public warehousing
Wallenius Wilhelmsen Logistics	Norway	Transportation and Logistics

Source: CDM Smith, www.seda.org, February 27, 2013

Figure 4-5: International Business Locations



4.2.5 Manufacturing

From light to heavy industrial and manufacturing activities, this sector represents the traditional freight generator. This sector has the potential to span the entire supply chain from raw materials, through sub-assembly, to final assembly or product manufacturing. There are twenty identified organizations in this sector with an employee count exceeding 100, as reported in October 2011.

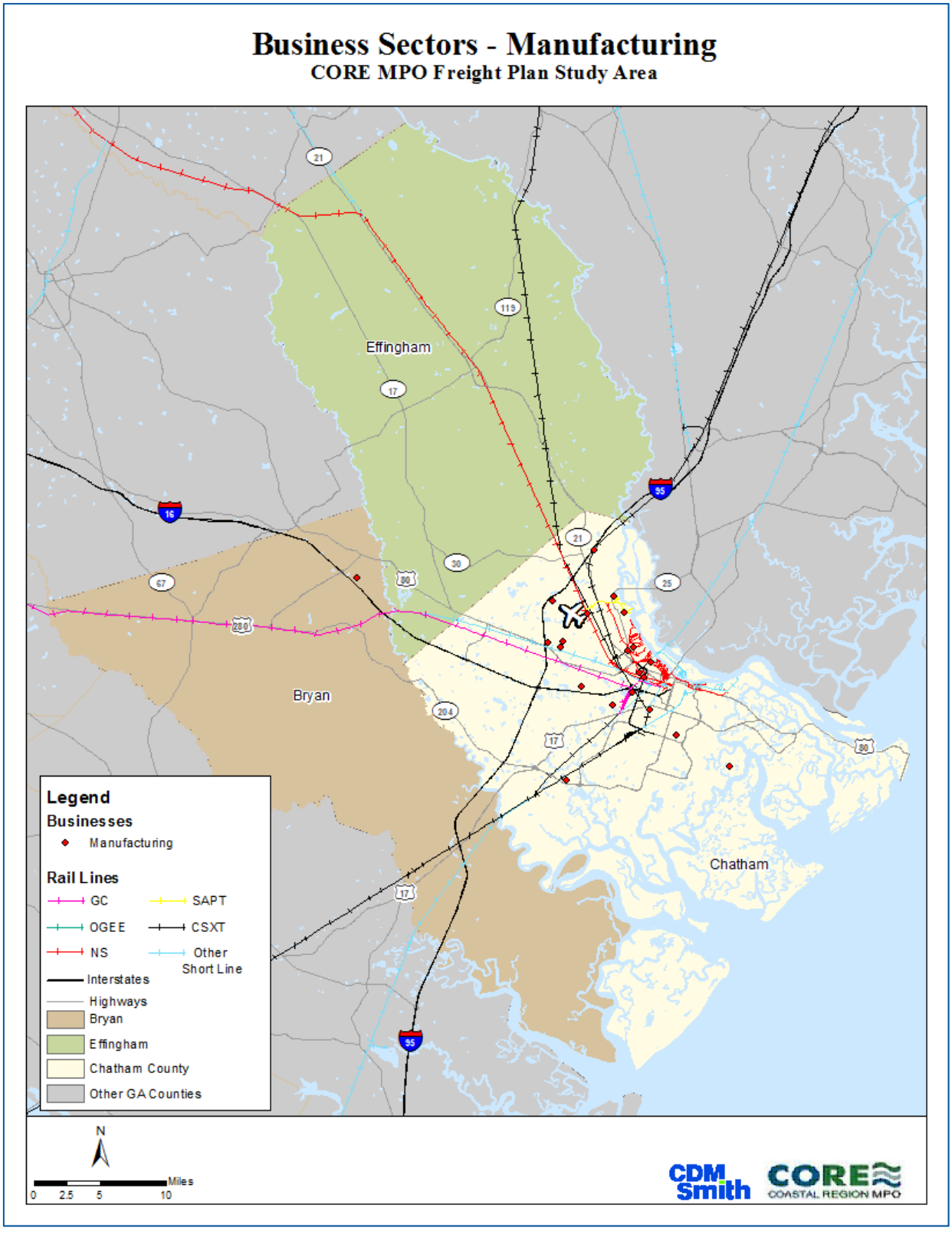
Significant employers are listed in **Table 4-5** and identified by specific location in **Figure 4-6**.

Table 4-5: Manufacturing Employers with Greater than 100 Employees

COMPANY	Product/Service	Employment
Gulfstream Aerospace Corporation (Direct & Contract Workers)	Jet aircraft, aerospace equipment	8,406
International Paper	Paper products, chemicals, corrugated containers	650
JCB Americas, Inc.	Construction equipment	558
Imperial Sugar	Refined Sugar	450
Brasseler USA, Inc.	Dental Instruments	400
Mitsubishi Power Systems Americas, Inc.	Gas turbines and steam turbines used bypower plant	315
Weyerhaeuser	Bleached pulp	300
Derst Baking Company	Bread, rolls, cakes	275
Diamond Crystal Brand	Salt, Pepper, Sugar Packaging	250
Roger Wood Foods	Smoked sausage and meats	220
Kerry Ingredients & Flavours	Formulation, manufacture, & containerization of technology-based ingredients, flavors & integrated solutions	200
Savannah Morning News	Information company - paper and pixels	200
Arizona Chemical	Specialty Resins & pine-based chemicals	175
EMD Chemical	Industrial Pigments	154
Oracal, USA	Adhesive film	137
Coastal Concrete SE, LLC	Ready mix concrete	125
Intercat	Catalyst production	120
GAF Materials Corporation	Residential and commercial rolled roofmanufacturer	113
Fuji Vegetable Oil, Inc.	Cooking Oils	105
DIRTT Environmental Solutions	Modular internal walls for residential, commercial and industrial buildings	100

Source: CDM Smith, www.seda.org, February 27, 2013

Figure 4-6: Manufacturing Locations



4.3 Safety and Security

4.3.1 Crash Hot Spots Analysis

Safety "hot spots" are locations with high truck crashes or rail related accidents such as rail-roadway at-grade crossings, roadways having design deficiencies, and roadways having operational issues. The GDOT statewide crash data from GEARS (Georgia Electronic Accident Reporting System) was retrieved from 2008 through 2012 in order to identify crash density and hot spot segments in the study area. The dataset specifically pertains to crash accidents involving commercial and non-commercial vehicles, and contains relative information (e.g., location of accident, accident type and severity). Data from the Federal Railroad Administration (FRA) Office of Railroad Safety was also obtained for accident information on national railroad lines and highway-rail crossings. **Table 4-6** shows the totals for fatalities, injuries, and total incidents recorded in this database for each year.

Table 4-6: Incidents Involving Trucks in the Study Area – 5 Year Totals

County	2008			2009			2010			2011			2012		
	Fatalities	Injuries	Total Incidents	Fatalities	Injuries	Total Incidents	Fatalities	Injuries	Total Incidents	Fatalities	Injuries	Total Incidents	Fatalities	Injuries	Total Incidents
Bryan	-	14	50	1	17	52	1	25	55	4	27	64	2	17	43
Chatham	5	16	62	2	14	49	9	12	43	2	12	55	5	12	53
Effingham	1	40	51	1	8	23	2	26	31	2	27	42	-	12	26
Study Area Total	6	21	72	4	16	57	12	17	52	8	17	65	7	15	60

Source: GDOT

The identification of hot spot locations was derived from an understanding of the overall crash density and a ranking of the individual roadway segments based on crash characteristics. The ranking of roadway segments was derived from the average of two categorical scores—the first score is based on type and count thresholds for accidents occurring on the segment, and the second score is based on the facility type of the given segment. Each of these categorical scores ranges from 1 to 4, with 4 being the most severe situation. For example, a roadway segment that is classified as a U.S. highway may have experienced one injury accident during the time period under study. Using the crash severity index criteria shown in **Table 4-7**, the ranking for this segment would be 2.5 (e.g., [2+3]/2), which is moderate. The highest crash totals among the highest severity index scores assisted in determining the top ten hot spot segments. **Table 4-8** shows the top ten hot spot segments. As shown in **Figure 4-7**, the hot spot segments fall within areas of high accident density and thus, are considered excessively unsafe locations along the freight network.

Table 4-7: Crash Severity Index Criteria Chart

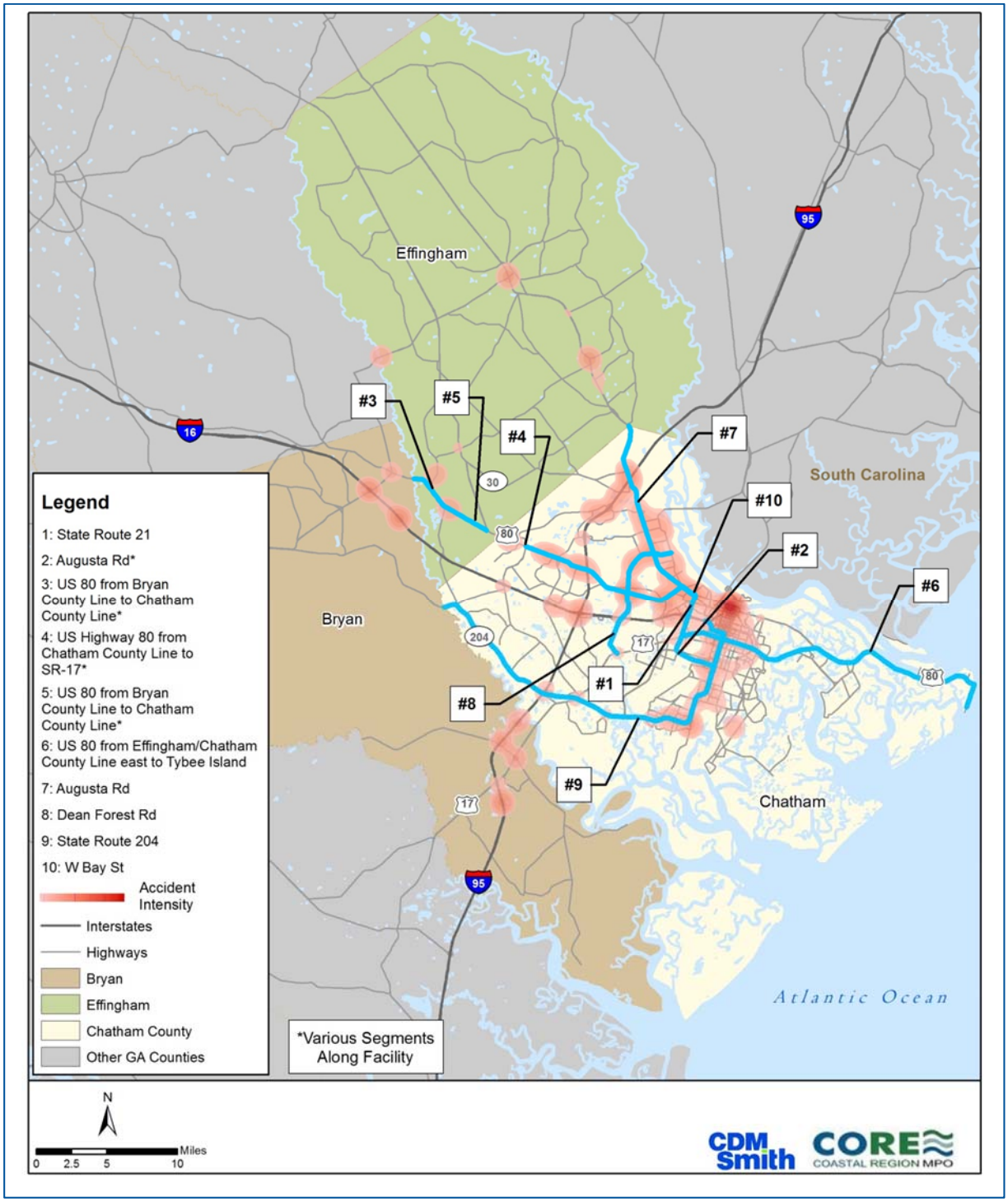
Rating	Crash Severity	Facility Type (FC)
1	PDO, 0 Fatalities, 0 Injuries	FC Lower than State Highway
2	0 Fatalities, 1 Injury	State Highway
3	0 Fatalities, >= 2 Injuries	US Highway
4	>= 1 Fatality	Interstate

Table 4-8: Top Ten Hot Spot Locations

Rank	Segment Name	Scoring	Notes
1	Augusta Rd/GA-21	3.5, 184 crashes on-segment. See *Note	Burnseed Blvd to Mildred St
2	Augusta Rd/GA-21	3.5, 184 crashes on-segment. See *Note	Burnseed Blvd, east to GA-17 Intersection
3	US 80	3.5, 10 crashes on-segment	US 80 from Bryan County Line to Chatham County Line
4	US 80	3.5, 5 crashes on-segment See *Note	US 80 from Chatham County Line to SR-17
5	US 80	3.5, 2 crashes on-segment	US 80 from Bryan County Line to Chatham County Line
6	US 80	3.0, 184 crashes on-segment	US 80 from Effingham/Chatham County Line east to Tybee Island
7	Augusta Rd/GA-21	3.0, 184 crashes on-segment	From Chatham County Line to intersection with Main St (GA-25)
8	SR 307/Dean Forest Rd	3.0, 109 crashes on-segment	From Ogeechee Rd (US-17) to Main St (GA-25)
9	State Route 204	3.0, 64 crashes on-segment	From Bryan/Chatham County Line to intersection with Ogeechee Rd (GA-25)
10	West Bay St	3.5, 184 crashes on-segment. See *Note	W Bay Street at the I-516/GA-25 Intersection

**Note – The crash dataset reported 184 crashes at a single location on the LRS network. Upon discussion this anomaly was attributed to data entry routines on the part of police/first responders. Since S Coastal Highway and Augusta Rd share an identical RCLINK segment identifier in the GDOT LRS, both segments inherited an identical crash count. Ranking between these particular segments was determined on the basis of shortest segment length; the theory being that if equal portions of 184 crashes were applied to each segment, S Coastal highway would have a higher crashes-per-mile. However, this distinction is tenuous and is essentially a means to avoid a perpetual tie for first place.*

Figure 4-7: Crash Location Density and Top Ten Hotspot Segments



4.3.2 Potential Crash Hot Spot Locations from Freight Advisory Committee

At the Freight Advisory Committee (FAC) Meeting in May 2014, meeting participants were shown the Crash Intensity map illustrated in **Figure 4-7** and asked to comment if this map was accurate and what other crash locations should be added as potentially hazardous locations for freight movements. The participants identified the following additional locations for consideration.

Table 4-9: Freight Advisory Committee (FAC) Identified Crash Locations

Locations	Comments
I-16 at Chatham Parkway	Crashes during the PM period
US 80 and SR 307	
I-95 at Jimmy DeLoach Parkway	Speed and geometric configuration of the segment
Rail Crossings along SR 21	Need roadway/rail grade separation
I-16 at SR 307	Geometry issues and congestion leading up to the intersection
Telfair and SR 307/Dean Forest Road	School zone with young drivers crossing traffic on Dean Forest Road, and speed and light issues from I-16 interchange
SR 21 Corridor	Multiple locations along the corridor are a concern

4.4 System Capacity

4.4.1 Traffic Count Data

Traffic count data is collected at numerous locations around the state by GDOT and is accessed through a web portal on GDOT's website. There are three types of count stations: continuous, short, and Weigh-In-Motion (WIM). The continuous count stations can supply hourly counts for a 24-hour continual loop. The short count station can also provide hourly counts, but for a short duration. Both count station types are used to calculate average annual daily traffic (AADT). Some of the count locations are capable of collecting more detailed information such as vehicle classification. WIM (weigh-in-motion) device can electronically detect vehicle types along with count data; however, there are no WIM stations located within the study area. **Table 4-10** displays the traffic counter information for the study area.

Table 4-10: Study Area Count Stations

County	Continuous	Short	WIM
Chatham	19	594	0
Effingham	0	94	0
Bryan	3	75	0

Source: GDOT

The traffic count data (accessed through the GDOT web portal) will be used to validate the hot spots and the FAF disaggregation results, where applicable.

Real-time traffic reports are available on the GDOT website. The mapping technology allows for the identification and assessment of count locations and bridges on specific routes. While there is

some information available in the identification display tool, more detailed information will be accessible through the other tools or the National Bridge Inventory (NBI) database.

4.4.2 Network Bottlenecks

A bottleneck is a roadway segment with particular and significant negative impacts on freight network performance. Bottlenecks are generally locations where capacities are inadequate to handle traffic flows, which impact the performance of freight network segments. Congestion, or the queuing/delay of freight movements, reduces the performance and dependability of the freight network in terms of serving freight traffic flows. The most critical bottlenecks were identified along the network. Information describing the performance and dependability of existing infrastructure along the freight network assists decision-makers in identifying problem areas where delays in freight movement originate. Positive identification of delay-prone network segments promotes better prioritization of freight investment.

It should be understood that the current method for identifying bottlenecks will be modified in the future. Moving Ahead for Progress in the 21st Century (MAP-21) contains several directives for the federal government to establish for the national transportation network. A primary directive of MAP-21 is the establishment of a performance-based and outcome-oriented program to assess transportation efficiency and effectiveness which would provide solutions consistent with achieving federal goals to improve the national transportation network. This includes the development of performance measures for freight transportation. The measures and targets used to identify bottlenecks for freight transportation must be consistent with federal freight performance measures. As MAP-21 guidance in regards to freight transportation performance was not available at the time this study was completed, they were not included in our methodology. Future iterations of this bottleneck identification analysis should incorporate available MAP-21 guidance.

In order to determine bottlenecks in the study area, congested segments were ranked in terms of its potential to disturb efficient operation of the network. This selection methodology was based on the following:

- Available GDOT time-congestion grades;
- Three-hour assessment timeframe for each AM and PM peak hour period;
- Traffic direction;
- Level of service (LOS) grade to determine quality of roadway traffic conditions; and,
- Weighted values according to the Average Annual Daily Traffic (AADT) on the roadway segment over the course of a 24-hour period.

Four categorical values for measuring congestion were associated with segments following application of the bottleneck analysis. The congestion intensity categories include: AM Congestion, AM Marginal Congestion, PM Congestion, and PM Marginal Congestion. For the purposes of this study, the highest severity segments were classified as “Congested” with lesser but still significant segments classified as “Marginally Congested.”

As shown in **Tables 4-11, 4-12, 4-13 and 4-14**, the Congestion categories can occur in any combination of Congested/Marginal with respect to AM/PM travel periods. Following this logic, the worst possible situation for a bottleneck segment is Congestion occurring in both the AM and PM timeframes, shown in **Table 4-12**, which amounts to significant congestion experienced throughout the entire day along the segment.

Table 4-11: AM Congestion with PM Marginal Congestion

Rank	Segment Name	Level of Service (Worst-Case Daily)	Notes
1	Fort Argyle Rd/Abercorn St	"F" for both Eastbound and Westbound Segments	From Sweetwater Station Drive to King George Blvd. This is the only facility showing AM Congestion and PM Marginal Congestion in the study area.

Table 4-12: AM and PM Marginal Congestion

Rank	Segment Name	Level of Service (Worst-Case Daily)	Notes
1	US 80	"D" for Eastbound and "E" for Westbound	From Dean Forest Rd to Griffin Ave. This is the only facility showing AM and PM Marginal congestion in the study area.

Table 4-13: AM Congestion

Rank	Segment Name	Level of Service (Worst-Case Daily)	Notes
1	Diamond Cswy	"F" for Northbound and "D" for Southbound	From Ferguson Ave to Pin Point Ave
2	Ferguson Ave	None Available	From Pin Point Ave to Diamond Cswy
3	Fort Argyle Rd	"F" for Eastbound and Westbound	From Ford Ave to Sweetwater Station Drive
4	I-16 Eastbound	"F" and "E" for Eastbound Segments	12 Segments included; From Pooler Parkway to I-95
5	I-16 Eastbound Ramp	"F" and "E" for Eastbound Segment	Ramp to Eastbound I-16 at Dean Forest Road

Table 4-14: PM Congestion

Rank	Segment Name	Level of Service (Worst-Case Daily)	Notes
1	Abercorn St	"E" Eastbound and Westbound	From Janet Dr to East De Renne Ave
2	Augusta Rd	"F" Northbound and Southbound	From Hendley Rd to I-95 NB Onramp
3	I-95 Offramp	"A" and "B" for ramp segments	At Exit #109 to Augusta Rd
4	Ogeechee Rd	"D" and "F" for Eastbound and Westbound segments	Chatham Parkway to Red Gate Farms Rd
5	Waters Ave	"E" for Northbound and "C" for Southbound	From Althea Pkwy to E De Renne Ave

No segments in the study area exhibited both AM and PM Congestion (congested all day).The lowest performing segment in the study area, Fort Argyle Road from Sweetwater Station Drive to King George Blvd, showed AM Congestion with PM Marginal Congestion. The second lowest performing segment, US 80 between Dean Forest Rd and Griffin Ave, showed both AM and PM Marginal Congestion (Marginally Congested all day).

To provide a simple bottleneck severity ranking, segments analyzed considered AM/PM congestion and marginal congestion characteristics, and were grouped into the output classification of the roadway segments as displayed in **Figure 4-8**.

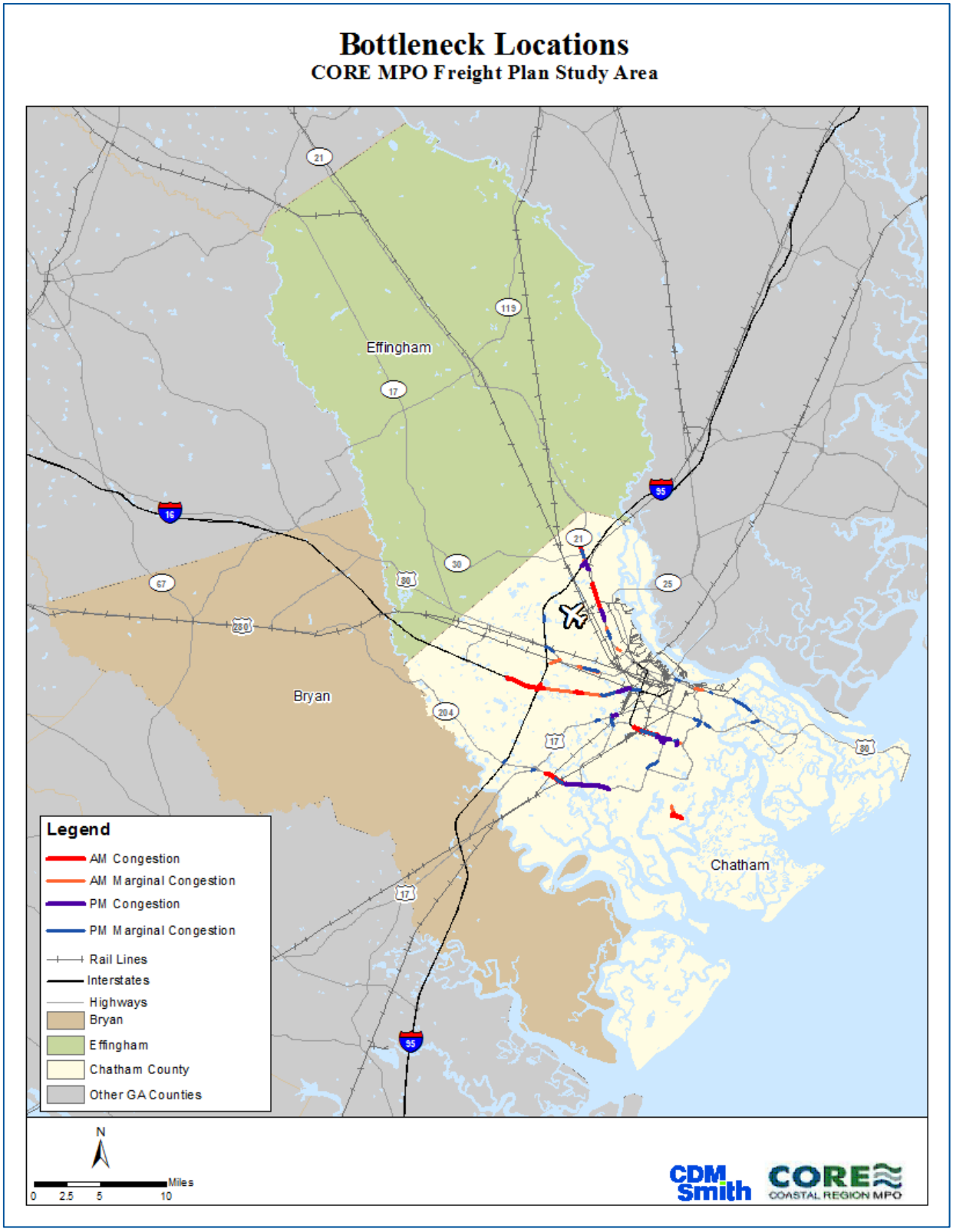
4.4.3 Potential Bottleneck Locations from Freight Advisory Committee

At the Freight Advisory Committee (FAC) Meeting in August 2014, meeting participants were shown the Bottleneck map illustrated in **Figure 4-8** and asked to comment if this map was accurate and what other segments with congestion should be added as potential bottleneck locations for freight movements. The participants identified the following additional locations for consideration which are shown in **Table 4-15**.

Table 4-15: Freight Advisory Committee (FAC) Identified Bottleneck Locations

Location	FAC Comments
SR 307 to I-16	Main Port Authority Route
SR 307 to SR 21 to Jimmy DeLoach Pkwy to I-95	Main Port Authority Route
Brampton Road route to I-516	Main Port Authority Route
US 17 through Richmond Hill	
I-516 Corridor	Obsolete Design Standards
Pooler Pkwy/Airways Ave @ I-95	Outlet Mall Development Mix between retail and freight traffic near Gulfstream Road Signal timing issue along Service Road (I-95 is city boundary for signal ownership)

Figure 4-8: Bottleneck Locations throughout the Study Area



5. FREIGHT PERFORMANCE MEASURES

5.1 Next Planning Steps

There is a growing national focus on using performance measures to inform decision making, improve accountability, and respond to stakeholder demands for transparency. The development of freight performance measures is the next critical step in achieving the tools necessary to effectively identify private sectors trends, needs, and challenges.

Freight performance measurements serve the following three functions:

1) Plan Development – Provide a means to quantify the performance of the transportation system in accommodating safe and efficient freight movements, and guide decisions on freight-related investment strategies during the planning process.

2) Plan Implementation – Emphasize agency goals and objectives and integrate them into budgeting, program structure, project evaluation/prioritization, and program implementation policies.

3) Accountability – Facilitate tracking and reporting on system performance relative to plan goals and objectives to support accountability for effective plan implementation and results.

The freight performance measures were developed within the context of the goals established in the Chatham County-Savannah Tricentennial Comprehensive Plan and the CORE MPO's 2040 Long Range Transportation Plan (LRTP) called Total Mobility Plan.

5.2 Existing Measures

Performance measures are indicators that quantify progress toward attaining the goals and objectives set by a transportation agency. Many transportation agencies have established performance measure systems to track overall system performance, but efforts to look specifically at freight performance are often still under development. Freight performance measurement is improving, however, as state and national efforts to define freight measurement evolve. The following section summarizes some of these national and state-level efforts to establish and measure freight transportation performance.

5.2.1 National

MAP-21 requires the U.S. DOT to establish national measures for the performance categories shown in **Table 5-1** through a series of rulemakings that will have a single effective date. As identified previously, state DOTs and MPOs are required to develop performance targets for these measures within one year of the final rulemaking.

Table 5-1: National Performance Measures Required under MAP-21

Program	Measure Category	States to Establish Targets:
National Highway Performance Program	Interstate Pavement Condition on the NHS	Within 1 year of final rule on national performance measures
	Non-Interstate Pavement Condition on the NHS	
	Bridge Condition on NHS (focus on SD)	
	Performance of Interstate System	
	Performance of Non-Interstate NHS	
Highway Safety Improvement Program	Serious Injuries per VMT	Within 1 year of final rule on national performance measures
	Fatalities per VMT	
	Number of Serious Injuries	
	Number of Fatalities	
Congestion Mitigation and Air Quality	Traffic Congestion	Within 1 year of final rule on national performance measures
	On-road mobile source emissions	
Freight Policy	Freight Movement on the Interstate	Periodically

Performance measures for freight developed by state DOTs and MPOs are required under MAP-21 to be consistent with established federal freight performance measures. This is important to consider federal guidance for freight to ensure future coordination and funding opportunities.

Pursuant to the federal surface transportation law, Moving Ahead for Progress in the 21st Century Act, or MAP-21, state DOTs and MPOs are required to set performance targets consistent with the established national performance measures for freight. Those targets are to be integrated within their planning processes to include long range transportation plans. These transportation agencies are also required to report their measured progress to the U.S. DOT. This federal requirement is connected to eligibility requirements under MAP-21 for increased federal funding shares for qualifying freight projects.

5.2.2 State

GDOT has identified performance measures for the goals and objectives within Georgia's SSTP, which are listed in **Table 5-2**.

Table 5-2: GDOT Performance Measures

Goal		Objective	Performance Measures
1	Supporting Georgia's economic growth and competitiveness	Improved access to jobs, encouraging growth in private-sector employment, workforce	Average number of workers that can reach a major employment center by auto in 45 minutes in the AM peak period*
			Average number of workers that can reach a major employment center by transit in 45 minutes in the AM peak period*
		Reduction in traffic congestion	Annual congestion cost per peak auto commuter*
		Improved efficiency, reliability of commutes in major metropolitan areas	Average work commute time*
			Daily average number of people traveling in HOT/express lanes during the weekday AM and PM peak periods*
			Daily average number of people taking rail trips during the weekday AM and PM peak periods*
		Efficiency and reliability of freight, cargo, and goods movement	Daily hours of truck delay on Georgia Interstates
		Border to border and interregional connectivity	Percent of population within 10 miles of a 4-lanes state or US route
		Support for local connectivity to statewide transportation network	Percent of state and federal transportation funds spent on local roads
2	Ensuring safety and security	Reduction in crashes resulting in injury and loss of life	Reduction in annual highway fatalities
3	Maximizing the value of Georgia's assets, getting the most out of the existing network	Optimized capital asset management	Percent of Interstates meeting maintenance standards
			Percent of state-owned non-Interstate roads meeting maintenance standards
			Percent of state-owned bridges meeting GDOT standards
		Optimized throughput of people and goods through network assets throughout the day	Metro Atlanta highway morning peak hour speeds*
			Metro Atlanta highway evening peak hour speeds*
			Average HERO response time*
			Percent of commute trips to major employment centers on transit*
4	Minimize impact on the environment	Reduce emissions, improve air quality statewide, limit footprint	Undetermined

**This measure is obtained only from the metropolitan Atlanta area.*

5.2.3 CORE MPO

The transportation component of the Tricentennial Plan was based on the CORE MPO's Total Mobility Plan. The CORE MPO has identified performance measures associated with the goals and objectives within the CORE MPO 2040 LRTP (Total Mobility Plan), as well as the CORE MPO's Congestion Management Process (CMP). These goals and objectives and associated performance measures, as described in **Table 5-3**, were approved by the CORE MPO Board. The goals and objectives are consistent and further those of the Tricentennial Plan.

Table 5-3: CORE MPO Total Mobility Plan

GOAL 1	**Economic Activity: Support the economic vitality of the region, matching the community's goals, especially by enabling local, regional and global competitiveness, productivity and efficiency.**	
	Objectives: • Minimize work trip congestion • Promote projects which provide the maximum travel benefit per cost	Performance Measures: • Project cost/vehicle miles of travel (VMT) • Reductions in VMT • Work trip vehicle hours of travel (VHT) • Sustained or increased funding status • Increased Sustainable development incorporating mixed-use, pedestrian-oriented design
GOAL 2	**Safety: Ensure and increase the safety of the transportation system for all users, including motorized vehicles, bicyclists and pedestrians.**	
	Objectives: • Eliminate at-grade railroad crossings • Minimize frequency and severity of vehicular accidents • Minimize conflicts and increase safety for non- motorized users	Performance Measures: • Total accidents per million miles traveled, involving all user types • Injury accidents per million miles traveled, involving all user types • Fatal accidents per million miles traveled, involving all user types • Implementation of transit and other safety projects • Number of increased bike and pedestrian facilities • Number of at-grade crossings reduced
GOAL 3	**Security: Ensure and increase the security of the transportation system for all users, including motorized vehicles, bicyclists and pedestrians.**	
	Objectives: • Promote projects which aid in hurricane evacuation • Adequately prepare for coordinated responses to incidents • Monitor vulnerable infrastructure through visual and other inspection methods	Performance Measures: • Hurricane evacuation route status • Improved emergency responses (e.g., ambulance travel times to hospitals) • Maximize transportation system mobility during disruptive events (such as reductions in time to clear major crashes from through lanes) • Reduction in vulnerability of the transportation system (such as implementation of monitoring infrastructure for major transportation system)

GOAL 4	**Accessibility, Mobility and Connectivity: Ensure and increase the accessibility, mobility and connectivity options available to people and freight, and ensure the integration of modes, where appropriate.**	
	Objectives: • Minimize congestion delays • Maximize regional population and employment accessibility • Provide efficient and reliable freight corridors • Minimize delays in corridors served by transit • Encourage use of transit and non-motorized modes, focusing on areas with low rates of automobile ownership or high population of elderly and/or disabled populations • Expand transit service area	Performance Measures: • Base year vs. future year volume/capacity ratios for various modes • Percent of population within ½ mile of transit route or facility connecting to regional activity center(s) • Daily freight truck use/lane • Operational performance of transit system (buses arriving/departing on schedule) • Percent of population within ½ mile of bicycle facility connecting to regional activity center(s)
GOAL 5	**Environment and Quality of Life: Protect, enhance and sustain the environment and quality of life, promote energy conservation and address climate change.**	
	Objectives: • Protect wetlands, historic resources, neighborhoods, recreational facilities and other important resources • Support infill development • Implement green infrastructure to reduce region's impact on storm water pollution and address potential impacts from a changing climate	Performance Measures: • Impacts to natural environment (such as rate of development of green space compared to the rate of green space preservation) • Impacts to historic and cultural resources (such as the strengthening of regulations to protect historic and cultural resources) • Strengthening of regulations promoting infill and brownfield development • Project utilization of green infrastructure • Vehicle miles of travel
GOAL 6	**System Management and Maintenance: Assess the transportation system to determine what works well, what does not work well, and potential improvement options.**	
	Objectives: • Maximize efficiency of signalized intersections • Expand use of Intelligent Transportation Systems (ITS) • Continue existing levels of maintenance for highways and bridges	Performance Measures: • Average Daily Traffic (ADT) per lane • Congestion Index (CI) • Level of Service (LOS) • ITS coverage of region • Roadway pavement ratings and bridge sufficiency ratings • Bicycle and pedestrian facility surface conditions • Transit user satisfaction (such as reliability)
GOAL 7	**Intergovernmental Coordination: Ensure coordination in the transportation planning process between intra- and inter-regional partners, including both state and local agencies.**	
	Objectives: • Enhance coordination between CORE MPO, Georgia Department of Transportation, County departments and City governments	Performance Measures: • CORE MPO represented at all project development meetings • Establishment of coordination policies to promote communications between various agencies

Source: CORE MPO 2040 LRTP

The CORE MPO's CMP has two main goals which include: 1) identifying problem areas through the use of travel-time studies, and 2) presenting recommendations to improve the traffic flow on the transportation system as whole, as well as on specific corridors. To further these goals, the CMP also contains a set of identified performance measures, as listed below:

- Congestion Index;
- Approach Level of Service;
- Preservation of regional mobility through the implementation of alternative access improvements to enhance local mobility;
- Implementation of sustainable development through the incorporation of mixed-use, pedestrian-oriented design that helps to minimize trip length; and,
- Promotion of multimodal connectivity through the implementation of transit, bicycle, and pedestrian enhancements.

5.2.4 Other States

A number of states have already established freight performance measures, including Florida, Iowa, Minnesota, and Oregon. The performance measures specific to each of these states are listed in **Table 5-4**.

Table 5-4: Freight Performance Measure Examples from Other States

Florida	Iowa	Minnesota	Oregon
Truck miles traveled	Truck crash rates	Miles below 45 MPH during peak hour	Distance from CBD to international container port
Seaport truck equivalent units	Railroad crossing crashes	Hours of daily truck delay	Truck travel time index
Average truck travel speed	Derailments	Cost of truck delay	Percent of peak time aviation capacity use
Hours of truck delay	Percent of 40 mph track miles	Travel time reliability index	Number of rail safety incidents
Highway adequacy (Level of Service (LOS))	Percent of 286K lb track miles		Average lock delay per tow
Quality rail access	Rail ton miles/gallon of fuel		Rail ton-miles per track mile
Vehicles per lane mile congested	Travel times to major markets		Freight facilities/population
Travel time reliability index			
Tonnage			

5.3 Recommended Measures

5.3.1 Framework

The establishment of freight performance measures by the CORE MPO will assist with the planning processes including the CORE MPO 2040 LRTP updates and the CMP updates, by providing the link from the policies, programs, plans, and projects back to the goals and objectives used for the LRTP and CMP. Performance measures will allow the CORE MPO to actively track the performance of their area's freight network, which will be critical for the identification of freight specific trends and challenges. Performance measures may allow the CORE MPO more flexibility while addressing the needs of its freight stakeholders and assist in communicating freight performance to external partners, e.g. GDOT. The measures will be most useful if they are appropriately tailored to the Savannah area. The considerations used for development of performance measures include:

- **Data availability** – the data and analysis tools needed for the measure should be readily available or easy to obtain. The data should be reliable, accurate, and timely.
- **Strategic alignment** – the measures should align well with the goals and objectives of the Chatham County-Savannah Tricentennial Comprehensive Plan, Georgia's SSTP, and the National Freight Policy.
- **Understandable and explainable** – the measures should be easy to understand and useful when communicating to external partners.
- **Causality** – the measures should focus on the items under the CORE MPO's span of control.
- **Decision-making value** – The measures should provide predictive, diagnostic and reporting value to agency decision makers.

It is recommended that the CORE MPO develop supplementary freight performance measures from existing performance measures identified within the CORE MPO 2040 LRTP and Congestion Management Process. These performance measures are already in use for the LRTP and CMP planning processes. **Table 5-5** provides an example of this as compared to the goals and objectives identified to further freight mobility under the Tricentennial Plan.

Table 5-5: Example Freight Performance Measures

Goals, Objectives, and Strategies		Example Freight Performance Measures from Existing MPO Measures	Example Freight Performance Measures from Other States
A	Objective 2, Strategy b	Increased sustainable development incorporating mixed-use, pedestrian oriented design Sustained or increased funding status	
	Objective 3, Strategy a	Operational performance of transit system Percent of population within ½ mile of transit route or facility connecting to regional activity center(s)	Freight facilities/population (Oregon)
B	Objective 1, Strategy a	Establishment of coordination policies to promote communications between various agencies and the public	
	Objective 1, Strategy c	Level of Service ADT per lane Congestion Index Project cost/vehicle miles of travel	Freight facilities/population (Oregon)
C	Objective 1, Strategy d	Increased sustainable development incorporating mixed-use, pedestrian oriented design Strengthening of regulations promoting infill and brownfield development Base year vs. future year volume/capacity ratios for various modes Level of Service Congestion Index	Travel time reliability index (Florida, Minnesota)
D		Percent of population within ½ mile of transit route or facility connecting to regional activity center(s) Operational performance of transit system Transit ridership	
E	Objective 1, Strategy a	Daily freight truck use/lane Level of Service ADT per lane Congestion Index Project cost/vehicle miles of travel	Seaport truck equivalent units (Florida)
	Objective 1, Strategy b	Base year vs. future year volume/capacity ratios for various modes Congestion Index	Truck miles traveled (Florida) Freight facilities/population (Oregon) Travel time reliability index (Florida, Minnesota)
	Objective 1, Strategy c	Total accidents per million miles traveled, involving all user types Implementation of transit and other safety projects Number of at-grade crossings reduced	Derailments (Iowa)
	Objective 1, Strategy d	Base year vs. future year volume/capacity ratios for various modes	Percent of peak time aviation capacity use (Oregon)
	Objective 1, Strategy e	Base year vs. future year volume/capacity ratios for various modes Congestion Index Daily freight truck use/lane ITS coverage of region Roadway pavement ratings and bridge sufficiency ratings	Hours of truck delay (Florida) Tonnage (Florida)
	Objective 1, Strategy f	Project cost/vehicle miles of travel Reductions in VMT Energy consumption trends	Quality rail access (Florida)
	Objective 2, Strategy a	Establishment of coordination policies to promote communications between various agencies and the public	
	Objective 2, Strategy b	Sustained or increased funding status	

This table contains a significant number of freight performance measures that the CORE MPO may choose from. Several states that have or are currently establishing freight performance measures may use as few as five or greater than ten. This is related to the previously mentioned considerations such as data availability and level of complexity. Understanding the parameters of a measure in relation to freight planning for the Savannah area is important. **Table 5-6** illustrates specific freight performance measures with their associated parameters by freight transportation mode.

Table 5-6: Example Freight Performance Measure Parameters

Mode	Example Freight Performance Measures	Parameters
Highway	Combination Truck Miles Travelled	Determined using combination truck traffic volume and segment length. Combination truck is defined as FHWA Classification 8-13.
	Truck Miles Traveled	Determined using truck traffic volume and segment length.
	Travel Time Reliability	Freight travel time reliability is defined as the percentage of travel that is greater than 45 mph on freeways.
	Combination Truck Average Travel Speed	The calculation of combination truck average travel speed is identical to the methodology for (passenger) vehicle's average travel speed, except that combination trucks are assumed to have a lower free-flow speed. The free flow truck speed is assumed to be equal to the speed limit.
	Vehicles Per Lane Mile	Vehicles per lane mile (freight) is calculated as the summation of each roadway segment's peak hour vehicle miles traveled divided by the number of lane miles.
Aviation	Tonnage	All air cargo landed at public airports.
Rail	Tonnage	Tons of freight carried by rail mode originated or terminated for a specific area.
Seaport	Truck Equivalent Units	Includes international and domestic waterborne cargo handled at both public and private terminals in port areas for a specific area.

Developing freight performance measures from existing measures as well as other documented measures will also ensure that tools used to analyze these measures are familiar and understandable to MPO staff. Examples of tools that can be used to analyze freight performance measures include benefit and cost analysis, scorecards, performance dashboards, data monitoring reports, and models. For example, for the Georgia Statewide Freight and Logistics Plan, GDOT utilized benefit and cost analysis, GDOT statewide travel demand model, and "off-model" analytical techniques as some of the tools for analyzing potential freight projects. The Florida Department of Transportation uses a combination of tools including a scorecard, quarterly performance reports, and customer satisfaction surveys.

5.3.2 Application and Implementation

Development and use of freight performance measures will identify areas of focus for planning and project purposes. Often, improvement needs are greater than available funding. The CORE MPO can use these performance measures to set performance targets which will be used to define acceptable levels of performance from the perspective of the decision maker and can be adjusted over time to reflect reasonable performance expectations in light of funding constraints. In

addition, these performance measures and their associated targets can then monitor the efficiency and effectiveness of the projects that have been prioritized.

Freight performance measures and their targets can be used in the CORE MPO's Total Mobility Plan Needs Assessment process. The needs assessment consists of a performance-based analysis of the existing CORE MPO area's transportation system to identify needs and deficiencies by mode. For example, the Georgia Statewide Freight and Logistics Plan has identified the deepening of the shipping channel for the Port of Savannah to increase utilization of the port and diverse its freight commodity flows to improve overall economic competitiveness. This can lead to impacts on the MPO's transportation system.

The CORE MPO can use performance measures such as Tonnage, Base year versus future year volume/capacity ratios, Congestion Index, and Level of Service to identify:

- the significant roadway segments for freight flows from the port;
- the growth of vehicles along these segments in response to growth at the port;
- what levels of congestion will be created; and
- whether deficiencies will arise from the increase in use.

The analysis will help identify whether a project is necessary to correct a deficiency and its level of importance. Development of freight performance measures can be complex. Most importantly, the performance measures must be specific, measurable, attainable, realistic and timely. They are only valuable if they can be re-produced and sustained over a sufficient period to time in order to identify trends and impacts of changes to the system. Performance measures for freight need to be tested, refined, and perhaps replaced on a regular cycle, both to keep up with changing issues as well as to take advantage of new technologies for collecting, processing, and displaying data. Like the freight system itself, performance measures cannot be static. Next steps should include refining the MPO's freight performance measures for ease of use during planning and project prioritization.