driving95
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North Carolina I-95 Economic Assessment Study

Task 6: Trucking and Shipping Analysis

prepared for

North Carolina Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

American Transportation Research Institute

June 2013

CAMBRIDGE SYSTEMATICS

technical memorandum

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1.0 Introduction

This technical memorandum describes the work completed for the North Carolina Department of Transportation (NCDOT) I-95 Economic Assessment related to the trucking industry and the shipment of goods. Data for this task were assembled, collected, and analyzed from a wide variety of sources. This memorandum is designed to cover each of the major freight data sources individually and then present key findings in a final chapter. The overall task was led by Cambridge Systematics. Significant pieces of this work were developed and led by the American Transportation Research Institute (ATRI).

The structure of this technical memorandum is as follows:

- **Chapter 1 – Introduction.** This chapter provides a brief description of the overall work completed in this report.
- **Chapter 2 – Truck Counts.** This chapter provides information on truck and auto counts, including variation by time of day, day of week, and month of year.
- **Chapter 3 – Roadside Truck Origin-Destination Surveys.** This chapter extracts truck movement data on I-95 using data from a roadside truck survey conducted at a weigh station in Carson, Virginia 35 miles north of the North Carolina-Virginia border on I-95.
- **Chapter 4 – FHWA Freight Analysis Framework (FAF) Data.** This chapter describes commodity flow movements in the State based on a county-level disaggregation of Federal Highway Administration (FHWA) Freight Analysis Framework version3 (FAF3) data.
- **Chapter 5 – License Plate Survey Data.** This chapter presents an analysis of the truck portion of an I-95 license plate survey that was completed for the NCDOT I-95 Corridor Planning and Finance Study.
- **Chapter 6 – Truck GPS Data.** This chapter describes truck movements along I-95 based on global positioning system (GPS) data from nearly 30,000 trucks that used I-95 over a one-year period.
- **Chapter 7 – Truck Costs and Market Analysis.** This chapter describes key components of trucking industry costs in North Carolina and compares them to costs in other states and in the U.S. as a whole.
- **Chapter 8 – Literature Review on Truck Response to Toll Roads.** This chapter describes the findings of recently completed research reports related to truck driver responses to toll roads.
- **Chapter 9 – Outreach.** This chapter describes information received on I-95 from three primary outreach mechanisms: 1) surveys of the trucking

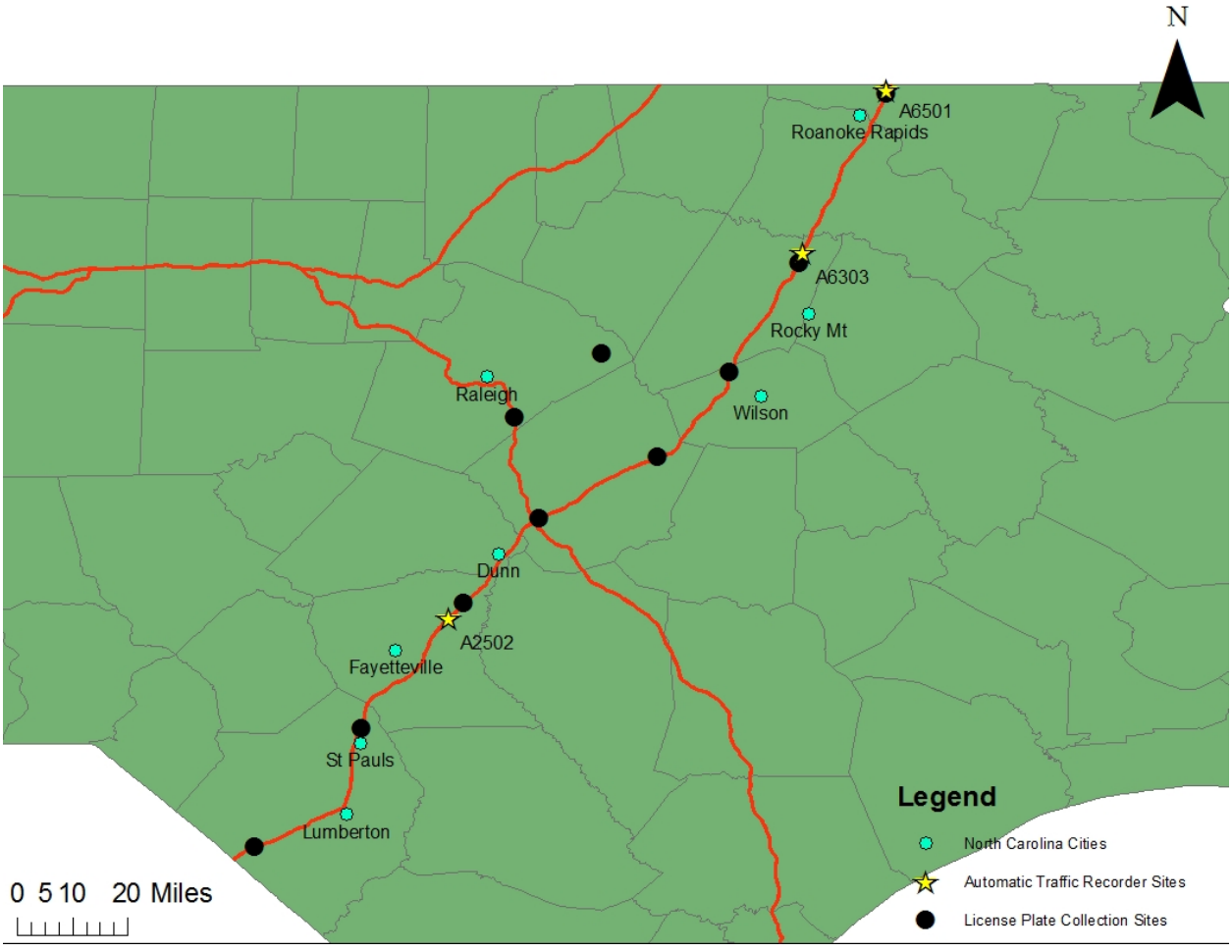
industry in North Carolina, 2) one-on-one interviews of trucking company operators and shippers, and 3) seven trucking and shipper focus groups conducted across the State.

- **Chapter 10 – Summary of Findings.** This chapter summarizes the findings of each of the previous chapters and describes elements of these findings that are common across different data/information sources. It also describes elements that are divergent across different sources.

2.0 Truck Count Data

This chapter provides information on truck and auto counts on I-95. Count data were assembled from two primary sources: 1) license plate matching surveys conducted as part of the NCDOT I-95 Corridor Planning and Finance Study and 2) NCDOT automatic traffic recorder sites. Figure 2.1 shows the license plate matching survey data collections locations and a few of the NCDOT data collection locations.

Figure 2.1 Locations of Count Collection Sites



Source: NCDOT website, NCDOT I-95 Corridor Planning and Finance Study crossing NC/VA.

2.1 LICENSE PLATE MATCHING SURVEY COUNT DATA

There were eight license plate matching sites on I-95. They are spaced approximately 20 miles apart. Classification counts were conducted at these locations beginning at 9 a.m. on Tuesday, November 17, 2009 and ending at 9 a.m. on Wednesday, November 18, 2009. These truck data range from a low of 6,989 trucks just north of the South Carolina border to as high as 16,827 trucks just south of the Fayetteville metropolitan region as shown in Table 2.1.

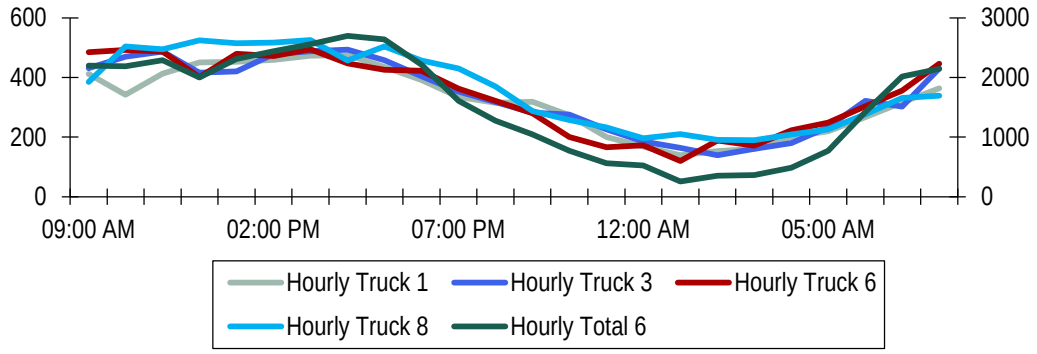
Table 2.1 Truck Counts at License Plate Matching Sites

Survey Site No.	Location Description	24-Hour Truck Count
1	Between Exit 180 and Exit 176	7,469
2	Between Exit 150 and Exit 145	9,385
3	Between Exit 127 and Exit 121	9,681
4	Between Exit 102 and Exit 95	10,350
5	Between Exit 81 and Exit 87	10,900
6	Between Exit 61 and Exit 65	16,827
7	Between Exit 33 and Exit 41	10,005
8	Between Exit 2 and Exit 7	6,989

Source: NCDOT I-95 License Plate Matching Survey.

Figure 2.2 shows the hourly truck volumes at select license plate matching sites. Each of the sites have similar hourly patterns with truck volumes reaching close to peak amounts by 9 a.m. and gradually increasing through the late afternoon before sharply declining between 5 p.m. and midnight. This is followed by an even more rapid increase from 5 a.m. back to peak volumes by 9:00 a.m.

Figure 2.2 Hourly Truck Volumes at Select License Survey Locations



Source: NCDOT I-95 License Plate Matching Survey.

2.2 AUTOMATIC TRAFFIC RECORDER AND VEHICLE MONITORING SITE COUNT DATA

NCDOT has 41 automatic traffic recorder (ATR) stations along I-95. Table 2.2 shows the average annual daily traffic (AADT) and average annual daily truck traffic (AADTT) estimates for these locations for 2011. The AADTT ranges from 5,543 just south of Fayetteville to over 10,000 just south of I-40. The truck percentages range from 14 percent to 30 percent along the corridor.

Table 2.2 Vehicle Classification Monitoring Locations with AADT, AADTT, and Truck Percentages

Station Identifier	I-95 Milepost	AADT2011	AADTT2011	Truck Percentage
VC7774	2	31,950	6,380	20%
VC7701	8	27,736	8,369	30%
VC7775	17	30,984	6,296	20%
VC7776	19	47,782	7,243	15%
VC7777	22	45,363	7,061	16%
VC7778	25	44,472	6,157	14%
VC7779	31	37,928	6,876	18%
VC7780	40	45,353	6,743	15%
VC2564	45	44,955	7,562	17%
VC2565	47	43,361	6,925	16%
VC2566	50	42,710	6,987	16%
VC2567	56	42,572	7,183	17%
VC2512	57	54,110	9,523	18%
VC2568	57	44,948	7,698	17%
VC2501	61	56,824	9,480	17%
VC2569	61	45,669	7,839	17%
VC2507	67	55,218	9,408	17%
VC4232	71	47,088	8,206	17%
VC4233	76	47,365	8,152	17%
VC5009	78	58,742	10,221	17%
VC5084	89	43,435	6,366	15%
VC5005	92	49,708	9,174	18%
VC5085	92	38,005	6,513	17%
VC5086	96	37,814	6,331	17%
VC5006	107	36,194	7,941	22%
VC5087	107	32,932	6,322	19%
VC9706	117	37,938	7,301	19%
VC9750	117	32,460	5,343	16%

Station Identifier	I-95 Milepost	AADT2011	AADTT2011	Truck Percentage
VC9751	120	44,707	7,085	16%
VC6384	136	36,135	5,588	15%
VC6308	138	41,150	7,019	17%
VC6385	140	39,902	6,563	16%
VC6386	145	36,397	6,110	17%
VC6304	148	37,914	8,130	21%
VC4104	152	40,862	8,079	20%
VC4109	158	37,490	8,747	23%
VC4167	158	42,096	6,029	14%
VC4168	170	39,370	6,286	16%
VC4169	172	44,053	6,929	16%
VC6504	178	41,253	8,626	21%
VC6532	180	43,084	6,529	15%
Average		42,147	7,359	17%

Source: NCDOT ATR data, 2011.

Monthly and daily vehicle volume data was extracted from three ATR sites on I-95. The volume data from these sites include both trucks and autos. Figure 2.3 shows the monthly average volumes from October 2011 to September 2012 at milepost 59 on I-95. Figures 2.4 and 2.5 show the same data for mileposts 148 and 180, respectively. These figures use the low volume month as the base of 1.0 and show the other volumes as a ratio relative to this base.

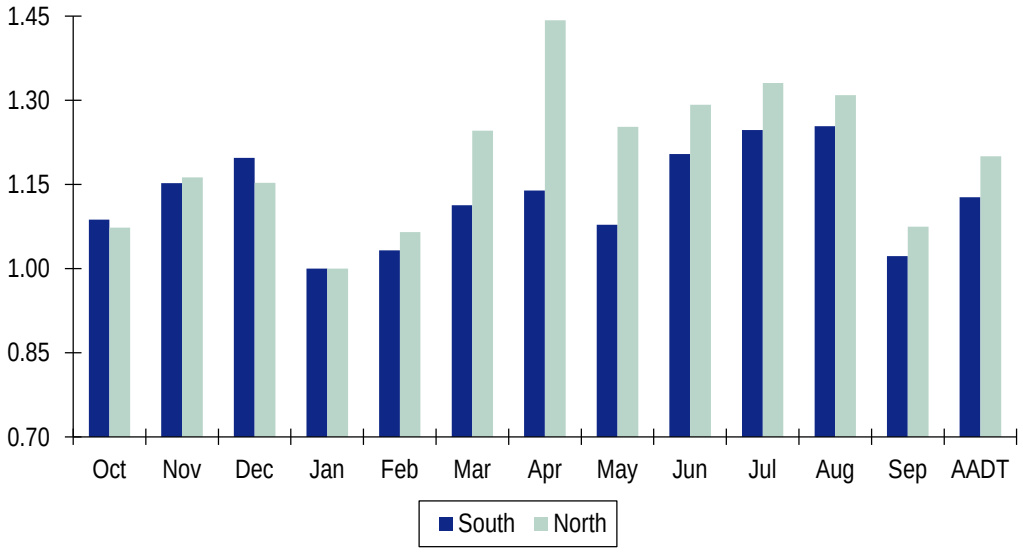
Figure 2.3 indicates that in the northbound direction the highest traffic volume occurs in the month of April with the entire six month period between March and August having high volumes in the northbound direction. September through February was a much lower volume time period. Northbound volumes were found to have a higher differential between lowest volumes and highest volumes relative to southbound.

Figure 2.4 shows the monthly average volumes from October 2011 to September 2012 at ATR site A6303 at milepost 148. Once again, the highest traffic volume in the northbound direction is in the month of April, with higher volumes between March and August. September through February was a lower time period for vehicle volumes.

Figure 2.5 shows the monthly average volumes from August 2006 through July 2007 at ATR site A6501 at milepost 180. Consistent with the other locations, the highest traffic volume in the northbound direction is in the month of April, with higher volumes between March and August. September through February were lower volumes months.

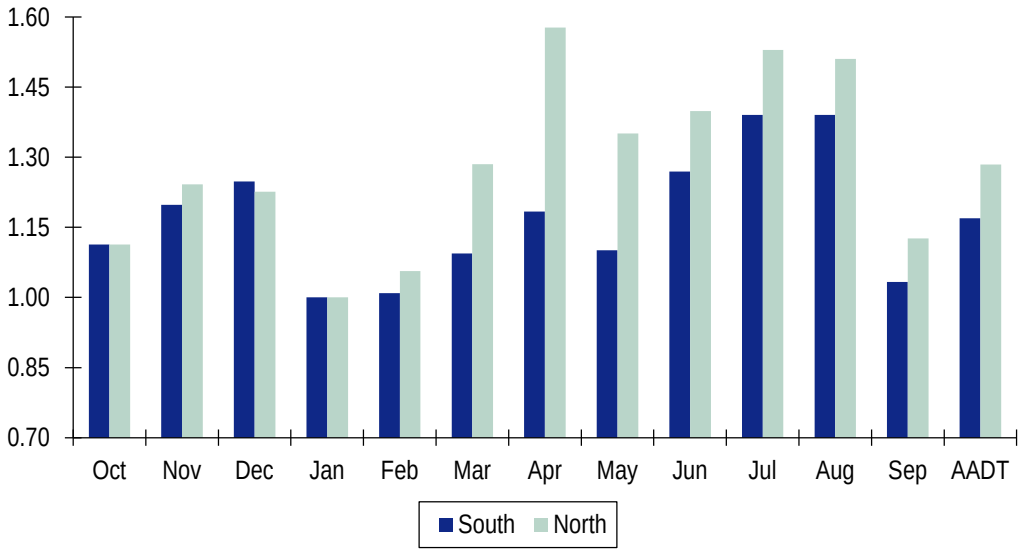
It is clear that April is the high volume month for I-95. This is likely due to a combination of spring break combined with the high traffic levels generated from the Easter holiday weekend.

Figure 2.3 Average Vehicle Count by Month at A2502 Milepost 59



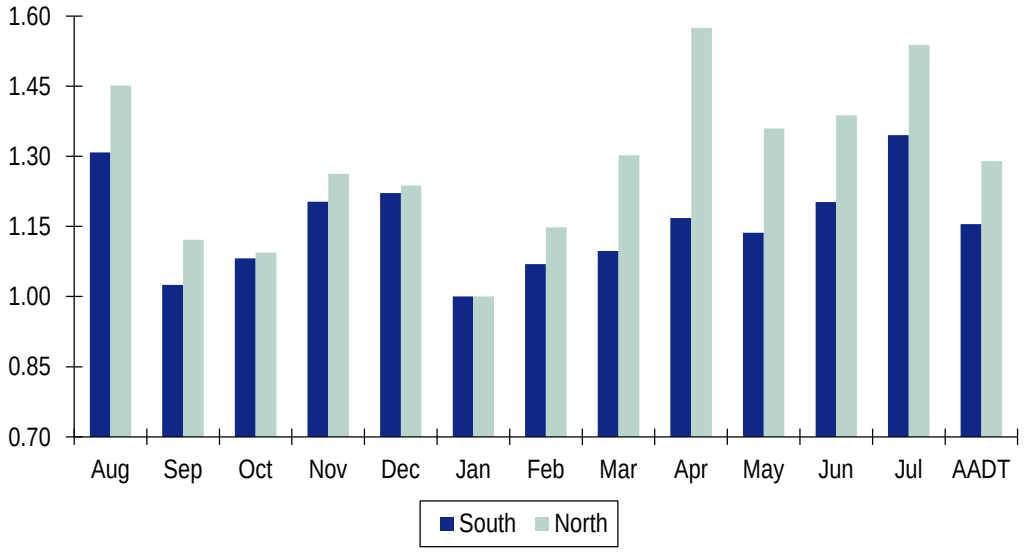
Source: NCDOT I-95 ATR data.

Figure 2.4 Monthly Average Vehicle Count at A6303 Milepost 148



Source: NCDOT I-95 ATR data.

Figure 2.5 Monthly Average Vehicle Count at A6501 Milepost 180



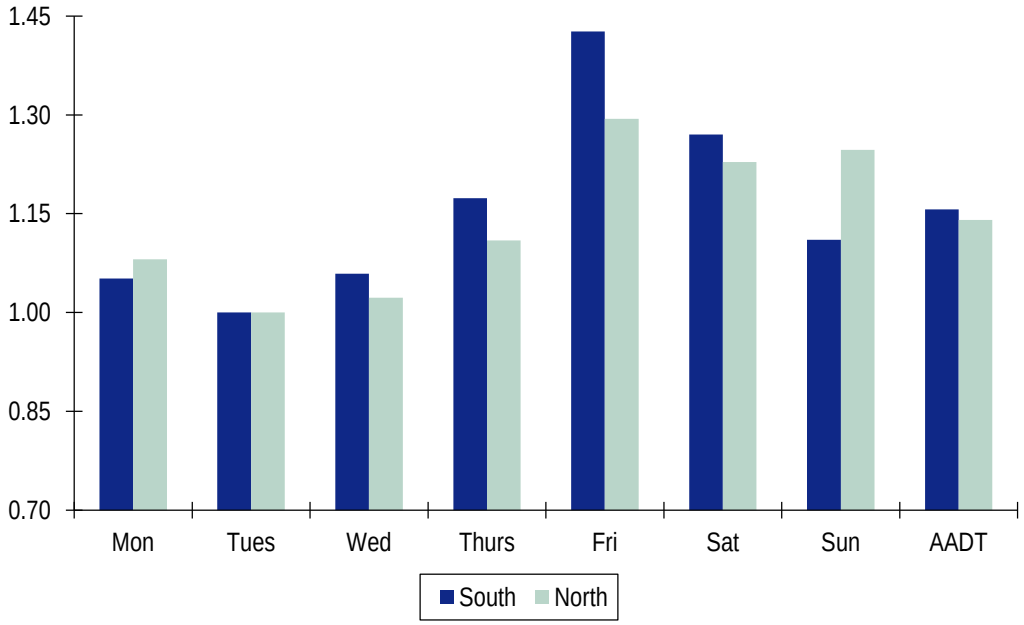
Source: NCDOT I-95 ATR data.

Figures 2.6, 2.7, and 2.8 show daily vehicle volume counts at mileposts 59, 148, and 180, respectively. These figures use the lowest day of the week as the base of 1.0 and show the other volumes relative to that amount. Figure 2.6 shows that Tuesday is the lowest vehicle volume day of the week at ATR site A2502 at milepost 59 and that Friday has the highest average volumes. Saturday and Sunday have the second and third highest volumes. This indicates that the weekend traffic is the heaviest traffic along I-95 in North Carolina.

Figure 2.7 shows that based on data collected in 2011 Tuesday is the lowest day of the week at ATR site A6303 at milepost 148. Friday has the highest average volumes in the southbound direction, while Sunday has the highest comparative volume in the northbound direction. Friday, Saturday, and Sunday have the top three highest volumes regardless of direction which reinforces the finding from the data collected at milepost 148 that the weekend traffic is the heaviest traffic along I-95.

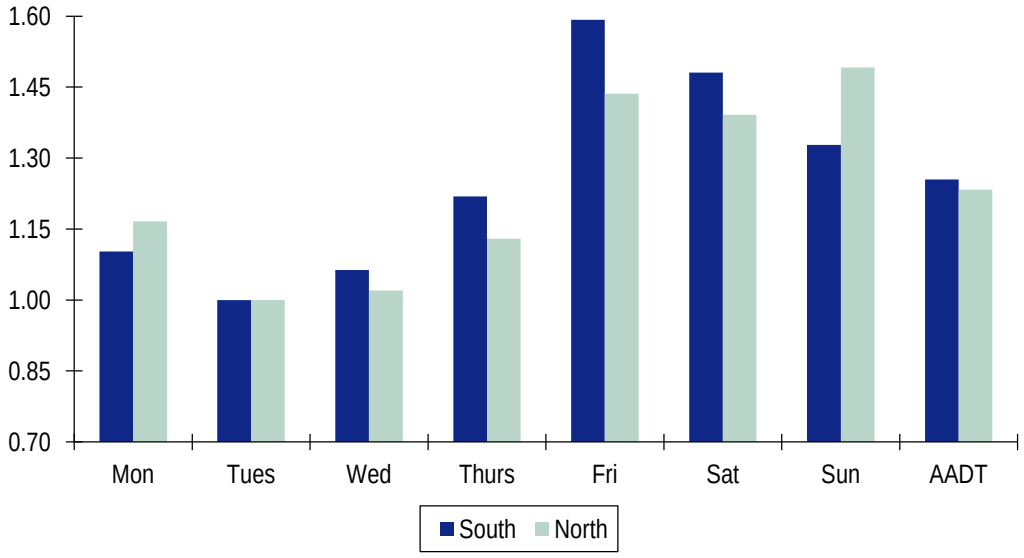
Figure 2.8 shows that based on data collected in 2006 once again Tuesday is the lowest day of the week at ATR site A6501 at milepost 180. Friday has the highest average volumes in the southbound direction, while Sunday has the highest comparative volume in the northbound direction. Friday, Saturday, and Sunday have the top three highest volumes regardless of direction which further reinforces weekend traffic as the heaviest along I-95.

Figure 2.6 Daily Average Vehicle Count at A2502 Milepost 59



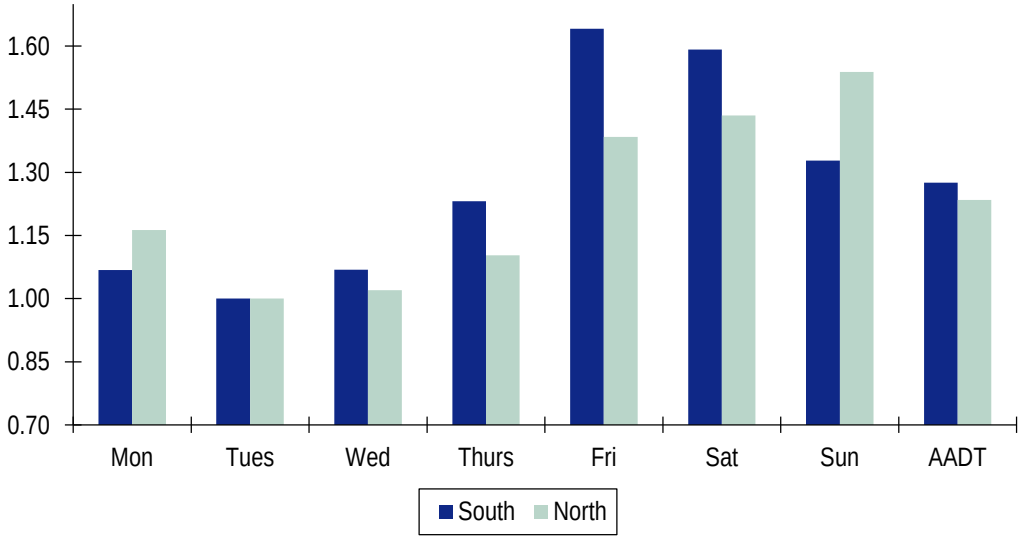
Source: NCDOT I-95 ATR data.

Figure 2.7 Daily Average Vehicle Count at A6303 Milepost 148



Source: NCDOT I-95 ATR data.

Figure 2.8 Daily Average Vehicle Count at A6501 Milepost 180



Source: NCDOT I-95 ATR data.

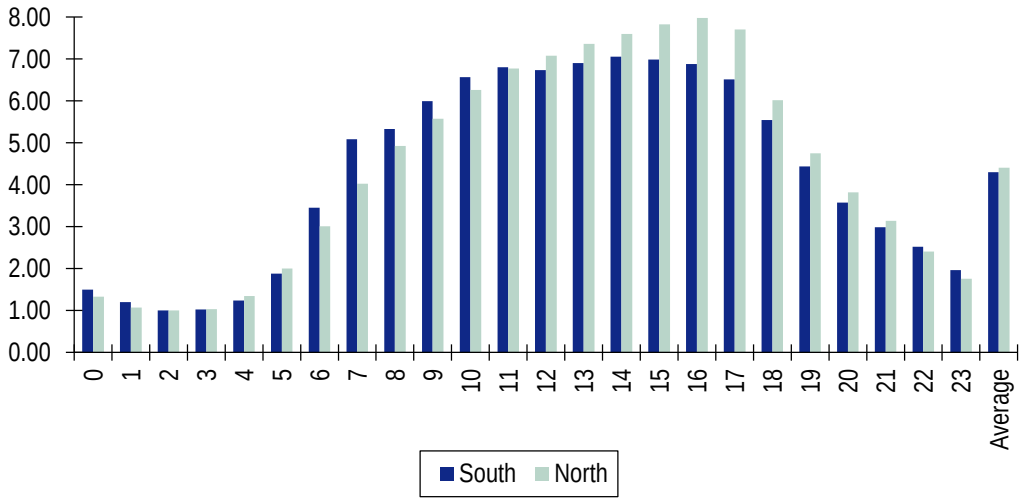
Figures 2.9, 2.10, and 2.11 show hourly vehicle volume counts at mileposts 59, 148, and 180 respectively. These figures use the lowest hour of the day as the base of 1.0 and show the other volumes relative to that amount. For the data collected from October 2011 through September 2012, Figure 2.9 shows that the hour starting at 2:00 a.m. has the lowest volumes of the day at ATR site A2502 at milepost 59 and that 4:00 p.m. has the highest average volumes in the northbound direction. In the morning peak, southbound directions are higher than northbound, however, this begins to shift at 11:00 a.m.

Figure 2.10 shows that based on data collected from October 2011 to September 2012, the hours starting at 2:00 a.m. and 3:00 a.m. have the lowest volumes at ATR site A6303 at milepost 148. The highest volumes occur in both directions during the hour starting at 2:00 p.m. Traffic is almost always higher in the northbound direction, except for between the hours of 11:00 p.m. and 1:00 a.m.

Figure 2.11 shows that based on data collected from August 22, 2006 to August 21, 2007, the lowest volume hour is once again at 2:00 a.m. at ATR site A6501 at milepost 180. The highest traffic volumes occur at 2:00 p.m. in both directions. Traffic in the northbound direction is generally higher than the southbound direction.

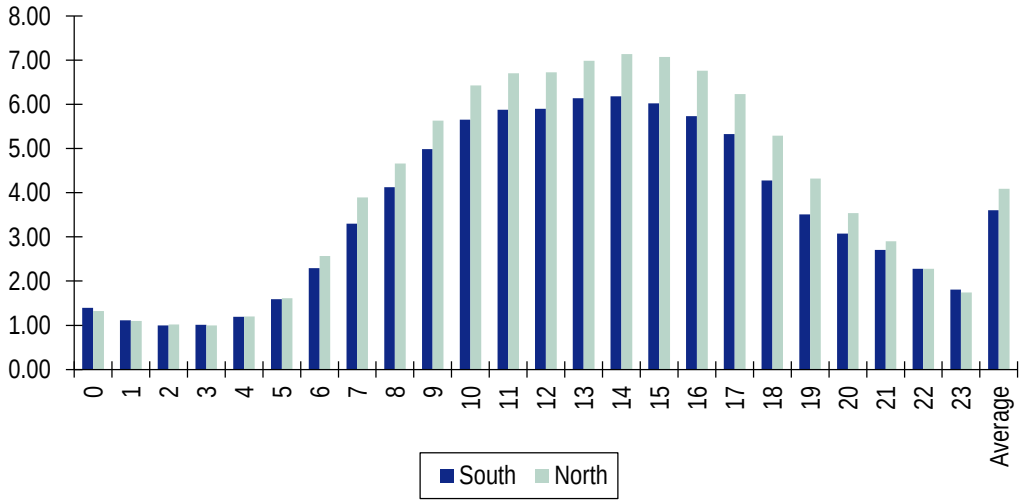
The hourly data indicate that the late afternoon time period is the highest volume time period on I-95. Combined with the other traffic count data, it appears that the highest volume time period is during the month of April on Fridays in the afternoon. Overall, the highest volumes are found in the spring and summer, during the weekends, and during late afternoons.

Figure 2.9 Hourly Average Vehicle Count at A6501 Milepost 59



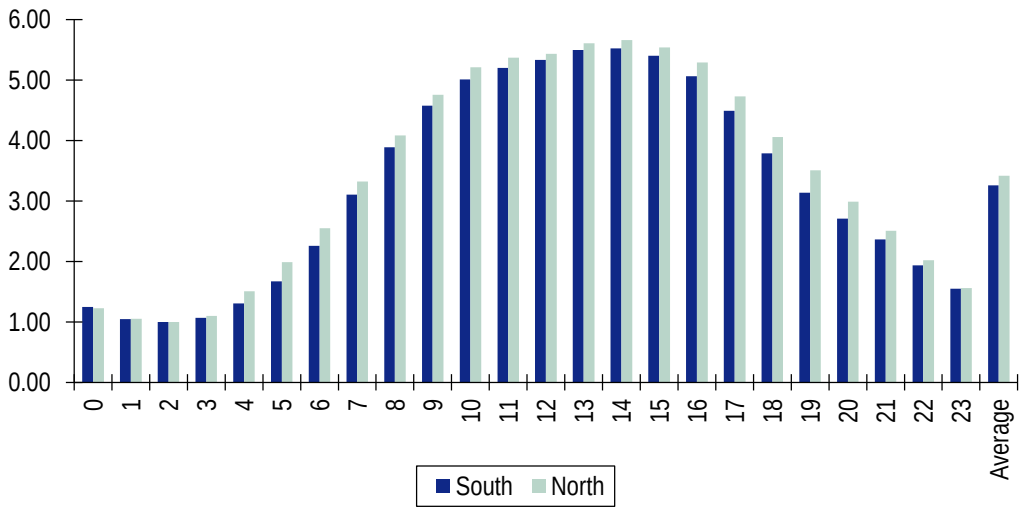
Source: NCDOT I-95 ATR data.

Figure 2.10 Hourly Average Vehicle Count at A6501 Milepost 148



Source: NCDOT I-95 ATR data.

Figure 2.11 Hourly Average Vehicle Count at A6501 Milepost 180



Source: NCDOT I-95 ATR data.

3.0 Roadside Truck Origin-Destination Surveys

This chapter presents a summary of information collected from a roadside truck survey conducted on I-95 in Carson, Virginia. Carson is approximately 30 miles north of the North Carolina-Virginia border as shown in Figure 3.1. These surveys were conducted December 12th and 13th in 2007. 805 surveys were conducted in the southbound direction. 873 surveys were conducted in the northbound direction. Trucks were pulled from the traffic stream at random to ensure an unbiased sample of trucks. Data collected during these surveys included origin and destination at the city/state level along with commodity carried information.

3.1 ORIGIN-DESTINATION ANALYSIS

The data collected in this survey can be used to analyze trucks moving through North Carolina on I-95 that do not have an origin or destination within the state. Table 3.1 shows the truck counts in Carson, the percent of surveyed trucks that reported moving through North Carolina, but did not have an origin or destination within the state, and the resultant estimate on the number of through trucks for North Carolina on I-95. The table shows that using the origin-destination surveys, just over 2,500 trucks per day pass through North Carolina on I-95 without having either an origin or a destination within the state. Using the average truck count from Table 2.2 of 7,349, it can be estimated that 35 percent of the truck counts at the average location along I-95 in North Carolina are trucks traveling through the state.

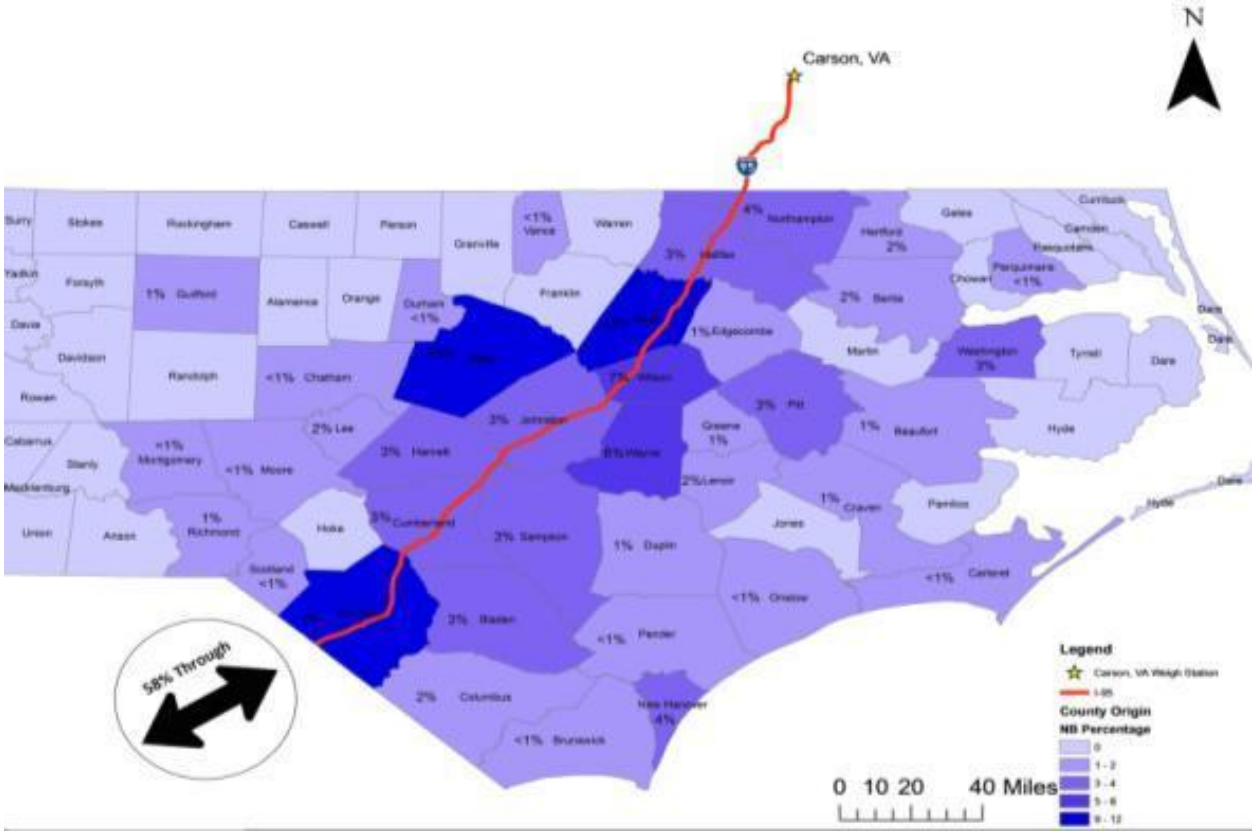
Table 3.1 Estimated North Carolina Through Truck Volume

Direction	Estimated Truck Count in Carson, VA*	Percent Trucks Traveling Through NC from O-D Survey	Number of Trucks Through NC
Northbound	2,932	52%	1,526
Southbound	1,944	55%	1,064
Total	4,877	53%	2,590

Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Note: Ncludes trucks not crossing NC/VA border.

Figure 3.1 County Distribution of Goods Originating in North Carolina

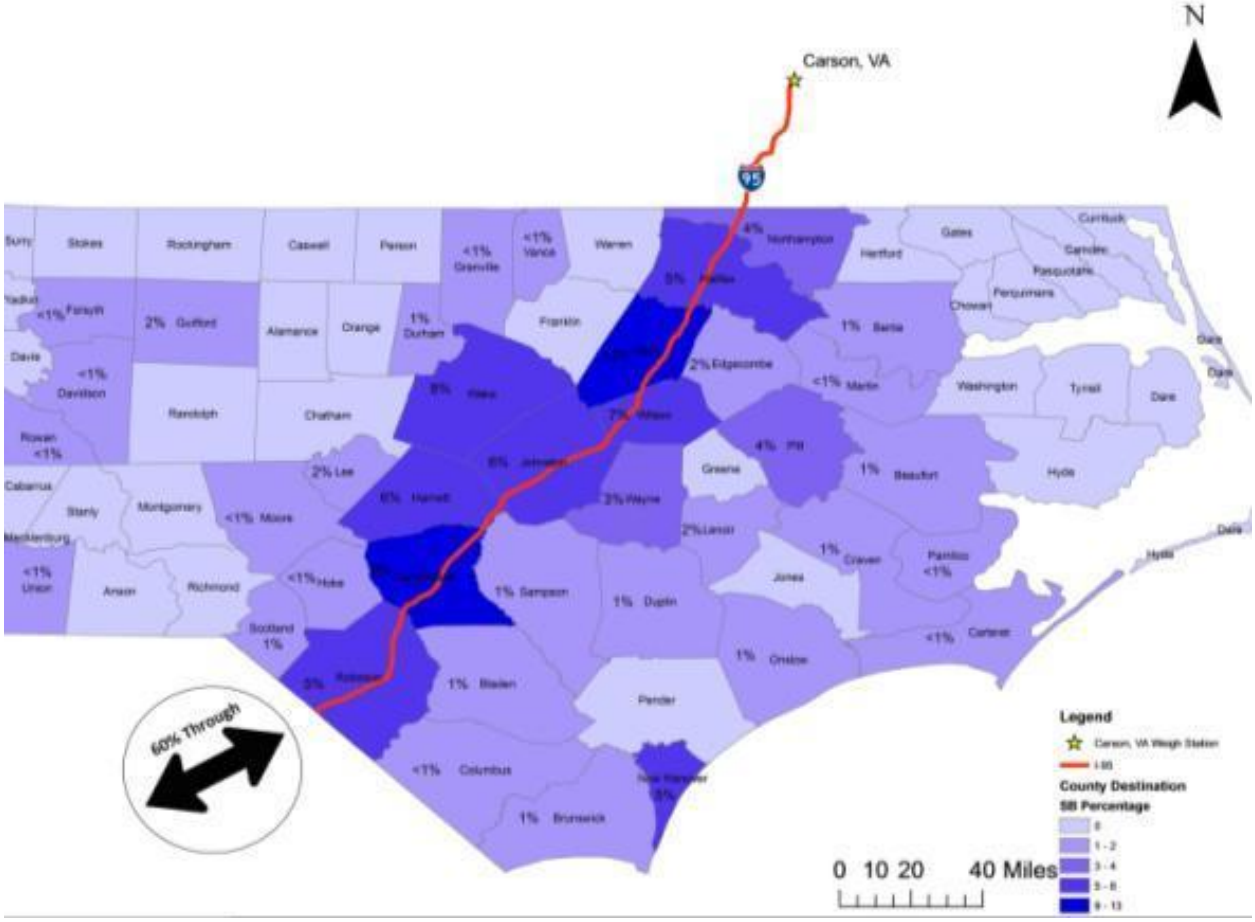


Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

The roadside origin-destination surveys were also used to determine locations within North Carolina for goods moving into the state on I-95 from the north. Figure 3.1 and Table 3.2 shows the distribution of goods at the county level within North Carolina for northbound flows through Carson, Virginia. It shows that Wake and Nash County are the two highest county generators of truck flows heading northbound on I-95 with 10 and 9 percent of the flows respectively. Wilson and Wayne counties were the only other counties to generate more than 5 percent of the truck traffic headed towards Virginia. The vast majority of the North Carolina destinations were located on or very close to the I-95 corridor with a total of 44 percent of the trucks originating in one of the eight counties located on I-95. The notable exceptions to this are the 4 percent of trucks that were generated in New Hanover County where the Port of Wilmington is located and the 3 percent from Washington County where timber and wood products are generated.

Figure 3.2 and Table 3.3 show county-level truck trip end data for southbound trucks captured in the survey with North Carolina as their destination. This map shows again that truck trip ends are clustered around I-95 with 55 percent of these trucks destined for one of the eight counties located along I-95. Other counties with relatively higher percentages of truck flows are Wake, New Hanover, and Pitt Counties.

Figure 3.2 County Distribution of Goods Terminating in North Carolina



Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Table 3.2 County Distribution of Goods Originating in North Carolina

County	Percentage
Nash	12%
Wake	10%
Robeson	9%
Wilson	7%
Wayne	6%
New Hanover	4%
Northampton	4%
Cumberland	3%
Halifax	3%
Bladen	3%

County	Percentage
Johnston	3%
Pitt	3%
Sampson	3%
Harnett	3%
Washington	3%
Other	13%
Total	100%

Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Table 3.3 County Distribution of Goods Terminating in North Carolina

County	Percentage
Nash	13%
Cumberland	9%
Wake	8%
Wilson	7%
Harnett	6%
Johnston	6%
New Hanover	5%
Robeson	5%
Halifax	5%
Northampton	4%
Pitt	3%
Wayne	3%
Lenoir	2%
Guilford	2%
Edgecombe	2%
Lee	2%
Other	18%
Total	100%

Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

3.2 COMMODITY DISTRIBUTION ANALYSIS

The roadside truck origin-destination surveys were also used to analyze the commodity distribution of trucks using I-95. Figure 3.3 and Table 3.4 show the commodity distribution for goods with a North Carolina origin traveling northbound on I-95 to Carson, Virginia. It shows that 15 percent of the trucks were carrying grains and food stuffs; 11 percent were carrying meats; and 10 percent were carrying agriculture. These three commodities are all food/farm related and total to 36 percent of the commodities generated in North Carolina moving northbound on I-95 out of the state.

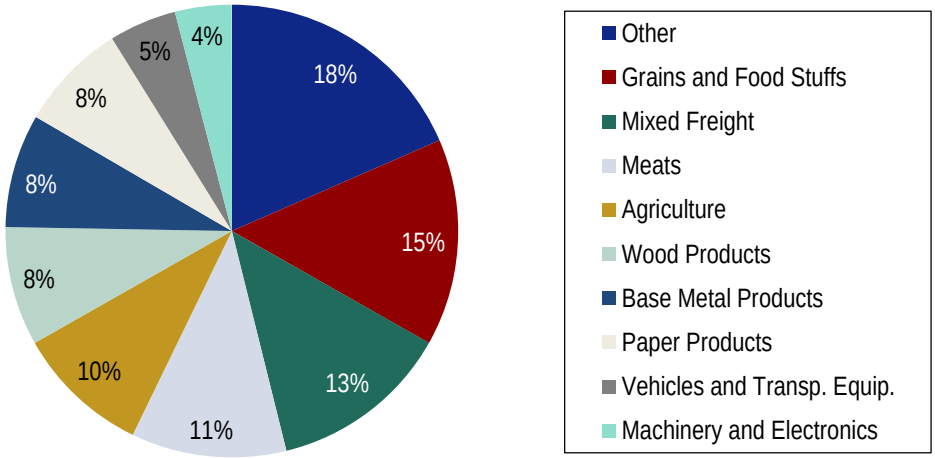
Wood products were another 11 percent of the goods in the northbound direction, while paper products were 8 percent. These two commodities total 19 percent. Therefore, the two sectors of food/farm and wood/paper constitute over half of the goods generated in the state that are traveling to the north. The largest commodities outside of these sectors were mixed freight (largely dray goods to/from distribution centers) with 13 percent and base metal products with 8 percent.

Figure 3.4 and Table 3.5 show the distribution for goods with a North Carolina destination traveling southbound on I-95 from Carson, Virginia. In the southbound direction, the food/farm sector totaled 25 percent. The wood/paper products totaled 9 percent. Therefore, these two sectors represented just over one-third of all of the goods traveling to North Carolina in the southbound direction. Other major commodities included mixed freight with 14 percent of the goods; machinery and electronics with 8 percent; and base metal products with 8 percent.

Figures 3.5 and 3.6 show the distribution of goods for trucks traveling through North Carolina. The northbound goods have an even higher percentage of food/farm sector commodities with 38 percent of the total through trucks. The wood/paper products represent another 15 percent of the total truck moves in the northbound direction for through trucks. Through trucks traveling in the southbound direction have a much lower percentage of food/farm trucks and wood/paper trucks than the northbound direction.

The roadside truck origin-destination surveys were also used to determine the origin-destination patterns of through truck trips. Table 3.6 shows the origins and destinations of through truck trips. Florida is the dominant state for both origins and destinations of through truck trips. South Carolina, Virginia, and Pennsylvania were the next highest states in terms of truck trip ends for through trucks on I-95 in North Carolina.

Figure 3.3 Distribution of Commodity Types for Goods with a North Carolina Origin



Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

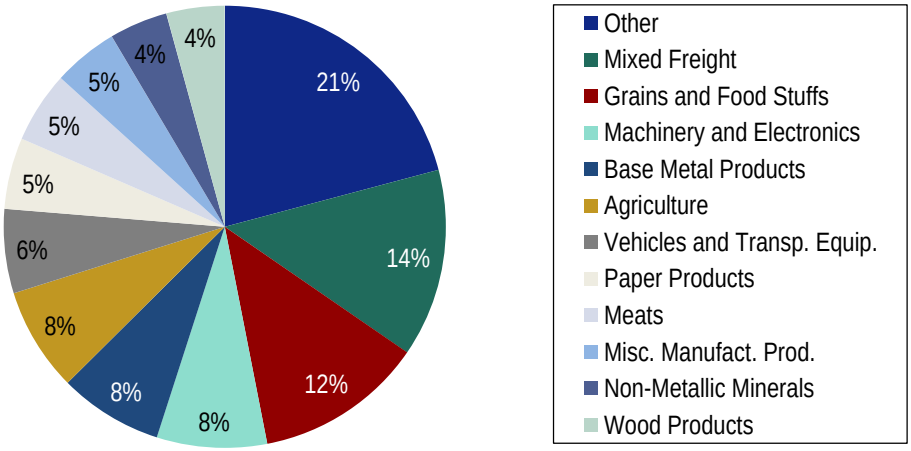
Table 3.4 Distribution of Commodity Types for Goods with a North Carolina Origin

Commodity	Percentage
Other Prepared Food Stuffs, and Fats and Oils	13%
Mixed Freight	13%
Meat, Fish, Seafood and Their Preparations	11%
Agricultural Products Except for Animal Feed	10%
Wood Products	6%
Base Metal in Primary/Semi-Finished Forms and Finished Basic Shapes	6%
Pulp, Newsprint, Paper, and Paperboard	5%
Nonmetallic Mineral Products	3%
Motorized and Other Vehicles (including parts)	3%
Logs and Other Wood in the Rough	3%
Paper or Paperboard Articles	3%
Articles of Base Metal	2%
Machinery	2%
Basic Chemicals	2%
Electronic and Other Electrical Equipment and Components and Office Equipment	2%
Furniture, Mattresses, Lamps, Lighting Fittings, and Illuminated Signs	2%
Milled Grain Products and Preparations, and Bakery Products	1%

Commodity	Percentage
Plastics and Rubber	1%
Textiles, Leather, and Articles of Textiles or Leather	1%
Transportation Equipment	1%
Miscellaneous Manufactured Products	1%
Other Coal and Petroleum Products	1%
Pharmaceutical Products	1%
Other Chemical Products and Preparations	1%
Waste and Scrap (except of agriculture or food)	1%
Animals and Fish (live)	<1%
Animal Feed and Products of Animal Origin	<1%
Fuel Oils	<1%
Alcoholic Beverages	<1%

Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Figure 3.4 Distribution of Commodity Types for Goods with a North Carolina Destination



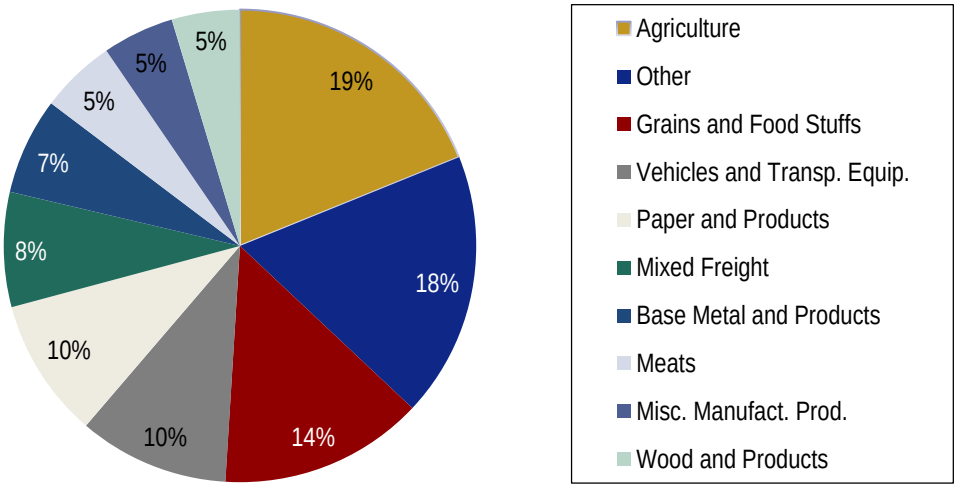
Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Table 3.5 Distribution of Commodity Types for Goods with a North Carolina Destination

Commodity	Percentage
Mixed Freight	14%
Other Prepared Food Stuffs, and Fats and Oils	11%
Agricultural Products Except for Animal Feed	8%
Meat, Fish, Seafood and Their Preparations	5%
Machinery	5%
Motorized and Other Vehicles (including parts)	5%
Paper or Paperboard Articles	5%
Miscellaneous Manufactured Products	5%
Nonmetallic Mineral Products	4%
Base Metal in Primary/Semi-Finished Forms and Finished Basic Shapes	4%
Plastics and Rubber	4%
Alcoholic Beverages	3%
Wood Products	3%
Articles of Base Metal	3%
Electronic and Other Electrical Equipment and Components and Office Equipment	3%
Furniture, Mattresses, Lamps, Lighting Fittings, and Illuminated Signs	3%
Basic Chemicals	2%
Textiles, Leather, and Articles of Textiles or Leather	2%
Cereal Grains (including seeds)	1%
Milled Grain Products and Preparations, and Bakery Products	1%
Sands and Quartz Sands	<1%
Limestone, Gravel, etc.	<1%
Other Nonmetallic Minerals	<1%
Logs and Other Wood in the Rough	<1%
Transportation Equipment	<1%
Animal Feed and Products of Animal Origin	<1%
Tobacco Products	<1%
Gasoline and Aviation Fuel	<1%
Other Coal and Petroleum Products	<1%
Pharmaceutical Products	<1%
Other Chemical Products and Preparations	<1%
Printed Products	<1%

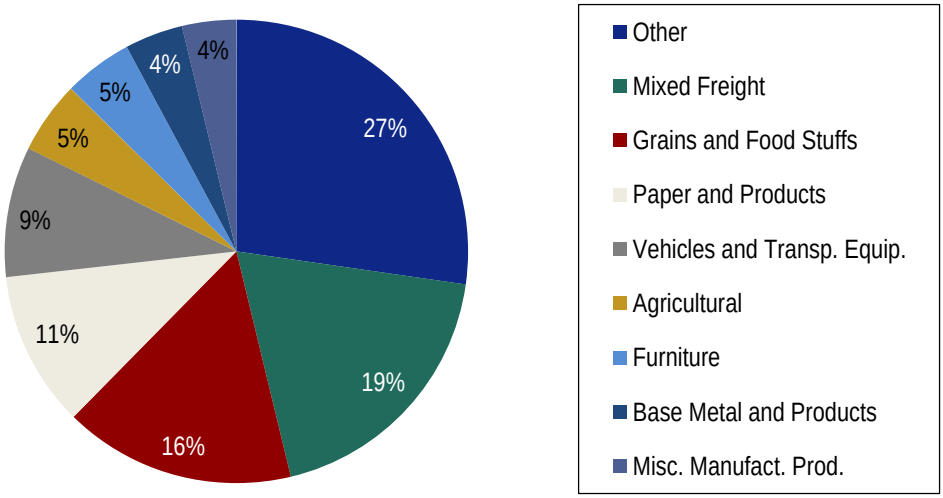
Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Figure 3.5 Distribution of Commodity Types for Goods Traveling Northbound Through North Carolina



Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Figure 3.6 Distribution of Commodity Types for Goods Traveling Southbound Through North Carolina



Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

Table 3.6 State Origins and Destinations for North Carolina Through Trucks on I-95

	Origin States					
Destination States	Florida	South Carolina	Virginia	Pennsylvania	Other	Total
Florida			4%	4%	17%	25%
South Carolina			4%	3%	7%	14%
Pennsylvania	9%	3%			3%	13%
Virginia	5%	4%			2%	11%
Other	17%	5%	4%	1%	10%	37%
Total	30%	11%	11%	8%	39%	100%

Source: Roadside Origin-Destination Data Collected on I-95 at Carson, VA.

4.0 FHWA Freight Analysis Framework Data

The Federal Highway Administration (FHWA) develops the Freight Analysis Framework (FAF) data which provides estimates and forecasts of commodity flows for the U.S. The estimates include origins, destinations, commodity, mode, and weight values for shipments in 89 predefined regions. Cambridge Systematics has developed a tool to disaggregate the FAF data to the county level based on local economic activity. This tool was applied to the North Carolina portion of the FHWA FAF version 3 data to develop more geographically specific estimates of freight flows for the State. This chapter describes the results of this data disaggregation process with a focus on the I-95 corridor.

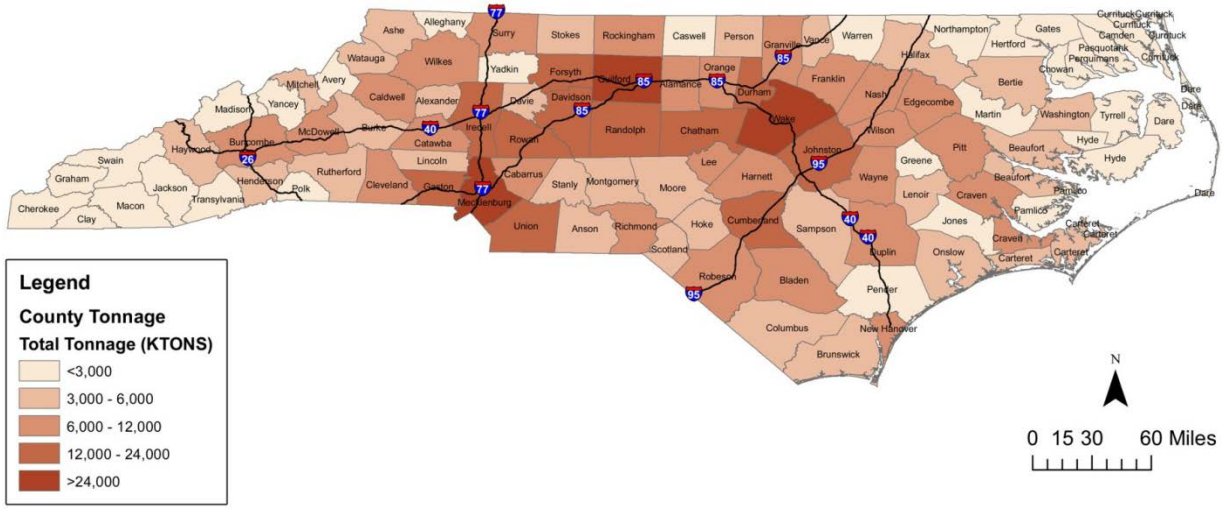
4.1 County-Level Truck Flows

Figure 4.1 shows the total truck tons for each county in North Carolina. This includes truck tons in, out and around each county for the year of 2007. It does not include tons moving through the county. The map indicates that truck tonnage is strongly correlated with population. This is likely due to the large component of the economy that is tied to personal consumption and the need to deliver many of the goods consumed by individuals to retail locations by truck. Similarly, many manufacturers locate near population centers to have access to a large workforce and to speed delivery times to final consumers. Therefore, large population centers tend to attract large manufacturing facilities and the truck traffic associated with this activity.

Table 4.1 lists total truck tonnage for select counties in North Carolina. The eight counties along I-95 are shown in bold. The two largest counties in terms of truck tonnage are Mecklenburg County and Wake County which are the two most heavily populated counties in the State. Both of these counties are estimated to have carried over 50 million truck tons in 2007. Guilford County has the third highest amount of truck tons in the State with 35 million.

Along the I-95 corridor, the largest counties in terms of truck tonnage are Johnston County and Cumberland County. Both of these counties have over 12 million truck tons moving in, out and around the State. Wilson, Nash and Harnett Counties all have between 6 to 12 million truck tons. East of I-95 the largest counties in terms of truck tons are in Wayne, Edgecombe, Pitt, Craven, Duplin, Bladen, and New Hanover. Each of these counties were estimated to move over 3 million truck tons in 2007. Overall, these data show that there is a significant amount of truck traffic both along the corridor and east of the corridor as well. However, the heaviest truck tonnage counties in the State are located west of the I-95 corridor in the heavily populated regions.

Figure 4.1 Truck Tonnage by County in North Carolina



Source: FHWA FAF3 data disaggregated to county level by consultant team.

Table 4.1 List of Truck Tonnage by County in North Carolina
Top 20 Counties and Other Select Counties

NC Rank	County	Tons (in thousands)
1	Mecklenburg	53,697
2	Wake	50,679
3	Guilford	35,134
4	Forsyth	19,305
5	Rowan	17,004
6	Davidson	16,025
7	Durham	14,913
8	Randolph	14,859
9	Gaston	14,619
10	Cumberland	14,561
11	Chatham	14,447
12	Iredell	14,062
13	Union	13,027
14	Johnston	12,162
15	Catawba	11,744
16	Cabarrus	11,724
17	Cleveland	11,578
18	Wayne	11,133

NC Rank	County	Tons (in thousands)
19	Nash	10,589
20	Harnett	10,306
25	New Hanover	8,705
28	Robeson	8,519
32	Pitt	8,013
36	Edgecombe	7,023
38	Wilson	6,903
40	Bladen	6,223
47	Sampson	5,536
58	Halifax	4,553
70	Northampton	2,984
N/A	Other	287,716
N/A	Total	717,743

Source: FHWA FAF3 data disaggregated to county level by consultant team.

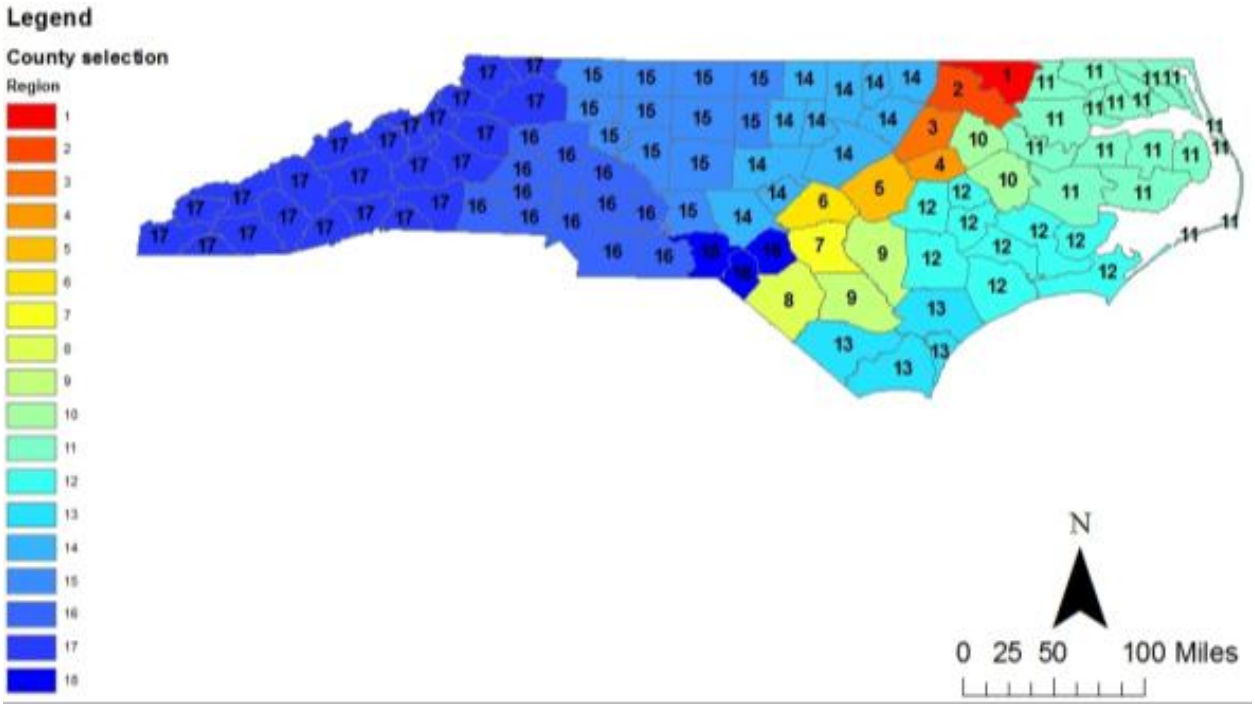
4.2 ORIGIN-DESTINATION PATTERNS

This section analyzes origin and destination patterns based on the disaggregated FAF data. Origins and destinations are defined into the 18 regions that are also used for the economic analysis. The definition of these regions is shown in Figure 4.2 and Table 4.2. Regions 19 through 31 are regions that are external to North Carolina.

Table 4.3 shows the total truck flows between key regions in the I-95 corridor study area and between key regions and external regions. The table shows that Johnston County has the highest number of truck flows of the eight counties located along I-95. However, much of this traffic goes to Region 14 which includes Wake County and does not utilize I-95. Overall, there is a large percentage of truck flows that travel to external regions using the disaggregated FAF data. The data capture the important long haul truck movements, but it does indicate that the FAF data are not the best source for capturing data on local, intra-county truck tonnages.

Table 4.4 shows the percent of the total flows that utilize I-95 for each of the 31 internal and external regions for this study. The range of percentages for the eight counties goes from a low of 33 percent for Johnston County to a high of 98 percent for Robeson Counties. These values represent estimates based on the configuration of the FAF road network relative to the location of these counties. However, the primary takeaway from this analysis is that not all counties have the same reliance on I-95 to move goods generated to/from their regions.

Figure 4.2 Map of 18 North Carolina Regions For Economic Analysis



Source: Consultant analysis.

Table 4.2 List of North Carolina Counties and External Region Assignment For Economic Analysis

Region	Counties
1	Northampton
2	Halifax
3	Nash
4	Wilson
5	Johnston
6	Harnett
7	Cumberland
8	Robeson
9	Bladen, Sampson
10	Edgecombe, Pitt
11	Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Gates, Hertford, Hyde, Martin, Pasquotank, Perquimans, Tyrrell, Washington
12	Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, Wayne
13	Brunswick, Columbus, New Hanover, Pender

Region	Counties
14	Chatham, Durham, Franklin, Granville, Lee, Moore, Orange, Person, Vance, Wake, Warren
15	Alamance, Caswell, Davidson, Davie, Forsyth, Guilford, Montgomery, Randolph, Rockingham, Stokes, Surry, Yadkin
16	Alexander, Anson, Cabarrus, Catawba, Cleveland, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, Union
17	Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Swain, Transylvania, Watauga, Wilkes, Yancey
18	Hoke, Richmond, Scotland
19	Eastern Virginia
20	Western Virginia
21	Connecticut, Delaware, D.C., Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
22	Eastern South Carolina
23	Western South Carolina
24	Georgia
25	Florida
26	Alabama, Arizona, California, Louisiana, Mississippi, New Mexico, Texas
27	Arkansas, Oklahoma, Tennessee
28	West Virginia
29	California, Colorado, Kansas, Kentucky, Missouri, Nevada, Utah
30	Alaska, Hawaii, Idaho, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, Oregon, South Dakota, Washington, Wisconsin, Wyoming
31	Canada

Source: Consultant analysis.

Table 4.3 Truck Tonnage Estimates by Region
Thousands of Tons

Origins	Northampton	Halifax	Nash	Wilson	Johnston	Harnett	Cumberland	Robeson	Regions 9-13	Regions 14-18	Regions 19-31	Grand Total
Destinations												
Northampton	20	15	27	21	11	7	25	21	316	659	737	1,858
Halifax	60	26	45	32	12	18	49	27	469	1,121	398	2,256
Nash	148	65	120	78	29	39	114	79	1,172	2,576	1,239	5,660
Wilson	42	24	44	50	14	7	45	36	606	1,397	795	3,059
Johnston	46	13	22	21	406	361	27	17	277	4,217	857	6,263
Harnett	29	14	26	14	326	361	32	15	223	3,447	508	4,995
Cumberland	186	86	153	142	50	55	178	97	1,900	4,799	1,848	9,494
Robeson	67	37	82	71	23	22	84	78	1,066	2,201	932	4,661
Total 8 I-95 Counties	598	280	519	429	871	870	554	370	6,029	20,417	7,314	38,246
Regions 9-13	901	567	1,164	920	307	265	1,167	979	14,191	29,032	12,218	61,712
Regions 14-18	2,602	887	1,817	1,413	4,119	3,807	1,926	1,400	20,629	163,981	57,123	259,704
Regions 19-31	2,203	562	1,430	1,083	602	368	1,420	1,108	14,602	56,871	12,706,228	12,786,476
Grand Total	6,303	2,297	4,929	3,844	5,899	5,311	5,066	3,858	55,449	270,300	12,782,885	13,146,140

Source: FHWA FAF3 data disaggregated to county level by consultant team.

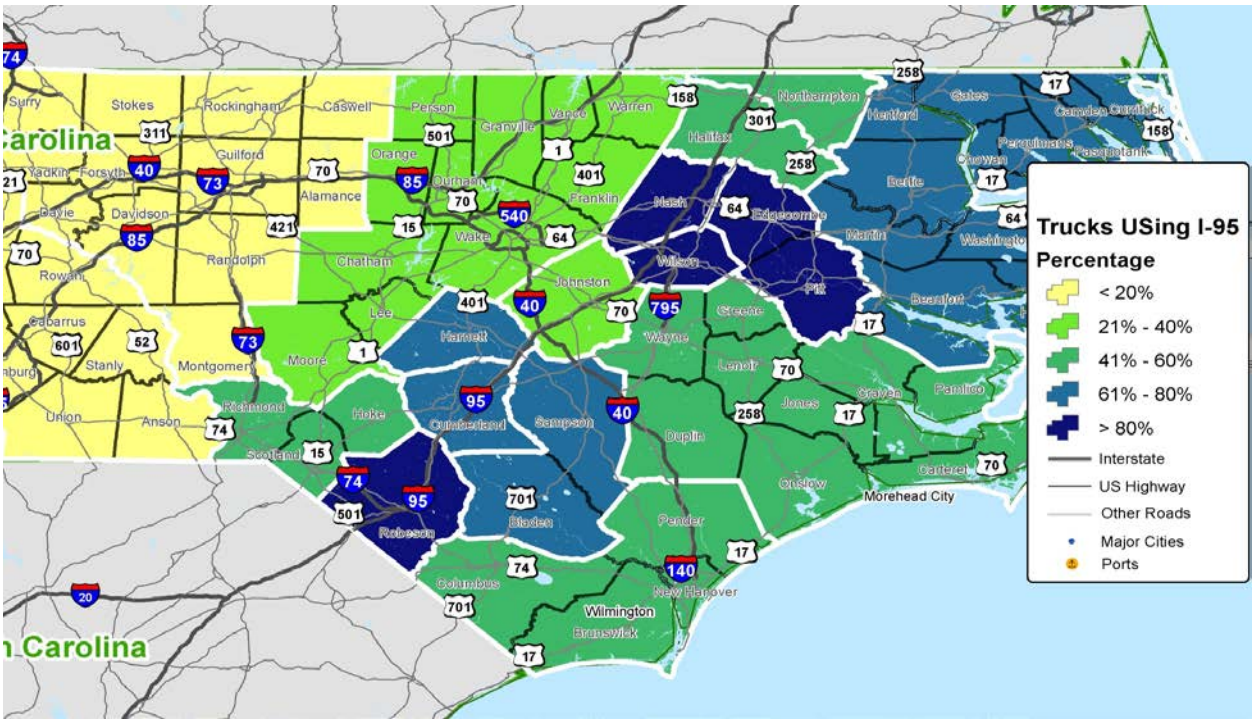
Table 4.4 Percent of Tonnage Using I-95
Origins and Destinations Combined

Region	Percent Using I-95
Northampton	55%
Halifax	59%
Nash	90%
Wilson	89%
Johnston	33%
Harnett	63%
Cumberland	65%
Robeson	98%
Regions 9-13	63%
Regions 14-18	17%
Regions 19-30	10%

Source: FHWA FAF3 data disaggregated to county level by consultant team.

Figure 4.3 shows the percent of tonnage using I-95 for each of the 18 analysis regions in North Carolina. It graphically depicts that different regions have different levels of reliance on the corridor. Regions located on or near the southern portion of the corridor along with counties located in the Rocky Mount region appear to have the highest reliance on I-95. The middle portion of the corridor and the northeast portion of the state have the next highest level of reliance on I-95. Regions that are located far away from the corridor have the lowest level of reliance on I-95.

Figure 4.3 Percentage of Total Tonnage Using I-95 by NC Region



Source: FHWA FAF3 data disaggregated to county level by consultant team.

4.3 COMMODITY DISTRIBUTION

Table 4.5 shows the commodity distribution for each of the counties along the corridor and the regions in eastern North Carolina. It shows that the main commodities moving through the eastern part of the state include items for construction (e.g., sand, gravel and nonmetallic mineral trucks) along with agricultural related products. Logs and wood products also are identified as key commodities moving in the eastern part of the state. This is consistent with the freight-related economic activity in eastern North Carolina which is known to be dominated by agriculture, food processing, timber, and wood/paper products. Nine of the top eleven commodities are either from food/farm, wood/paper or construction industry related commodities.

Table 4.5 Commodity Distribution for Eastern North Carolina Region
Thousands of Tons

Commodity	Northampton	Halifax	Nash	Wilson	Johnston	Harnett	Cumberland	Robeson	Region 9	Region 10	Region 11	Region 12	Region 13	Total
Limestone and Gravel	315	419	638	1,063	4,156	3,349	2,515	900	788	3,109	1,957	7,458	3,566	30,232
Logs and Wood in the Rough	633	772	2,046	583	958	839	1,775	1,134	1,465	1,207	7,172	5,915	3,005	27,502
Nonmetallic Mineral Products	1,005	836	805	1,002	1,236	1,347	1,223	369	304	873	1,691	2,268	2,909	15,867
Waste and Scrap	321	337	620	469	1,063	606	1,281	551	419	1,246	1,804	2,834	1,642	13,193
Cereal Grains	60	52	378	388	109	43	177	975	2,148	369	1,250	3,180	153	9,280
Animal Feeds	150	186	253	164	338	242	384	416	1,382	541	1,283	3,065	598	9,001
Wood Products	589	262	712	233	562	316	570	433	202	512	1,166	1,791	1,359	8,706
Gasoline and Aviation Fuel	266	424	890	13	486	1,500	1,024	344	130	883	1,048	718	683	8,411
Animals and Fish	34	185	337	242	83	81	476	504	519	475	1,506	1,974	393	6,809
Other Prepared Food Stuffs and Oils	32	54	367	284	261	57	426	455	874	460	761	1,764	649	6,444
Sands	84	102	156	281	273	212	627	220	197	830	479	1,958	919	6,338
Mixed Freight	217	122	359	258	191	181	957	234	169	508	710	1,129	750	5,783
Fuel Oils including Diesel	651	217	451	3	91	257	505	174	65	447	528	355	345	4,089
Agricultural Products	88	22	145	147	144	73	141	353	749	156	419	1,195	127	3,760
Meat Fish and Seafood	76	12	151	150	81	31	122	364	801	149	409	1,226	118	3,689
Fertilizers	444	40	194	128	125	30	205	81	68	259	327	406	370	2,678
Pulp Newsprint and Paperboard	204	51	140	56	60	106	147	83	200	120	732	517	214	2,630
Other Coal and Petroleum Products	68	139	288	5	177	327	329	114	44	289	342	245	228	2,596
Plastics and Rubber	268	71	75	366	44	29	417	65	59	143	387	457	113	2,494
Basic Chemicals	362	5	350	205	201	1	50	4	15	350	373	118	421	2,455
Other Nonmetallic Minerals	1,228	35	109	64	122	84	129	28	22	136	154	189	135	2,436
Base Metal	100	28	92	164	279	27	19	40	64	238	347	742	82	2,222

Commodity	Northampton	Halifax	Nash	Wilson	Johnston	Harnett	Cumberland	Robeson	Region 9	Region 10	Region 11	Region 12	Region 13	Total
Machinery	70	26	178	73	243	92	80	88	136	219	293	406	147	2,051
Articles of Base Metal	104	8	189	73	111	81	78	115	66	219	152	240	193	1,630
Textiles and Leather	52	2	7	21	11	33	38	27	387	104	308	613	20	1,623
Other Chemical Products and Preparations	62	11	184	111	157	9	71	21	22	200	222	145	256	1,471
Miscellaneous Manufactured Products	29	20	34	91	56	47	108	72	32	262	165	274	170	1,361
Motorized and Other Vehicles	25	28	39	23	25	52	88	119	7	122	255	408	144	1,335
Alcohol	14	15	59	56	91	72	137	41	119	121	176	279	148	1,328
Pharmaceutical Products	14	11	100	62	217	14	62	21	19	117	134	121	157	1,049
Milled Grained Products	4	8	44	39	40	15	67	83	164	58	113	310	81	1,026
Paper and Paperboard Articles	23	15	117	14	15	51	143		38	75	147	105	61	832
Furniture	95	14	22	27	47	21	77	32	29	62	88	168	88	771
Electronic Equipment and Office Equipment	17	12	33	19	46	20	53	18	34	101	119	147	92	711
Coal	375	2	–	–	1	1	–	1	–	2	–	3	4	388
Building Stone	3	4	11	15	31	22	28	9	8	42	22	84	51	329
Printed Products	2	3	12	6	15	34	26	4	6	22	25	31	24	208
Metallic Ores and Concentrates	70	–	–	1	15	–	–	–	–	1	1	4	–	93
Tobacco	6	–	2	3	2	2	4	–	8	6	10	9	1	53
Transportation Equipment	1	–	1	1	–	–	2	2	–	2	3	6	3	22
Precision Instruments and Apparatus	1	–	1	1	1	1	2	1	–	4	2	4	3	20
Crude Petroleum Oils	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Totals	8,160	4,553	10,589	6,903	12,162	10,306	14,561	8,519	11,759	15,036	27,084	42,861	20,422	192,915

Source: FHWA FAF3 data disaggregated to county level by consultant team.

4.4 COMPARISON OF ROADSIDE TRUCK ORIGIN-DESTINATION SURVEY DATA TO FREIGHT ANALYSIS FRAMEWORK DATA

The roadside truck origin-destination survey data was compared to the disaggregated FAF3 data to find common elements that can be validated through multiple sources. The comparison also identifies differences between the datasets that should be considered during the application of these data to determine actual truck activity in the State. It should be noted that the roadside survey and FAF data are very different in terms of data collection methodology, data collected, commodity definitions, and geographic focuses. Therefore, the two datasets should not be expected to be similar for all analyses.

Table 4.6 shows a comparison of the distribution of origins and destinations by analysis region using the roadside survey and the disaggregated FAF data. It shows that there are many similarities between the two datasets. The distribution of truck flows to Northampton County is identical in the two datasets. It is also noteworthy that Nash County is the highest county in terms of the roadside survey and the disaggregated FAF3 data. The roadside survey estimated that 11.6 percent of the total trucks go to this county, while the disaggregated FAF data estimated that 7.9 percent go to this county. Similarly, other counties such as Halifax, Wilson, Johnston, and Cumberland have good comparisons between the two datasets. Robeson County and Harnett County have higher allocations using the roadside survey than they do have tonnage allocated from the FAF data. The comparison for these two counties is not particularly good.

The most significant difference between the datasets is that the roadside survey identified 12.9 percent of the truck flows going to Region 14 (which includes Wake County), while the FAF data did not identify any flows to this region. This is likely due to the specifics of the routing mechanism within the disaggregated FAF data that route all of those flows along I-85 rather than splitting them between I-85 and I-95. This is a peculiarity that will need to be considered as future analyses with these data are developed. At the other end of the spectrum, the disaggregated FAF data over allocated flows to Regions 10 through 12 (east of I-95).

Table 4.7 shows the allocation of truck flows and tons to all 31 regions comprising the U.S. and Canada. Again the comparison is generally favorable. Both datasets identified large truck flows to Virginia, locations further northeast, South Carolina, Georgia, and Florida. The biggest differences are that the disaggregated FAF data has a significantly higher estimate of the flows to Georgia and to states located along the I-10 corridor relative to the roadside surveys.

Overall, the comparison by truck trips ends between the two datasets is favorable which indicate that they are useful for estimating truck origins and destinations in the I-95 region.

Table 4.8 compares the commodity distribution between the roadside truck survey and the disaggregated FAF data. This distribution is based on total trips (goods originating in and destined for North Carolina combined). Since both datasets were collected in Carson, Virginia, there were no inter-North Carolina movements which would have resulted in a single movement being double counted. The comparison of the two datasets in Table 4.8 shows them to be relatively similar. The largest discrepancies are with Agricultural Products (except feed) and Mixed Freight. There is general concurrence between general commodity groups in the two datasets such as combined farm/food products and combined wood/paper products. This indicates that the commodity distributions of these two datasets are presenting a realistic view of commodity movements in the State.

Table 4.6 Comparison of Roadside Truck O-D Survey Data and Disaggregated FAF3 by North Carolina Analysis Region

+Region/County	Roadside Truck O-D Survey Data	FAF Data
Northampton	4.4%	4.4%
Halifax	3.5%	2.8%
Nash	11.6%	7.9%
Wilson	7.3%	6.2%
Johnston	3.7%	5.1%
Harnett	5.0%	1.7%
Cumberland	6.0%	4.8%
Robeson	8.3%	3.5%
Region 9	4.6%	6.2%
Region 10	5.2%	10.4%
Region 11	4.8%	12.9%
Region 12	11.6%	24.9%
Region 13	6.8%	6.8%
Region 14	12.9%	0.0%
Region 15	1.7%	0.0%
Region 16	1.5%	0.0%
Region 17	0.6%	0.0%
Region 18	0.6%	2.5%
Total	100.0%	100.0%

Source: FHWA FAF3 data disaggregated to county level by consultant team, I-95 roadside truck survey at Carson, VA.

Table 4.7 Comparison of Roadside Truck Survey and Disaggregated FAF3 Data for All Analysis Regions

Region	Roadside Truck O-D Survey Data	FAF Data
1	0.9%	0.5%
2	0.8%	0.3%
3	2.6%	1.0%
4	1.5%	0.8%
5	0.9%	0.6%
6	0.9%	0.2%
7	1.3%	0.6%
8	1.4%	0.4%
9	0.9%	0.7%
10	1.0%	1.3%
11	1.0%	1.6%
12	2.3%	3.0%
13	1.4%	0.8%
14	2.7%	0.0%
15	0.4%	0.0%
16	0.3%	0.0%
17	0.1%	0.0%
18	0.3%	0.3%
19	13.4%	5.2%
20	2.6%	2.3%
21	31.4%	39.0%
22	7.4%	5.0%
23	0.0%	0.1%
24	4.4%	12.9%
25	16.4%	14.1%
26	0.9%	5.6%
27	0.1%	0.0%
28	0.2%	0.4%
29	0.1%	0.7%
30	0.4%	2.5%
31	2.0%	0.0%
Total	100.0%	100.0%

Source: FHWA FAF3 data disaggregated to county level by consultant team, I-95 roadside truck survey at Carson, VA.

Table 4.8 Commodity Distribution Comparison between Roadside Truck Survey and Disaggregated FAF3 Data

Commodity	Roadside Truck Survey Data	FAF Data
Animals and Fish (live)	0.4%	5.2%
Cereal Grains (incl. seed)	0.6%	1.7%
Agriculture Products (except feed)	8.7%	1.7%
Animal Feed and Animal Products	0.6%	4.0%
Meat, Fish, and Seafood	8.5%	8.0%
Milled Grain and Bakery Products	1.5%	2.7%
Other Prepared Food Stuffs	12.2%	8.3%
Alcoholic Beverages	1.7%	1.0%
Tobacco Products	0.2%	0.0%
Monumental or Building Stone	0.0%	0.1%
Sands	0.4%	0.3%
Limestone and Gravel	0.4%	1.8%
Other Non-Metallic Minerals	0.4%	1.5%
Metallic Ores and Concentrates	0.0%	0.1%
Coal	0.0%	0.0%
Crude Petroleum	0.0%	0.0%
Gasoline	0.2%	0.9%
Fuel Oils	0.4%	0.5%
Other Coal and Petroleum Product	0.8%	0.4%
Basic Chemicals	1.9%	2.3%
Pharmaceutical Products	0.8%	2.3%
Fertilizers	0.0%	2.5%
Other Chemical Products	0.8%	2.7%
Plastics and Rubber	2.5%	6.0%
Logs and Wood in the Rough	1.9%	1.2%
Wood Products	4.8%	7.3%
Pulp, Newsprint, and Paper	2.9%	4.8%
Paper or Paperboard Articles	3.5%	2.2%
Printed Products	0.2%	0.3%
Textiles and Leather	1.7%	2.2%
Non-Metallic Mineral Products	3.7%	4.5%
Base Metal in Primary or Semi-Finished Forms	5.2%	6.7%
Articles of Base Metal	2.7%	2.1%

Commodity	Roadside Truck Survey Data	FAF Data
Machinery	3.5%	1.8%
Electronic Equipment	2.3%	1.7%
Motorized and Other Vehicles	4.1%	2.3%
Transportation Equipment	1.2%	0.0%
Precision Instruments	0.0%	0.0%
Furniture, Mattresses, and Lighting	2.3%	1.0%
Misc. Manufactured Products	2.9%	2.2%
Waste and Scrap	0.6%	1.1%
Mixed Freight	13.3%	4.4%

Source: FHWA FAF3 data disaggregated to county level by consultant team, I-95 roadside truck survey at Carson, VA,

5.0 Truck License Plate Survey Data

This chapter examines origin-destination data collected through the automatic license plate recognition survey conducted as part of the I-95 Corridor Planning and Finance Study.

5.1 Overview of License Plate Survey

In November of 2009, an automatic license plate recognition survey was conducted over a thirty hour period. A total of forty cameras were installed on ten sites to capture the license plate images for both passenger cars and heavy vehicles. The locations of the license plate survey sites are shown in Figure 5.1 and listed in Table 2.1 of the truck count chapter. Tube counts were used to collect vehicle classification information while the surveys were in process. Approximately, 144,000 license plates were recorded for passenger vehicles and 54,000 license plates were recorded for heavy vehicles. Vehicles were classified using the FHWA vehicle classification system. Small delivery trucks and box trucks were not included in the heavy vehicle class.

5.2 Summary of Analysis

Data collected through the survey were expanded to generate a 24-hour truck trip table based on the capture rate at each location. Table 5.1 shows the expanded license plate survey trip table for trucks for the southbound direction. The trip table estimates an average daily volume at Station #1 of 7,469 trucks. 2,540 of these trucks (38 percent) are not identified at any of the sites further downstream meaning that these trips ended before they reached Station #2.

At Station #2, there were 4,756 trucks that were first identified at Station #2. 3,603 of these trucks (or 76 percent) were not identified at any downstream location. Therefore, 76 percent of the trucks that entered the interstate between Stations #1 and #2 ended their trip between Stations #2 and #3. Similarly, the data for Station #3 indicate that 77 percent of the trucks that enter the interstate between Stations #2 and #3 ended their trip between Stations #3 and #4. These high percentages are consistent for Stations #2 through #7 as shown in Table 5.2. The implication of this analysis is that the vast majority of trucks that enter I-95 between Stations #1 and #8 only pass through one of the stations. This means that they travel under 50 miles because the average spacing between stations is between 20 and 30 miles. It is more likely that their average travel distance on

I-95 is around 30 miles. Note also that the trip tables are balanced such that the same pattern occurs in the northbound direction.

The license plate data also provide the ability to estimate the number of through trucks for I-95. This can be estimated by using the number of trucks that are first identified at Station #1 and then are subsequently identified at Station #8. This value is 1,142 trucks in the southbound direction as shown in Table 5.1. In both directions, the total number of through trucks is estimated to be 2,284 trucks. This is similar to the 2,590 trucks that are estimated as through trucks based on the roadside truck origin-destination survey data discussed in Chapter 3.

The implication of the license plate survey is that there are a large number of very short truck trips, a significant fraction of through truck trips, and a very small portion of other types of trips. Using a rough approximation of the weighted average of these trips generates an estimate of 60% of the truck trips passing through only one station; 30% of the truck trips are through truck trips; and 10% being other types of trips that either pass through multiple stations or have one truck trip end inside the state and the other truck trip end outside of the state.

The through truck trips can be assumed to travel the full 182 miles of I-95. The average trip length for the trucks captured at one station can be assumed to be 30 miles. Most of the other truck trips are likely to be trucks that have one truck trip end in the state. It is reasonable to assume those truck trips have an average truck trip length of roughly half of the corridor or 90 miles. When applying the truck trip percentages to the trip length average assumptions, an estimate of the percent of truck VMT by truck trip type can be generated. This is shown in Table 5.3. It shows that the short truck trips represent less than one-quarter of the truck VMT on I-95, while the through truck trips represent approximately two-thirds of the truck VMT.

The key take away from the analysis of the license plate survey data is that short truck trips are the most common type of truck trip on I-95. However, long-haul truck trips make up the bulk of the VMT on the corridor.

Figure 5.1 Map of License Plate Stations

Source: I-95 Corridor Planning and Finance Study License Plate Survey.

Table 5.1 Expanded License Plate Survey Trip Table for Trucks *Southbound*

	Station Where Plate Is Last Recorded								
Station Where Plate Is First Recorded	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Total
Station 1	2,840	629	599	191	363	944	761	1,142	7,469
Station 2	0	3,603	198	106	106	314	190	239	4,756
Station 3	0	0	3,466	109	155	309	211	278	4,528
Station 4	0	0	0	3,581	270	503	248	330	4,932
Station 5	0	0	0	0	3,422	583	237	295	4,537
Station 6	0	0	0	0	0	8,468	671	1,104	10,243
Station 7	0	0	0	0	0	0	3,735	564	4,299
Station 8	0	0	0	0	0	0	0	3,037	3,037

Source: I-95 Corridor Planning and Finance Study License Plate Survey.

Table 5.2 Percent of Trucks Identified at Only One Station *Southbound*

Station	Percent of Trucks Identified Only at This Station
Station 1	38%
Station 2	76%
Station 3	77%
Station 4	73%
Station 5	75%
Station 6	83%
Station 7	87%
Station 8	100%

Source: I-95 Corridor Planning and Finance Study License Plate Survey, consultant analysis.

Table 5.3 Approximate I-95 Truck VMT by Truck Trip Type

Truck Trip Type	Percent of Truck Trips	Average Trip Length within NC	Number of Truck Trip Miles	Percent of Truck Miles
Through Truck Trips	30%	182	436,800	67%
Medium-/Long-Haul	10%	90	72,800	11%
Short Truck Trips	60%	30	144,000	22%
Total	100%		653,600	100%

Source: Consultant analysis.

6.0 Truck GPS Data

This section documents and analyzes trucking activity related to I-95 in North Carolina collected using GPS-equipped trucks. Consultant team member, the American Transportation Research Institute (ATRI), collects and manages a truck GPS database that covers North America and spans from 2005 to the present. Several hundred thousand trucks contribute speed, time and location information to the database, which grows by more than 7 billion points annually.

The truck GPS database is employed in this chapter to do the following:

- Identify areas in North Carolina where truck activity is most significant;
- Conduct a truck flow analysis that identifies and quantifies truck trips as well as origins and destinations (O-Ds) that have a nexus to the I-95 corridor;
- Scan routes that could be used as an alternative to I-95; and
- Assess congestion along the I-95 corridor in North Carolina.

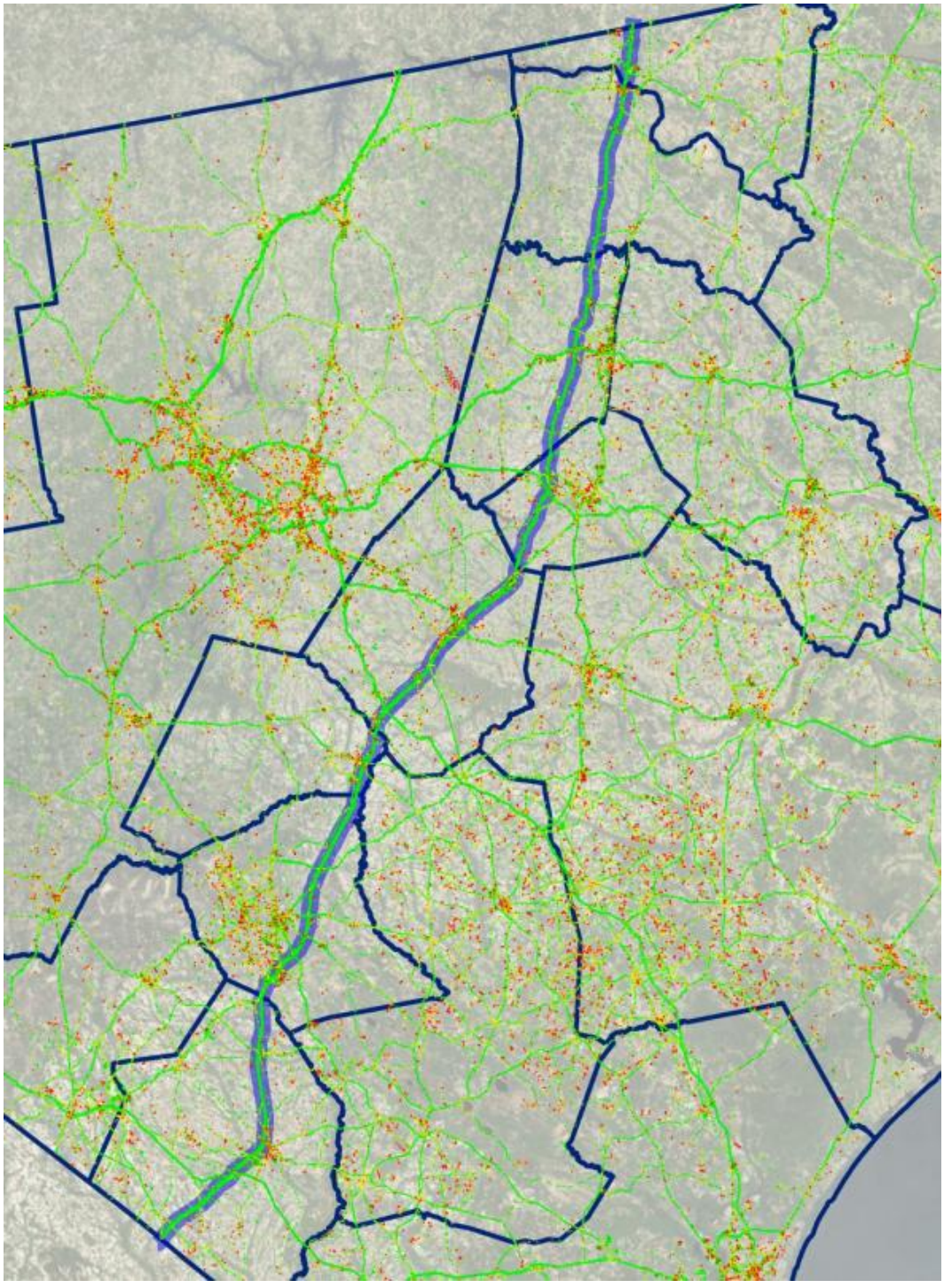
Among the key findings of the trucking industry supply chain data analysis is that the vast majority of truck trips studied (83 percent) utilize I-95 in North Carolina as a means to pick up and/or deliver goods within the State. The data also indicate that, if the corridor were to become tolled, there are viable alternative route choices for motor carriers to avoid some or all of I-95. Finally, a review of congestion along the corridor found few recurring congestion issues. I-95 is currently one of the least congested interstates in North Carolina in terms of recurring congestion.

6.1 Truck Activity Data Collected from GPS Equipment

The research team conducted an initial analysis to identify locations within the State that had the greatest concentration of truck activity. Using a truck GPS data sample from one week in 2012, Figure 6.1 illustrates raw truck position points located near the I-95 corridor. This image can be used to gain a general understanding of where trucks are operating.

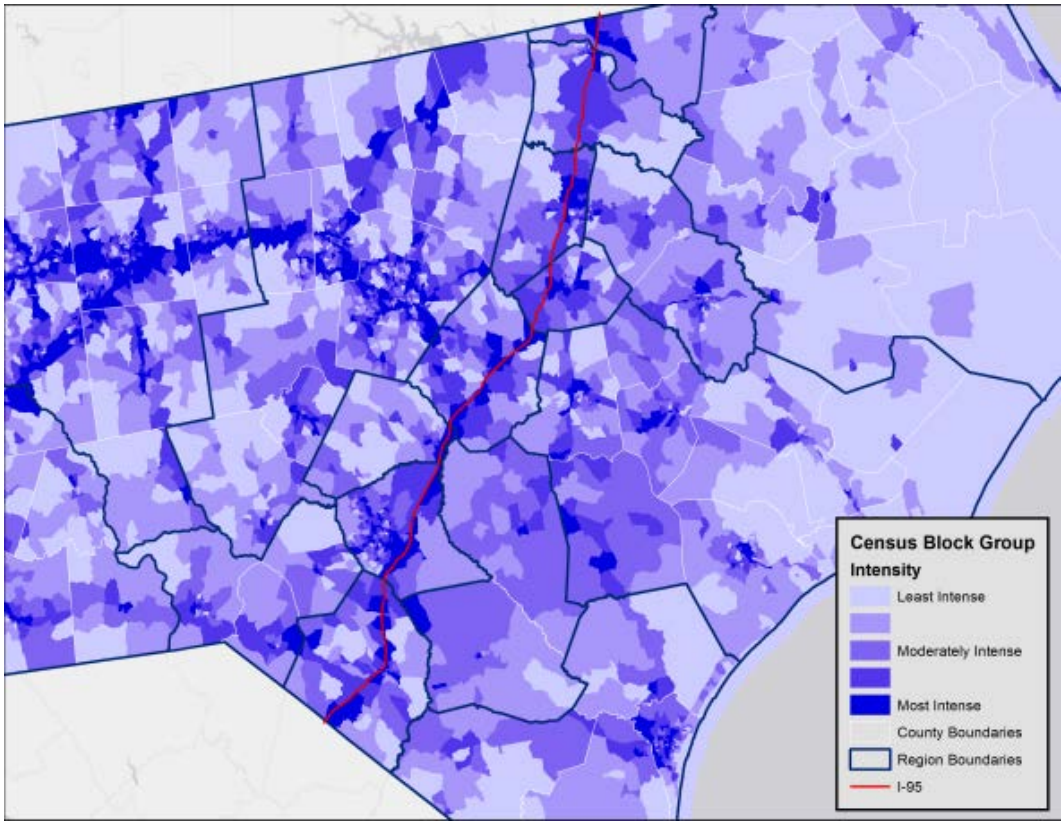
A measure of Freight Activity Intensity for the entire State was developed next. To generate this, the total number of truck position data points contained within each census block group was divided by the total area of the census block group to produce a per-mile figure. Grouping these individual values into categories of concentration (i.e., the relative density of truck position data points) highlights geographic freight intensity levels. Figure 6.2 illustrates truck intensity in the areas that surround I-95.

Figure 6.1 Raw Truck Position Data Points near the I-95 Corridor



Source: ATRI GPS Data for NC, June 2012.

Figure 6.2 Freight Intensity Analysis by Census Block Group



Source: ATRI GPS Data for NC, June 2012.

6.2 ANALYSIS OF TRUCK TRIP TYPES

ATRI's truck GPS data was next analyzed to identify truck trip patterns for vehicles utilizing I-95 in North Carolina. Specifically, the research team sought to determine the distribution and travel characteristics of through trips, intrastate trips, and interstate trips that include a North Carolina origin or destination.

To accomplish this, a sample dataset from June 2012 was produced for the region. Next, vehicles not operating on I-95 were filtered from the dataset and trip paths were produced for each remaining unique vehicle.

Origins and destinations were identified using an algorithm that scans elapsed time and distance moved between each consecutive GPS point found within a truck trip series. In general terms, a destination was recorded when a truck remained in approximately the same location for longer than 30 minutes. One exception to the 30-minute rule applied to vehicles located at known major truck stops. Stops that were identified as being related to rest breaks or off-duty time were therefore filtered from the dataset and not marked as destinations.

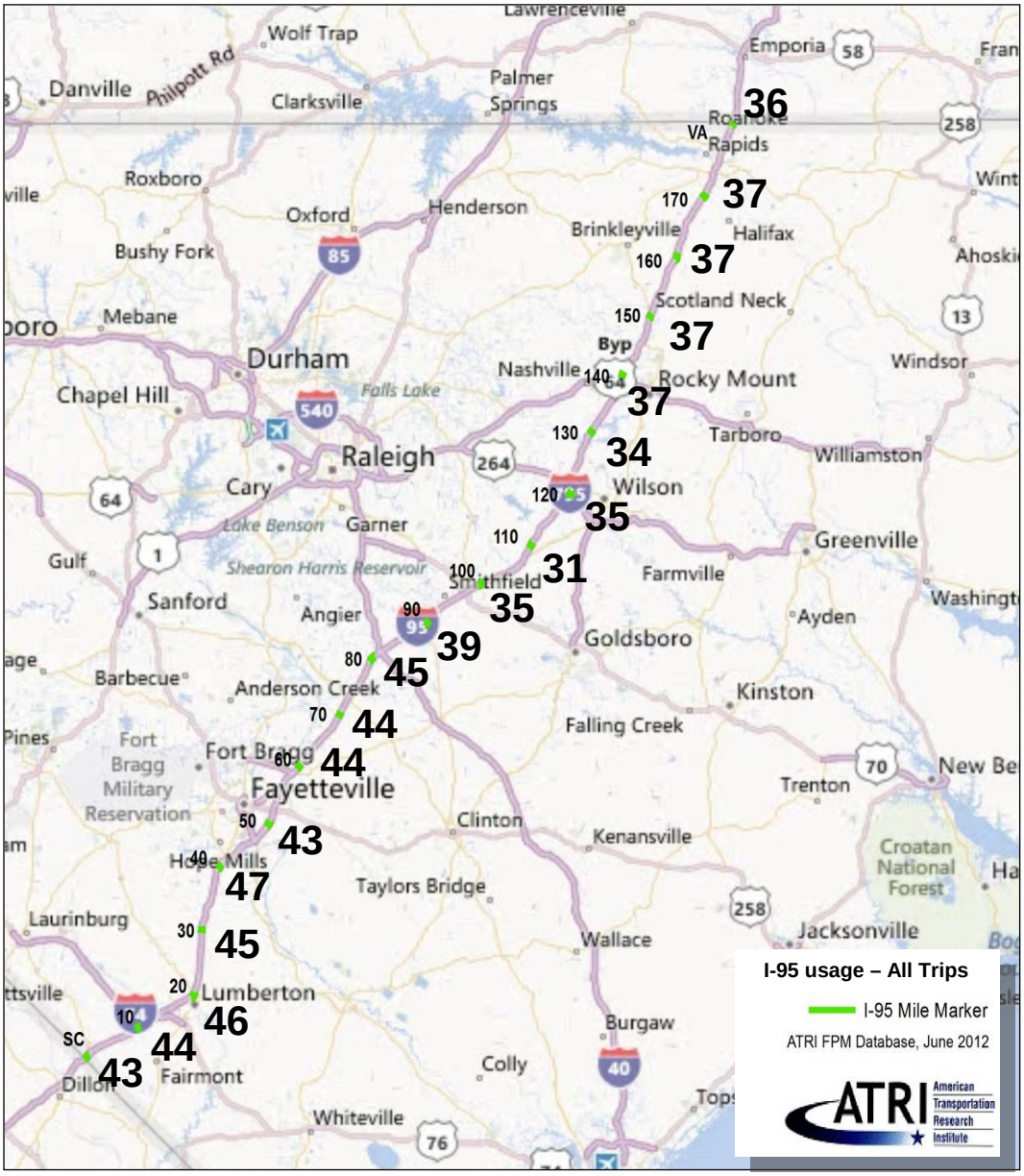
It is important to note that the definition of truck trips for the GPS analysis is different than the definition used in the license plate matching survey described in Chapter 5. For the GPS analysis, through trips are defined based on the specific and known origin and destination for each truck. It is possible that some of these trips only traveled a short distance on I-95 in North Carolina, but had both of their trip ends outside of the state. This would not have been considered a through truck trip based on the license plate matching survey. For the license plate matching survey, through trips were defined based on traveling through each of the license plate stations within a thirty hour period. It is possible that there are some trucks that passed through each survey location within this period actually had a brief stop within the study area and then continued on in the same direction, so that they would be captured by every survey station and therefore considered to be a through truck trip for the license plate matching analysis. Similar points of disconnect between the two methodologies can be found when considering the intrastate truck trips. For intrastate truck trips, the license plate matching survey considers this to be all trucks that get on and off between Stations #1 and Stations #8, while the GPS data bases its definition on actual trip ends as recorded by the GPS unit. Also, the GPS data includes only trucks that are equipped with a GPS transponder, while the license plate matching technology captured a sample of trucks using I-95. Therefore, the truck populations captured by each dataset are also different. Because of the differences between the GPS and license plate datasets, there are some commonalities between the two datasets and some differences as well.

The trip algorithm implemented on the GPS data identified a total of 28,294 unique truck trips, each categorized as either through, intrastate, or interstate with a North Carolina origin or destination. A trip analysis was conducted for the full set of trips as well as for each of the three categories. Of the 28,294 trips, 17 percent were through trips, 32 percent of these trips were intrastate trips, and 51 percent were interstate trips.

Utilization of I-95 varied across the corridor. Figure 6.3 presents the share of total truck trips that crossed a particular mile marker along the corridor. This analysis revealed that trucks generally used the southern portion of I-95 more frequently than the northern portion. Mile marker 40 had the highest usage, with 47 percent of total I-95 truck trips crossing that marker. Mile marker 110 had the lowest usage, with only 31 percent of total trips crossing that section.

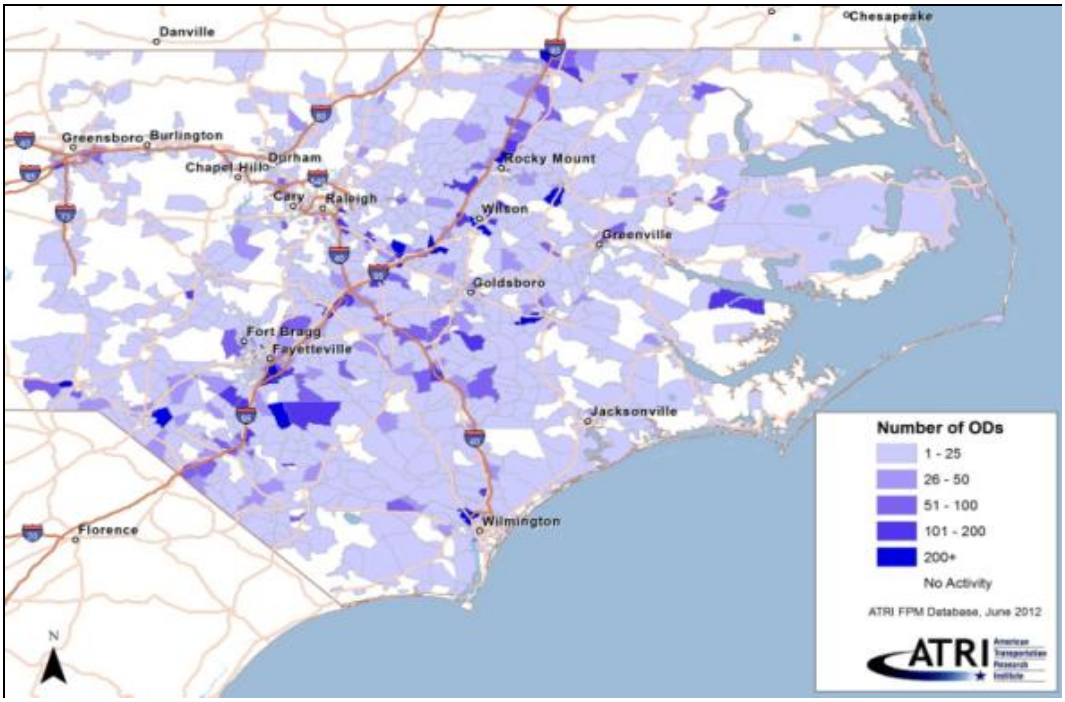
Origin and destination locations were identified for non-through truck trips (all truck trips excluding those with both trip ends outside of the state). After aggregating this information, O-D intensity was calculated at the census block group level to identify areas within North Carolina that generated truck trips on I-95. Figure 6.4 presents the origin-destination information aggregated to the census block group level. This figure shows that for trucks that use I-95, the vast majority of truck trip ends are very close to the corridor. However, there is still significant usage of I-95 throughout eastern North Carolina.

Figure 6.3 Share of Total I-95 Truck Trips at Select Mile Markers



Source: ATRI GPS Data for NC, June 2012.

Figure 6.4 O-D Intensity in North Carolina for "Nonthrough" Truck Trips



Source: ATRI GPS Data for NC, June 2012.

Table 6.1 shows the percent of truck trips by truck type along I-95. The percents are based on the total 28,294 truck trips that were captured in the overall GPS analysis. Therefore, 15 percent of the total 28,294 trips passed mile marker 80 and had both their origin and destination outside of the state. Similarly, 13 percent of the total 28,294 trips passed through mile marker 80 and had both trip ends inside the state. Finally, 18 percent of the total 28,294 rips passed through mile marker 80 and had one trip end inside the state.

From another perspective, when considering only the trucks that pass through mile marker 80, 33 percent are through truck trips; 28 percent are intrastate truck trips; and 39 percent are interstate truck trips. The through truck percentage is relatively close to the weighted average of 30 percent estimated from the license plate matching survey. The intrastate percentage is considerably smaller than the license plate matching survey. This is potentially due to the differences in the definition of intrastate truck trips along with the differences in the vehicle fleets included in each analysis.

Table 6.1 Percent of Truck Trips by Truck Type along I-95

Milepost	Through	Intrastate	Interstate	Total
0	15	0	28	43
10	15	1	28	44
20	15	5	25	45
30	15	6	24	45
40	15	8	24	47
50	15	9	19	43
60	15	11	18	44
70	15	11	18	44
80	15	13	18	46
90	14	11	14	39
100	14	9	12	35
110	14	8	10	32
120	14	8	13	35
130	14	8	13	35
140	14	6	17	37
150	14	3	20	37
160	14	3	20	37
170	14	3	20	37
180	15	0	21	36

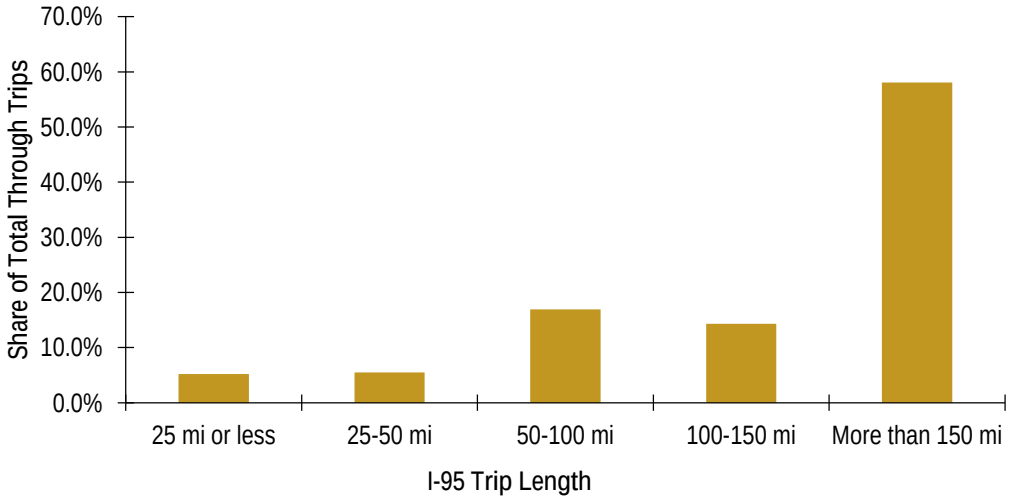
Source: ATRI GPS Data for NC, June 2012. Note that percents are calculated relative to the 28,294 truck trips included in the GPS analysis.

Through Truck Trips

Through trips are defined in this GPS analysis as those that entered and left the State without originating or terminating within North Carolina. Of the 28,294 total truck trips, 17 percent were classified as through trips.

Typically, through trips covered the entire length of the I-95 corridor in North Carolina. As a result, the category had the highest average I-95 trip length at 136.3 miles. The median I-95 trip length was even higher at 164.3 miles. Figure 6.5 shows the distribution of through trips by distance traveled on I-95. The majority (58 percent) of through trips utilized most, if not all, of I-95 during the course of North Carolina travel. Since some trucks did not utilize all of I-95 as part of their through movements, it was necessary to isolate only those trucks that entered and exited the State on I-95 to achieve an I-95-only through trip share. Of the 28,294 total trips, only 12.9 percent were through trips that crossed both the South Carolina and Virginia border while on I-95.

Figure 6.5 Distribution of Through Trips by Length Traveled on I-95



Source: ATRI GPS Data for NC, June 2012.

Intrastate Truck Trips

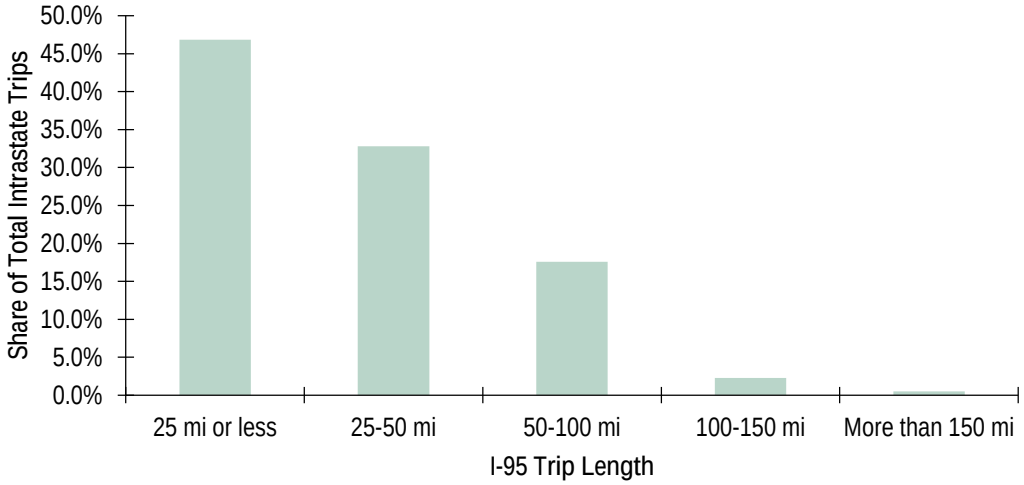
Intrastate trips are defined in this GPS analysis as those that had an origin and destination within North Carolina and did not leave the State at any point. Of the 28,294 of trips, 32.3 percent were intrastate trips.

Intrastate trips on average utilized I-95 for the shortest distance of the three trip types: 34.1 miles. The median I-95 trip length for intrastate trips was 26.7 miles. Figure 6.6 shows the distribution of intrastate trips by distance traveled on I-95. The plurality of intrastate trips (47 percent) utilized I-95 for 25 miles or less.

For this trip type, use of I-95 was concentrated in the central portion of the corridor, particularly between Fayetteville and the I-40 interchange. As Table 6.1 shows, mile marker 80 had the highest share of intrastate trips (13 percent). Given that Fayetteville is the largest city along the I-95 corridor, a higher concentration of intrastate trips in this area is expected. Intrastate travel was virtually nonexistent north of Rocky Mount and south of Lumberton.

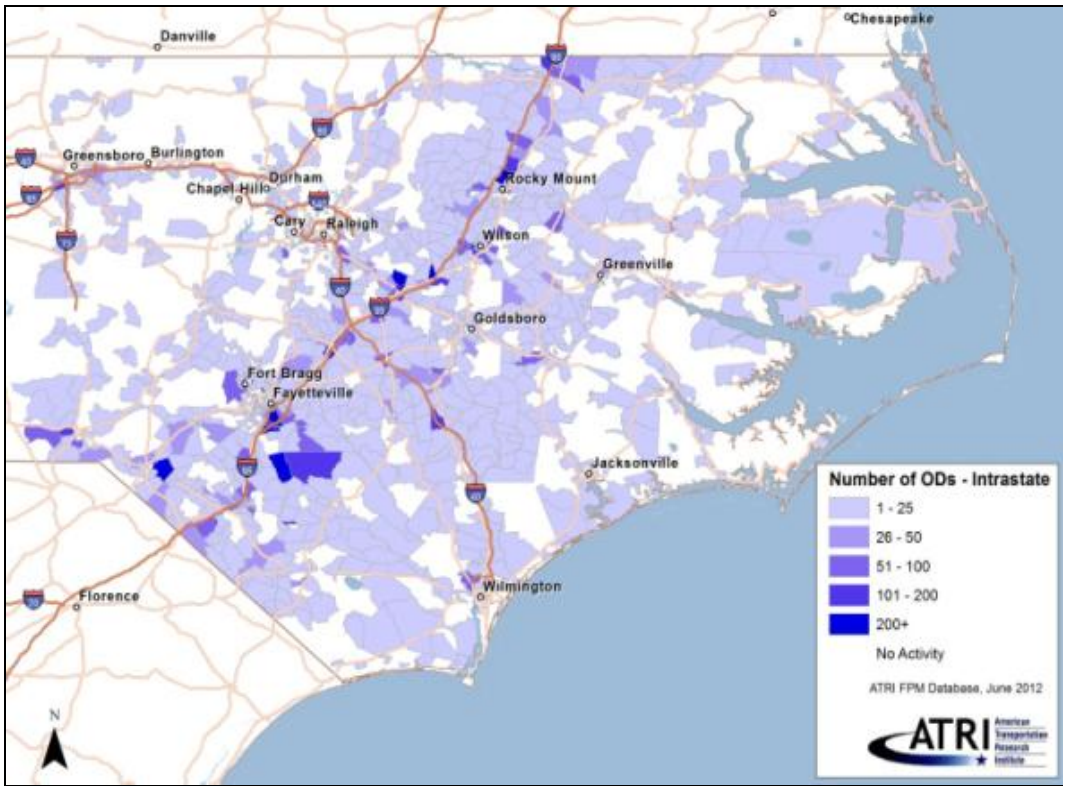
Intrastate truck trip travel tended to utilize different classes of roads beyond major highways. This is the result of a more dispersed pattern of origin-destination concentration, as illustrated in Figure 6.7. Of the 1,710 block groups that recorded at least one origin or destination in the State, intrastate activity was recorded in 83 percent of block groups (compared to only 71.9 percent for interstate activity). This yielded an average of 12.8 intrastate origins/ destinations per block group, compared to 23.3 interstate origins/destinations per block group.

Figure 6.6 Distribution of Intrastate Trips by Length Traveled on I-95



Source: ATRI GPS Data for NC, June 2012.

Figure 6.7 Intrastate Trip Origin/Destination Concentration within North Carolina



Source: ATRI GPS Data for NC, June 2012.

Interstate Truck Trips

Interstate trips are truck trips that have one trip end inside of North Carolina and the other trip end outside of North Carolina. Of the 28,294 trips, 51 percent fell within this category.

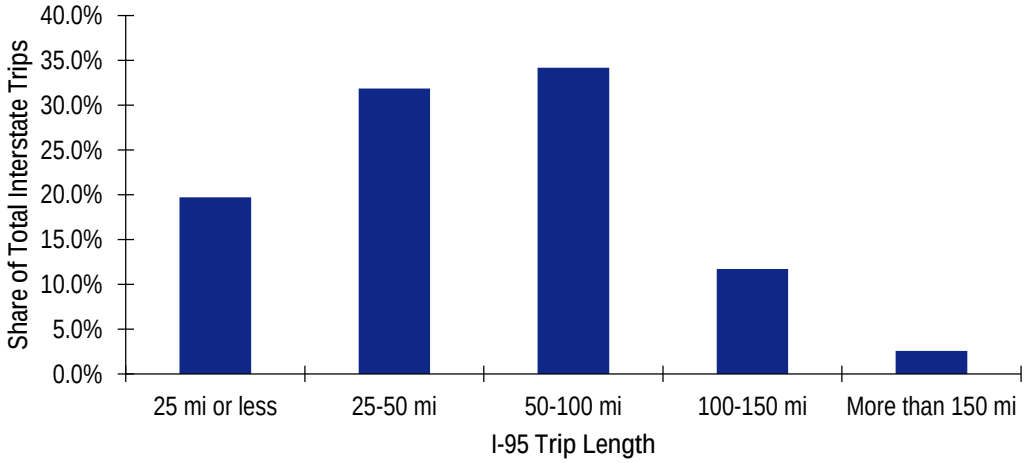
The average interstate trip utilized I-95 in North Carolina for 58.2 miles. The median I-95 interstate trip length was 48.8 miles. Figure 6.8 shows the distribution of interstate trips by distance traveled on I-95. The plurality of interstate trips (34 percent) utilized I-95 for 50 to 100 miles, although 25 to 50 miles was similar with 32 percent of trips.

For this trip type, use of I-95 was concentrated in the northern and southern thirds of the corridor, particularly south of Fayetteville and north of Rocky Mount. As Table 6.1 shows, the South Carolina border and mile marker 10 had the highest share of interstate trips (28 percent). This trip type was less common in the central portion of the corridor.

Given the longer trip distances, interstate travel tended to utilize major highways. The need for quick access to highways results in a denser pattern of origin-destination concentration, as illustrated in Figure 6.9. Of the 1,710 block groups that recorded at least one origin or destination in the State, interstate activity was recorded in 72 percent of block groups (compared to only 83.3 percent for intrastate activity). This yielded an average of 23.3 interstate origins/destinations per block group, compared to 12.8 intrastate origins/ destinations per block group.

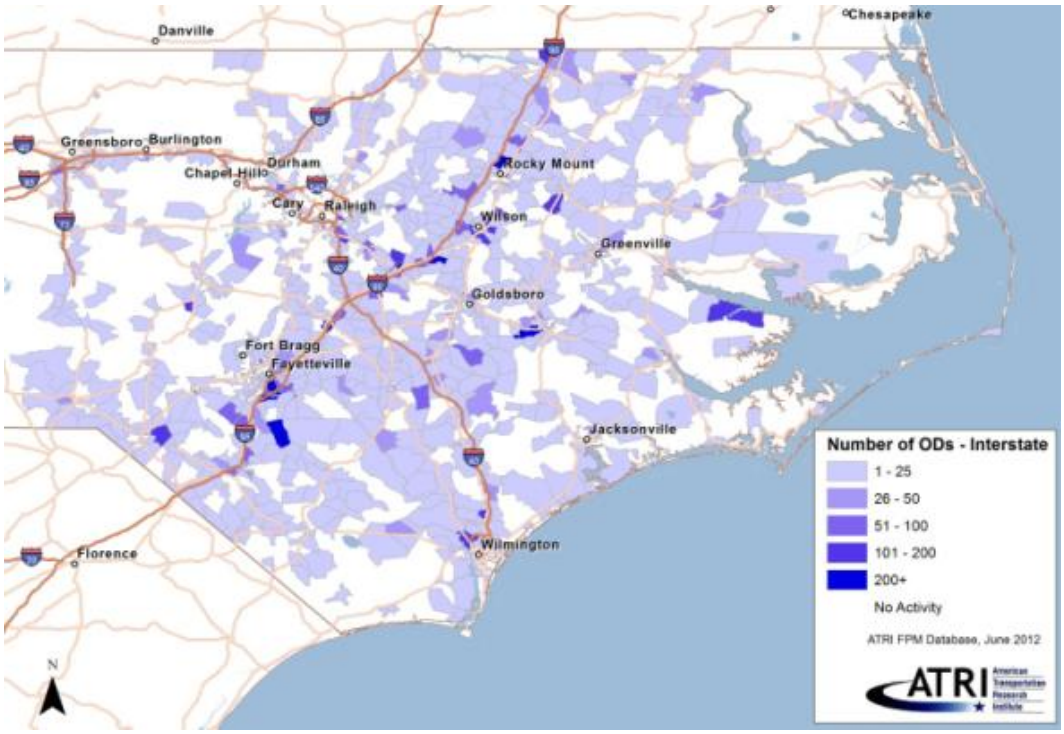
While the percentage split between the interstate and intrastate truck trips is different for the license plate matching survey and the GPS data, both datasets are consistent in that they have identified the vast majority of truck trips on I-95 have very short travel distances along the corridor.

Figure 6.8 Distribution of Interstate Trips by Length Traveled on I-95



Source: ATRI GPS Data for NC, June 2012.

Figure 6.9 Interstate Trip Origin/Destination Concentration within North Carolina



Source: ATRI GPS Data for NC, June 2012.

6.3 TRUCK DIVERSION SCAN

The GPS data was also used to conduct a high-level scan of possible diversion route types. This scan considered both a local route and a long-haul diversion scenario which offers two examples of diversion and route choice. If a toll is levied on I-95 in the future, the rate per mile and location of toll booths will play a large role in how the industry calculates the costs and benefits of certain routes.

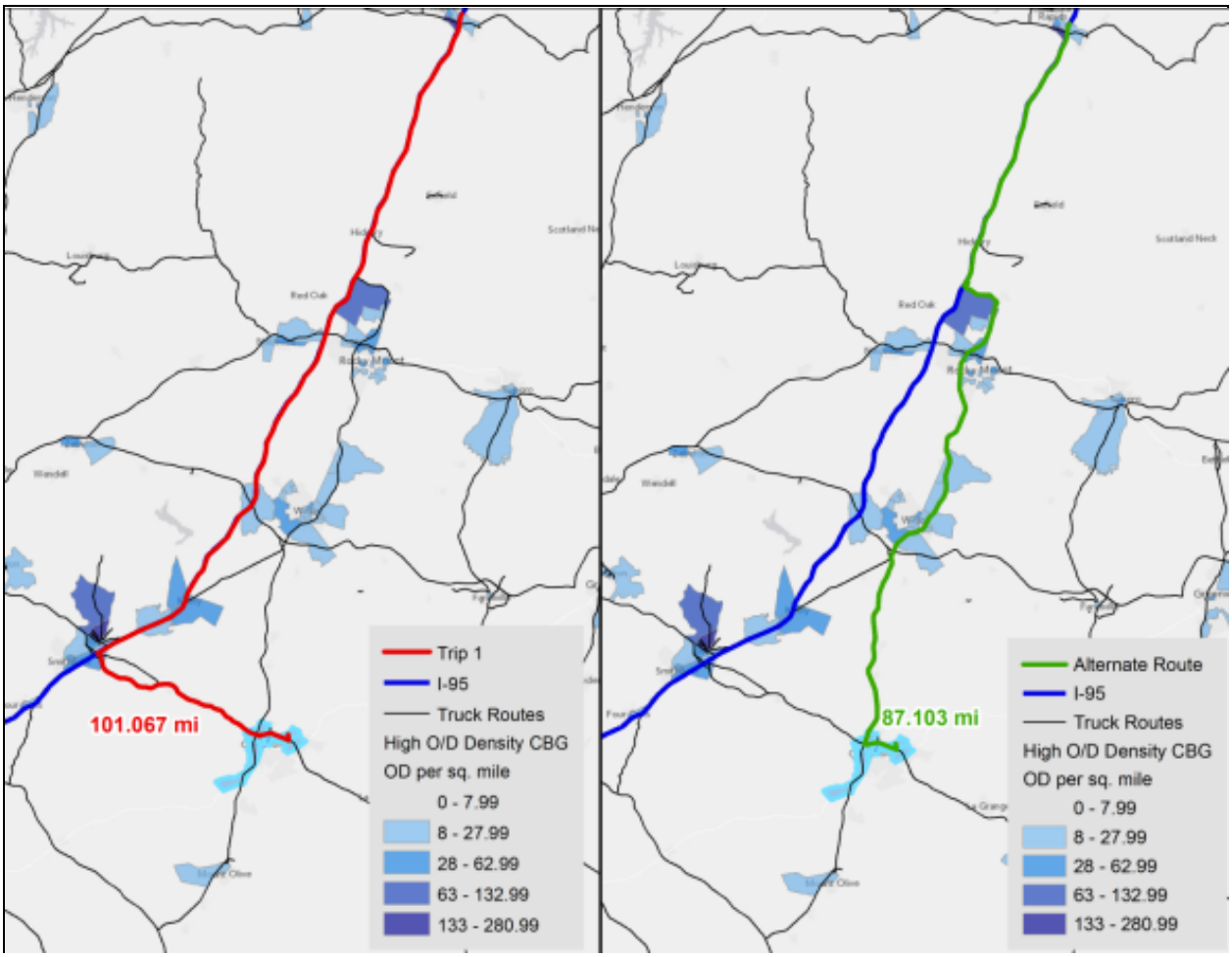
The research team first evaluated a local-level diversion example. Using actual truck trips and key O-D locations from the GPS database, a freight generator near I-95 was selected, and truck trips to that location were used to identify available route choices.

As shown in Figure 6.9, two routes were selected for a freight generator located in Goldsboro, North Carolina. From a point on I-95 near the northern border, the "red line" route, which many of the truck trip samples utilized, is the longer distance route. This longer distance route relies on I-95 which offers interstate speed limits with no traffic signals. The "green line" route, which fewer trucks in our sample took, is shorter in distance but has lower speed limits and multiple traffic signals. Since both of these options are viable and in use today, one could assume that many trips destined for this location might choose to shift over to the green route if it would allow them to avoid paying a toll.

The research team also analyzed a long-haul route example. I-20 west of Atlanta was selected as a starting point. Unique trucks heading eastbound from that point were selected and matched with data in North Carolina. It was found that trucks from the same location in Atlanta use two roadways to reach similar destinations: I-85 and I-20/I-95. The I-95 route was found to be longer in distance. However, ATRI's interstate speed database indicated that average speeds were higher along the route. While I-85 is the shorter of the two routes, it had lower average speeds possibly due to travel through areas such as Charlotte and Greensboro.

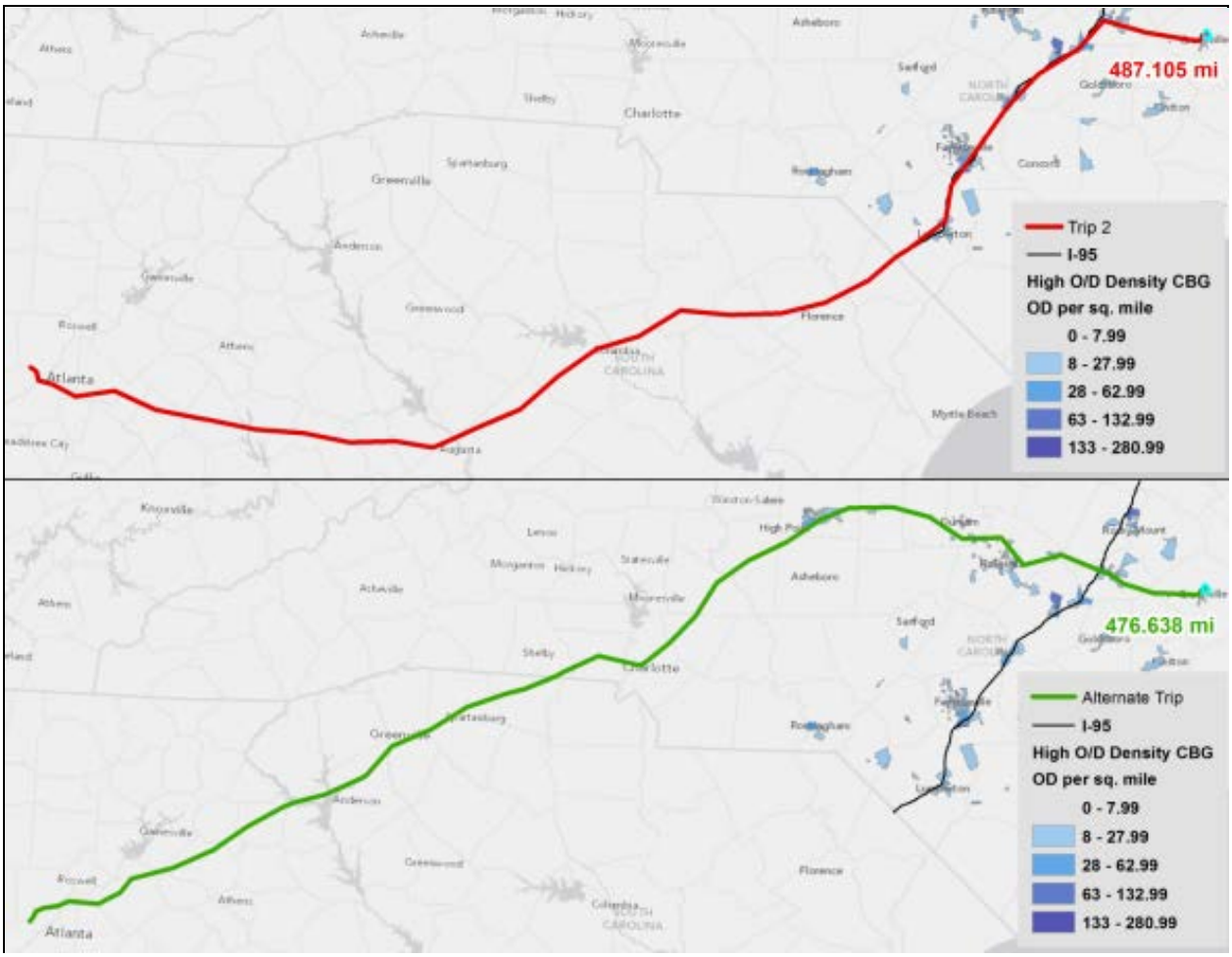
Figure 6.10 shows two trip options from I-20 west of Atlanta to a freight significant census block group in the vicinity of Greenville, North Carolina. The red route covered a slightly greater distance, using I-20 and I-95. It is selected presumably because of low traffic volumes and higher average speeds. The green route utilizes the less efficient, but shorter, I-85 corridor, and other Interstates in the Research Triangle region. It is assumed that route choice in this scenario would be impacted by an I-95 toll, and that green route trips would increase while red route trips would decrease if a toll were applied to I-95.

Figure 6.10 Local Route Choice Example



Source: ATRI GPS Data for NC, June 2012.

Figure 6.11 Long-Haul Route Choice Example



Source: ATRI GPS Data for NC, June 2012.

6.4 CONGESTION ANALYSIS USING GPS DATA

The GPS data were also used to conduct a congestion analysis along I-95 in North Carolina.

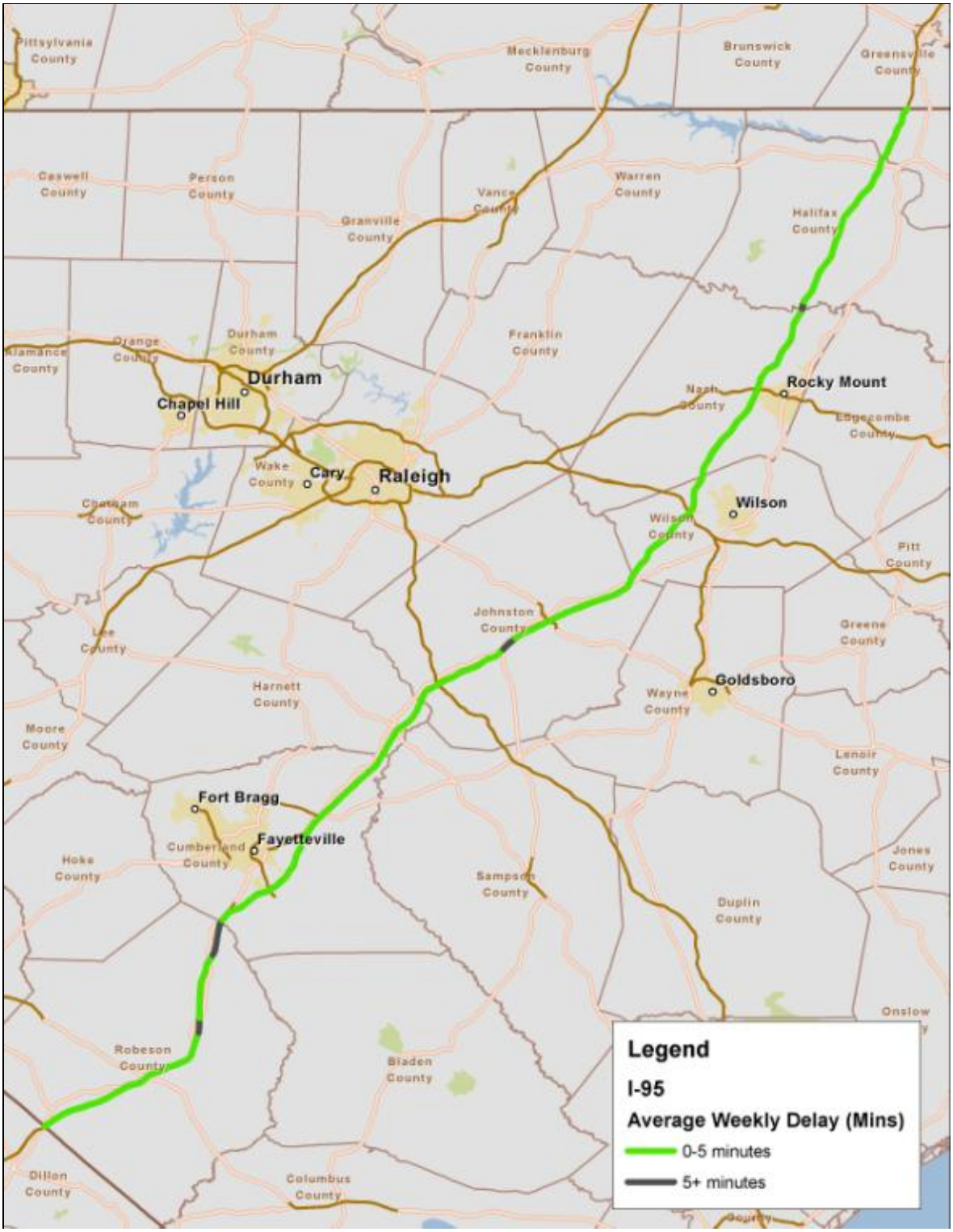
As a first step, a truck GPS dataset containing spot speeds for activity during June 2012 was produced, and all data points that fell along the I-95 corridor in North Carolina were compiled. The roadway was segmented bidirectionally at each mile of the 182 centerline miles to produce a shapefile with 364 bidirectional segments. The compiled data points were then matched to the 364 one-mile road segments. Within each of the 364 data bins, the data were separated further by day of week (Monday to Sunday) and hour of day to produce 61,320 data bins.

An average speed was produced for each bin and the results were scanned for congestion. The scan focused on data bins where average speeds within a segment fell below 85 percent of the free-flow speed at some point during a week. For this analysis free-flow speed was considered to be the maximum average speed across all one-hour time bins. Bins that fell below the 85 percent criteria were flagged for further congestion analysis, which included a calculation of average minutes of delay per week.

Findings from Congestion Analysis Using GPS Data

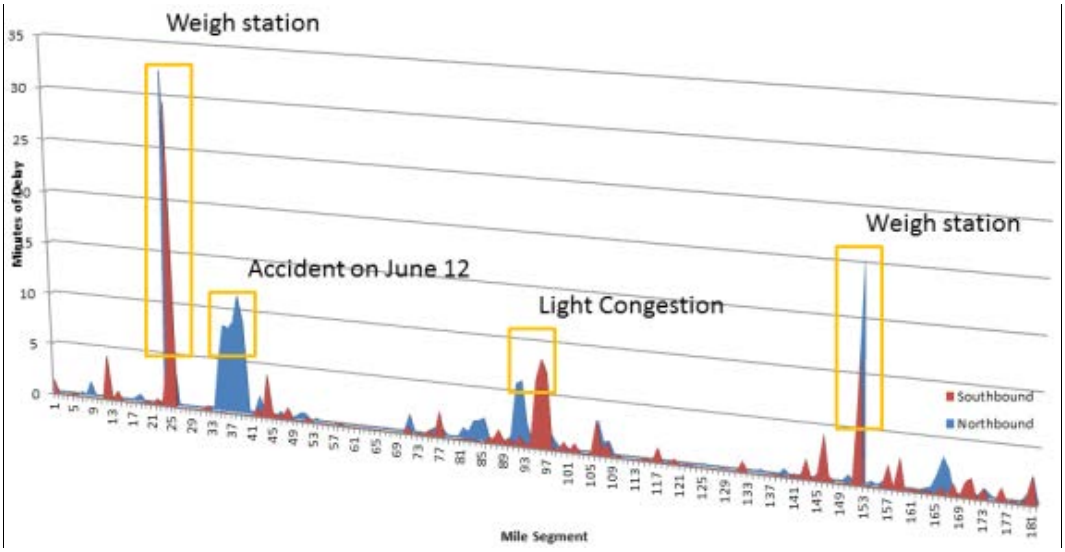
There is no significant recurring congestion along the I-95 corridor. Of the 61,320 bins, only 1,491 showed congestion as defined in the section above. Only 15 of 364 segments (4 percent) experienced delays greater than 5 minutes per week using the 85 percent criteria described above. The locations where the delays occurred are shown in Figures 6.11 and 6.12. Based on the data displayed in Figure 6.12, the areas where the greatest minutes of delay occurred on the corridor were two weigh stations. Delay also occurred due to an accident in Robeson County, as well as due to light congestion in Johnston County.

Figure 6.12 I-95 Delay Locations Using GPS Data
June 2012



Source: ATRI GPS Data for NC, June 2012.

Figure 6.13 Weekly Minutes of Delay
June 2012



Source: ATRI GPS Data for NC, June 2012.

Additional Congestion Analysis

While recurring congestion does not appear to currently be a problem on the corridor, small levels of congestion were found at some points each day in June 2012. On June 12 and 14, 2012 the corridor had the highest number of congested mile-hours (82) while June 24 had the least number of congested mile-hours (6). For context, there were a total of 8,736 mile-hours on the corridor in June 2012, meaning that even on the most congested day only 0.9 percent of mile-hours were congested. For the month, there were a total of 1,268 congested mile-hours out of 262,080 total mile-hours (0.5 percent).

Most of the noticeable areas of recurring congestion on the corridor are directly related to weigh stations and likely do not impact passenger vehicles. Four of the top five mile segments that have congestion are adjacent to a weigh station facility a few miles north of Lumberton. The lower speeds appear in the database at those locations as trucks slow down to exit, or accelerate from a slow speed as they leave the weigh station. It is possible that queues extending onto the highway at these weigh stations contribute to the lower speeds.

These four weigh station segments taken together account for 396 congested mile-hours, which represents 31 percent of the total monthly congested mile-hours for the corridor. Mile segment 152 also contains a weigh station and contributed 154 congested mile-hours (12 percent of monthly total). Table 6.2 lists the 20 mile segments with the highest congestion levels.

Regarding time of day, the highest levels of congestion occur between 10 a.m. and 3 p.m. As noted in the preliminary congestion scan, much of that congestion is related to weigh stations. Thus, given that weigh station activity is generally heaviest during the midday hours, this analysis further validates the findings of the preliminary congestion scan. A day-of-week analysis reveals that Tuesday has the highest number of congested mile-hours (273) and Sunday has the lowest number (39). This is interesting because Tuesday was one of the lowest vehicle volume days according to the count data presented in Chapter 2. Sunday was the third highest day of the week for vehicle volumes. Tables 6.2 and 6.3 describe these results further.

Table 6.2 Top 20 Congested Locations

Top 20 Locations	Mile Segment	Number of Days with Some Congestion (0-30)	Number of Hours with Some Congestion (0-720)	Likely Cause of Congestion
1	24_N	21	124	Weigh station
2	25_S	22	120	Weigh station
3	152_N	23	90	Weigh station
4	24_S	23	75	Weigh Station
5	25_N	23	73	Weigh Station
6	152_S	21	64	Weigh Station
7	95_S	5	20	Traffic Incident(s)
8	181_N	13	19	Traffic Incident(s)
9	97_S	11	19	Traffic Incident(s)
10	181_S	13	18	Traffic Incident(s)
11	93_N	6	17	Traffic Incident(s)
12	71_N	13	15	Traffic Incident(s)
13	48_S	11	15	Traffic Incident(s)
14	97_N	11	15	Traffic Incident(s)
15	94_S	4	14	Traffic Incident(s)
16	96_S	4	14	Traffic Incident(s)
17	92_N	3	13	Traffic Incident(s)
18	106_S	9	12	Traffic Incident(s)
19	71_S	10	10	Traffic Incident(s)
20	91_N	3	10	Traffic Incident(s)

Source: ATRI GPS Data for NC, June 2012.

Table 6.3 Congestion by Hour of Day

Hour		
Begin Hour	End Hour	Number of Mile-Days of Congestion
0	1	3
1	2	6
2	3	7
3	4	11
4	5	9
5	6	28
6	7	49
7	8	61
8	9	84
9	10	98
10	11	121
11	12	112
12	13	124
13	14	120
14	15	111
15	16	90
16	17	99
17	18	51
18	19	35
19	20	22
20	21	12
21	22	10
22	23	2
23	24	3

Source: ATRI GPS Data for NC, June 2012.

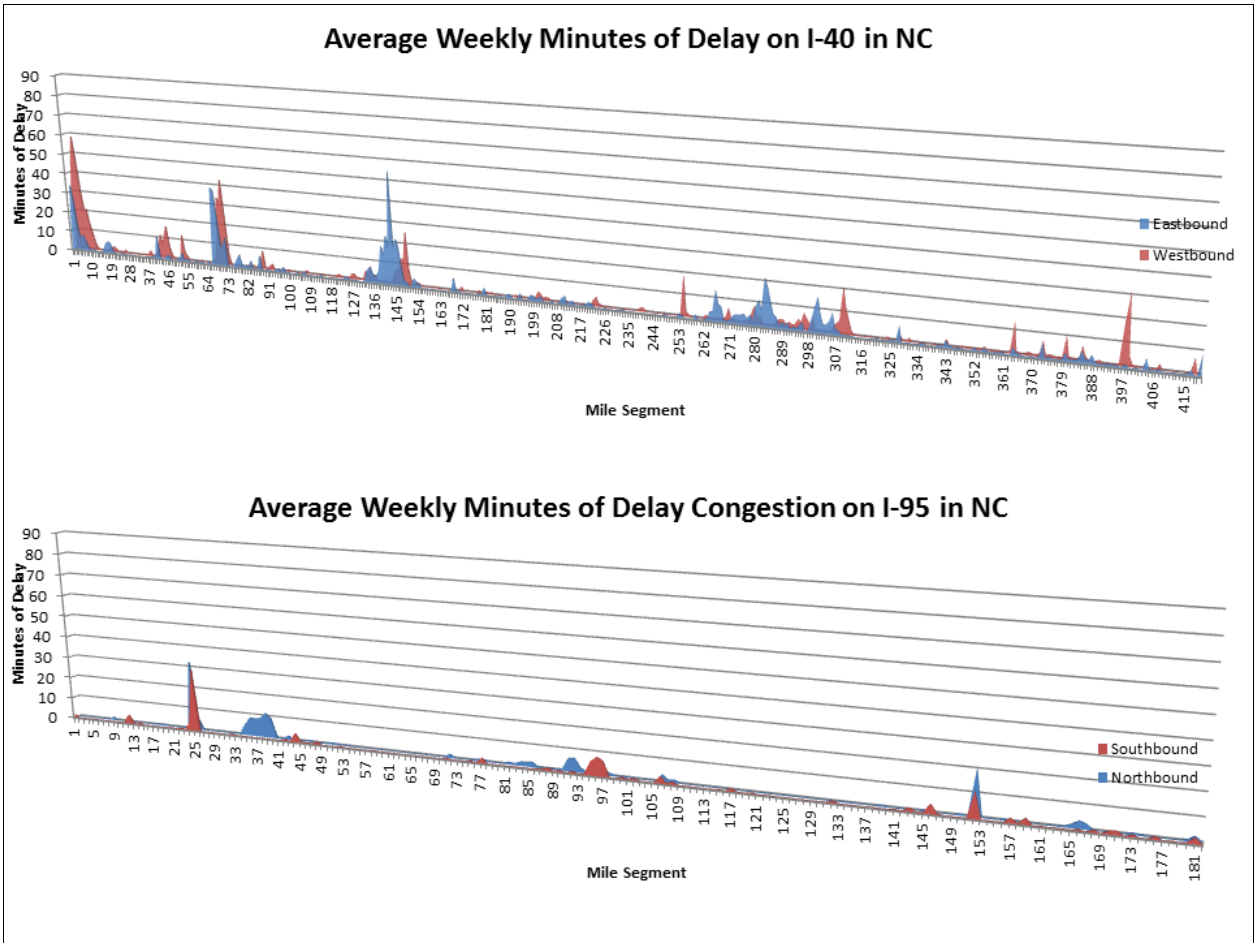
Table 6.4 Congestion by Day of Week

Day of Week	Number of Mile-Hours of Congestion
Monday	160
Tuesday	273
Wednesday	239
Thursday	258
Friday	210
Saturday	89
Sunday	39

Source: ATRI GPS Data for NC, June 2012.

Figure 6.13 compares congestion on I-95 to I-40. It shows that there are significantly higher levels of congestion along I-40 relative to I-95. Most of the congestion on I-40 occurs on its urbanized sections. It is likely the result of commute traffic peaking patterns. Similar results can be found along other corridors, where interstate recurring delay is primarily the result of urbanized commute patterns. There is little of this peaking pattern evident along I-95.

Figure 6.14 Congestion on I-95 Relative to I-40



Source: ATRI GPS Data for NC, June 2012.

7.0 Truck Costs

This chapter compares current trucking industry costs in North Carolina to trucking industry costs in others states and regions, particularly where tolls are more prevalent. Additionally, this chapter describes the operational and economic models associated with the trucking component of the supply chain. The data contained within this technical memorandum will assist the study team, the Advisory Council and the North Carolina Department of Transportation (NCDOT) in estimating the impact of tolling I-95 in North Carolina on the trucking industry.

As industry background, intense competition and low profit margins are realities for most trucking companies. Federal deregulation of the trucking industry took place in the early 1980s, which led to an increase in the number of trucking companies competing to move freight. As a result, barriers to entering the industry were significantly lowered and the number of companies nationwide shifted from approximately 20,000 to today's level of more than 400,000 for-hire interstate motor carriers. Trucking is currently an industry where a new company can quickly be established and enter the market for freight services.

As a result, competition among motor carriers for customers is intense. Shippers, those who hire trucking companies to move goods, are able to command low rates as trucking companies bid prices down in order to compete for contracts. The outcome of this competition is lower income per dollar spent, and subsequently lower profit. With such constraints in the market, each individual trucking firm must scrutinize all expenditures, including fuel, driver, equipment, tax and toll costs, to ensure long-term viability.

7.1 North Carolina Motor Carrier Cost Analysis

This section begins with an overview of the average cost of moving freight for different types of trucking operations in the U.S. This is followed by a comparative review of the taxes and fees paid by motor carriers that operate in North Carolina and throughout the U.S., along with a state and regional review of the prevalence of tolling. Finally, the section concludes with a discussion of the impact that changes to trucking industry costs in North Carolina could have on businesses.

Cost to Operate a Truck per Mile. The economic environment of the trucking industry dictates that individual trucking firms must closely monitor each variable cost. To track and study the impact of changes in these costs, the American Transportation Research Institute (ATRI) annually collects and analyzes detailed motor carrier financial data on operating costs including fuel,

tires, truck and trailer lease or purchase payments, repair and maintenance, insurance, special licenses and permits, driver pay and driver benefits.[1] This analysis provides a benchmark of average motor carrier operational costs, reported as cost per mile (CPM) and cost per hour (CPH). This technical memorandum will focus on per-mile costs.

Table 7.1 shows average motor carrier operating costs per mile by region, excluding toll costs. The national average CPM was $1.689 in 2011. Within this CPM figure, the largest cost centers were fuel ($0.59) and driver wages ($0.46), followed by equipment lease and purchase costs, repair and maintenance, driver benefits and insurance premiums.

Table 7.1 Average Carrier Costs per Mile Nationally and by Region, 2011
Excluding Tolls

Motor Carrier Costs	Midwest	Northeast	Southeast	Southwest	West	USA
Vehicle-based						
Fuel and Oil Costs	$0.586	$0.629	$0.542	$0.595	$0.670	$0.590
Truck/Trailer Lease or Purchase Payments	$0.190	$0.248	$0.156	$0.178	$0.200	$0.189
Repair and Maintenance	$0.145	$0.186	$0.151	$0.131	$0.141	$0.152
Truck Insurance Premiums	$0.066	$0.082	$0.057	$0.075	$0.073	$0.067
Permits and Licenses	$0.033	$0.056	$0.037	$0.027	$0.050	$0.038
Tires	$0.042	$0.040	$0.042	$0.041	$0.045	$0.042
Driver-based						
Driver Wages	$0.476	$0.496	$0.445	$0.465	$0.454	$0.460
Driver Benefits	$0.173	$0.163	$0.152	$0.118	$0.124	$0.151
Total	$1.711	$1.900	$1.582	$1.630	$1.757	$1.689

Regional costs (based on the boundaries found in Figure 7.1) vary, with the Southeast having the lowest CPM of $1.582 and the Northeast having the highest CPM at $1.900 per mile.

Per-Mile Tolling Costs

Per-mile toll costs, which were excluded from the above national and regional costs table and figure, are not a required cost of doing business for all trucking companies. Some carriers operate in states with no tolls or choose to avoid tolled routes. Others however, due to the location of operations or customers, have very high toll costs. In the U.S., the operational cost data show that the annual

[1] Fender, Katherine J.; D. Pierce. *An Analysis of the Operational Costs of Trucking: A 2012 Update*. American Transportation Research Institute (ATRI). September 2012.

per-mile cost of tolls is highest in the Northeastern region at $0.032 per mile. This is at least twice the average toll cost of each of the other regions (see Table 7.2).

Figure 7.1 Regional Cost per Mile Map, 2011
Excluding Tolls

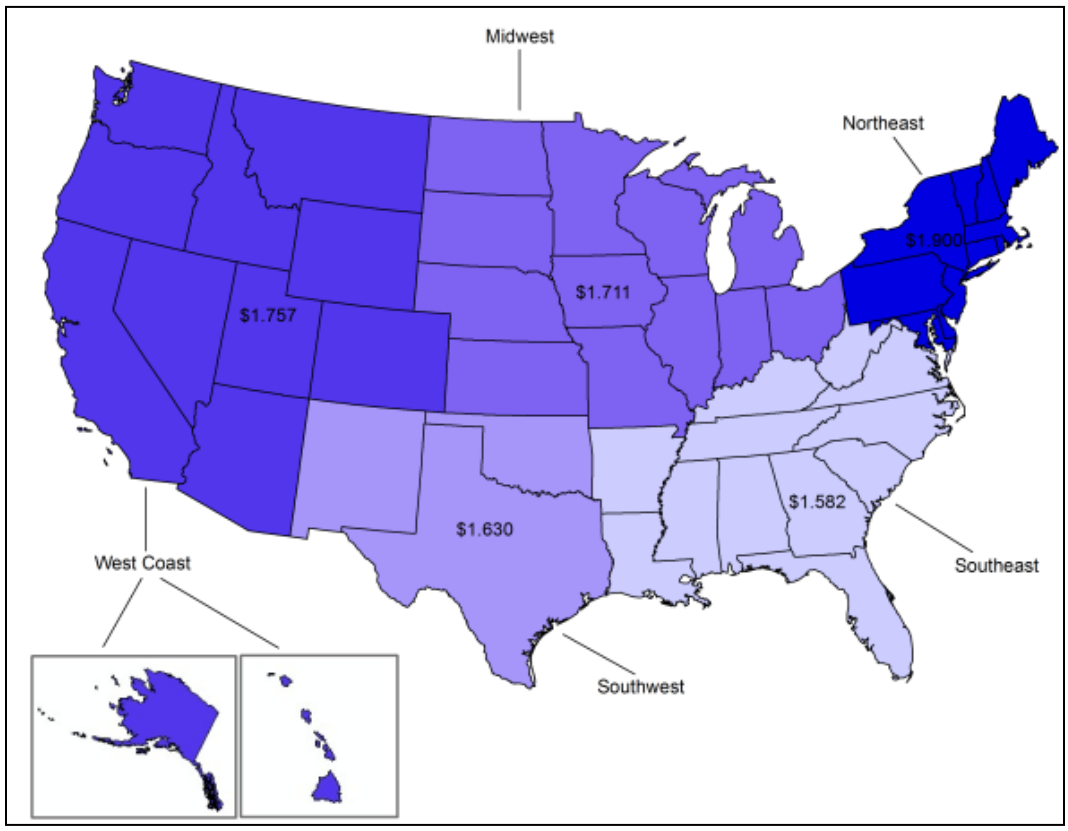


Table 7.2 Motor Carrier Toll Cost per Mile by Region, 2011

Cost	Midwest	Northeast	Southeast	Southwest	West	USA
Tolls	$0.016	$0.032	$0.015	$0.015	$0.012	$0.017

For the individual trucking firms that were included in the CPM calculations, a number of carriers paid several million dollars in tolls annually, while others had negligible or no toll expenses.

On a cost-per-truck basis, one firm operating primarily in the Northeast paid nearly $5,150 per truck in tolls annually; the median among respondents was $1,912 per truck.

Analyzing the data on a mileage basis, another company that operated 95 percent of their vehicle-miles in the Northeast reported paying $63,000 per million miles; the median toll cost per million miles was $17,000. Tolling I-95 in North Carolina would add to these costs, particularly among those carriers that are based in the State or along the corridor.

Due to the highly mobile, transient nature of trucking, precise state-level cost per mile figures are difficult to pinpoint. A for-hire interstate motor carrier based in North Carolina may have costs associated with travel in the more expensive Northeast due to proximity, and can even be influenced by travel as far away as the west coast. Within the operational cost data, several North Carolina carriers were found to have high per-mile toll costs that were not a result of travel within the State.

An approximate North Carolina CPM figure was, however, derived from the national CPM data and U.S. Census data, and validated through a limited financial cost survey of North Carolina carriers.

To produce the North Carolina CPM, recent Cost of Living Index (CLI) data from the U.S. Census Bureau[2] was used to calculate a state-level index.[3] The national CPM figure of $1.689 calculated by ATRI was multiplied by each state's index number. The result was a lower than average CPM estimate for North Carolina, which ranks 28 among all states at $1.656. Figure 7.2 illustrates these costs on a national scale. Table 7.3 shows the national, regional, and state-level CPM figures.

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[2] Cost of Living Index-Selected Urban Areas: Annual Average 2010. These data measure "relative price levels for consumer goods and services in participating areas for a mid-management standard of living. The nationwide average equals 100 and each index is read as a percent of the national average. The index does not measure inflation, but compares prices at a single point in time." The dataset was accessed at the following URL on 12/07/12: http://www.census.gov/compendia/statab/cats/prices/consumer_price_indexes_cost_of_living_index.html.

[3] City-level data was averaged to produce state level averages.

Figure 7.2 State Cost per Mile Figures

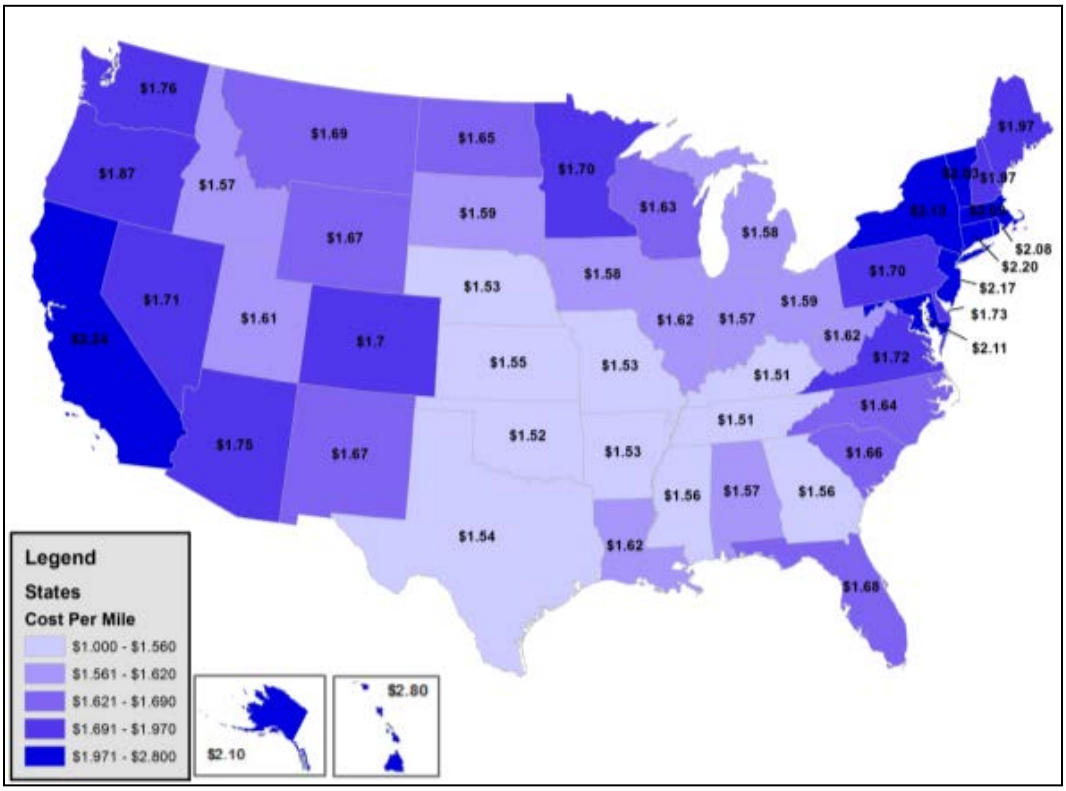

Table 7.3 State, Regional, and National Average Operating Costs

Motor Carrier Costs	National	Southeast	North Carolina
Vehicle-based			
Fuel and Oil Costs	$0.590	$0.542	$0.573
Truck/Trailer Lease or Purchase Payments	$0.189	$0.156	$0.184
Repair and Maintenance	$0.152	$0.151	$0.148
Truck Insurance Premiums	$0.067	$0.057	$0.065
Permits and Licenses	$0.038	$0.037	$0.037
Tires	$0.042	$0.042	$0.041
Driver-based			
Driver Wages	$0.460	$0.445	$0.447
Driver Benefits	$0.151	$0.152	$0.147
Total	**$1.689**	**$1.582**	**$1.640**

7.2 TAXES AND FEES PAID BY THE TRUCKING INDUSTRY IN NORTH CAROLINA

North Carolina motor carriers pay Federal and state taxes and fees, which include (but are not limited to) the following:

- Federal and state fuel taxes;
- Truck and trailer registration fees;
- Federal highway use taxes;
- Federal excise taxes on truck, trailer and tire purchases;
- Local service charges;
- Sales tax;
- Carrier gross receipts taxes;
- Mileage and ton-mile taxes;
- Property tax on rolling stock;
- Special license fees; and
- Certificate or permit fees.[4]

The North Carolina trucking industry paid approximately $1.0 billion in Federal and state roadway taxes and fees in 2009.[5] This totals 34 percent of all taxes and fees paid for all North Carolina vehicles; trucks, however, represented only 11 percent of vehicle-miles traveled in the State during that year.

In 2012, a typical five-axle tractor-semitrailer combination paid $6,103 in state highway user fees and taxes and $7,771 in Federal user fees and taxes.

Federal highway user taxes[6] for North Carolina motor carriers in 2009 equated to $49.8 million paid by North Carolina motor carriers in retail taxes on trucks and

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[4] American Trucking Trends 2011. American Trucking Associations. Arlington, Virginia, 2011.

[5] Highway Statistics, 2009. FHWA, U.S. DOT, Washington, D.C.

[6] Federal highway user taxes include the retail truck and trailer tax, the heavy vehicle use tax and the tire tax. These are respectively: 1) 12 percent of retailer's sales price for tractors and trucks over 33,000 pounds gross vehicle weight (GVW) and trailers over 26,000 pounds GVW (FHWA); 2) HVUT: Trucks 55,000 pounds and over GVW, $100 plus $22 for each 1,000 pounds (or fraction thereof) in excess of 55,000 pounds (maximum tax of $550); 3) Tires: No tax on tires weighing 40 pounds or less; $0.15 per pound for tires in excess of 40 pounds but weighing less than 70; $4.50 plus $0.30 per pound for tires in excess of 70 pounds but weighing less than 90; and $10.50 plus $0.50 per pound for tires in excess of 90 pounds (FHWA).

trailers, $25.4 million paid in Federal use taxes and $8.29 million paid in excise taxes on tire purchases.[7]

Key North Carolina Taxes

Fuel Tax. In 2009 North Carolina collected more than $400 million from motor carriers through state fuel taxes.[8] The current state tax on diesel and gasoline is 37.8 cents per gallon, which includes a 17.5 cent flat rate, a variable component that is indexed to the price of fuel, and an inspection tax.[9] This is significantly higher than the 30.3 cents per gallon that was charged in North Carolina as of December 2011, when North Carolina was ranked 13th in the country for diesel taxes.

Connecticut, California and Indiana have the three highest state diesel tax rates. Of the 50 states, North Carolina currently has the ninth highest tax as shown in Table 7.4. Additionally, Figure 7.3 shows fuel tax rates geographically.

Table 7.4 Top 10 State Fuel Taxes
as of October 2012

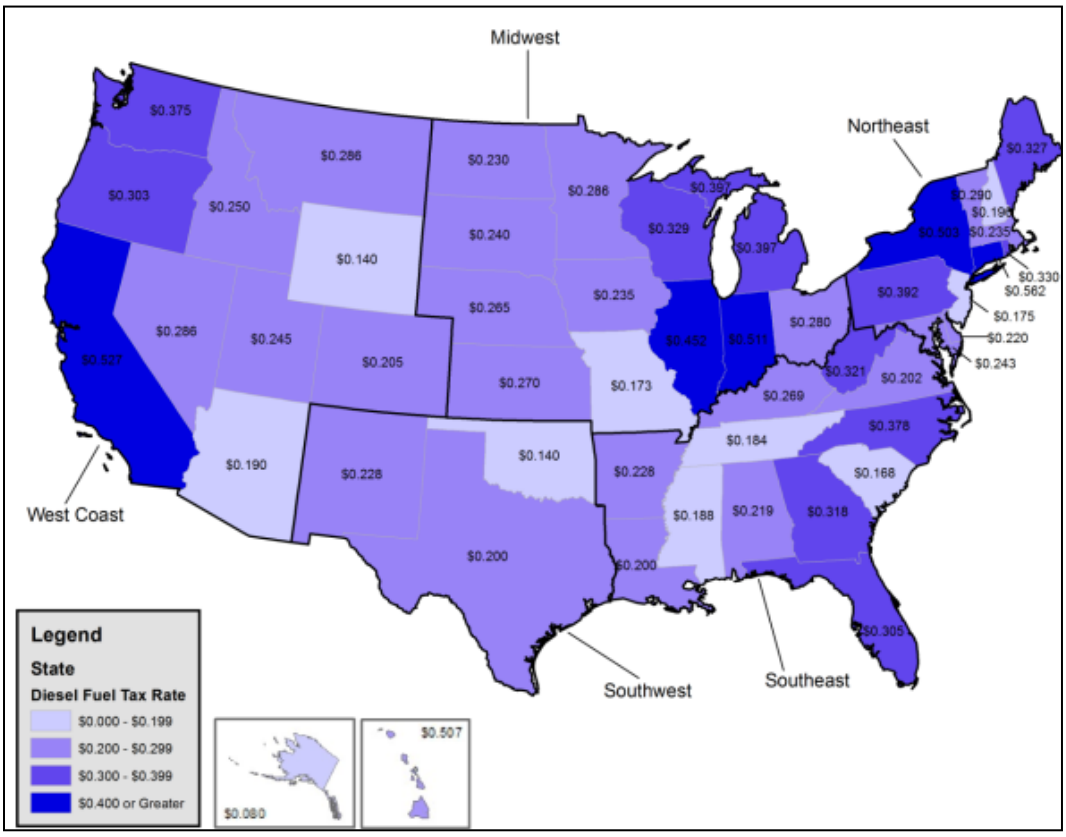
Rank	State	Diesel Tax Rate October 2012
1	Connecticut	$0.562
2	California	$0.527
3	Indiana	$0.511
4	Hawaii	$0.507
5	New York	$0.503
6	Illinois	$0.452
7	Michigan	$0.397
8	Pennsylvania	$0.392
9	North Carolina	$0.378
10	Washington	$0.375

[7] Highway Statistics, 2009. FHWA, U.S. DOT, Washington, D.C.

[8] Highway Statistics. U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information.

[9] API chart: http://www.api.org/oil-and-natural-gas-overview/industry-economics/~/media/Files/Statistics/State_Motor_Fuel_Excise_Tax_Update.ashx.

Figure 7.3 Diesel Fuel Tax Rate
Cents Per Gallon, October 2012



Since North Carolina taxes are indexed, if fuel prices decrease it is likely that a significant decrease in rates and revenues would occur.

It is also important to note that the diesel tax in North Carolina is paid by motor carriers for travel in the State, regardless of where the carriers are based, where origins or destinations are located or where the fuel is purchased. Like nearly all states and Canadian provinces, North Carolina is part of the International Fuel Tax Agreement (IFTA) program. IFTA's purpose is to redistribute state fuel taxes based on miles traveled in each state through a reporting system, and therefore taxes are paid by all carriers using all roadways within the State based on mileage.

Registration Fees

In 2009 North Carolina collected $211 million in truck, truck tractor and trailer registration fees.[10] During that same year there were 48,585 truck tractors registered in the State, and 74,335 commercial trailers registered in the State. Registration fees in North Carolina are relatively low, with an average cost of $1,255 per tractor-semitrailer combination.[11] As shown in Table 7.5, North Carolina ranks 34th in the U.S. The map in Figure 7.4 shows a national comparison of average registration fees.

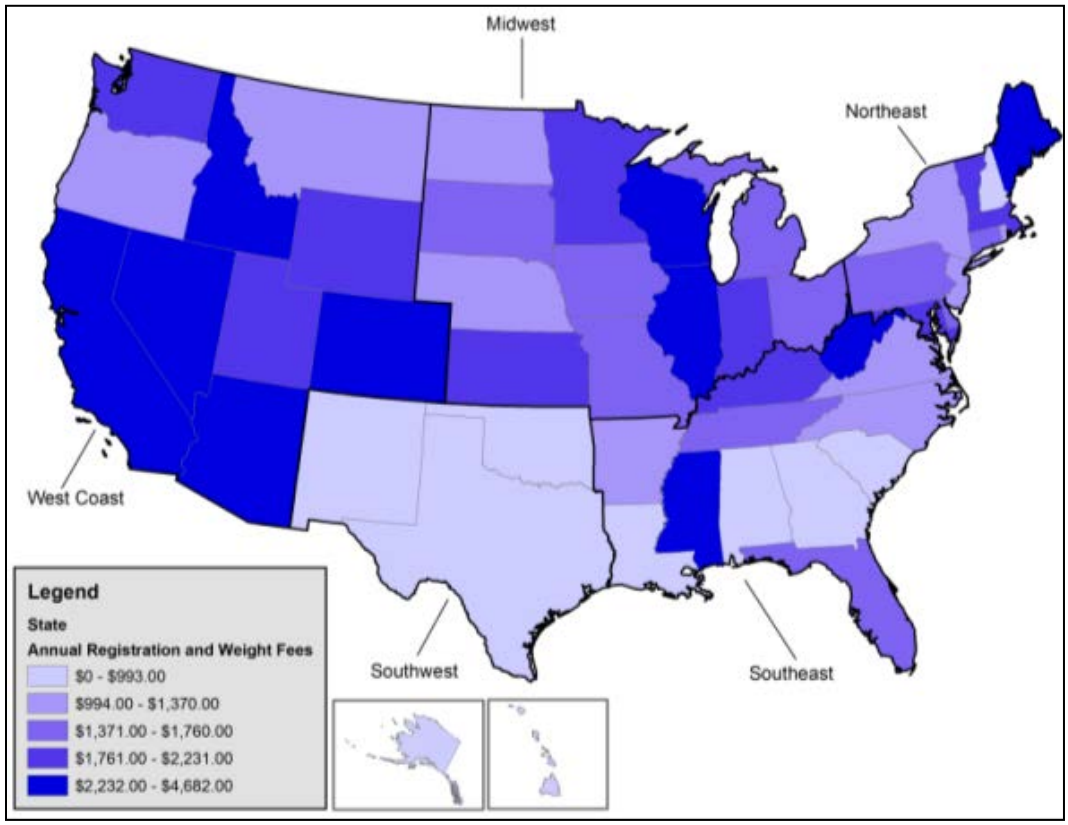
Table 7.5 Average Annual Registration Fees

Rank	State	Average Annual Fee
1	Colorado	$4,682.00
2	Arizona	$3,960.00
3	Maine	$3,462.00
4	Idaho	$3,389.00
5	Illinois	$3,210.00
6	Mississippi	$2,927.00
7	California	$2,775.00
8	Nevada	$2,718.00
9	Wisconsin	$2,575.00
10	West Virginia	$2,301.00
11	Wyoming	$2,231.00
12	Indiana	$2,072.00
13	Kentucky	$1,976.00
14	Vermont	$1,922.00
15	Utah	$1,858.00
…	…	…
35	North Carolina	$1,255.00

[10] Highway Statistics. U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information.

[11] The annual registration and weight fee figure ($1,255 in North Carolina) is for a tractor semi-trailer with 80,000 pounds gross weight, that operates for a full year within the state (i.e., does not leave North Carolina), and is registered in the capital city.

Figure 7.4 Registration Fees by State

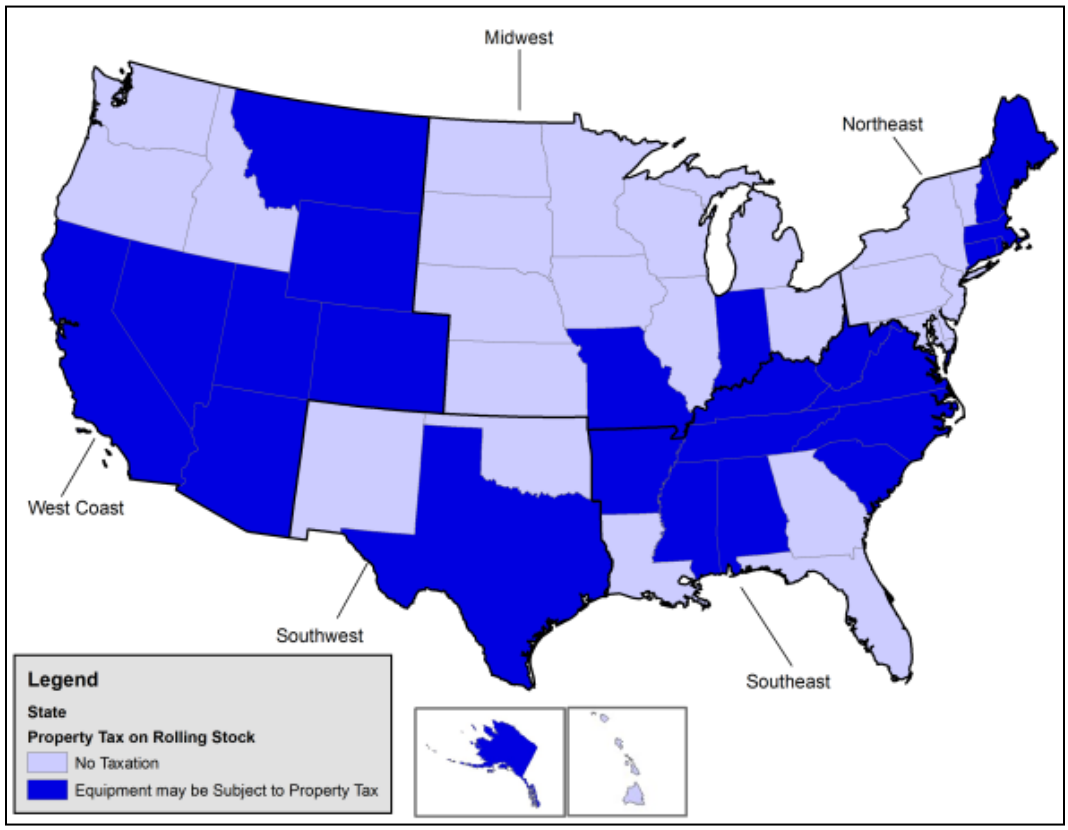


Similar to IFTA's role in reallocating fuel taxes, the International Registration Plan (IRP) is a system of apportionment for registration fees for tractors. Under this plan interstate carriers pay registration fees to states based on the percentage of mileage that is traveled in a state or province. A truck registered in North Carolina that travels in other states will therefore pay those states an apportioned annual registration fee based on mileage. Likewise, out-of-state vehicles will pay North Carolina a registration fee based on mileage accrued within the State.

Property Taxation of Motor Carrier Rolling Stock

Half of the states in the U.S. do not have (or will not have by 2014) a property tax on motor carrier rolling stock, which is equipment such as trucks, tractors, trailers and semi-trailers. North Carolina, however, does tax rolling stock for motor carriers that have a significant presence in the State. This tax can be apportioned if the equipment is used in interstate commerce. Figure 7.5 displays the states where motor carriers may be subject to taxation of rolling stock:

Figure 7.5 States Where Motor Carriers May Be Subject to Property Taxation on Rolling Stock



State Tolling Prevalence

To identify regions and states where tolling is prevalent, Federal Highway Administration (FHWA) toll revenue data across all modes and VMT figures were analyzed.[12] For each state, annual toll revenue and VMT were calculated into a value of "toll revenue per 1,000 miles driven" for all vehicles. The results show a relatively high level of tolling in the Northeastern U.S. compared to other regions of the U.S.

Of the 50 states, 17 do not have any tolls. The top 10 states where tolling is prevalent are found in Table 7.6, with Delaware having the highest rating.

Figure 7.6 shows a national comparison of toll revenue collected by a state per 1,000 VMT: The same calculations were performed on a regional basis (based on the regions shown in Figure 7.1), and the Northeast was found to have the highest toll revenues per VMT.

[12]FHWA's Functional System Travel – 2010 Annual Vehicle-Miles (Table VM-2) and Disposition of Highway-User Revenues, All Levels of Government – 2010 (Table HDF).

Table 7.6 Toll Revenue Statewide, 2010
Dollars per 1,000 VMT

Rank	State	Revenue per 1,000 VMT
1	Delaware	$47.54
2	New York	$23.18
3	New Jersey	$16.25
4	Maine	$9.55
5	Pennsylvania	$9.35
6	Alaska	$9.14
7	New Hampshire	$8.91
8	Massachusetts	$7.19
9	Illinois	$6.30
10	Florida	$5.82
…	…	…
30	North Carolina	$0.02

Figure 7.6 Toll Revenue by State, 2010
Dollars per 1,000 VMT

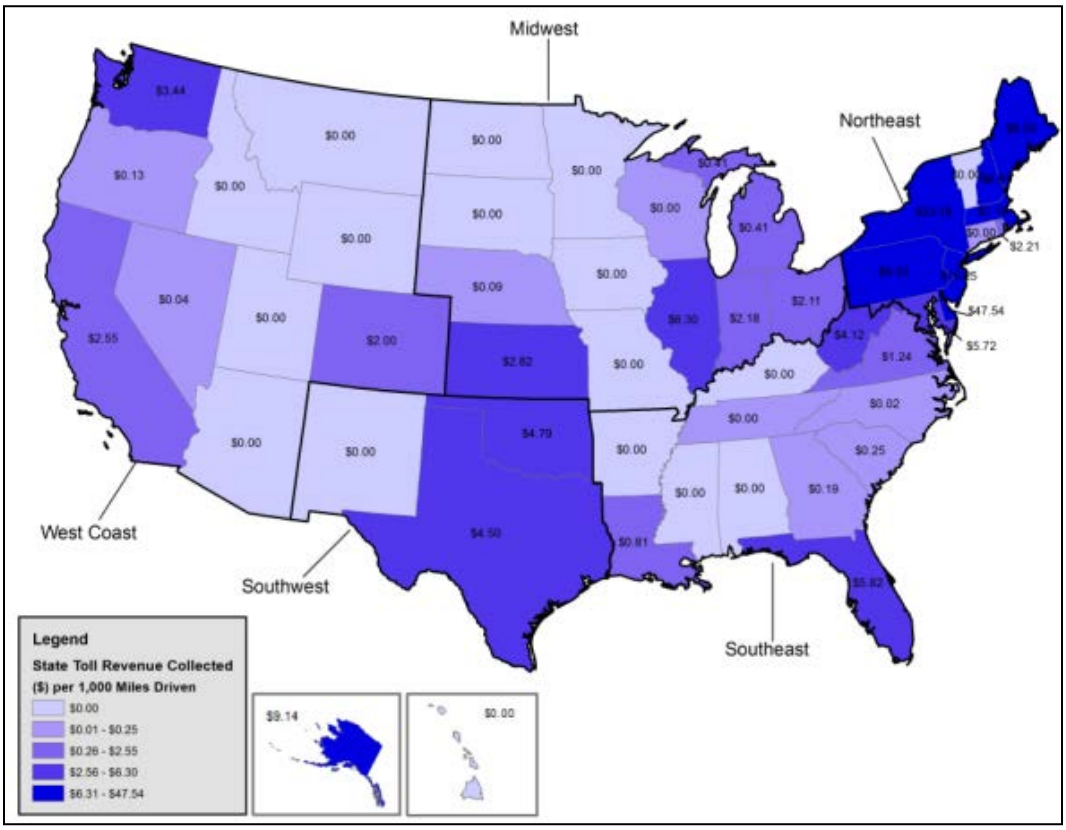
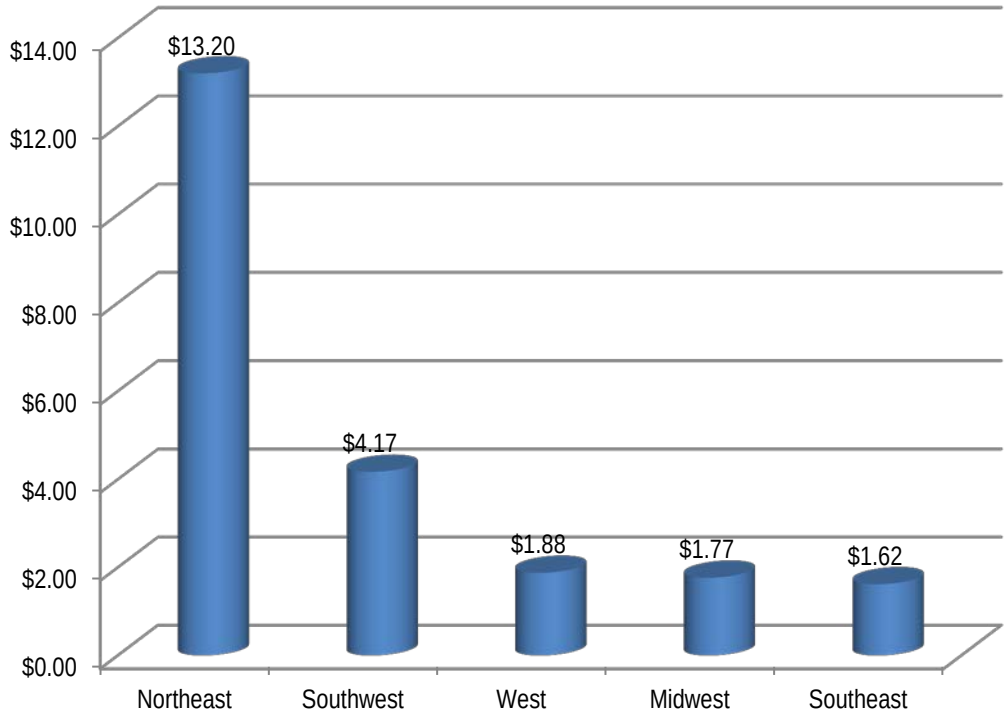


Figure 7.7 Toll Revenue Regional, 2010
Dollars per 1,000 VMT



Trucking Industry Market Segmentation

The U.S. trucking industry is exceptionally large and complex, having boundaries that now virtually extend – through supply chains, data transactions and asset movements – to every corner of the globe. In fact, in 2011 commercial trucks moved nearly 9 billion tons of goods, logging 397 billion driving miles.

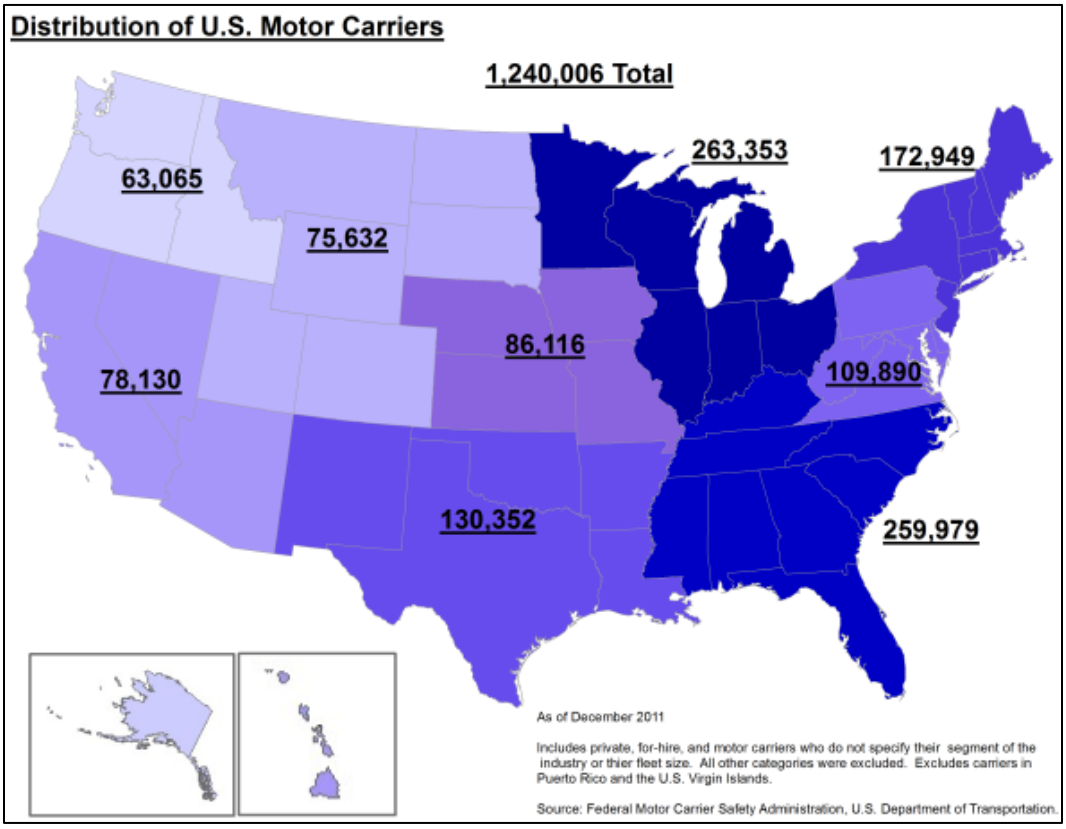
On a less macroscopic scale, the same can be said for the trucking industry in North Carolina. While the State's role in certain economic sectors is more pronounced than in others, nearly every raw commodity and manufactured product produced within the State is either consumed in North Carolina or is transported on its 105,000 miles of public roads. Not surprisingly, commercial trucks in North Carolina logged 10.9 billion miles in 2009.[13]

While all freight modes are represented in North Carolina's freight distribution network, the trucking industry is by far the largest and most ubiquitous of the modes. Trucks transported 89 percent of total manufactured freight tonnage in

[13] Highway Statistics. U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information.

the State in 2011, representing more than 731,000 tons of goods moved every day.[14] While the State is served by several Class 1 and short-line railroads, more than 86 percent of North Carolina communities depend exclusively on trucks to move their goods. It should be noted that the number of *all* registered trucking companies in the southeast region of the U.S. is second only to the Midwest in scope, but in terms of for-hire trucking companies, the southeast region has more fleets than any other region of the country (Figure 7.8).

Figure 7.8 Distribution of U.S. Motor Carriers



The economies of both the U.S. and North Carolina generate millions of commodity types and products; of all sizes, both raw and manufactured. The complexity of this freight output is equally matched by the transportation requirements needed to move the products to and from markets. Consequently, the U.S. trucking industry is composed of more than 550,000 trucking companies that utilize as many as 20 million commercial vehicles to move goods. Approximately 11,600 of these fleets were base-stated in North Carolina. The

[14] IHS Global Insight, TRANSEARCH Data (2012).

number of commercial trucks registered in North Carolina increased from 652,000 in 2008 to 692,000 in 2009 – reflecting the slow improvement in the State's post-recession economy.[15]

The role of North Carolina in the nation's freight distribution network can be well documented in many ways. One indicator is that North Carolina is one of the top 10 states for both surface imports from Mexico and surface exports to Mexico.

To document the role of the trucking industry in North Carolina, and the impact that different transportation planning and programs may have on the State's freight industries, a careful dissection of the industry's segmentation is needed.

Major Trucking Industry Sectors and Related Operational Models

The trucking industry can generally be broken into several major strata of business operations with the highest level of dissection occurring between "for-hire" and "private fleet" firms. Private fleets are essentially the truck fleets associated with firms whose primary business has nothing to do with trucking. These firms own, maintain and (exclusively or partially) use their own trucks to move their raw and manufactured goods to and from markets. More common examples of private fleet firms include Walmart, Kraft Foods, Ashley Furniture, and other well-known firms. But they also include local farm and produce companies as well as raw aggregate firms. Alternatively, "for-hire" firms represent the classic trucking company that sell, to multiple shipper customers, a range of freight transportation services, using their own vehicles. Common for-hire trucking companies include UPS, Schneider National, Landstar, and JB Hunt. However, the large majority (96 percent) of for-hire trucking companies own 20 or fewer trucks.

Beyond the clear division of private and for-hire fleets, motor carrier fleet sector descriptions become a bit more blurred, but major groupings can still be defined.

Truckload Operations. The leading sector of the for-hire industry is the "truckload" (TL) sector, which can most easily be defined by when a shipper customer purchases a full trailer of space for its freight movement. These TL movements can be of any trip length or distance but they commonly travel 400 miles or more. As the TL trip length increases beyond 500 to 750 miles, shippers and trucking companies start to consider rail intermodalism as a legitimate alternative to long truck trips. However, certain shipper and commodity characteristics may still preclude rail intermodalism, including critical delivery times, fragile goods, perishable goods (although refrigerated or "reefer" rail cars are sometimes used), and rail access.

[15] Highway Statistics. U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information.

The TL industry typically links a series of point-to-point routes, where some or all of the customer's freight is dropped off (or picked up). For this reason, TL firms typically log the most miles and TL truck drivers are often away from home for weeks at a time.

The TL represents sector does, and can use, a variety of different truck and trailer types, but the most common configuration is the tractor-trailer combination that uses a 53-foot "dry van" trailer.

Based on the sample of more than 200 motor carriers and truck drivers surveyed as part of this study, 66.5 percent of the for-hire carrier respondents described themselves as TL operators. The equipment utilized by the majority of motor carrier respondents are dry van trailers (52 percent) which can be employed to move dozens of different commodity types.

Less-Than-Truckload. As the name implies, an entirely different sector and industry business model is the "LTL" sector, which sells partial load space to multiple customers. Because LTL operations have to pick up and consolidate freight shipments from multiple customers, they typically design a "hub and spoke" system that collects shipments from an area and reconsolidates the multicustomer freight into different trucks heading to different regions or states. Major LTL firms include Yellow/Roadway, Conway, Estes Express and ABF. There are also many regional LTL firms, but given the high capital costs associated with maintaining a large network of vehicles and de/consolidation facilities, there are almost no small LTL fleets. LTL fleets are often known to run the double and triple trailer configurations that operate in specific locations throughout the U.S.

The percentage of the North Carolina for-hire survey respondents that identified with LTL operations was 6.9 percent – a figure lower than the national percentage of LTL carriers and drivers.

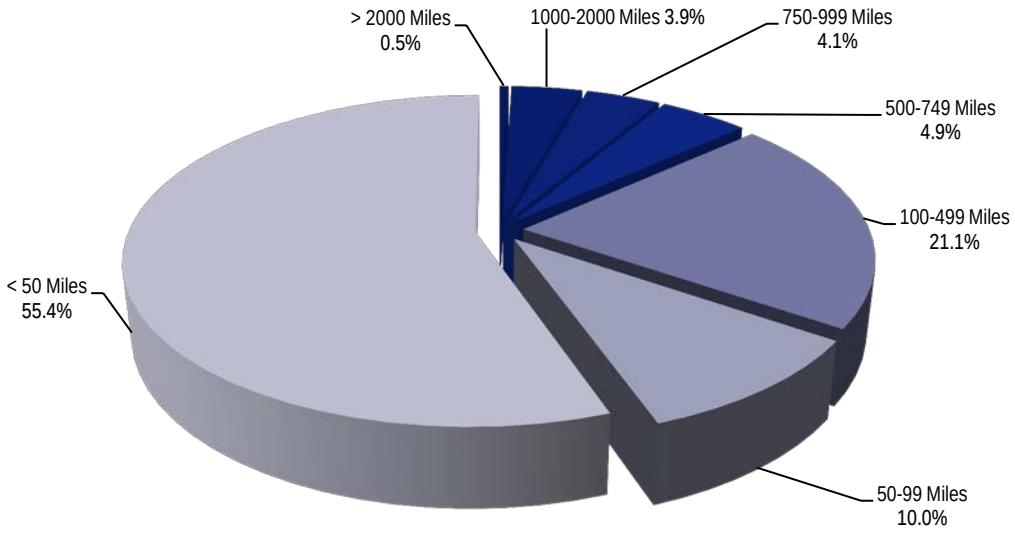
Specialized Fleets. Specialized fleets, represent one of the largest sectors of the industry because of the myriad, unique trailer types needed to move large or unique products or equipment. There are standard "specialized" truck trips that primarily utilize flatbed trailers used in the housing, construction and government fleet industries. There are also "oversize/overweight" (OS/OW) fleets that move a variety of items including mobile homes, energy generators and wind turbine blades. These trucks often use multiple-axle trailers, and require government OS/OW permits and very specialized truck routing plans.

Tank Trucks. With tank fleets moving hundreds of different commodities in dry, liquid and gas forms, the use of a "tank" trailer is really the only commonality among this sector. These fleets move chemicals, raw and processed food-grade materials and a variety of petroleum products. The tank trucks may or may not include baffles to minimize product slosh. In addition, many chemical tankers require special equipment to maintain very narrow tolerances of pressure and temperature. Tank truck fleets and drivers often have unique safety issues such as higher centers of gravity, and wider turning radii. Consequently, tank trucks

and trailers are often very expensive and utilize specially trained, veteran truck drivers.

Truck Trip Lengths. From a transportation planning perspective, trip lengths can be an important surrogate for understanding economic development issues, local trucking activities and to some degree, elasticity of truck travel. The presumption is that long-distance pass-through trips have more flexibility and route alternatives than local trips (those with one or more pickups or deliveries or total trip miles of less than 100 miles). Figure 7.9 shows the distribution of tonnage by trip length in the U.S.

Figure 7.9 U.S. Distribution of Tonnage by Trip Length



7.3 KEY FINDINGS

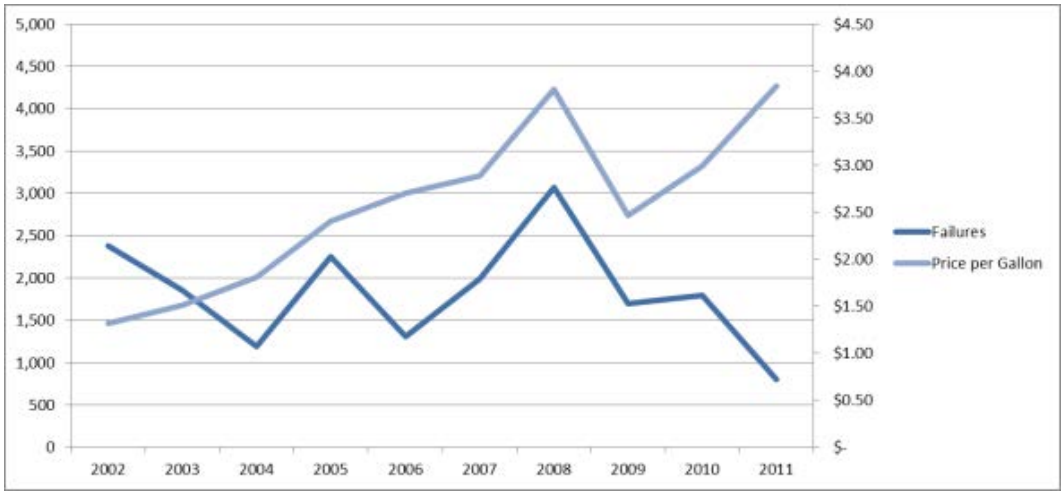
As discussed in this chapter, trucking companies face significant costs that are unique to the industry. These costs, coupled with a competitive market, create an environment where trucking companies have slim margins and little room to adapt to additional costs.

Figure 7.10 demonstrates the industry's sensitivity to fuel costs, particularly when faced with a slowing economy. In 2007 and 2008, as fuel prices rose to record levels and as the recession emerged, trucking company failures increased rapidly. As a result, marginal firms were forced out of the industry due to weak demand for freight services and an inability to adapt to the new fuel cost levels.

Those carriers that remained were better prepared for the fuel cost increases that occurred in 2011, utilizing mechanisms such as hedging and fuel surcharges. This preparation, combined with an increase in demand for freight services as the economy recovered, limited the number of failures during the most recent spike in price.

Preparation for a new toll cost may prove more difficult. Recent research indicates that shippers are reluctant to accept toll costs.[16] Additionally, because alternative routes exist, carriers will need to weigh the benefits and costs of utilizing a toll facility.

Figure 7.10 Truck Failures to Fuel Costs



Source: Trucking Trends, American Trucking Associations, 2012.

[16] Wood, H.P. *Truck Tolling: Understanding Industry Tradeoffs When Using or Avoiding Toll Facilities*. NCFRP Project 19: Transportation Research Board, 2011. Wood states that based on interview data shippers (those who pay for the services of a for-hire trucking company) are interested in paying a single rate quote to move goods, and prefer not to have charges such as tolls in addition to that quote. Use of a toll road is seen by the shipper as a choice that is made by a motor carrier and is outside of the shipper's sphere of influence.

8.0 Trucking Industry and Shipper Outreach

This chapter describes outreach to the trucking and shipping industries including a trucking industry survey, trucker/shipper interviews and trucker/shipper focus groups.

8.1 TRUCKING INDUSTRY SURVEYS

The American Transportation Research Institute (ATRI) created a series of surveys to solicit feedback from the trucking industry to better understand industry opinions on the condition of I-95 in North Carolina. Additionally, the survey effort was designed to gauge industry attitudes toward proposed improvements to the corridor. Two surveys were created and were posted on-line; one was geared toward carriers and one was customized for owner-operators. Numerous outlets were utilized to market the surveys to industry stakeholders that operate along I-95 in North Carolina. Feedback was solicited using contacts at state trucking associations along the mid-Atlantic I-95 corridor, ATRI carrier distribution lists and media announcements through the American Trucking Associations and Transport Topics. Additionally, the owner-operator survey was deployed at a truck stop kiosk along I-95 in North Carolina to more effectively reach owner-operators. A total of 210 responses with usable data were collected, with 87 from motor carriers and 113 from owner-operators. The responses were aggregated and analyzed to identify industry attitudes and opinions. The next few sections present the results of the combined carrier and owner-operator analysis. In cases where there were marked differences between carrier and owner-operator results, both sets of results are also presented.

Demographics

Consistent with the overall industry composition, the majority of respondents (66 percent) are from the truckload sector. Figure 8.1 presents the full distribution of responses. As Table 8.1 shows, the for-hire truckload responses are somewhat overrepresented compared to the overall for-hire industry, while the less-than-truckload responses are underrepresented. The specialized share is consistent with national figures.

The majority (61 percent) of respondents are owner-operators. As Figure 8.2 shows, there is a fairly even distribution of carriers of all sizes. The smallest carrier surveyed has four power units, while the largest has 9,500 power units. Excluding owner-operators, the median carrier size is 88 power units. Compared to national figures, which report that over 90 percent of carriers have six or fewer power units, responses from larger carriers appear to be somewhat over-represented in the survey sample.

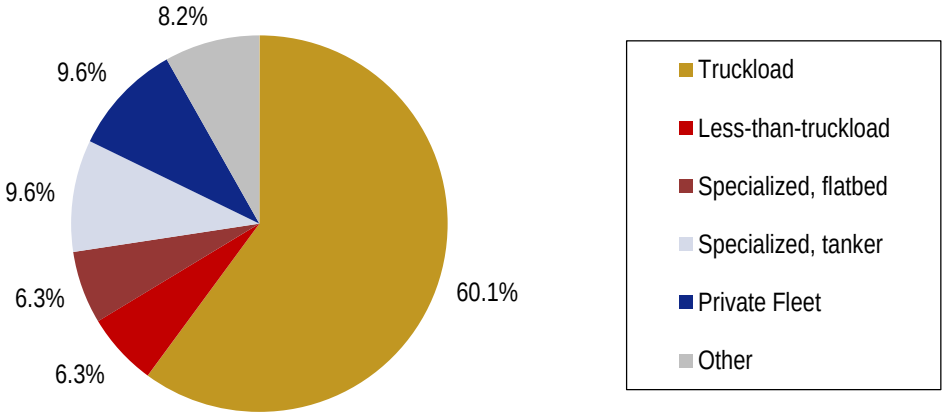
Table 8.1 For-Hire Industry Sector Breakout

Industry Sector	North Carolina I-95 Survey Respondents	U.S. Trucking Industry
Truckload	66%	52%
Less-Than-Truckload	7%	24%
Specialized/Other	27%	24%

Source: North Carolina I-95 Trucking Survey, ATA. American Trucking Trends: 2005-2006. Arlington, Virginia (2007).

Figure 8.1 Distribution of Industry Sectors

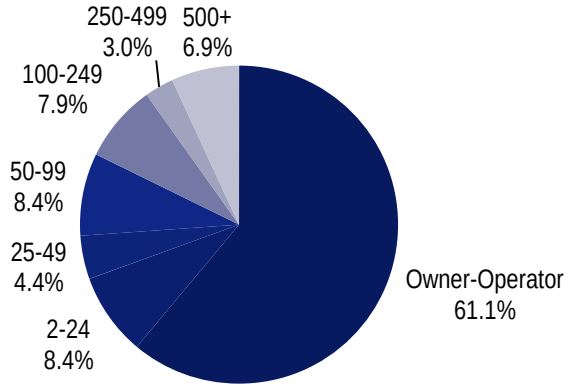
What is your primary type of operation?



Source: North Carolina I-95 Trucking Industry Survey.

Figure 8.2 Distribution of Fleet Sizes

How many power units does your fleet operate?



Source: North Carolina I-95 Trucking Industry Survey.

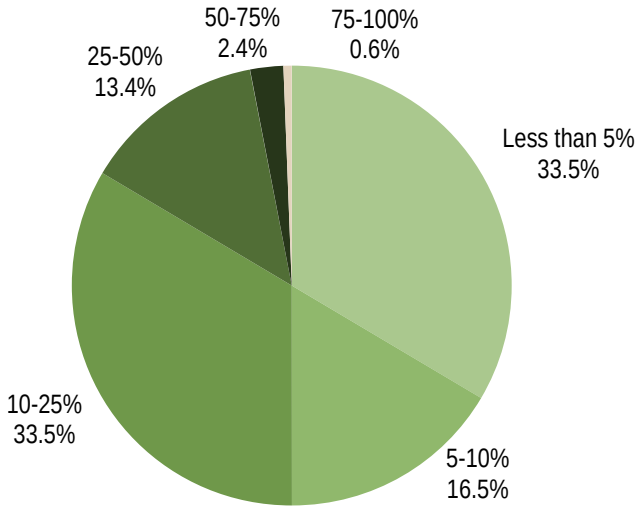
I-95 Corridor Usage

The survey respondents utilize North Carolina roads for a variety of trip types. Respondents indicate that the plurality (44 percent) of their trips that include the State are regional trips with lengths between 150 miles and 700 miles. Slightly more than a quarter of trips (29 percent) are classified as long-haul (over 700 miles), while a similar share (27 percent) are short-haul trips (less than 150 miles). Owner-operators tended to have more long-haul trips (54 percent of trips) compared to other carriers (12 percent of trips). Given that the owner-operator survey was conducted at a truck stop facility, which is generally used for drivers on longer hauls, the higher share of long-haul trips for owner-operators is expected.

Respondents estimate that 35 percent of their total annual vehicle-miles traveled (VMT) are driven in North Carolina. Of that 35 percent, an estimated 43 percent of those miles occur on I-95. Taken together, these figures indicate that 14.7 percent of respondents' total annual VMT are driven on I-95 in North Carolina. Some respondents are extremely reliant on I-95 in North Carolina, as demonstrated in Figure 8.3. Approximately one in six respondents utilize I-95 for at least a quarter of their annual VMT, making I-95 a critical corridor for these industry stakeholders.

Figure 8.3 Distribution of Annual Vehicle-Miles Traveled on I-95 in North Carolina

What percent of your annual miles are driven in North Carolina on I-95?



Source: North Carolina I-95 Trucking Industry Survey.

This relatively high share of VMT is likely due to the location of industry facilities along the I-95 corridor, particularly in North Carolina. Over three

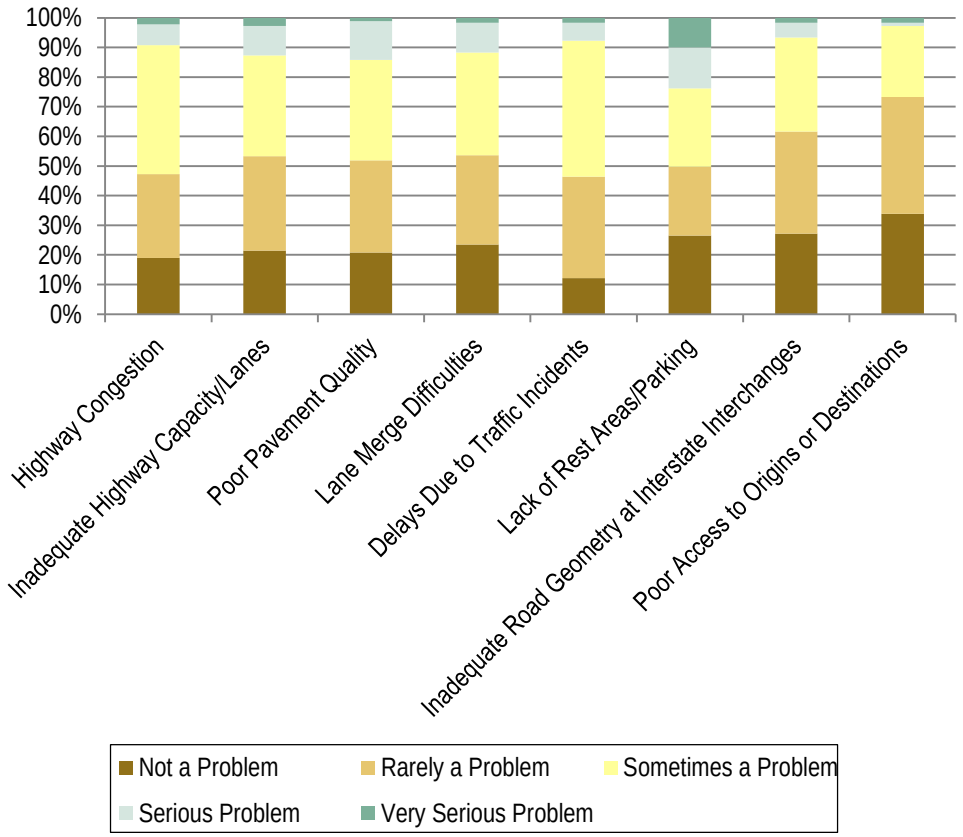
quarters of respondents (77 percent) to the carrier survey indicate that their company has facilities in North Carolina and most of those facilities (75 percent) are within 50 miles of I-95. Fayetteville, Wilson and Selma were the most commonly cited facility locations. Regardless of whether or not company facilities are located in North Carolina, most of the respondents use the corridor to service their customers. A majority (81 percent) of combined respondents indicate that they have key customer origins and destinations along the I-95 corridor in the southeast.

Condition of I-95 in North Carolina

Generally speaking, respondents indicate very few serious problems on I-95 in North Carolina, as shown in Figure 8.4. The issue of least concern is poor access to origins and destinations, with only 2.8 percent of respondents believing that to be a very serious or serious problem. A lack of rest areas and/or parking for trucks is the top concern, with 23.8 percent of respondents indicating that is a very serious or serious problem. A shortage of safe truck parking is a national problem for the trucking industry and was recently ranked the number eight issue on ATRI's annual survey of top trucking industry issues.[17] However, while less than 10 percent of the respondents felt that delays due to traffic incidents were a serious or very serious problem, over half mentioned that delays due to traffic incidents was either sometimes a problem or worse.

[17] American Transportation Research Institute. *Critical Issues in the Trucking Industry – 2012.* October 2012.

Figure 8.4 Industry Attitudes on Current I-95 Condition in North Carolina
Do any of the following conditions present a problem when traveling on I-95 in North Carolina?

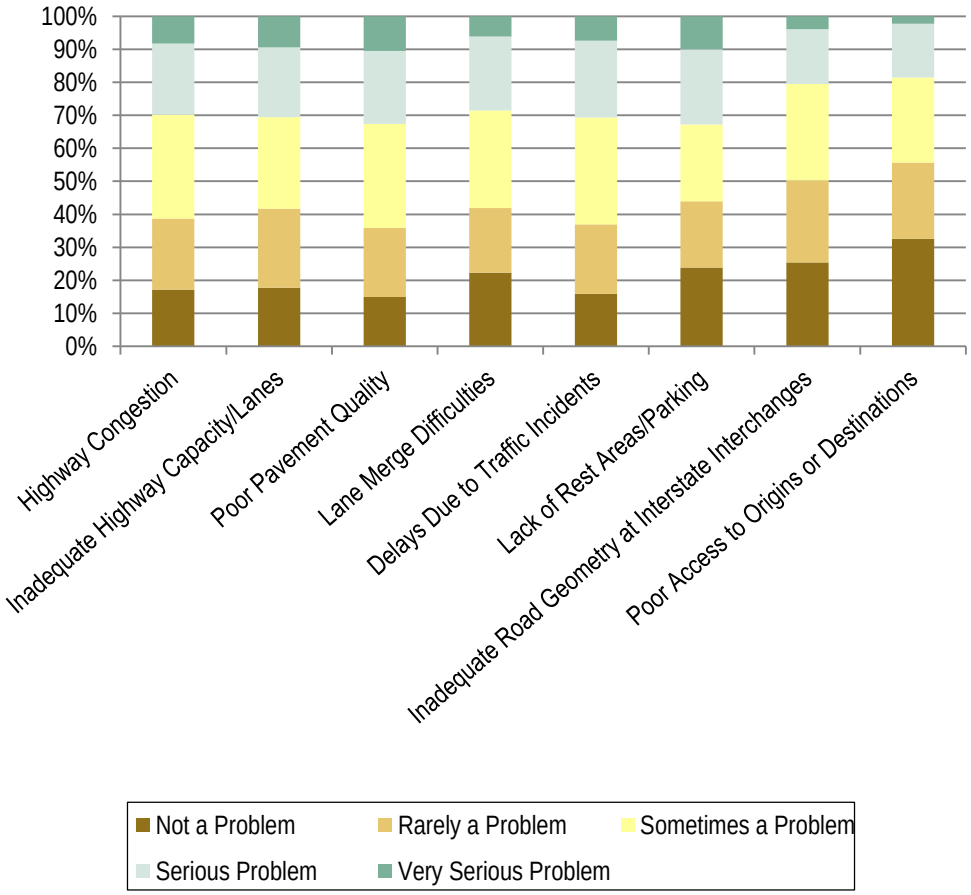


Source: North Carolina I-95 Trucking Industry Survey.

Respondents were then asked if the same set of issues would be a problem in 5 to 10 years if no major improvements to I-95 were made during that period. As indicated in Figure 8.5, each condition is generally expected to become a more serious problem without major improvements. Once again, lack of rest areas is of most concern with 32.8 percent indicating they expect this issue to be a serious or very serious problem in 5 to 10 years. Poor pavement quality is a close second with 32.6 percent indicating this will become a very serious or serious issue. Issues such as highway congestion, delays due to traffic incidents, lane merge difficulties, and inadequate highway capacity was also thought to be a serious or very serious problem by around 30 percent of the respondents. Poor access to origins and destinations is again the issue of least concern, with 18.5 percent of respondents rating that issue as serious or very serious.

Figure 8.5 Industry Attitudes on I-95 Condition in North Carolina in 5 to 10 Years

Without major improvements, will any of the following conditions present a problem 5-10 years from now when traveling on I-95 in North Carolina?



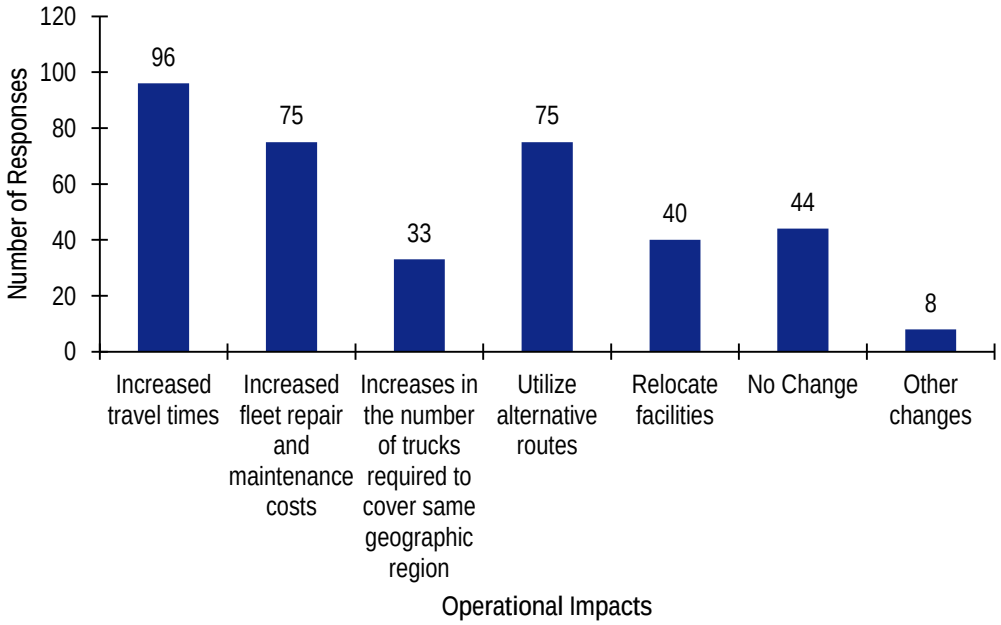
Source: North Carolina I-95 Trucking Industry Survey.

Respondents also had the opportunity to list up to four specific problems with traveling on I-95 in North Carolina. Issues related to tolling were listed most frequently, constituting 45.3 percent of all specific issues listed. Congestion was the second-most noted issue, with 23.4 percent of responses. Pavement quality (9.4 percent) and lack of parking (7.8 percent) were the only other issues to be mentioned by more than two respondents.

Many respondents expect negative operational impacts if major improvements along the corridor do not occur over the next 5 to 10 years. As reflected in Figure 8.6, the most expected impact is an increase in travel times, which was chosen by 57.8 percent of respondents (N = 166). Increased fleet repair/

maintenance costs and utilization of alternative routes are the second-most popular responses, each chosen by 45.2 percent of respondents.

Figure 8.6 Operational Impacts with No Major Improvements on I-95
If improvements to capacity, bridge clearances and interchange redesign are not undertaken on I-95 in NC in the next 20 years, what are the likely impacts on your operations?



Source: North Carolina I-95 Trucking Industry Survey.

There is some variation in responses when comparing long-haul operators to short-haul operators. For carriers that primarily perform long-hauls, 52 percent expect increased repair and maintenance costs would occur if there were no major improvements to I-95 in the next 5 to 10 years. That figure is only 32 percent for short-haul operators. This difference is likely a result of varying exposure levels to I-95 travel based on length of haul. Shorter haul carriers will generally spend less time on I-95, while longer haul carriers will spend more time on I-95. If I-95 pavement quality deteriorates, carriers with more miles on I-95 will see the greatest maintenance impacts.

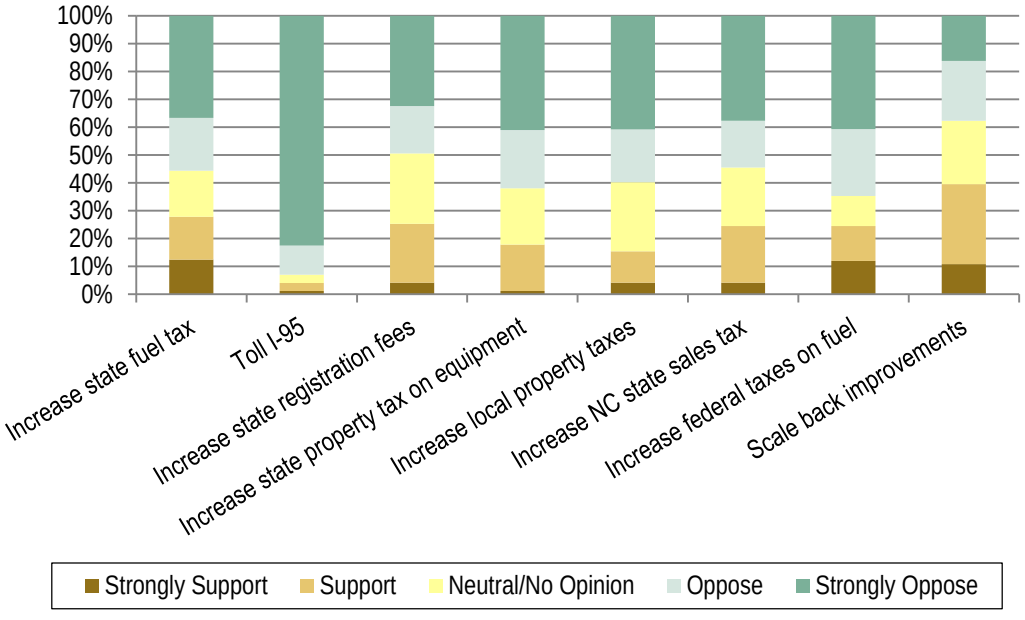
Another area of difference when comparing long-haul and short-haul carriers is on the relocation of facilities. A higher share of long-haul operators (33 percent) expect to relocate facilities compared to short-haul operators (5 percent) if no improvements are made to I-95 in the next 5 to 10 years. This divergence is expected given that short-haul carriers would have to completely relocate their operations to avoid I-95. Conversely, long-haul operators have a more dispersed operational footprint that would generally only require a partial relocation, thus making relocation easier.

Similar divergences exist when comparing owner-operators to fleet carriers, with a higher share of owner-operators expecting increased repair and maintenance costs and facility relocation. These discrepancies can largely be attributed to similar causal factors as found in the long-haul versus short-haul comparison. Owner-operators tend to operate on longer hauls and have more flexible operations, subjecting them to greater I-95 exposure and allowing them to more easily relocate.

Proposed Improvements to I-95 in North Carolina

To gauge support for several different infrastructure improvement funding options, respondents were asked if they support or oppose a particular option. As shown in Figure 8.7, scaling back the proposed improvements is the option with the most support and is the only option with a positive favorability rating (i.e., those who support outnumber those who oppose). However, with a favorability rating of only 1.8 percentage points, support is far from unanimous. While 39.5 percent of respondents support or strongly support scaling back improvements, 37.7 percent of respondents oppose or strongly oppose that option. There is more agreement on the least-supported options. Tolling I-95 is the least popular option with 93.0 percent of respondents stating that they oppose or strongly oppose tolling I-95 to fund infrastructure improvements along the corridor. Only 4.1 percent support or strongly support tolling I-95.

Figure 8.7 Support for I-95 Infrastructure Improvement Funding Options
What is your level of support for each of the following improvement options on I-95 in North Carolina?



Source: North Carolina I-95 Trucking Industry Survey.

The next several questions dealt with industry usage of toll roads. Most respondents (64 percent) indicate that their company does not have specific policies regarding toll road usage. However, the majority of respondents (63 percent) indicate that their company uses toll roads in North Carolina or other states. Generally, those that use toll roads are unable to avoid them based on operations in areas with extensive tolling (e.g., New York, New Jersey) or a lack of viable alternative routes. Those that do not use toll roads indicate they are able to avoid toll roads and do so to save on costs. On average, respondents estimate that they pay $15.63 in toll costs per 1,000 VMT. As discussed in Chapter 7, the national average for for-hire trucking companies was $17.20 in toll costs per 1,000 VMT in 2011.[18] The lower cost among survey respondents is expected given the relative lack of tolling in North Carolina and the southeast compared to other parts of the nation.

The industry utilizes a variety of methods to cover tolling costs. According to respondents, approximately half (50 percent) of toll costs are ultimately covered by trucking companies, with 37 percent of toll costs covered by drivers and the remaining 13 percent covered by shippers or other sources. The low share of tolling costs that are covered by shippers or other sources is indicative of the difficulty the trucking industry faces when trying to pass along the cost of tolls to customers.

Impact of I-95 Funding Mechanisms

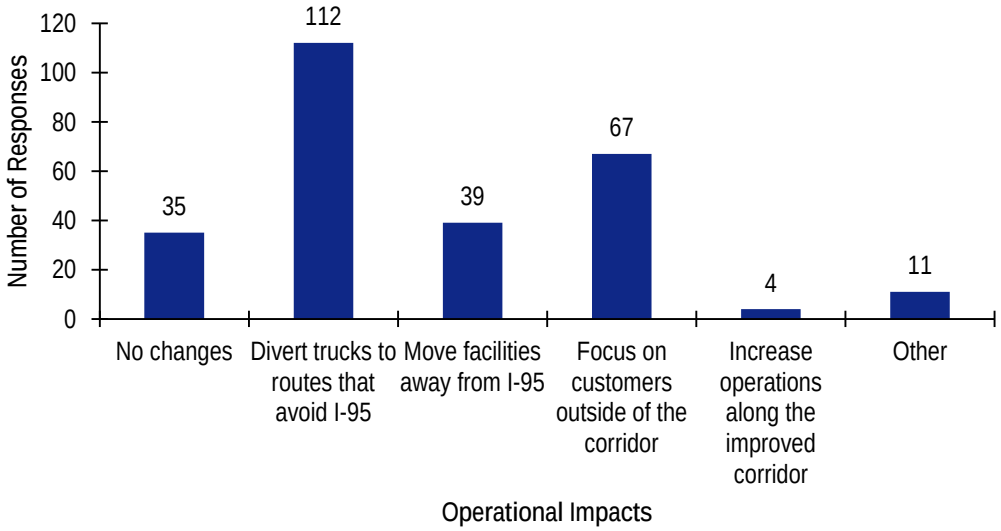
Respondents were asked a series of questions on how the proposed mechanisms for funding I-95 improvements would likely impact their operations. If I-95 were tolled to pay for improvements, the most commonly cited operational impact was to divert trucks to other routes that avoid I-95. Over two-thirds of respondents (69 percent) believe that they or their company will avoid I-95 if it is tolled. Figure 8.8 shows the frequency of responses for each operational impact (N = 163). A change in focus toward customers outside the I-95 corridor was also mentioned often, with 41 percent of respondents anticipating that impact.

Generally, responses were similar when comparing long-haul carriers to short-haul carriers. The lone major divergence in opinion centers around focusing on customers outside of the corridor. While 38 percent of long-haul respondents anticipate they would refocus on customers outside of the corridor if tolls were implemented, only 9 percent of short-haul respondents expect that same impact. The differences are even greater when analyzing owner-operator responses compared to fleet responses. Over half (52 percent) of owner-operators indicate they would focus on other customers compared to only 22 percent of fleet respondents. These differences are largely explained when understanding the operational context of these industry sectors. Short-haul carriers generally

[18] American Transportation Research Institute. *An Analysis of the Operational Costs of Trucking: A 2012 Update*. September 2012.

concentrate on one geographic area and fleet carriers have significant facility investments. In contrast, long-haul carriers have a more dispersed operational pattern and owner-operators have very few facility investments. Therefore, short-haul carriers, as well as fleet carriers, tend to be less flexible compared to long-haul carriers and owner-operators which would allow them to more easily focus on customers in other areas.

Figure 8.8 Operational Impacts Due to Tolling
If I-95 was improved and tolls were used to pay for those improvements, what changes would you consider?



Source: North Carolina I-95 Trucking Industry Survey.

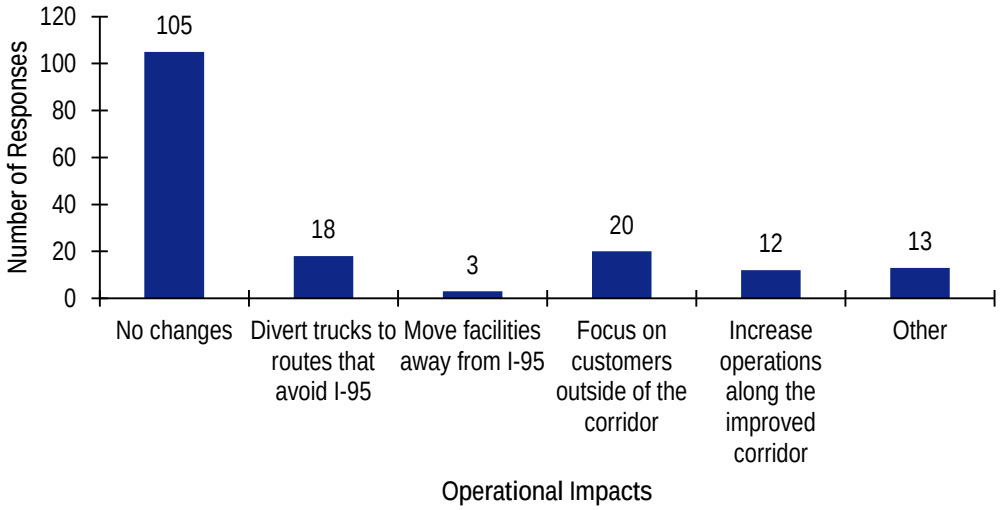
Respondents were asked to specify the route(s) they would use to divert from a tolled I-95. The most commonly cited alternate route was U.S. 301, which was chosen by two-thirds of respondents (67 percent). The only other routes to be mentioned by more than 10 percent of respondents were I-85 (16 percent), U.S. 17 (13 percent), U.S. 64 (11 percent), and I-81 (11 percent).

Another question regarding the operational impacts of tolling dealt with the ability to pass along toll costs to customers and/or shippers. Overall, 47 percent of respondents indicate they do not believe they would be able pass along a toll cost to customers or shippers. Only 16 percent believe they would be able to fully pass along the cost of a toll, while another 16 percent believe they could partially pass on the cost. The remaining 21 percent are unsure. As expected, responses varied somewhat between carriers and owner-operators. Over half of owner-operators (54 percent) do not believe they could pass on the cost of a toll, compared to 34 percent of carriers.

Respondents were also asked to anticipate the operational impacts resulting from raising fuel or property taxes in order to pay for I-95 improvements. As

Figure 8.9 demonstrates, most respondents (71 percent) do not expect to not make any changes to the way they utilize I-95 if fuel or property taxes are increased (N = 149). The next most popular response, focusing on customers outside the I-95 corridor, was only chosen by 13 percent of respondents.

Figure 8.9 Distribution of Operational Impacts Due to Higher Taxes
If I-95 was improved and increased fuel or property taxes were used to pay for those improvements, what changes would you consider?



Source: North Carolina I-95 Trucking Industry Survey.

Summary on Trucking Industry Surveys

ATRI received 210 responses to the survey from trucking industry stakeholders that utilize the I-95 corridor in North Carolina. The responses came from both motor carriers and owner-operators, representing diverse operational sectors and fleets of varying sizes. For the respondents, I-95 in North Carolina is a critical goods movement corridor, representing 14.7 percent of total annual VMT. The corridor is crucial for reaching industry logistics facilities within North Carolina as well as for servicing customers throughout the southeast.

Generally, respondents do not feel there are currently many serious operational issues along I-95 in North Carolina. However, the respondents do recognize that without major improvements, corridor conditions will deteriorate over the next decade, likely leading to increased travel times. Despite the recognized need for improvements, there is little consensus among stakeholders regarding the best way to pay for upgrades to I-95. Only one funding option, scaling back improvements, received a positive favorability rating (+1.8 points). Tolling is the least preferred option, with 93 percent opposition. Over two-thirds of respondents (69 percent) indicate they will avoid I-95 if it is tolled. While increasing fuel and property taxes also have strongly negative favorability

ratings (e.g., 28 points for increasing state fuel tax), most respondents (715 percent) indicate those increases would not lead to any changes in I-95 utilization in North Carolina.

8.2 MOTOR CARRIER INTERVIEWS

ATRI also led the interviews of motor carriers including 15 in-person and phone interviews of trucking companies based in or near North Carolina. The interview guide sought carrier opinions on the level of service along the corridor and the proposed funding mechanisms for improvements to I-95 in North Carolina. The interviews were completed over a two-week period in December of 2012.

ATRI developed an interview guide to obtain carriers' opinions on the economic issues and impacts associated with the proposed plan to improve I-95 in North Carolina. The interview guide included topics such as demographic and operational information, level of service required/desired from I-95, impacts of the funding options for the proposed improvements as well as a section focusing solely on tolls. The interview guide was designed to be used in conjunction with the "I-95 Economic Impact Assessment" motor carrier survey which was available on-line from November 6 through December 12, 2012.

Potential interviewees were identified from the survey responses,[19] ATRI's database of motor carrier contacts, and in coordination with the North Carolina Trucking Association. The North Carolina Trucking Association is also a member of the project's Advisory Council. If they had not already done so, carriers were asked to complete the on-line survey prior to the interview and the survey responses were used to pre-populate the interview guide. The interviews typically lasted 30 to 45 minutes.

In most cases, two researchers participated in each interview, with one staff member leading the interview and the other taking notes. After each discussion, all of the notes were reviewed and interviewees were contacted to clarify responses as needed.

Demographics

The interviewees represented the following industry sectors:

- Private fleets (6);
- For-Hire Specialized (5);

[19] Respondents to the motor carrier survey were given the option of providing their contact information if they were interested in providing additional information for the research study.

- Truckload (3); and
- Less-Than-Truckload (1).

All but two of the carriers were based in North Carolina and four had facilities located within 10 miles of the I-95 corridor. Fleet size ranged from four power units for a specialized tanker carrier to over 2,000 units for a large less-than-truckload (LTL) carrier. The majority of carriers interviewed use employee drivers. Only one carrier reported employing owner-operators.

Key Findings from Trucking Interviews

I-95 Level of Service. Opinions were mixed on the current I-95 level of service, with some carriers noting that it is currently in "acceptable" condition and others pointing to specific system deficiencies. Poor pavement quality was the most prevalent problem that the interviewees mentioned. Several respondents pointed to the segment of I-95 from Lumberton to Dunn (passing through Fayetteville) as the section most in need of improvements.

A lack of truck parking was also noted by participants. Parking shortages can result in safety hazards for commercial drivers who are forced to park in unsafe or illegal areas when required to obtain their Federally mandated hours-of-service rest breaks. Additional issues included delays due to traffic incidents, congestion on holidays and summer weekends, and inadequate roadway geometries (narrow travel lanes and shoulders, and entrance ramps that are too short). Several carriers recommended adding additional travel lanes to address the delays caused by accidents and holiday travel patterns.

When asked about improvements to the corridor that would allow for increased speeds, several interviewees indicated that their fleets are governed. Many motor carriers utilize a device in their vehicles that limits the top speed of the truck in order to improve safety and fuel economy. A number of the respondents noted that because their fleets are speed limited/governed, higher free-flow speeds or posted speed limits resulting from the proposed improvements would not be of benefit to their operations.

Funding Options for I-95 Improvements. All but one of the carriers interviewed oppose tolling I-95 to fund the proposed improvements. The administrative costs associated with tolls were viewed as too high by the interviewees and many thought that they would unfairly burden businesses and residents located along the corridor.

Eight of the interviewees support raising the state fuel tax rate as a funding mechanism. Fuel taxes are a "tried and true" collection system and the infrastructure is already in place for this funding option. Several carriers mentioned, however, that North Carolina already has one of the highest state diesel fuel tax rates in the U.S. and would not approve of further increases.

It should be noted that while none of the funding options were viewed very favorably by the carriers, most agreed that the I-95 corridor in North Carolina will need improvements in the next 5 to 10 years.

Tolls. The majority of carriers do not have a formal company policy regarding the use of toll roads but most indicated that they avoid using toll roads when possible for financial reasons. Consistent with this view, many of the respondents would divert their company trucks off of I-95 if it were to become tolled. The most commonly cited alternate route was U.S. Route 301.

Nearly all of the carriers interviewed would be unable to recoup toll fees. Private carriers have no one but their customers to pass additional costs on to and many noted that they would be unable to raise the prices of their products enough to recover the fees and remain competitive. For-hire carriers typically do not include toll fees as line items in their contracts and are therefore unable to charge shippers for the actual tolls incurred on a trip. LTL carriers have an even greater challenge in that they typically move goods for several customers with each trip and would have to incrementally charge each customer for a portion of the toll.

Several interviewees also noted the impact that tolls would have on their employees' commute to and from work and how the tolling of I-95 would likely result in those employees diverting to other routes for their commute.

Additional Comments. Several carriers thought that tolling the I-95 corridor in North Carolina would hurt the local economies along the Interstate. Many drivers will likely divert off of the route if it becomes tolled and the drivers who do remain on I-95 may be less likely to exit once they have paid a toll. Toll roads also typically limit access to/from the corridor which in turn will further reduce traffic to local businesses.

Since a significant portion of the I-95 traffic may divert to alternate routes, a number of the representatives questioned whether the nearby roadways were designed to handle increased traffic, particularly increased truck traffic.

Many of the interviewees also believed that it was not fair to place the burden of financing improvements to an Interstate on local residents and businesses. Historically, all drivers pay for highway projects through fuel taxes, and other, related taxes and fees. Accordingly, the interviewees believe that highway funding discussions should take place at a national level, not state or local.

It was also noted by several carriers that if additional funding is ultimately raised through one of the proposed mechanisms, those funds should be required to be spent on highway projects.

8.3 SHIPPER INTERVIEWS

The shipper interview process occurred between November and December of 2012. Most of the interviews occurred in-person with consulting staff visiting the offices of the interviewees. A few of the interviews occurred over the phone.

The 23 interviews covered a wide range of shipper stakeholders including agricultural associations, meat and food processors, logging and timber interests, small and medium-sized farmers, aggregate-related companies, and distributors of retail goods.

The key conclusions from the shipper interview process are as follows:

- There is general agreement that additional capacity and major maintenance upgrades are needed on I-95 in the medium-term. This means that they would need to occur in the next 10 to 15 years.
- Raw agricultural and timber goods have high levels of east-west flows that do not use I-95. These industries can often also take advantage of higher weight allowances on the state highway system and therefore sometimes avoid using I-95 today to enable them to carry these heavier loads. These truck trips would not be directly impacted by operational conditions or tolls on I-95.
- Finished food and wood products have both east-west flows (primarily using I-40 and U.S. 64) along with north-south flows that use I-95. I-95 is seen as critical for getting goods to their customers and for receiving some of their necessary supplies.
- Other sectors (non-food/farm, non-logging/wood) rely heavily on I-95 to deliver goods and to receive supplies. Many of these companies felt that they are captive to the operational performance of I-95 as utilizing U.S. 301 for long-haul shipments was not deemed as feasible.
- Transportation costs are relatively low for shippers. Most reported between 2 to 4 percent with most leaning towards 2 percent. Some of the smaller farmers did not have transportation as even a line item in their annual crop budgets. The only industries found to be higher than this range were in the aggregate industry.
- Opinions on tolling varied, but generally large shippers were less concerned than small shippers. Many of the large shippers were accustomed to paying tolls in other regions and felt that the preservation of the operational performance of I-95 was critical and that a toll would not impact their operations. However, many of the smaller shippers stated that they would divert away from a tolled facility. Oftentimes, the increased travel time of the alternative routes would not impact their operations. Several other shippers said that they would have to sit down "with a pen and paper" and calculate the benefits and costs of using the toll road.
- Most formal associations are opposed to tolls. Some have formal policies against tolls, but they can often review these policies on an annual basis. However, when interviewing members within these organizations, a range of opinion about tolling was evident. The range was from opposition to tolling to ambivalence about tolling.

- There was significant opposition to increased property or income taxes. Many believed that this would be unfair to property owners and the overall economy. There was a general sentiment that users of the highway system should pay based on actual usage. This was particularly noteworthy for agricultural companies that owned large pieces of land as part of their daily operation.
- There were no new funding sources identified through the shipper interview process.
- Most shippers have not considered the impact of congestion on I-95 to their operations. However, upon further discussion, it was understood that this would be a cost to their operations as well.
- Providing a frequent I-95 user discount was viewed very favorably under a tolled scenario. Opposition to tolling softened considerably when discussing potential discounts for frequent users.

8.4 MOTOR CARRIER FOCUS GROUPS

ATRI led three motor carrier focus groups for this study. The focus groups were designed to solicit detailed opinions on the level of service along the corridor and the proposed funding mechanisms for improvements to I-95 in North Carolina. The focus groups were completed over a two-day period in February 2013 and were held in Fayetteville, Roanoke Rapids, and Greensboro. A total of 32 people attended the three focus groups (excluding observers). Each focus group had at least two representatives from the consultant team, along with other observers from the NCDOT and the NCTA.

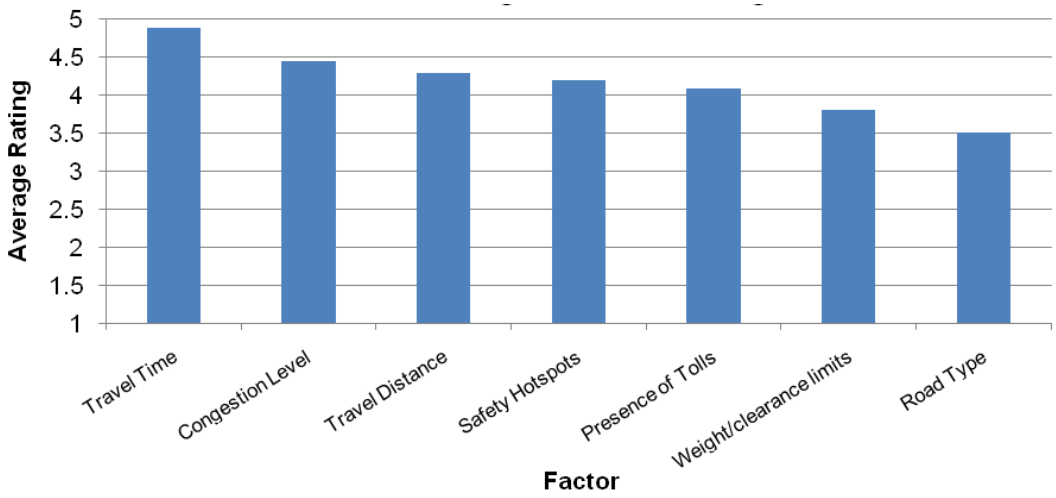
A focus group guide was developed by the consultant team to facilitate the discussions. The focus groups were designed to discuss topics such as routing, quality of I-95 in North Carolina, need for I-95 improvements, and funding options for I-95 improvements. In addition to group discussions, three worksheets were handed out during the focus groups to solicit individual responses. Each focus group lasted approximately 90 minutes. Similar to the interview process, potential participants were identified using ATRI's large database of motor carrier contacts, along with coordination from the NCTA.

Discussion on Routing Decisions

To understand the motor carrier perspective, the focus group conversations touched on industry operations. Each participant was asked to rate a series of factors on how important it was to them when making routing decisions (1 = not important, 5 = very important). As Figure 8.10 shows, travel time received the highest average score (4.9) while road type (number of lanes, access control, etc.) received the lowest average rating (3.5). One important factor not listed as an option, while implied, was cost. Participants noted that the final decision on routing is routinely made by using some type of benefit/cost analysis. Given

that all factors received relatively high ratings, cost usually becomes the key dynamic. Nearly all participants planned their routes ahead of time and generally did not like for drivers to deviate from those routes.

Figure 8.10 Importance of Each Factor on Routing Decisions
5 Being Very Important



Discussion on I-95 Usage and Conditions

Participants varied in their operational dependence on I-95. As Table 8.2 shows, half of respondents utilized I-95 for less than a quarter of their operations. However, 28 percent of participants relied on I-95 for over three-quarters of their mileage.

There was consensus across the focus groups that North Carolina roads are usually in better condition than the roads of other states. This perception of high quality was particularly pronounced when compared to roads in northeastern states. Most respondents did not identify any specific quality issues on I-95, although a few did note that certain roadway segments were somewhat outdated compared to other Interstates in North Carolina.

Generally speaking, most participants felt that I-95 does not suffer from any severe problems. Congestion was reported to be relatively minor, particularly when compared to other Interstates in the State such as I-85 and I-40. Most respondents indicated that the only congestion issues occurred as a result of traffic incidents and those seemed to be most frequent during holidays when passenger vehicle travel increases. The only other problem that was mentioned often by participants was a lack of truck parking along the corridor.

Given a lack of perceived issues on I-95, most participants felt that investments in improvements would be better suited for other highways in the State. However, there was a general expectation that volumes would steadily increase on I-95, necessitating capacity increases and other upgrades in the mid- to long-term.

Table 8.2 Distribution of Participant Dependence on I-95

Dependence	Share of Participants
Over 90%	11.1%
75-90%	16.7%
50-75%	5.5%
25-50%	16.7%
Less than 25%	50.0%

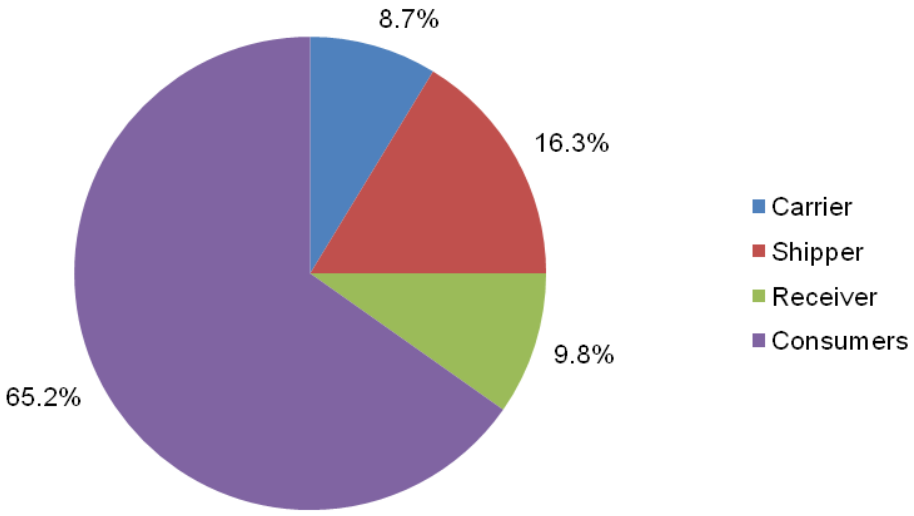
Discussion on Infrastructure Funding Options

There was no consensus among participants on the best way to pay for transportation improvements. The most common opinion was that the existing fuel tax is the easiest method for collecting funds and that raising the fuel tax would work in the short-term. However, many were reluctant to raise the fuel tax for several reasons, including an already high diesel tax in North Carolina, worry that the fuel tax funds would go to nonroad projects, and a decline in fossil fuel dependence.

Tolling was generally opposed by the participants. There was concern that a toll would have serious negative consequences on the local economy and the impacts would be felt beyond the trucking industry. Given a hypothetical 30 cents per mile toll, most participants expected there would be diversion onto nontolled roads such as U.S. 301, I-85, U.S. 70, NC 43, and NC 48. It was expected that this would cause increased congestion on alternate routes. There was further concern that in addition to local diversion from I-95, there also could be some business relocation to other states without tolling. Actual decisions on diversion or relocation would be determined based on benefit/cost analyses once the financial impact of tolling became clearer.

Despite worry over increased costs to local businesses, most participants expect the majority of the cost burden to ultimately fall on consumers if I-95 is tolled. Carriers were asked to estimate what percent of the cost burden would be paid by carriers, shippers, receivers, and consumers. As Figure 8.11 illustrates, the average response was that consumers would shoulder 65.2 percent of the toll cost.

Figure 8.11 Share of Toll Cost Burden
Who will bear the burden of the toll?



Summary Thoughts

Overall, it appears that participants did not find I-95 to be particularly in immediate need of improvement. However, there did seem to be an acknowledgment that parts of the road are outdated and the corridor will eventually be in need of an upgrade as demand slowly increases. Congestion was reported to be worse on other Interstates in the State and many respondents felt that I-85 and I-40 should see investment before I-95.

Participants were not in agreement over how to pay for future road investments. While many felt the fuel tax was the most efficient manner to raise funds, there was some skepticism over increasing taxes. Tolling was generally not favored as it was viewed as having a negative impact on the local economy. Many participants stated that they expected tolling would result in the diversion of trucks onto alternate routes along I-95 as well as possible business relocations to other states. However, participants acknowledged that final decisions would be based on benefit/cost calculations.

8.5 SHIPPER FOCUS GROUPS

There were over 45 attendees in total at four shipper focus groups: 8 in Rocky Mount and Raleigh, 7 in Fayetteville, and over 20 at an agriculture-themed focus group in Raleigh. In total the attendees represented a wide range of businesses including agriculture, loggers, food processors, pharmaceuticals, aggregates and manufacturers. There were some motor carriers in attendance as well.

Summary Highlights of Group Discussions

- There was a wide range of opinion about the need to improve I-95. Most of the participants in Rocky Mount and Raleigh believed that significant improvements including additional capacity would be needed in the next 10 to 20 years. However, many participants in Fayetteville did not think that additional capacity would be needed even looking out 10 to 20 years.
- There is the perception by some that I-95 does not handle crashes well – both in terms of incident clearance times and notification of I-95 drivers to use diversion routes.
- An average operating speed on I-95 of 45 mph is a general threshold that would force shippers and truckers to change their operations. These changes in operations can include increasing their rates or prices charged to customers, decreasing their output, relocating facilities, or changes in expansion location considerations. Table 8.3 shows the number of participants that changed their behavior based on decreasing travel speeds on I-95.
- A $20 toll per trip on I-95 is the general threshold where truckers would start to attempt to pass on the costs to customers or start looking for diversion routes. Otherwise they would absorb this cost into their operations. Table 8.4 shows the number of participants that changed their behavior based on increasing toll levels along I-95. Attendees were told that tolls would be used to fund capacity, maintenance and upgrade projects along I-95.
- Many of the attendees felt that their businesses have sufficient fixed costs that they would not move their operations. However, they thought it could hurt potential new business to the State and that it would impact where they would consider future expansions in their operations.
- There is a lot of doubt that tolls raised on I-95 would only be used on I-95. There is general questioning of what happens with transportation revenues, because of the amount of transportation money that is currently transferred to the general fund. There is also a general belief that NCDOT (and other state agencies) do not use their currently allocated resources efficiently.
- Many participants were open to alternative funding sources besides just fuel tax. Sales tax is seen as a viable alternative to fuel tax. It is preferable in many ways because it will not decrease over time due to fuel efficiency. However, as mentioned by one participant, one negative of using a sales tax is that it allows "through-state" drivers to use North Carolina roads without paying for them.
- Several of the participants mentioned that a toll on I-95 would put them at a disadvantage in competing for business off of the corridor. For example, it will cost them more money to reach Raleigh customers relative to competitors located in Greenville due to the fact that as users of I-95 would have to pay a toll twice to access these customers. If both the pickup and delivery happened away from I-95, they would be significantly disadvantaged.

- Mitigation for locals was viewed favorably by most participants. However, one participant described it as a "slippery slope" that would eventually allow for greater taxation of local residents.

Summary Worksheet Results

Participants of the focus groups were asked to complete worksheets during the focus group to record their behavior in response to alternative operating conditions on I-95 and to roughly gauge their perspectives on alternative funding sources for transportation and which party would bear the burden of tolls on I-95 if that alternative were pursued.

Table 8.3 shows that 45 mph is the speed at which shippers would alter their operations. The most common change is to use alternative routes. 18 of the 23 participants mentioned route diversion as an operational change if average speeds on I-95 dropped to 45 mph. Secondarily, the reduced operation option was the second most common operational change with 11 participants stating that they would reduce operations if average speeds declined to 25 mph. Only 5 of the participants said that they would relocate outside of North Carolina under these circumstances. This is consistent with the group discussions which mentioned that fixed costs would keep existing businesses from relocating.

Table 8.4 shows that $20 per trip is the average toll amount at which significant diversion away from I-95 occurs. 17 of the 23 participants stated that they would divert away from I-95 under this toll scenario and 10 would divert some traffic to rail. Given that the average trip on I-95 is relatively short (30 to 40 miles), a $20 toll is a reasonable average dollar per mile diversion threshold. Under the extremely high toll level of $100 per trip, over half of the participants stated that they would consider reducing their current operations or foregoing expansion along the I-95 corridor.

Table 8.5 shows that perspective of the participants in regards to who would pay the burden of toll if it were used as a funding source for improvements on I-95. On average, it was believed that over half (57 percent) of the burden would fall to the end customers. On average, it was believed that between 10 and 20 percent of the burden would fall to the trucking company, the shippers and the receivers with only 2 percent being paid by truck drivers.

Each participant was also asked the percent of statewide transportation that should be funded from alternative sources. The average percentages are shown in Table 8.5. Several of the participants used this worksheet as an opportunity to note that they felt that the primary funding issue was NCDOT (and other state agencies) efficiently using existing funding. This resulted in a high percentage (38 percent) of "Other" responses. However, fuel taxes, sales taxes and tolls were the top three revenue sources cited by participants. This is consistent with the group discussion where revenue sources other than fuel taxes were generally seen as acceptable. Property taxes, income taxes, and VMT taxes received very low response percentages.

Table 8.3 Response to Decreasing Average Speeds on I-95

Response to Use of I-95 under Alternative Average Speed Scenarios	Average Speed on I-95			
	55 mph	45 mph	35 mph	25 mph
Divert to Another Roadway	2	18	20	20
Divert to Rail	0	5	7	9
Reduce Operations	1	5	9	11
Forego Expansion of Operations	0	5	7	8
Relocate to Another North Carolina Location	1	5	5	5
Relocate Outside of North Carolina	1	4	7	8
Other	0	0	0	0

Table 8.4 Response to Increasing Toll Rates on I-95

Response to Using I-95 under Different Toll Amounts	Toll for "Typical Trip" at 65 mph				
	$1	$5	$20	$50	$100
Divert to Another Roadway	2	7	16	17	17
Divert to Rail	0	1	6	7	10
Reduce Operations	0	2	5	7	12
Forego Expansion Of Operations	0	2	7	9	12
Relocate to Another North Carolina Location	0	0	4	4	7
Relocate Outside of North Carolina	0	0	3	4	6
Other	0	0	0	0	0

Table 8.5 Average Response Percentages for Who Would Bear the Burden of a Toll

Respondent	Average Response Percentages
Truck Driver	1%
Trucking Company	15%
Shipper	11%
Receiver	18%
Customer	54%
Total	100%

Table 8.6 Average Response Percentages for Transportation Funding Sources

Funding Source	Average Response Percentages

Fuel Tax	27%
Tolls	19%
General Sales Tax	12%
Property Tax	3%
Income Tax	2%
VMT Tax	1%
Other	38%
Total	100%

8.6 SUPPLY CHAIN MAPS

The combination of stakeholder outreach activities conducted throughout the study allowed for the development of schematic supply chains to represent some of the major industries in the State. Figure 8.12 shows the supply chain map for hog production. It reinforces the conclusion that the raw inputs to hog farms tend not to rely on I-95, but that the finished and processed meat relies on I-95 to reach final customers along the eastern part of the U.S.

Figure 8.13 shows a schematic supply chain for soybeans. It also shows the prevalence of truck activity away from I-95. Soybeans tend to travel east-west around the state between farms and mills. After processing at the mills, some of the product is shipped to other farms for consumption by livestock. On occasion, soybean products are shipped out of state. However, more recently, North Carolina has been a net consumer of soybeans, so it has been more heavily reliant on rail brought in from the Midwest with an increasing amount of international imports to make up for drought conditions in the Midwest.

Figure 8.14 shows a schematic supply chain for logs, wood products and paper products. Much of the timberland in the study area is produced east of I-95 and travels west to wood and paper mills located along I-95 or near the Port of Wilmington. Some logs are shipped to out-of-state mills. Most of these products do not take I-95 because they travel east-west. The logs that could use I-95 often avoid it, so that they can utilize overweight shipments on state highways. However, products shipped from mills do not have this option and based on their longer travel distance tend to rely on I-95 heavily. Additionally, empty trucks returning to eastern North Carolina to pick up more logs often utilize I-95.

Figure 8.12 Supply Chain Map for Hogs

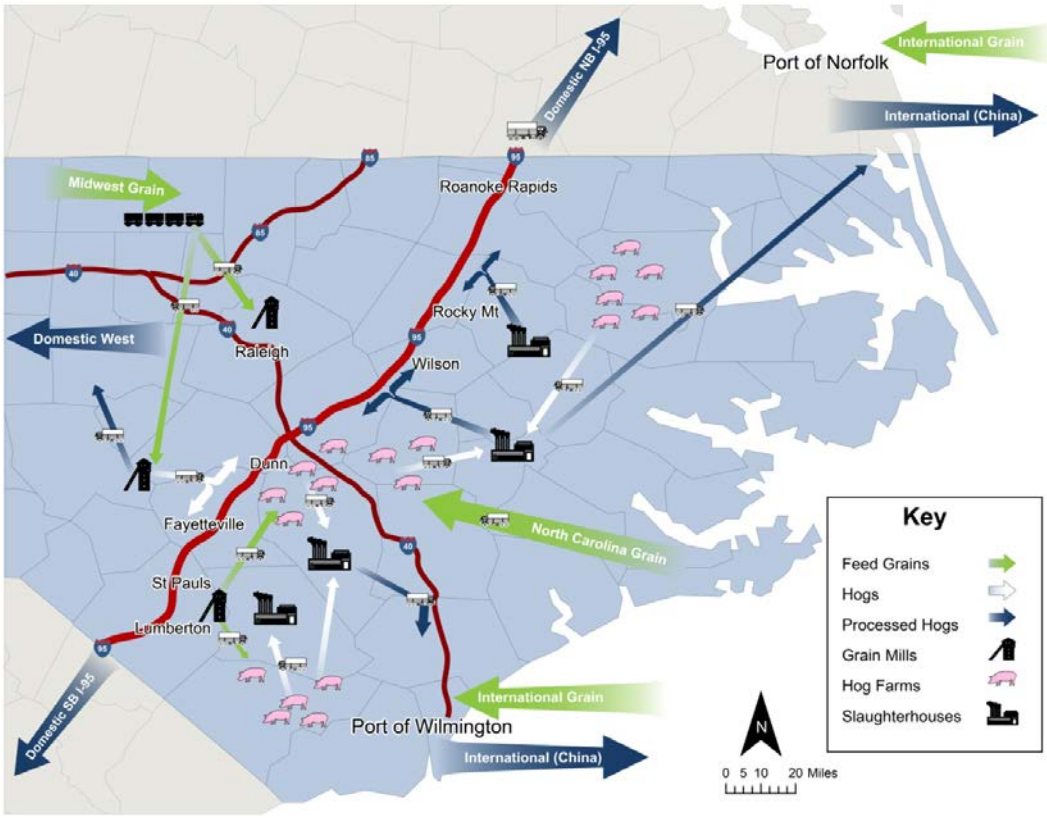


Figure 8.13 Supply Chain Map for Soybeans

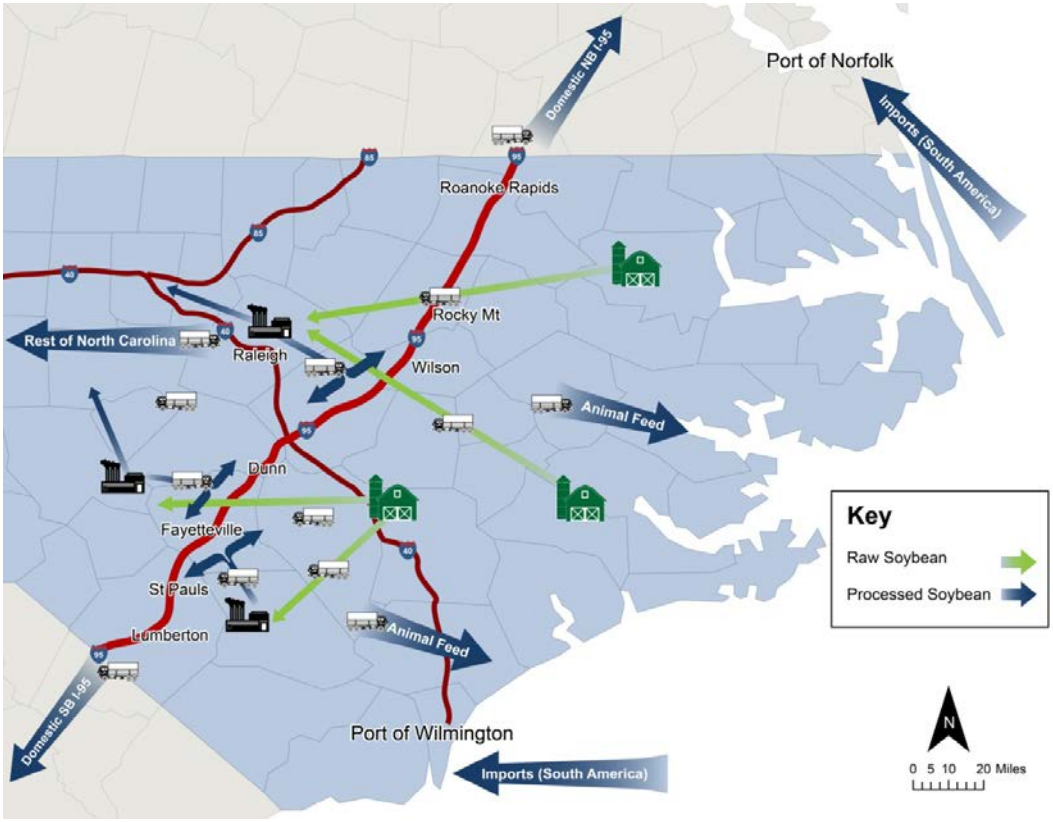
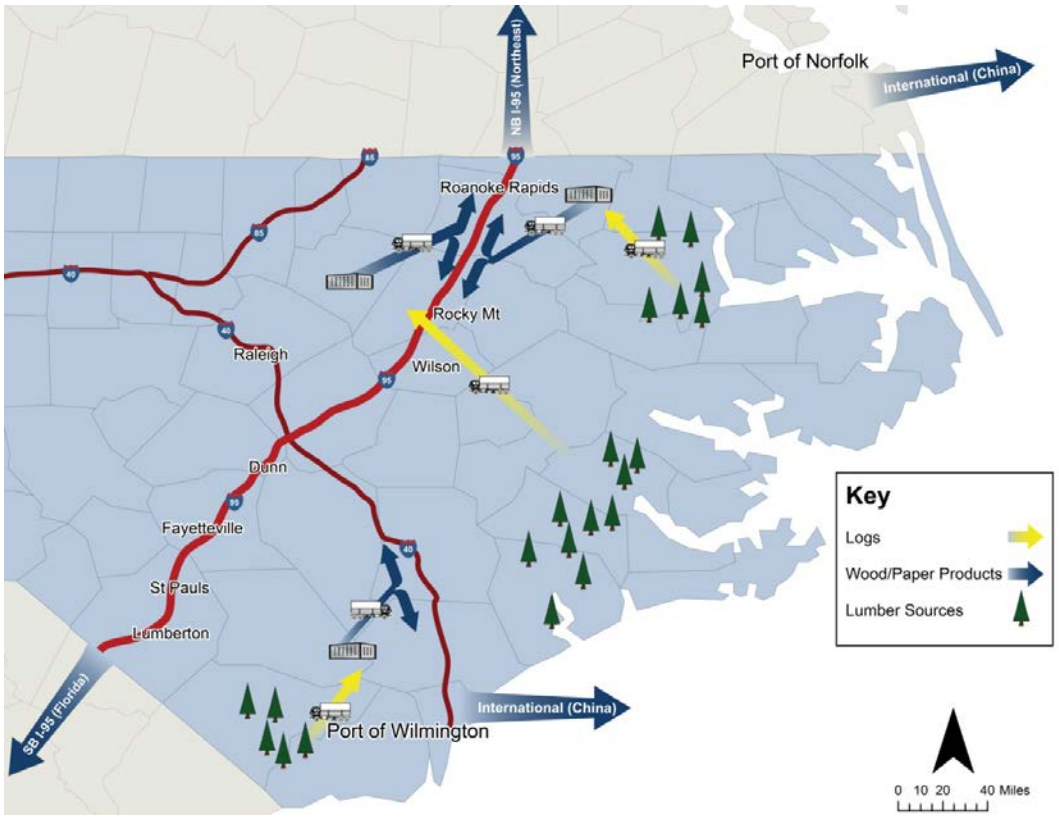


Figure 8.14 Supply Chain Map for Logs and Wood/Paper Products



9.0 Literature Review on Truck Response to Toll Roads

The following is a list of relevant, trucking industry-related resources related to transportation funding options and economic analysis of funding options (including tolling) for investment. Each of the eight entries contains a citation and a brief description of relevant content.

Document Reviewed – Reebie Associates; Atherton, Mease & Co., *The Impact of Tolls on Freight Movement for I-81 in Virginia: Examining the Potential Freight Diversion Impact of Tolling on I-81 in Virginia*. Final Report Prepared for Virginia Department of Rail and Public Transportation. April 2004.

This study sought to quantify the potential diversion rate for commercial vehicle traffic on I-81 in Virginia under several per-mile toll rates. The authors found that the number of trucks "diverted from I-81 increases approximately linearly with the cost of tolls per mile." The diversion impacts found by Reebie are shown in the Table 9.1 and Figure 9.1.

The study concludes that "the economic impact of Virginia I-81 Tolling is likely to be felt only in the parts of Virginia whose accessibility would be severely impacted by the I-81 tolls." Additionally, it was found that "the impact is likely to be most severe in those areas where the economy is not broadly diversified, and whose primary industries are heavily dependent on truck transportation."

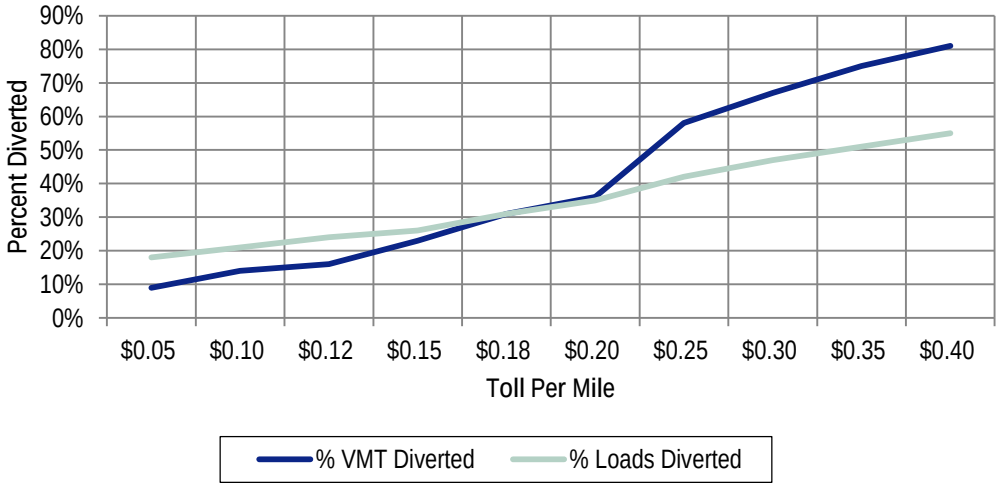
This report contains an examination of diversion rates and other insights related to a broad, rural interstate corridor similar to I-95 in North Carolina. The Reebie analysis shows that as toll rates increase, trucking companies seek ways to decrease the number of loads that are subject to the toll, and more importantly seek to decrease the number of tolled miles.

Table 9.1 Estimated Commercial Vehicle Diversion

Toll Cost Per Mile	Loads Diverted	Percent of Loads Diverted	I-81 VMTs Diverted	Percent of VMTs Diverted
$0.05	762,477	18%	33,556,408	9%
$0.10	882,824	21%	48,196,645	14%
$0.12	979,625	24%	56,676,929	16%
$0.15	1,087,198	26%	82,121,158	23%
$0.18	1,268,790	31%	109,966,819	31%
$0.20	1,458,151	35%	127,668,342	36%
$0.25	1,746,742	42%	204,494,431	58%
$0.30	1,952,905	47%	236,868,280	67%
$0.35	2,094,475	51%	264,801,528	75%
$0.40	2,286,875	55%	287,394,756	81%
Infinite	4,126,314	100%	355,162,922	100%

Note: See page 9 of Reebie Associates.

Figure 9.1 Estimated Commercial Vehicle Diversion Chart



Document Reviewed – Ohio State Highway Patrol Office of Strategic Services – Statistical Analysis Unit. *Ohio Turnpike and Parallel Routes Project: Safety and Traffic Report Final Evaluation.* February 2007.

In the early 2000s safety concerns emerged as toll rate increases on the Ohio Turnpike led to increased truck traffic on non-Interstate routes. Several strategies were implemented to counteract this truck diversion. The strategies included an increase in truck speed limit and significant toll reductions on the Turnpike. The *Ohio Turnpike and Parallel Routes Project* was conducted to measure the safety-related outcomes of these changes.

The study found that commercial vehicle volume increased 22 percent on the Turnpike as a result of the changes. There was also a decrease in commercial vehicle volume on parallel, non-Interstate routes of 16 percent. The study concluded that due to these shifts in volume, safety on parallel routes improved.

The results of this study show that changes in toll rates do impact the route choices made by truck drivers and trucking companies. It also shows that safety levels can decrease as trucks divert to non-Interstate routes.

Document Reviewed – Short, Jeffrey. *Survey of Motor Carrier Opinions on Potential Optional Truck Only Toll (TOT) Lanes on Atlanta Interstate Highways.* TRB 2007 Annual Meeting. January 2007.

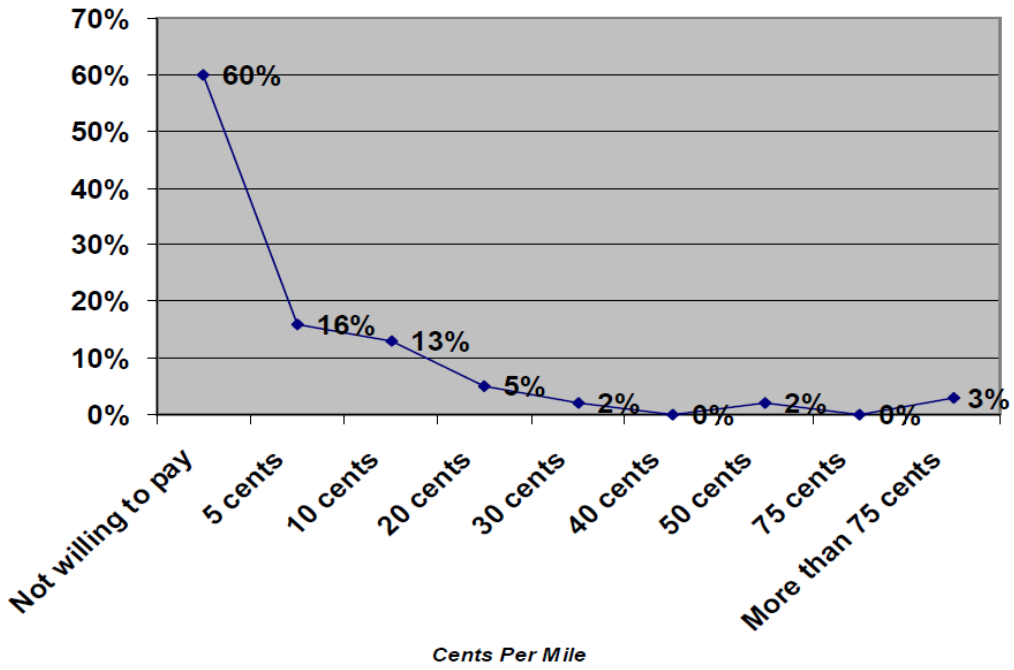
This report describes a survey of 71 Georgia-based trucking companies on their likely use of an optional truck only toll lane in Atlanta, Georgia. The conceptual TOT lanes would function at free-flow speeds through a pricing mechanism that increases per-mile charges as volumes increase. A key question in the survey was as follows:

If truck-only lanes charged a fee due to congestion, what amount (Per Mile) would your company be willing to pay to keep your vehicles in optional truck only lanes, and moving at the speed limit?

Sixty percent of carriers indicated that they would not be willing to pay to use a TOT lane, as shown in Figure 9.2.

This offers evidence that price does impact demand for a roadway, especially when there are free alternatives. In this case the majority of respondents were not willing to pay anything to travel on the priced lane, even though it would likely result in decreased travel times. Thus, the survey results demonstrate that there is a willingness by some carriers to select a free facility even when faced with increased travel times and decreased average speeds on that facility.

Figure 9.2 Percent of Respondents Willing to Pay for Use of a TOT Lane



Document Reviewed – Parsons Brinkerhoff; P.B. Consult. *Interstate 80 Tolling Feasibility Study: Final Report.* Prepared for Wyoming Department of Transportation. October 2008.

As part of this tolling feasibility study, Parsons identified optimal toll rates (in terms of revenue generation) for trucks on I-80 in Wyoming. As shown in Table 9.2, the study authors found that the optimal toll rate was one that would divert 46 percent of trucks from a tolled I-80 in Wyoming. This report describes a method for identifying optimal revenue. Additional considerations related to the full costs of diversion are found in subsequent literature.

Table 9.2 Toll Rates versus Diversion Rates

	Toll Rate	Diversion	AADTT	Annual Revenue (Millions)
	$32	4%	7,228	$83.10
	$42	8%	6,960	$106.80
	$53	16%	6,375	$122.20
	$63	19%	6,121	$140.80
	$74	26%	5,615	$150.70
	$84	32%	5,163	$158.40
	$95	36%	4,803	$165.80
	$105	43%	4,267	$163.60
Optimal Toll Rate	$116	46%	4,051	$170.90
	$126	54%	3,499	$161.00
	$137	58%	3,188	$158.90
	$147	59%	3,090	$165.90
	$158	60%	2,996	$172.30
	$168	78%	1,658	$101.70
	$179	79%	1,602	$104.40
	$189	85%	1,145	$79.00
	$200	86%	1,062	$77.40

Note: See page 51 of Reebie Associates.

Document Reviewed – Zhou, Lin; M. Burris; R. Baker; T. Geiselbrecht. *Impact of Incentives on Toll Road Use by Trucks*. Transportation Research Record: Journal of the Transportation Research Board No. 2115. 2009.

As part of this study, researchers sought to identify incentives to attract motor carriers to a new toll road, SH 130 near Austin, Texas, from I-35 (which is not tolled). The study found that within the industry, "owner-operators were the least likely to use toll roads because of the difficulty passing the cost of the toll on to their customers." Additionally, small profit margins are cited by the authors as a reason that trucking companies avoid roads that are tolled. Within the industry, the authors found that private carriers (those companies whose primary business resides outside of trucking but who operate a fleet) are the most willing to pay a toll. The most relevant aspect of this work is the willingness to pay among the different sectors of the industry, and the impact that changes in behavior within those sectors might have on toll revenue and alternate routes.

Document Reviewed – Swan, Peter; M. Belzer. *Empirical Evidence of Toll Road Traffic Diversion and Implications for Highway Infrastructure* Privatization. Journal of Public Works Management and Policy. 2010.

This article discusses the elasticity of demand by truck drivers for paying tolls on limited access highways. The authors found that diversion is "substantial," and that the external cost of this diversion might outweigh the benefits (in terms of revenue) of tolling. The authors identify external costs as 1) safety-related costs, and 2) costs that result from less efficient interstate commerce. This identifies that there are significant external costs described associated with toll implementation that should be accounted for in an economic analysis.

Document Reviewed – Wood, H.P. *Truck Tolling: Understanding Industry Tradeoffs When Using or Avoiding Toll Facilities*. NCFRP Project 19: Transportation Research Board. 2011.

Wood (2011) states that based on interview data shippers (those who pay for the services of a for-hire trucking company) are interested in paying a single rate quote to move goods, and prefer not to have charges such as tolls in addition to that quote. Use of a toll road is seen by the shipper as a choice that is made by a motor carrier and is outside of the shipper's sphere of influence. This is important to consider when reviewing shipper feedback as part of the I-95 Economic Assessment Study.

Wood also finds that "truck drivers stated an extremely low willingness to pay even a token toll for different time saving scenarios." The research concluded that the negative attitudes that the drivers had for tolls impacted their ability to see the time-saving benefits that might be found through tolls. It was also concluded that "toll roads are viewed negatively because a large cross-section of the trucking business cannot monetize toll road benefits."

Document Reviewed – Swan, Peter; M. Belzer. *Tolling and Economic Efficiency: Do the pecuniary benefits exceed the safety costs?* Journal of Public Works Management and Policy. Forthcoming 2012.

Swan and Belzer conducted additional diversion-related research that is outlined in a forthcoming 2012 study. This research examines safety costs versus revenue benefits related to truck tolling. The authors suggest, based on past literature, that "if the costs associated with the increased crashes exceed the benefits associated with increased tolls levied either by quasi-public toll authorities or private roadway lessees, then benefit/cost analysis should lead policy-makers to reject this approach." Citing past research which indicated that toll increases cause the diversion of trucks from highways to other roadways, the study uses historical crash data to measure the safety costs of truck diversion. As part of the benefit/cost equation, the authors identify three data inputs for estimating crash cost increases that result from truck toll diversion:

- The frequency with which diversion takes place and the road types where traffic diverts to; data should cover times before and after a change in tolling practices;
- Crash rates or crash rate estimates for both the tolled road and the diversion road; this can be based on road type; and
- Crash costs for the tolled road and the diversion road.

The authors employ these data types to conduct a benefit/cost analysis of a toll increase on the Ohio Turnpike. Swan and Belzer find an "estimated total additional crash cost of $39 million resulting from trucks diverting off the Ohio Turnpike."

Incorporation of the safety impacts of alternative I-95 scenarios in North Carolina would also be important for this ongoing study. A review of the full methodology described in this report would help identify the external costs of tolling as part of the funding options analysis.

10.0 Summary of Findings

This chapter summarizes the key findings of the freight analysis by topic area.

10.1 KEY FINDINGS RELATED TO TRUCK COUNTS

Classification count data collected by NCDOT indicate that AADTT (average annual daily truck traffic counts) on I-95 ranged from 5,343 to 10,221 in 2011. This range is generally confirmed by the truck counts collected for license plate survey. Both datasets also show a significant amount of variability along the corridor indicating that truck traffic is concentrated at several segments along the corridor.

Truck percentages range from a low of 14 percent to a high of 30 percent. This wide range is due to a combination of truck count variability along the corridor and passenger vehicle count variability along the corridor.

The count data were found to have significant hourly, daily and monthly peaks. Hourly truck counts are as low as 50 at 2 a.m. with a high of over 500 between 9:00 a.m. and 4:00 p.m. based on the counts collected at the license plate survey locations.

Daily vehicle volume (trucks and autos combined) peaks on I-95 on Fridays as local commute and truck traffic mixes with vacation and tourism traffic. Tuesdays were found to be the low vehicle volume day at all locations along I-95. In the southbound direction, Friday traffic can be as much as 60 percent higher than Tuesday. In the northbound direction, Sunday traffic can be as much as 50 percent higher than Tuesday traffic.

Traffic volumes are typically highest in the summer months. However, the highest volume single month is April. This is likely be related to a combination of spring break and Easter traffic which was noted as particularly high during many of the outreach sessions.

10.2 KEY FINDINGS RELATED TO ORIGIN-DESTINATION PATTERNS AND OPERATIONS ON I-95

There were several different data sources that were used to examine origin-destination patterns. Because each of these sources utilizes different technologies, focus on different types of vehicles, define trip types in different ways, and were applied during different periods, there are some consistencies between the datasets and some differences between the data sets in regards to origin-destination patterns.

The roadside truck origin-destination survey and license plate matching survey both show that there are approximately 2,500 trucks per day that travel through North Carolina without having an origin or destination within the study area.

Based on the roadside truck surveys, Florida is the state that generates the most through truck traffic for I-95 in North Carolina with over 25 percent of the origins and 30 percent of the destinations of through trucks. South Carolina, Virginia, and Pennsylvania were the three next highest states. All combined these states accounted for over 60 percent of both the origins and destinations of through truck trips for I-95 in North Carolina.

The license plate data and GPS data identified that there is a large percentage of truck trips that have very short trip lengths. In the license plate survey, roughly 60 percent of the trucks surveyed only passed through one station meaning that the trip lengths along I-95 were less than 60 miles long and probably closer to an average of 30 to 40 miles long. The GPS data identified 32 percent of truck trips as intrastate with an average trip length along I-95 of 27 miles. Another 51 percent of the truck trips identified by GPS data were categorized as interstate trips (with one trip end in the state and the other outside the state). These truck trips had an average length on I-95 of 49 miles. Therefore, both datasets are consistent in that they identify a large fraction of the truck trips that have relatively short trip lengths. The distribution of truck trip lengths is an important feature of the economic assessment. Shorter truck trips are more likely to divert because they have more options to do so and their travel time penalty is likely proportionally less than longer truck trips.

Using the truck trip lengths calculated from the license plate matching survey data, the through truck trips represent approximately 30 percent of the counts at a particular location. However, through truck trips account for roughly 67 percent of the total truck VMT on I-95 due to their longer truck trip lengths relative to other truck trip types. The GPS data are consistent with the license plate survey in that they appear to estimate that approximately 30 percent of the trucks at any particular location are through trucks. However, due to different estimates of truck trip length for trip types, the percentage of truck VMT from through trips estimated using the GPS data is lower than the license plate survey data.

The GPS data and the roadside truck origin-destination survey data are both consistent in identifying that the majority of trip ends for trucks that utilize I-95 are clustered around the corridor. The roadside survey data indicate that nearly half of all trucks traveling on I-95 with one trip end in North Carolina have that truck trip end in one of the eight counties through which I-95 traverses in the state. Similarly, origin-destination intensity maps developed using the GPS data show that the highest concentrations of trip ends are close to the corridor. The most common destinations away from the I-95 corridor are the Raleigh metropolitan area and the Port of Wilmington.

Disaggregated FAF data were developed by the consultant team and used to construct an origin-destination trip table for trucks at the county-level for North Carolina using 2007 base year data. It showed that statewide, the two largest counties for truck tonnage are Mecklenburg and Wake Counties. Both of these counties ship over 50 million truck tons annually. Population centers tend to be the large generators of freight traffic as goods are brought in to support local consumption and several goods-producing businesses locate near these population centers to have access to a large pool of labor. For the eight counties located along I-95, Johnston County has the highest tonnage of goods moving over 12 million tons annually. Nash and Harnett Counties are the next highest with over 10 million truck tons moved annually.

The disaggregated FAF data were also used to estimate each county's reliance on I-95. It showed that Johnston County has the lowest reliance on I-95 with an estimated one-third of its truck tonnage using the corridor. This is likely due to the county's easy access to I-40 and the likelihood that many of its truck shipments travel to and from Wake County. Wilson, Nash and Robeson Counties were estimated to have the highest reliance on I-95 with over 80 percent of the truck tons in these states estimated to use the corridor. The western part of North Carolina had a less than 20 percent reliance on the corridor.

Truck GPS data were used to identify that there are route alternatives to using I-95 for both short and long distance trips in North Carolina.

Truck GPS data were also used to determine that there is virtually no recurring traffic congestion in the corridor today. The vast majority of the low truck speed locations were due to incidents or egress locations for weigh stations along I-95. I-95 was found to be the major interstate in North Carolina with the lowest levels of congestion today.

North Carolina ranks 28th for average truck costs per mile in the U.S. Compared to other states in the southeast, North Carolina is lower than Virginia, South Carolina and Florida, but higher than Georgia and Tennessee.

10.3 KEY FINDINGS RELATED TO COMMODITY DISTRIBUTION

Commodity distribution data was obtained from both roadside truck surveys conducted on I-95 and the disaggregated FAF data.

Roadside truck surveys were used to develop commodity distributions for through truck trips and truck trips with one trip end in the state. For these types of truck trips, the roadside survey data indicate that over one-third of the commodities traveling along I-95 are farm or food products. Approximately 15 percent of the commodities are logs, wood products, or paper products. Therefore, approximately half of the goods moving along the corridor are from these two industry groupings: 1) farm/food and 2) logs/wood/paper products. This is consistent with the largest types of industries located in eastern North Carolina.

The percentage of these two industry groups was higher for goods moving in the northbound direction relative to the southbound direction. This directional variation in commodity distribution was consistent for both through trucks and trucks with one trip end in the state. Both trends are consistent with the economy in the southeast having a higher percentage of farm/food products and logs/wood/paper products, while the economies in the northeast have a more diversified manufacturing sector.

The disaggregated FAF data confirmed that a large percentage of the goods moving through the 8 I-95 counties in North Carolina are in agricultural related sectors or timber related sectors as well. This FAF data also identified a large percentage of sand, gravel and other aggregate type of material moving through these counties. However, as mentioned previously, most of these goods do not travel along I-95 due to their generally shorter truck trips and origin-destination patterns that do not align with I-95.

10.4 KEY FINDINGS RELATED TO OUTREACH ACTIVITIES

There was a broad range of stakeholder outreach that occurred for the freight sectors. There was a survey of over 200 motor carriers. There were over three dozen interviews of both motor carriers and shippers. There were also seven focus groups – three for motor carriers and four for shippers. This outreach confirmed much of the quantitative analysis and it identified additional issues for consideration by the project team. The key findings are described below.

Freight stakeholders stated that many of the shipments of the raw products in the agricultural and timber industries do not use I-95 due to the general east-west nature of these flows and the desire by these industries to utilize higher weight limits available on several state highways.

Outreach activities highlighted that there are a broad set of opinions regarding I-95. In general, there was consensus that I-95 would need significant improvements in at least the medium term – approximately 10 to 20 years. However, there were a handful of stakeholders that believed that improvements would be needed as soon as five years and another handful that felt that even in the long term that improvements would not be needed.

When considering the cost of the improvements on I-95, many of the stakeholders believed that the extent of the improvements suggested may be more than what is actually needed. Freight-related stakeholders did not want to do anything more than what is absolutely necessary to improve the corridor in the medium run.

There was a strong sentiment in the motor carrier outreach that tolls are not a preferred method of generating new revenues. There was significantly less opposition to raising fuel taxes. Many stakeholders mentioned that North

Carolina already has some of the highest fuel taxes in the country, so increasing fuel taxes may cause even more people to refuel out of state. This is less of a concern for trucks, because they have to apportion their paid taxes based on where they operate. In general, there was openness to the consideration of a sales tax. This has been given additional prominence due to Virginia's adoption of a broad set of transportation revenue sources rather than strict reliance on a gas tax.

Participants in the shipper focus group were asked to indicate their preferred balance of revenue sources by filling out individual forms. Surprisingly, tolling ranked second to fuel taxes and higher than sales taxes on the completed forms. There does appear to be some sentiment that tolling can be considered as a revenue source even though this was not verbalized strongly during the discussion portion of the focus groups.

There was deep concern regarding the generation of additional revenue from any source. This is in large part due to the transfers that currently occur from transportation related taxes to the general fund in North Carolina. Additionally, there is the belief that state agencies are not being as efficient as they should be with the resources that they already have.

The shipper focus group revealed that speeds reduced to 45 mph or a toll in the amount of $20 per trip would be thresholds that would cause them to change their operations. These changes included charging more for their products and services, reducing the level of output due to a change in customer mix, and a reconsideration of locations for expansion opportunities. Most of the stakeholders had invested significant resources in their local facilities and did not think that they would relocate their current facilities based on either of these two thresholds.

There was divergence between some of the motor carrier outreach and the shipper outreach in terms of who would pay the cost of a toll if it were implemented. Many of the for-hire motor carriers included in the survey believed that they would have to pay the costs and that they could not pass it on to their customers. However, when surveyed as part of the freight forums, both the motor carriers and shippers responded that well over half of the toll costs would ultimately be passed on to the consumer. The remainder was spread roughly evenly between the trucking company, shipper, and receiver.

10.5 CONCLUDING COMMENT

This study has reviewed, collected, and analyzed trucking and shipping information and data from a wide range of sources. The information collected through this process will be used to inform several aspects of the economic analysis. Additionally, it will also be used as a reasonableness check to the results developed from the travel demand model, the economic analysis, and the funding analysis.