

NASHVILLE AREA MPO FREIGHT AND GOODS MOVEMENT STUDY - PHASE III

*Technical Review and Analysis of Historic,
Existing, and Future Conditions*

Technical Report

prepared for

Nashville Area Metropolitan Planning Organization

prepared by

Cambridge Systematics, Inc.

December, 2014

technical report

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date

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1.0 Overview of Project and Historical Freight Flows

The Nashville Area Metropolitan Planning Organization (MPO) is charged with providing the tools and plans necessary to help ensure that a multimodal transportation infrastructure system is maintained and developed in a manner that supports all modes of travel. This includes the safe and efficient movement of freight and goods. The MPO has developed and continues to develop several tools and plans to assist in maintaining and enhancing the regional transportation infrastructure, and the Regional Freight and Goods Movement Studies make up one of those tools. These documents identify many potential infrastructure and policy-related projects to maintain and improve the freight transportation network over the next several years.

In 2003, the Nashville Area MPO published the results from Phase I of the Regional Freight and Goods Movement Study. That report served to highlight the role that the freight industry plays in the success of local economy; and to illustrate the movement of freight in, out, around, and through the Nashville region. The principal goal of that study was to build a foundation to formally integrate freight into the overall MPO planning process. To that end, the study was designed to achieve the following objectives:

- Establish the basis for subsequent freight planning efforts by assembling a regional Freight Advisory Committee and developing a regional freight profile; and
- Identify quick-action, freight-related strategies, policies, and projects specific to the Nashville area that could be implemented into the MPO's plans and programs.

Phase II of the study provided the needed technical tools to help regional partners, including developing techniques and tools to:

- Predict future freight traffic volumes through the year 2035;
- Identify areas likely to see future capacity constraints and infrastructure deficiencies;
- Identify possible traffic bottlenecks and safety concerns; and
- Evaluate the costs and benefits of potential improvements.

The second phase of the study also was used to develop specific long-range transportation projects, identify potential funding sources for those projects, and evaluate policy-based solutions to accommodate future levels of freight on the regional transportation system while protecting the mobility and safety of the traveling public.

The Freight and Goods Movement Study – Phase III will build upon the Nashville Area MPO's previous efforts in order to provide the MPO, its member jurisdictions, and strategic partners with information and recommendations to help minimize the negative impacts of freight movement on local communities, while also embracing freight's key contributions to regional prosperity. Highlights of the effort include:

- A review and analysis of historic trends and existing conditions in the region including an analysis of commodity flows, import/export trading partners, local freight attractors and generators, freight networks and routing, economic impact of freight and logistics, etc.;
- A review and analysis of future conditions including a forecast of future commodity flows and freight movements, and an evaluation of programmed and planned transportation improvements, future land use policies, economic and community development plans, etc. that may affect or be affected by freight and goods movement;
- Development of a guiding vision for the region's freight system, including a designated truck route network, and supporting polices, strategies, regulations to facilitate its implementation;
- Recommendations for optimizing local land use plans and land development policies, codes, and ordinances in support of improved freight access and delivery;
- Print and web-based communication tools that help promote awareness of freight movements, associated benefits and challenges, proposed strategies, and proposed improvements across the region.

This report describes historic, existing, and future conditions for goods movement in the Nashville region. It serves as the Task 3 deliverable for the Nashville Freight and Goods Movement Plan Phase III. This document is divided into the following seven chapters:

- **Chapter 1.0** – Overview of Document and Historical Freight Flows;
- **Chapter 2.0** – Overview of Economy and Regional Freight Flows;
- **Chapter 3.0** – Truck Flow Analysis;
- **Chapter 4.0** – Freight Rail Analysis;
- **Chapter 5.0** – Port and Waterways Analysis; and
- **Chapter 6.0** – Air Cargo Analysis.

1.1 History of Nashville Freight Flows

Nashville is located at the northern terminus of the Natchez Trace. This trace was originally forged by large game located in Mississippi, such as bison, as a means for them to access the salt licks in the Nashville region. Over the course of hundreds of years, Native Americans developed the trail further into a well-worn footpath. At the direction of President Jefferson, the trail was made to be fully navigable by wagon through joint efforts of the U.S. Army and later civilian contractors. This work was completed in 1809, and Nashville then developed rapidly as a cotton center and river port along the Cumberland River. The Cumberland River provided access to the Ohio and Mississippi rivers; and through the middle of the 19th century, settlers depended on rivers for freight and passenger travel.

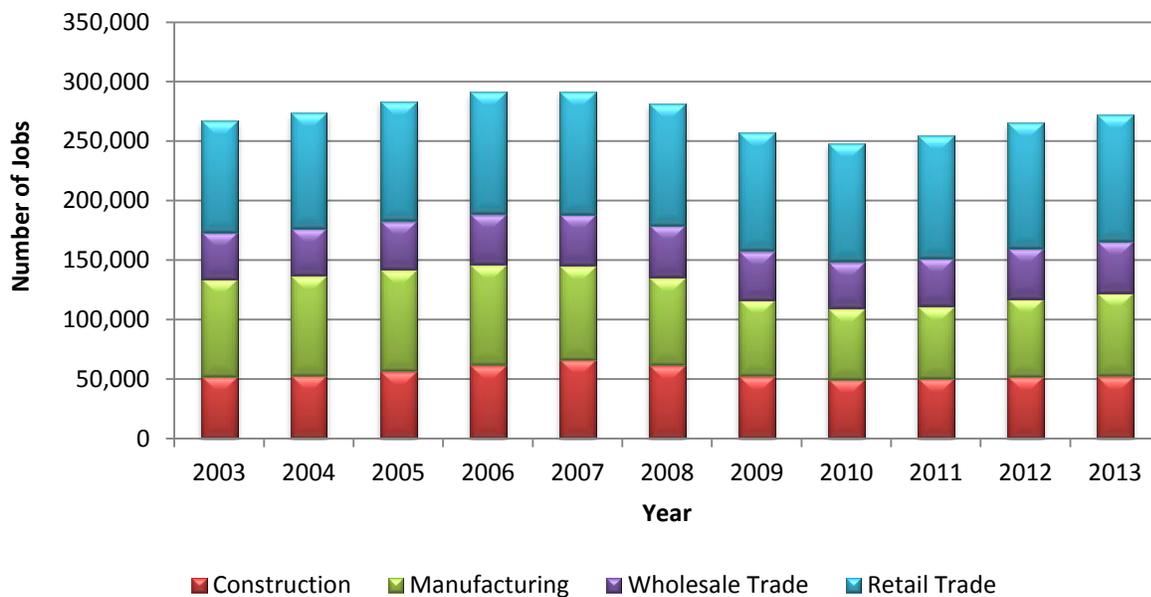
The first railway to operate in Tennessee was the Nashville and Chattanooga railway chartered in Nashville in 1845 and completed in 1859. In 1850, the State of Kentucky chartered the Louisville and Nashville Railroad. This railroad operated continuously for 132 years serving freight and passengers. The railroad connected the Nashville region with Louisville, Kentucky; St. Louis, Missouri; Memphis, Tennessee; Atlanta, Georgia; and New Orleans, Louisiana. In 1880, the Louisville and Nashville Railroad gained a controlling interest of the Nashville and Chattanooga Railroad (then called the Nashville, Chattanooga, and St. Louis Railroad). At their peak in 1970, the merged railroad carried 16.5 billion ton miles of freight. Eventually, the combined railroad was merged in to the Seaboard System Railroad, and finally into the CSX freight railroad of today. CSX still operates over the original Nashville, Chattanooga, and St. Louis tracks between Nashville, Chattanooga, and Atlanta.

With the development of the interstate system in the late 1950s, trucking became the dominant mode of freight transportation in the Nashville region in line with the rest of the U.S. with rail, waterway, and air cargo flows focused on specialized commodities and origin-destination patterns. The following sections discuss the current and future freight flows for the Nashville region.

2.0 Overview of Economy and Regional Freight Flows

Freight activity is a critical component of the Nashville regional economy. As of the end of 2013, more than 250,000 jobs in the Nashville MPO region were directly related to the four key freight-dependent sectors: manufacturing, construction, wholesale trade, and retail trade. Figure 2.1 shows how the number of employees in these sectors has fluctuated over an 11-year period. The number of freight-dependent jobs in the region was nearly 300,000 prior to the most recent recession and after bottoming out in 2010, that number has been rising, and is likely to continue to increase as the Nashville economy improves along with the rest of the U.S. economy.

Figure 2.1 Freight-Sector Employment versus All Others



Source: U.S. Bureau of Economic Analysis.

Freight flow data in the Nashville region were provided using the IHS/Global Insight TRANSEARCH database. This database includes freight flows at the county level for Tennessee for each of the major freight modes across more than 20 commodities for a baseyear of 2012 and a future year of 2040. This is a similar data source as the one used in previous freight studies in the Nashville region. However, the methodology has changed somewhat, so the results are not directly comparable with previous studies. Additionally, this most recent TRANSEARCH database is a statewide freight flow database, so through freight flows for the Nashville region could not be estimated from this source.

The commodities moved around the Nashville region are shown in Table 2.1. These tables include inbound, outbound, and internal truck trips; through trips are not included. From a tonnage perspective, the bulkier commodities have the highest percentage of truck moves. This includes sand and stone along with nonmetallic minerals; both of which are used for

construction of roads and buildings along with road maintenance, and occasionally to support manufacturing activities. These two commodities represent over one-third of all of the freight flows in the region. Virtually all of this moves by truck.

Sand, stone, and nonmetallic minerals are mined from quarry locations. The largest quarry in the region is along Whites Creek Pike just south of Briley Parkway in northern Nashville. In 2013, 500,000 tons of stone were extracted from this quarry and used to produce asphalt for road projects, such as the widening of Interstate 65.¹ Other major quarry locations in the region include Franklin Limestone Road just southeast of the Nashville International Airport in Antioch, Downs Boulevard in Franklin, Old Hickory Boulevard in Hermitage, Joe Dowlen Road in Pleasant View, River Road in Nashville, and Highway 4275 in Springfield. Transportation of sand, stone, and nonmetallic minerals tends to be expensive relative to the material itself. A dump truck full of sand will cost between \$50 and \$150 depending on the type of sand, while the transportation even for a short trip can add another \$100 to the total cost. Therefore, every effort is made to utilize sand and stone quarries that are as close as possible to construction sites. Therefore, the trip patterns from these quarries are dominated by short distance truck trips making several round trips per day.

Truck drays are the second largest commodity movement in the Nashville region, representing over nine million tons. Truck drayage includes truck trips from distribution centers to retail outlets, containerized truck trips to/from intermodal railyards and truck trips to/from airports. The specific goods transported are typically generalized consumer goods, but can also reflect single commodity shipments, particularly at railyards and airports.

The next two largest commodities are crude, petroleum and associated products, along with unspecified coal and petroleum products. The first commodity includes tanker truck shipments of gasoline and diesel to regional fueling stations. It also includes delivery of fuel to industrial sites and shipments of specialty fuel products. In contrast to the transportation of bulk materials, the transportation component of purchasing fuel tends to be relatively small. For gasoline, nine percent of the total retail price includes a combination of transportation, storage, the cost of doing business, and the retailer's margin.² A generalized fuel distribution supply chain is shown in Figure 2.2. Most notably, the last leg of the supply chain is truck shipments from fuel storage tanks to local gasoline and diesel filling stations. This corresponds with the tanker trucks that are commonly seen on the region's roadways.

The next largest commodities in the region include agricultural products, followed by waste and scrap. Agricultural products are shipped into the region primarily by truck. These shipments may go to food processing facilities located in the region, or directly to grocery stores and restaurants. Some waste and scrap from residences, businesses, and industrial facilities is shipped around the region to local landfills. Others are shipped out of the region to further

¹ The Tennessean, *Rogers Group's quarry plans rattle neighbors*, May 20, 2014.

² Tennessee Fuel & Convenience Store Association web site, www.tfca.info, September 2014.

landfills or processing facilities. Approximately 20 percent of waste and scrap are shipped out of the region by rail or waterway.

Vehicle and vehicle parts is the next largest commodity in the Nashville region. This also is the second largest commodity in the region that is shipped primarily by rail. The vast majority of the rail shipments are outbound shipments of cars from the region’s two auto manufacturing facilities: the Nissan plant in Smyrna and the GM plant in Spring Hill.

Generally speaking, the value of commodities and time sensitivity of goods determines the mode of shipment. Air transportation is the fastest and most reliable form of freight transportation. As such, commodities typically transported by this mode are low weight, high value, and time sensitive. Truck and rail are also fast and reliable forms of shipment, but are less expensive for transport than air. On the other end of the spectrum lies water transport and unit trains. These tend to be the slowest forms of transport with the heaviest goods that have a lower value and are less time-sensitive.

This pattern is evident in the freight flows within the Nashville Region. Tables 2.2 and 2.3 detail the total value of each of these commodities as well as the value per ton. While construction materials represent the highest commodity group by tonnage, this is in fact the lowest group by both value and value per tonnage. Yet, within this commodity the trends by mode and value are apparent. The value per ton of construction materials transported by air far exceeds that of the other modes whereas water transport represents the lowest cost per ton.

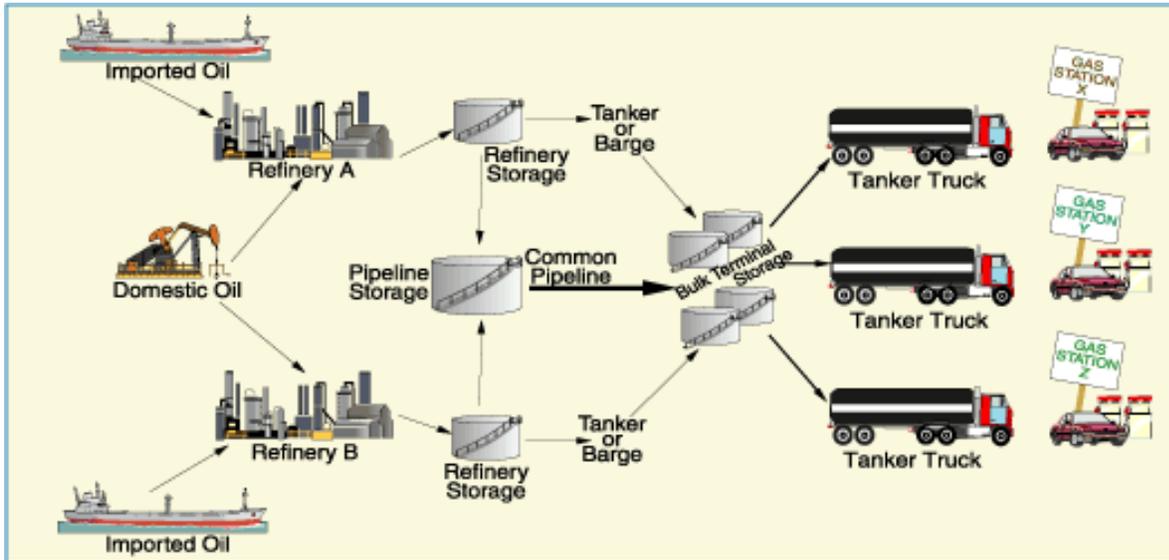
Table 2.1 Nashville Region Freight Flows by Commodity and Mode, 2012 (Tons)

Commodity Name	Truck	Air	Water	Rail	Total
Construction Materials	29,303,527	566	1,666,462	140,480	31,111,037
Gravel and Crushed Stone	18,256,922	104	740,331	29,160	19,026,517
Nonmetallic Mineral Prods.	7,034,945	16	430,050	32,120	7,497,131
Natural Sands	1,788,018	20	372,944	20,000	2,180,983
Articles of Base Metal	1,240,917	425	121,087	9,200	1,371,630
Wood Products	848,386	1	282	49,240	897,908
Logs, Other Rough Wood	112,422	-	1,553	760	114,736
Monumental or Building Stone	21,917	< 1	215	-	22,132
Energy	8,733,594	8	5,827,195	6,520	14,567,318
Coal	43,567	-	5,680,763	-	5,724,330
Gasoline and Aviation Turbine Fuel	3,787,432	-	13,858	-	3,801,290
Coal and Petroleum Prod.	3,256,930	8	126,553	6,520	3,390,012
Fuel Oils	1,645,655	-	6,021	-	1,651,676
Crude Petroleum Oil	10	-	-	-	10
Agriculture/Food	9,405,417	33	107,447	413,160	9,926,058
Other Prepared Foodstuffs, Fats and Oils	3,266,136	1	-	72,600	3,338,737

Commodity Name	Truck	Air	Water	Rail	Total
Other Agricultural Prod.	3,094,613	-	-	29,920	3,124,533
Milled Grain Prod. and Bakery Prod.	955,863	-	-	102,788	1,058,651
Animal Feed and Products of Animal Origin	755,212	-	-	47,816	803,028
Cereal Grains	487,505	-	-	7,800	495,305
Meat, Fish, and Seafood	352,438	-	-	-	352,438
Fertilizers	6,408	32	107,447	139,636	253,523
Animals and Fish	211,610	-	-	-	211,610
Tobacco Prod.	149,644	-	-	-	149,644
Alcohol	125,988	< 1	-	12,600	138,589
Truck Drays to/from DCs, Railyards and Airports	9,096,890	0	0	0	9,096,890
Truck Drays to/from DCs, Railyards and Airports	9,096,890	-	-	-	9,096,890
Other	4,511,205	29,317	467,996	1,366,264	6,374,779
Waste and Scrap	2,981,062	1	215,357	161,264	3,357,683
Non-Metallic Minerals	1,028,395	17	129,760	12,480	1,170,651
Mail, Shipping Containers, or Unidentified	-	-	-	780,800	780,800
Base Metal	396,145	55	118,083	258,600	772,884
Basic Chemicals	52,232	358	4,796	153,080	210,465
Pharmaceutical Prod.	38,194	661	-	40	38,895
Mixed Freight	5,915	28,225	-	-	34,139
Metallic Ores and Concentrates	9,262	-	-	-	9,262
Other Manufacturing	5,103,282	9,790	14,078	1,221,685	6,348,835
Motor Vehicles and Parts	846,667	1,561	-	793,080	1,641,308
Plastics and Rubber	771,832	632	160	161,760	934,384
Chemical Prod. and Preparations	615,366	355	5,970	31,932	653,624
Machinery	611,834	1,856	657	2,920	617,267
Electronics and Electrical Equipment	474,773	2,942	76	-	477,791
Paper or Paperboard Articles	434,723	60	-	2,360	437,142
Furniture and Lighting	359,910	133	28	200	360,271
Printed Products	284,101	506	-	-	284,607
Misc. Manufactured Prods.	273,171	720	1,119	1,200	276,210
Pulp and Paper Prods.	56,606	-	-	206,720	263,326
Textiles, Leather and Associated Articles	233,241	378	-	-	233,619
Transportation Equipment	68,619	243	6,068	21,513	96,443
Precision Instruments and Apparatus	72,439	404	-	-	72,843
Total	66,153,915	39,715	8,083,178	3,148,109	77,424,917
Percent of Total	85.4%	0.1%	10.4%	4.1%	100.0%

Source: TRANSEARCH. Note: Freight flows are not directly comparable to previous Nashville freight studies due to database development methodology differences. Freight flow data through the Nashville region are also not available in this analysis.

Figure 2.2 Fuel Distribution System



Source: U.S. Energy Information Administration.

Table 2.2 Nashville Region Freight Flows by Commodity and Mode, 2012 (Value - \$M)

Commodity Name	Truck	Air	Water	Rail	Total
Other Manufacturing	\$30,376	\$1,976	\$29	\$8,114	\$40,495
Vehicles and Parts	\$6,973	\$374	\$0	\$7,196	\$14,543
Machinery	\$5,650	\$290	\$3	\$29	\$5,972
Electronics and Electrical Equipment	\$4,889	\$628	\$0	\$0	\$5,517
Plastics and Rubber	\$2,812	\$22	\$1	\$540	\$3,375
Chemical Prod. And Preparations	\$2,128	\$86	\$12	\$69	\$2,295
Misc. Manufactured Prods.	\$1,353	\$289	\$3	\$7	\$1,652
Textiles, Leather and Associated Articles	\$1,518	\$44	\$0	\$0	\$1,562
Furniture and Lighting	\$1,121	\$34	\$0	\$1	\$1,155
Precision Instruments and Apparatus	\$1,025	\$88	\$0	\$0	\$1,113
Transportation Equipment	\$1,000	\$57	\$9	\$20	\$1,086
Printed Products	\$990	\$56	\$0	\$0	\$1,046
Paper or Paperboard Articles	\$878	\$8	\$0	\$5	\$891
Pulp and Paper Prods.	\$41	\$0	\$0	\$247	\$288
Truck Drays to/from DCs, Railyards and Airports	\$15,443	\$0	\$0	\$0	\$15,443
Truck Drays to/from DCs, Railyards and Airports	\$15,443	\$0	\$0	\$0	\$15,443
Agriculture/Food	\$11,998	\$3	\$39	\$291	\$12,331
Other Prepared Foodstuffs, Fats and Oils	\$3,062	\$0	\$0	\$38	\$3,101
Tobacco Prod.	\$2,402	\$0	\$0	\$0	\$2,402
Other Agricultural Prod.	\$2,309	\$0	\$0	\$67	\$2,376

Commodity Name	Truck	Air	Water	Rail	Total
Milled Grain Prod. And Bakery Prod.	\$1,589	\$0	\$0	\$50	\$1,639
Meat, Fish, and Seafood	\$1,349	\$0	\$0	\$0	\$1,349
Animal Feed and Products of Animal Origin	\$488	\$0	\$0	\$25	\$513
Animals and Fish	\$471	\$0	\$0	\$0	\$471
Alcohol	\$166	\$0	\$0	\$15	\$181
Cereal Grains	\$159	\$0	\$0	\$1	\$160
Fertilizers	\$4	\$3	\$39	\$95	\$140
Other	\$2,918	\$2,269	\$253	\$4,690	\$10,130
Mail, Shipping Containers, or Unidentified	\$0	\$0	\$0	\$3,950	\$3,950
Mixed Freight	\$52	\$1,965	\$0	\$0	\$2,017
Base Metal	\$839	\$4	\$173	\$399	\$1,415
Waste and Scrap	\$899	\$0	\$60	\$70	\$1,028
Pharmaceutical Prod.	\$770	\$206	\$0	\$1	\$977
Basic Chemicals	\$316	\$94	\$10	\$269	\$689
Non-Metallic Minerals	\$18	\$0	\$10	\$1	\$29
Metallic Ores and Concentrates	\$24	\$0	\$0	\$0	\$24
Energy	\$7,168	\$1	\$308	\$7	\$7,484
Gasoline and Aviation Turbine Fuel	\$4,087	\$0	\$17	\$0	\$4,105
Fuel Oils	\$1,776	\$0	\$7	\$0	\$1,784
Coal and Petroleum Prod.	\$1,302	\$1	\$61	\$7	\$1,371
Coal	\$2	\$0	\$222	\$0	\$224
Crude Petroleum Oil	\$0	\$0	\$0	\$0	\$0
Construction Materials	\$6,053	\$63	\$252	\$48	\$6,417
Articles of Base Metal	\$4,121	\$62	\$190	\$29	\$4,402
Non-Metallic Mineral Prods.	\$1,191	\$1	\$53	\$6	\$1,251
Wood Products	\$560	\$0	\$0	\$11	\$571
Gravel and Crushed Stone	\$148	\$0	\$6	\$3	\$157
Natural Sands	\$14	\$0	\$3	\$0	\$17
Logs, Other Rough Wood	\$15	\$0	\$0	\$0	\$15
Monumental or Building Stone	\$4	\$0	\$0	\$0	\$4
Total	\$73,957	\$4,312	\$881	\$13,150	\$92,300
Percent of Total	80.1%	4.7%	1.0%	14.2%	100%

Source: TRANSEARCH

Table 2.3 Value of Nashville Region Freight Flows by Commodity and Mode, 2012 (Dollars per Ton)

Commodity Name	Truck	Air	Water	Rail	Total
Other Manufacturing	\$5,952	\$201,797	\$2,040	\$6,641	\$6,378
Chemical Prod. And Preparations	\$3,458	\$241,857	\$2,019	\$2,165	\$3,511
Plastics and Rubber	\$3,643	\$34,933	\$5,174	\$3,339	\$3,612
Pulp and Paper Prods.	\$721	-	-	\$1,194	\$1,093
Paper or Paperboard Articles	\$2,019	\$135,655	-	\$2,137	\$2,037
Printed Products	\$3,485	\$111,014	-	-	\$3,676
Textiles, Leather and Associated Articles	\$6,508	\$116,164	-	-	\$6,686
Machinery	\$9,234	\$156,379	\$5,109	\$9,821	\$9,675
Electronics and Electrical Equipment	\$10,298	\$213,398	\$3,951	-	\$11,548
Vehicles and Parts	\$8,235	\$239,280	-	\$9,074	\$8,860
Transportation Equipment	\$14,579	\$235,443	\$1,467	\$927	\$11,266
Precision Instruments and Apparatus	\$14,150	\$217,151	-	-	\$15,277
Furniture and Lighting	\$3,113	\$252,450	\$3,854	\$3,782	\$3,206
Misc. Manufactured Prods.	\$4,953	\$401,817	\$2,829	\$5,625	\$5,982
Truck Drays to/from DCs, Railyards and Airports	\$1,698	-	-	-	\$1,698
Truck Drays to/from DCs, Railyards and Airports	\$1,698	-	-	-	\$1,698
Other	\$647	\$77,412	\$541	\$3,433	\$1,589
Non-Metallic Minerals	\$17	\$3,429	\$79	\$69	\$25
Metallic Ores and Concentrates	\$2,637	-	-	-	\$2,637
Basic Chemicals	\$6,054	\$262,865	\$2,019	\$1,759	\$3,275
Pharmaceutical Prod.	\$20,155	\$312,506	-	\$18,949	\$25,120
Base Metal	\$2,118	\$71,777	\$1,469	\$1,543	\$1,831
Waste and Scrap	\$302	\$64,124	\$277	\$432	\$306
Mail, Shipping Containers, or Unidentified	-	-	-	\$5,059	\$5,059
Mixed Freight	\$8,752	\$69,613	-	-	\$59,069
Agriculture/Food	\$1,276	\$82,171	\$360	\$705	\$1,242
Animals and Fish	\$2,225	-	-	-	\$2,225
Cereal Grains	\$326	-	-	\$142	\$323
Other Agricultural Prod.	\$746	-	-	\$2,240	\$760
Animal Feed and Products of Animal Origin	\$646	-	-	\$516	\$639
Meat, Fish, and Seafood	\$3,828	-	-	-	\$3,828
Milled Grain Prod. And Bakery Prod.	\$1,662	-	-	\$488	\$1,548
Other Prepared Foodstuffs, Fats and Oils	\$938	\$81,585	-	\$525	\$929
Alcohol	\$1,314	\$86,165	-	\$1,230	\$1,307
Tobacco Prod.	\$16,050	-	-	-	\$16,050
Fertilizers	\$604	\$82,131	\$360	\$680	\$553
Energy	\$821	\$75,913	\$53	\$1,123	\$514
Coal	\$48	-	\$39	-	\$39

Commodity Name	Truck	Air	Water	Rail	Total
Crude Petroleum Oil	\$355	-	-	-	\$355
Gasoline and Aviation Turbine Fuel	\$1,079	-	\$1,243	-	\$1,080
Fuel Oils	\$1,079	-	\$1,243	-	\$1,080
Coal and Petroleum Prod.	\$400	\$75,913	\$483	\$1,123	\$405
Construction Materials	\$207	\$111,879	\$151	\$341	\$206
Monumental or Building Stone	\$190	\$1,428	\$190	-	\$190
Natural Sands	\$8	\$1,428	\$8	\$8	\$8
Gravel and Crushed Stone	\$8	\$1,428	\$8	\$87	\$8
Logs, Other Rough Wood	\$130	-	\$128	\$124	\$130
Wood Products	\$661	\$440,877	\$128	\$214	\$636
Non-Metallic Mineral Prods.	\$169	\$59,870	\$123	\$175	\$167
Articles of Base Metal	\$3,321	\$145,700	\$1,573	\$3,144	\$3,209
Total	\$1,118	\$108,570	\$109	\$4,177	\$1,192

Source: TRANSEARCH

Waterway shipments in the Nashville region are dominated by inbound shipments of coal to supply the region’s power plants. There also have recently been major purchases by a local barge company that are believed to be part of increased natural gas shipments that will be going to serve petrochemical industries along the State’s inland waterway system.

Air cargo is a relatively small component of the overall freight flows in the region in terms of tonnage. This mode does, however, handle freight shipments that require rapid delivery such as perishables.

The distribution of tons by trip direction and mode are provided in Table 2.4. This shows that the truck and water modes are tilted significantly towards inbound flows which results in a regionwide imbalance of inbound flows relative to outbound flows. This is consistent with growing urban regions which consume goods in the process of expanding the physical infrastructure and supporting the daily consumption patterns of the local population.

Table 2.5 shows the forecast of freight flows for the Nashville region. Overall, the tonnage of freight is expected to grow from 77.4 million tons in 2012 to 148.9 million tons in 2040. This represents a compound annual growth rate (CAGR) of 2.4 percent overall for a total growth of 92 percent by 2040. The region’s high value commodities are forecast to be some of the fastest growing of all of the commodities. Electronics, precision instruments, pharmaceutical products, machinery and motor vehicles and parts are all forecast to grow over 4 percent per year between 2012 and 2040.

Table 2.4 Freight Flows by Direction and Mode, 2012 (Tons)

Mode	Inbound	Outbound	Internal	Mode Total
Truck	36,381,869	24,551,092	5,220,954	66,153,915
Water	7,673,383	271,400	138,395	8,083,178
Rail	1,914,305	1,219,432	14,372	3,148,109
Air	16,876	22,839		39,715
Trip Total	45,986,433	26,064,762	5,373,721	77,424,917

Source: TRANSEARCH Database

Table 2.5 Nashville Region Forecast Freight Flows by Commodity (Tons)

Commodity Name	2012	2040	CAGR	Total Growth
Electronics and Electrical Equipment	477,791	2,158,979	5.5%	352%
Logs, Other Rough Wood	114,736	435,351	4.9%	279%
Precision Instruments and Apparatus	72,843	271,067	4.8%	272%
Pharmaceutical Prod.	38,895	141,189	4.7%	263%
Machinery	617,267	2,079,164	4.4%	237%
Motor Vehicles and Parts	1,641,308	5,348,813	4.3%	226%
Articles of Base Metal	1,371,630	4,024,692	3.9%	193%
Misc. Manufactured Prods.	276,210	753,111	3.6%	173%
Wood Products	897,908	2,447,261	3.6%	173%
Plastics and Rubber	934,384	2,386,542	3.4%	155%
Natural Sands	2,180,983	5,425,371	3.3%	149%
Other	9,096,890	21,716,436	3.2%	139%
Basic Chemicals	210,465	498,792	3.1%	137%
Transportation Equipment	96,443	227,017	3.1%	135%
Base Metal	772,884	1,774,343	3.0%	130%
Monumental or Building Stone	22,132	48,839	2.9%	121%
Mixed Freight	34,139	74,059	2.8%	117%
Non-Metallic Mineral Prods.	7,497,131	16,212,402	2.8%	116%
Furniture and Lighting	360,271	775,180	2.8%	115%
Waste and Scrap	3,357,683	6,662,374	2.5%	98%
Gravel and Crushed Stone	19,026,517	36,360,057	2.3%	91%
Non-Metallic Minerals	1,170,651	2,182,528	2.2%	86%
Chemical Prod. and Preparations	653,624	1,140,170	2.0%	74%

Commodity Name	2012	2040	CAGR	Total Growth
Pulp and Paper Prods.	263,326	457,968	2.0%	74%
Coal	5,724,330	9,913,285	2.0%	73%
Alcohol	138,589	233,574	1.9%	69%
Animal Feed and Products of Animal Origin	803,028	1,324,411	1.8%	65%
Paper or Paperboard Articles	437,142	699,968	1.7%	60%
Meat, Fish, and Seafood	352,438	558,471	1.7%	58%
Fertilizers	253,523	396,978	1.6%	57%
Cereal Grains	495,305	756,929	1.5%	53%
Mail, Shipping Containers, or Unidentified	780,800	1,185,253	1.5%	52%
Milled Grain Prod. and Bakery Prod.	1,058,651	1,584,290	1.5%	50%
Metallic Ores and Concentrates	9,262	13,662	1.4%	48%
Other Prepared Foodstuffs, Fats and Oils	3,338,737	4,640,400	1.2%	39%
Animals and Fish	211,610	282,810	1.0%	34%
Textiles, Leather and Associated Articles	233,619	289,073	0.8%	24%
Printed Products	284,607	333,407	0.6%	17%
Other Agricultural Prod.	3,124,533	3,636,334	0.5%	16%
Crude Petroleum Oil	10	12	0.5%	20%
Fuel Oils	1,651,676	1,762,740	0.2%	7%
Gasoline and Aviation Turbine Fuel	3,801,290	4,056,902	0.2%	7%
Coal and Petroleum Prod.	3,390,012	3,596,226	0.2%	6%
Tobacco Prod.	149,644	50,388	-3.8%	-66%
Total	77,424,917	148,916,820	2.4%	92%

Source: TRANSEARCH Database.

The top trading partners for the Nashville region are shown at the state level in Table 2.6. The largest component of Nashville freight flows are inbound freight flows from other locations within Tennessee. Tennessee outside of the MPO region constituted 15.4 million of the total 77.4 million tons in 2012, nearly 20 percent of the total flows. This compares to 5.4 million tons that move around internally in the M region. Nashville also tends to be a net importer of goods. The only top trading partner for which Nashville is a net exporter is the state of Louisiana.

Table 2.6 Nashville Region's Top Trading Partners – All Modes, 2012 (Tons)

State	Outbound	Inbound	Total	Percent of Total
Tennessee (remainder)	5,379,425	10,016,215	15,395,641	19.9%
Kentucky	3,438,273	8,244,475	11,682,747	15.1%
Illinois	1,086,834	5,145,090	6,231,924	8.0%
Alabama	2,759,165	3,375,309	6,134,475	7.9%
Nashville region	5,373,721	5,373,721	5,373,721	6.9%
Indiana	1,540,686	2,759,773	4,300,460	5.6%
Georgia	1,793,352	2,199,126	3,992,478	5.2%
Ohio	815,063	2,024,101	2,839,164	3.7%
Missouri	708,333	1,853,213	2,561,546	3.3%
Texas	919,903	1,055,374	1,975,276	2.6%
North Carolina	671,824	980,592	1,652,416	2.1%
Louisiana	936,118	668,344	1,604,462	2.1%
Mississippi	665,003	859,887	1,524,890	2.0%
Other	5,350,784	6,804,934	12,155,717	15.7%
Total	31,438,484	51,360,154	77,424,917	100.0%

Source: TRANSEARCH database.

Note: The internal Nashville region flows are counted in the “From” column and the “To” column, but not summed in the “Total” column to avoid double-counting.

Kentucky is the largest state trading partner with the Nashville region for both inbound and outbound flows with more than 11.7 million tons. A large component of the Kentucky freight flows are coal flows that are shipped into the region on barge and are inputs to the region's power plants. There also is a significant amount of short-distance truck trips that flow between Kentucky and the Nashville region based on the shared border between the two regions. Illinois and Alabama are the next highest freight flows for the Nashville region with just over 6 million freight flows apiece. These both include a mix of rail and truck flows moving between the Nashville region and these two states. Indiana and Georgia are the only two other states that have over 3 million or more tons of trade with the Nashville region. Overall, the top trading partners reflect the fact that the bulk of trade is either within Tennessee or with neighboring states.

3.0 Truck Flow Analysis

3.1 Nashville Region Truck Counts and Volume Estimates

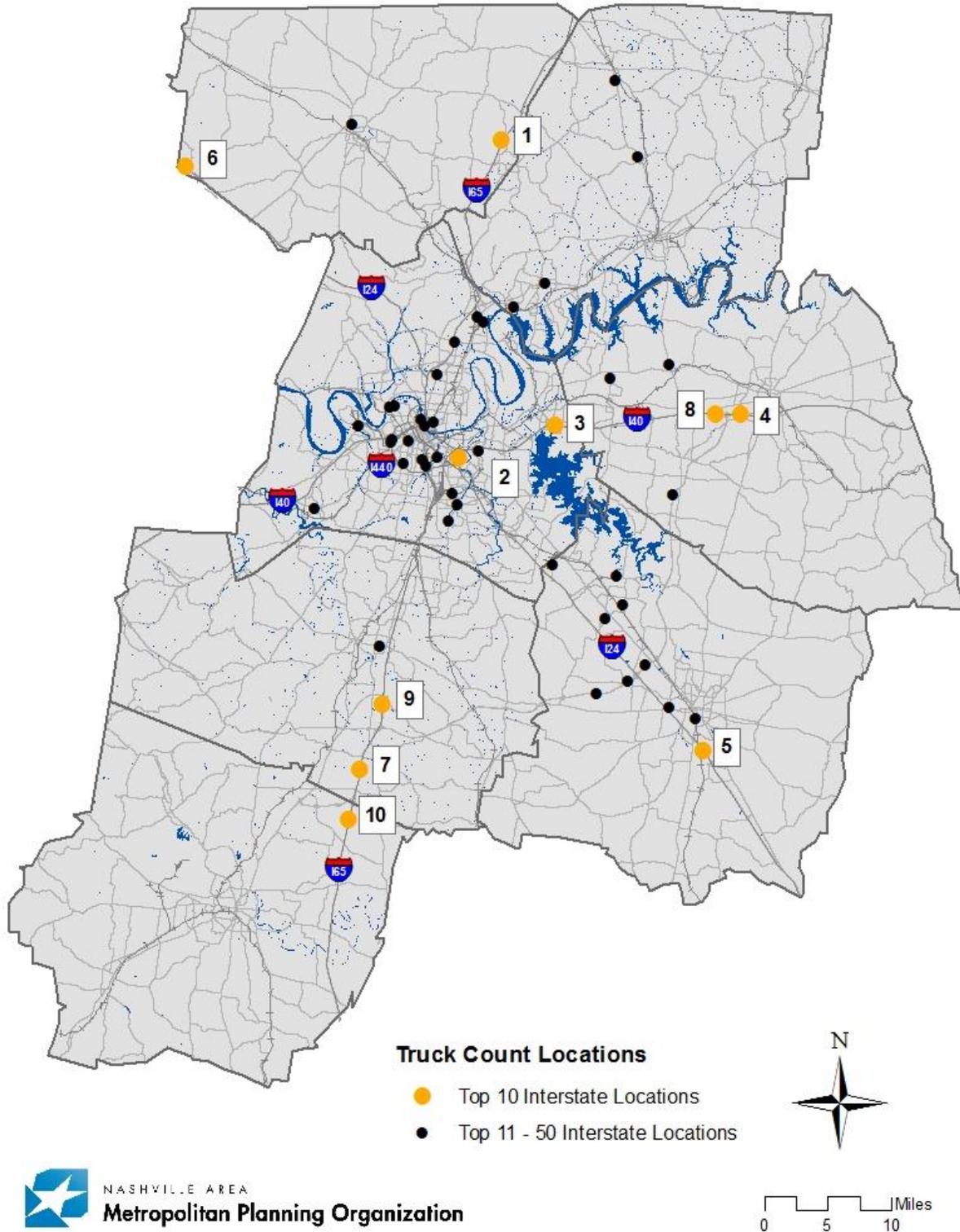
Truck count data can be used to determine the set of roadways that are most important for supporting truck freight movement in the Nashville region. Figure 3.1 and Table 3.1 provide the top truck count locations in the Nashville region based on data provided by the Tennessee Department of Transportation (TDOT). The figure and table indicate that the top truck count locations are clustered on the region's interstates. I-65 has the highest truck count volumes with more than 16,000 trucks per day at a location in the northern part of the MPO region. Other locations with more than 10,000 trucks per day are located on I-24 and I-40. These high truck volumes are a result of the combination of long-haul truck traffic that utilize these locations, along with high numbers of local distribution and delivery trucks that also use these interstates to connect from regional distribution centers and production facilities to retail outlets.

The largest non-interstate truck volumes were identified on SR 840 with more than 6,000 trucks per day just east of I-24; and more than 4,000 trucks per day at several locations further away from I-24. At its highest truck count location, SR 840 has slightly less trucks than I-65 just south of I-440 south of downtown Nashville. Other non-interstate locations with more than 4,000 trucks per day include Briley Parkway near I-40, SR 6 in Hendersonville, Nolensville Pike (SR 11) just north of Harding Place (SR 255), and SR 1 near SR 106. Figure 3.2 and Table 3.2 list the top non-interstate truck count locations. While there are high truck count locations throughout the metropolitan region, there does appear to be some clustering of locations in the downtown Nashville area and in the southeast portion of the Nashville region.

The Nashville MPO regional travel demand model also can be used to estimate truck volumes in the region and identify truck-intensive roadways. Figure 3.3 shows the truck volume estimates from the model for 2010. This map reinforces the finding from the truck count data that the heaviest truck traffic is found on the interstates. It also shows how truck traffic over 10,000 trucks per day can be found on the radial interstates I-24, I-40, and I-65.

The radial interstate with the heaviest truck volumes appears to be I-24 southeast of Nashville, as it has the longest stretch of interstate with more than 10,000 trucks per day. It also is the only interstate that has truck volume estimates over 10,000 trucks per day outside of SR 840. I-65 south of Nashville has the second longest stretch of interstate with truck volumes above 10,000 trucks per day. U.S. 70, SR 6 in Hendersonville, SR 31 in the south Nashville region, and Briley Parkway are some of the non-interstate highways where truck volumes on some portions are over 2,500 trucks per day.

Figure 3.1 Top 50 Truck Count Locations in Nashville Region



Source: TDOT Vehicle Classification Data.

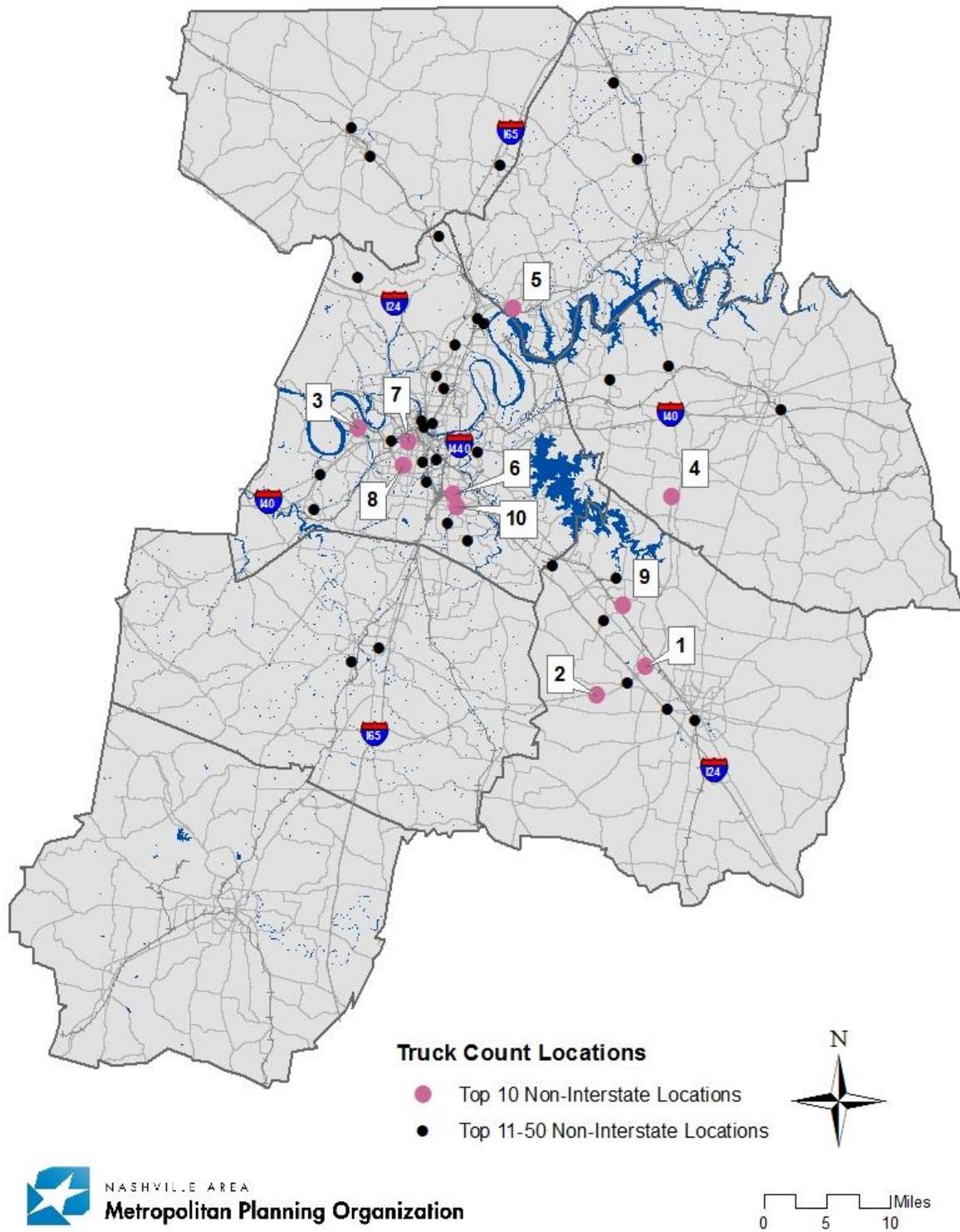
Table 3.1 Top 50 Truck Count Locations in Nashville Region

Rank	County	Route No.	Location	Truck AADT	Year
1	Robertson	I-65	S. of SR 25	16,740	2011
2	Davidson	I-24	Near I-24 & I-440 Jct.	12,569	2009
3	Davidson	I-40	Near Wilson Co Line	12,131	2010
4	Wilson	I-40	S.W. Lebanon	11,498	2013
5	Rutherford	I-24	[Loops] SE of Church St. (U.S. 231)	10,781	2011
6	Robertson	I-24	Near Montgomery Co. Line	9,326	2013
7	Williamson	I-65	South of SR 840	8,930	2012
8	Wilson	I-40	West of SR 840	8,906	2013
9	Williamson	I-65	N of SR 840, S of Franklin	8,043	2012
10	Maury	I-65	South of Saturn Pkwy.	7,406	2012
11	Davidson	I-65	N of Thompson Lane	6,497	2010
12	Rutherford	SR 840	B/N SR 1 and I-24	6,368	2013
13	Davidson	I-440	S of I-40	6,270	2013
14	Rutherford	SR 840	West of I-24	4,988	2013
15	Davidson	SR 155	Briley Pkwy-West Nashville, Near I-40	4,595	2013
16	Wilson	SR 840	South of Stewarts Ferry Pike	4,428	2013
17	Sumner	SR 6	Hendersonville	4,308	2013
18	Davidson	SR 11	Nolens Pike-North of Harding Place	4,095	2013
19	Davidson	SR 1	Near Jct SR 106 & SR 1 West Eend	4,014	2013
20	Davidson	SR 106	Near I-440	3,941	2013
21	Rutherford	SR 102	East Smyrna	3,748	2013
22	Davidson	SR 255	W. of Nolensville Pike	3,536	2013
23	Rutherford	SR 840	Between Manson Pk & Florence Road – Murfreesboro	3,435	2013
24	Davidson	SR 1	I-40 At Vaughns Gap	3,266	2013
25	Williamson	SR 96	W of I-65 In Franklin	3,220	2013
26	Davidson	SR 11	N of I-440	2,950	2013
27	Davidson	SR 45	O.H. Blvd-B/T Dickerson & Gallatin Rd	2,827	2013
28	Davidson	SR 24	Charlotte Ave-West At 25th Ave At I-40	2,732	2013
29	Davidson	SR 6	Vic Mem Bridge – CBD	2,451	2013
30	Rutherford	SR 266	Smyrna- Near Airport	2,428	2013
31	Davidson	1017	Myatt Dr – Madison	2,416	2013
32	Rutherford	1048	West Murfreesboro	2,413	2013
33	Davidson	SR 12	Bordeaux	2,402	2013
34	Davidson	SR 11	Dickerson Rd – S of Ewing Lane	2,315	2013

Rank	County	Route No.	Location	Truck AADT	Year
35	Davidson	3252	Near Woodland St Bridge	2,239	2013
36	Davidson	SR 6	S of Two Mile Pike	2,208	2013
37	Davidson	3258	Jefferson St Bridge	2,061	2013
38	Rutherford	SR 102	South Smyrna	2,051	2013
39	Wilson	SR 109	N. of Jct SR 24 and SR 109	2,035	2013
40	Davidson	SR 155	Briley Pkwy-S of I-40 Interchange	2,021	2013
41	Davidson	SR 6	Franklin Pike	1,957	2013
42	Wilson	SR 171	N. of Mt. Juliet	1,922	2013
43	Sumner	SR 109	Portland	1,907	2013
44	Rutherford	SR 10	South Murfreesboro	1,842	2013
45	Rutherford	1057	West La Vergne	1,830	2013
46	Davidson	SR 12	Metro Ctr Blvd-Near Broadway	1,650	2013
47	Sumner	SR 386	Hendersonville	1,571	2013
48	Davidson	3289	Edmondson Pk-Near Williamson Co Line	1,494	2013
49	Robertson	SR 11	Springfield	1,431	2013
50	Sumner	SR 109	N. of S. Tunnel Road	1,324	2013

Source: TDOT Vehicle Classification Count Data.

Figure 3.2 Top 50 Non-Interstate Truck Count Locations in Nashville Region



Source: TDOT Vehicle Classification Data.

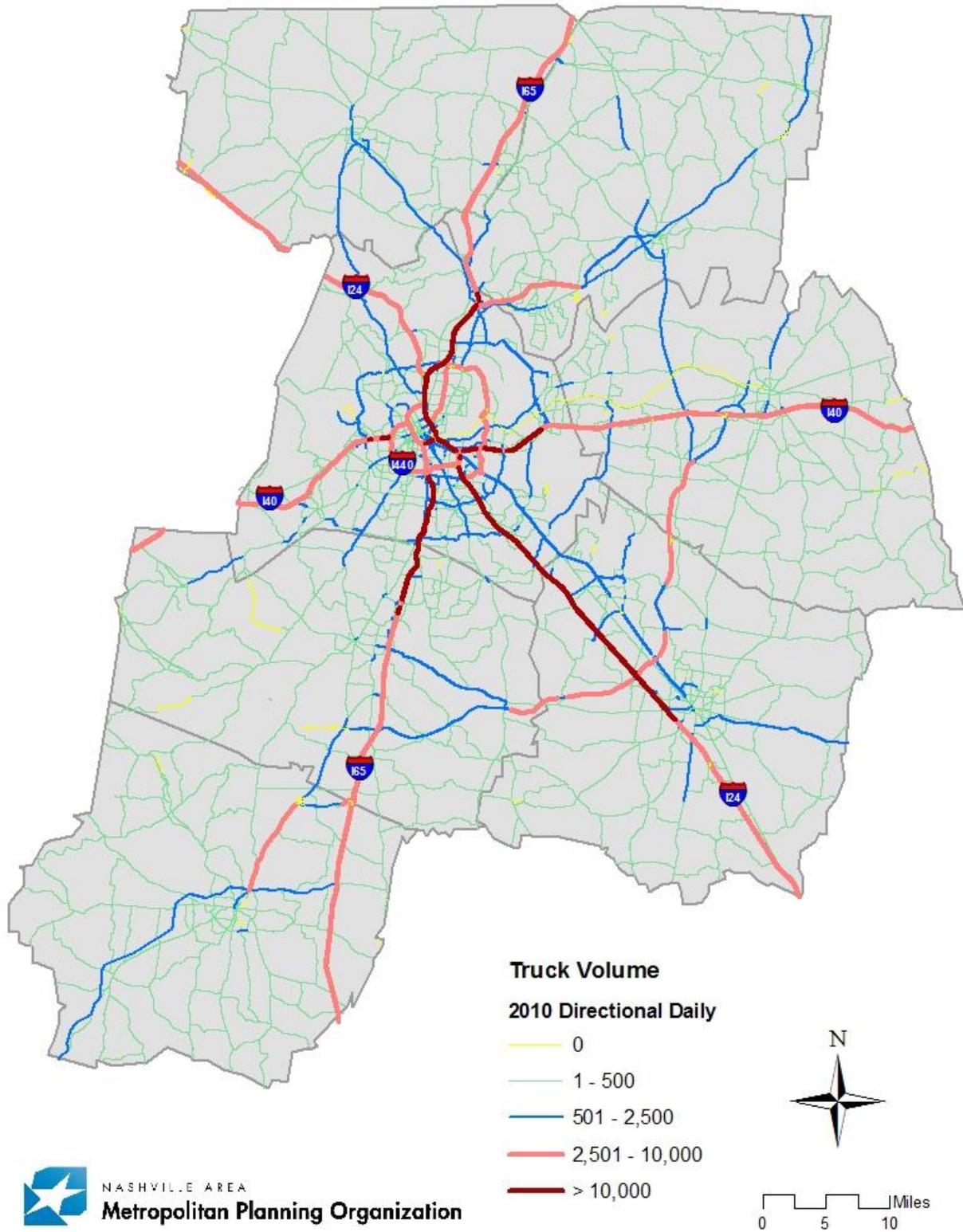
Table 3.2 Top 50 Non-Interstate Truck Count Locations in Nashville Region

Rank	County	Route	Location	Truck AADT
1	Rutherford	SR 840	B/N SR 1 & I-24	6,368
2	Rutherford	SR 840	West of I-24	4,988
3	Davidson	SR 155	Briley Pkw-West Nashville, Near I-40	4,595
4	Wilson	SR 840	South of Stewarts Ferry Pike	4,428
5	Sumner	SR 6	Hendersonville	4,308
6	Davidson	SR 11	Nolens. Pk-N of Harding Place	4,095
7	Davidson	SR 1	Near Jct SR 106 & SR 1 Westend	4,014
8	Davidson	SR 106	Near I-440	3,941
9	Rutherford	SR 102	East Smyrna	3,748
10	Davidson	SR 255	W. of Nolensville Pike	3,536
11	Rutherford	SR 840	Between Manson Pk & Florence Road – Murfreesboro	3,435
12	Davidson	SR 1	I-40 at Vaughns Gap	3,266
13	Williamson	SR 96	W of I-65 In Franklin	3,220
14	Davidson	SR 11	N of I-440	2,950
15	Davidson	SR 45	O.H. Blvd-B/T Dickerson & Gallatin Rd	2,827
16	Davidson	SR 24	Charlotte Ave-West At 25th Ave At I-40	2,732
17	Davidson	SR 6	Vic Mem Bridge – CBD	2,451
18	Rutherford	SR 266	Smyrna – Near Airport	2,428
19	Davidson	1017	Myatt Dr – Madison	2,416
20	Rutherford	1048	West Murfreesboro	2,413
21	Davidson	SR 12	Bordeaux	2,402
22	Davidson	SR 11	Dickerson Rd – S of Ewing Lane	2,315
23	Davidson	3252	Near Woodland St Bridge	2,239
24	Davidson	SR 6	S of Two Mile Pike	2,208
25	Davidson	3258	Jefferson St Bridge	2,061
26	Rutherford	SR 102	South Smyrna	2,051
27	Wilson	SR 109	N. of Jct SR 24 and SR 109	2,035
28	Davidson	SR 155	Briley Pkwy-S of I-40 Interchange	2,021
29	Davidson	SR 6	Franklin Pike	1,957
30	Wilson	SR 171	N. of Mt. Juliet	1,922
31	Sumner	SR 109	Portland	1,907
32	Rutherford	SR 10	South Murfreesboro	1,842
33	Rutherford	1057	West La Vergne	1,830
34	Davidson	SR 12	Metro Ctr Blvd-Near Broadway	1,650

Rank	County	Route	Location	Truck AADT
35	Sumner	SR 386	Hendersonville	1,571
36	Davidson	3289	Edmondson Pk-Near Williamson Co Line	1,494
37	Robertson	SR 11	Springfield	1,431
38	Sumner	SR 109	N. of S. Tunnel Road	1,324
39	Wilson	SR 26	S.E. Lebanon	1,266
40	Williamson	SR 6	S Franklin	1,256
41	Davidson	SR 11	Near Williamson Co Line	1,245
42	Robertson	SR 76	W. of White House	1,176
43	Davidson	SR 11	Near Robertson Co. Line	1,161
44	Davidson	SR 6	Franklin Rd-S of Woodmont Blvd	1,102
45	Rutherford	SR 266	East of Smyrna	1,005
46	Robertson	SR 11	Springfield	963
47	Davidson	SR 106	Near Jct SR 70 & SR 106	939
48	Davidson	SR 251	Near I-40 West	922
49	Davidson	SR 65	N of Joelton	911
50	Davidson	SR 6	Ellington Pky – South of I-65	868

Source: TDOT.

Figure 3.3 2010 Truck Volume Estimates in Nashville Region



3.2 Nashville Region Truck Origins and Destinations

Truck traffic is generated by many dispersed locations throughout the Nashville region. Major freight facilities such as truck terminals can generate several hundred trucks per day. Similarly, warehouses and distribution centers can generate well over 100 trucks per day. The CSX Radnor intermodal railyard, where goods are transferred between truck and rail, also likely generates hundreds of trucks per day. Grocery stores and other retail establishments can attract up to a dozen trucks per day depending on their size and the types of goods sold. Additionally, locations such as malls, shopping centers, and commercial locations in the downtown Nashville area are also major truck trip generators.

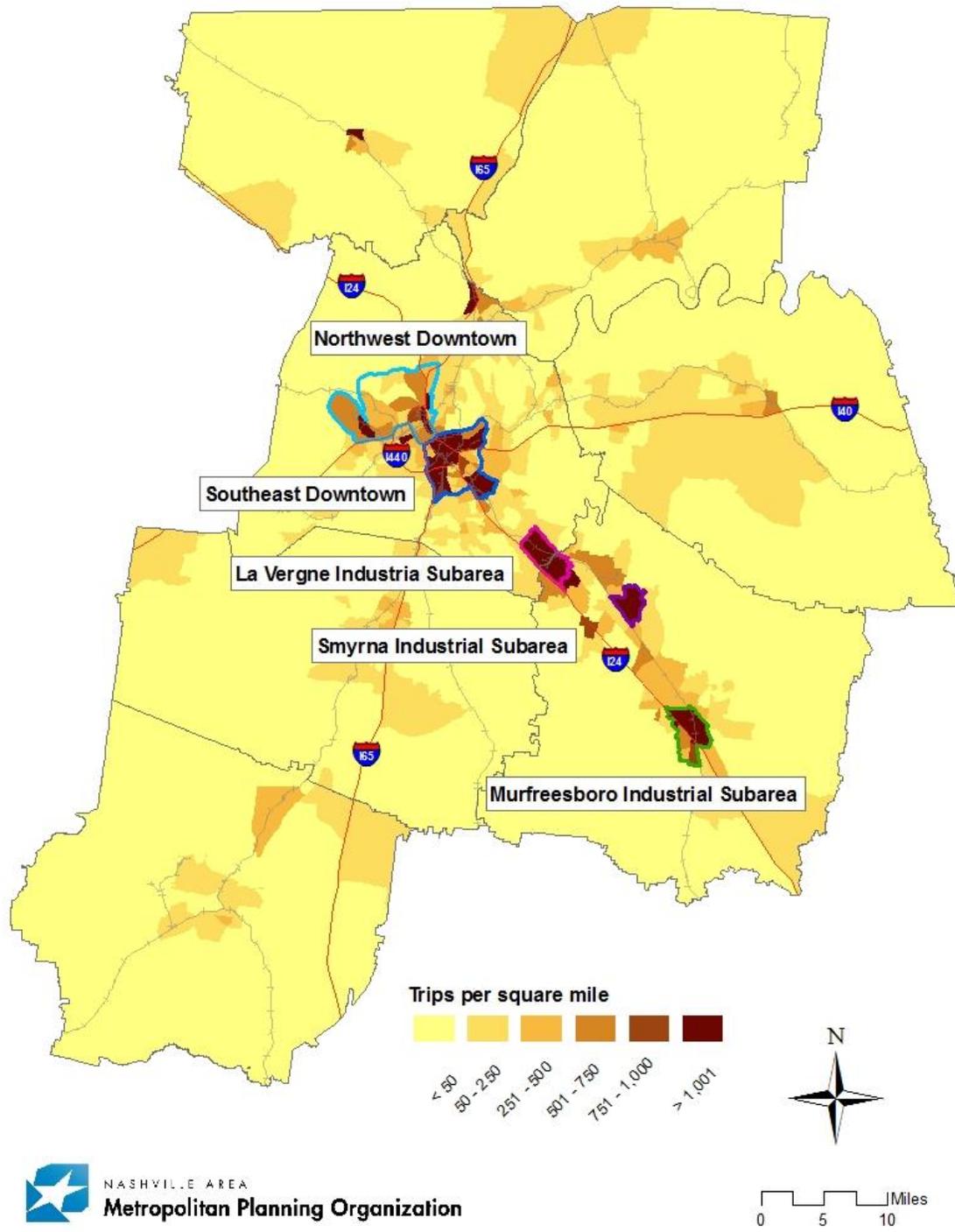
A truck global positioning system (GPS) database from the American Transportation Research Institute (ATRI) was used to determine truck trip ends in the Nashville region. This database includes truck GPS position information on the vast majority of the membership of the American Trucking Association which represents approximately 5 to 10 percent of the total truck volumes on the road network. This database has a large component of short haul truck trips, but based on the membership of the American Trucking Association, it is likely that this database does have a bit of a skew towards long haul truck trips and very little, if any, representation of service trucks. Figure 3.4 shows the locations of truck trip ends based on this data, which was collected over four weeks (one week in each of the four seasons) during 2012. The figure shows truck trip generation density (on a per square mile basis) for each of the traffic analysis zones in the metropolitan Nashville portion of the Tennessee Statewide travel demand model. The figure highlights that a large portion of the truck trips in the Nashville region is generated in either the downtown area or in the southeast.

Figure 3.4 further indicates that there are five high density truck trip generation subareas in the Nashville Area MPO planning area. These truck-intensive subareas are:

1. The Northwest portion of downtown Nashville;
2. The Southeast portion of downtown Nashville;
3. The La Vergne industrial area;
4. The Smyrna industrial area surrounding the Nissan plant; and
5. The western portion of Murfreesboro straddling I-24.

Table 3.3 shows the number of truck trips by county based on the GPS data. This table shows that more than two-thirds of the truck trips in the region are generated in Davidson and Rutherford Counties. Davidson County alone generates more than 40 percent of the truck trips in the region, with Rutherford County generating another 28 percent of truck trips. This is followed by Wilson County with 12 percent. The remaining four counties in the region have between 2.9 and 5.2 percent each of the region's total truck trips.

Figure 3.4 Truck Trip Origins and Destinations in Nashville Region



Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

Table 3.3 Number of Truck Trips by County ³

County	Number of Total Truck Trips	Percent of Total	Number of Truck Trips Internal to Nashville Region	Percent of Total
Davidson	116,940	42.8%	37,552	43.5%
Rutherford	76,456	28.0%	23,793	27.5%
Wilson	32,322	11.8%	9,922	11.5%
Sumner	13,729	5.0%	4,488	5.2%
Williamson	13,368	4.9%	4,279	5.0%
Mauy	12,257	4.5%	3,849	4.5%
Robertson	8,439	3.1%	2,483	2.9%
Total	273,511	100.0%	86,366	100.0%

Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

With the exception of the Northwest Downtown location, all of the top five freight-intensive subareas generate more than 1,000 truck trips per square mile of land area per day. The five freight-intensive subareas are estimated to generate more than 40 percent of the truck trips in the Nashville region (Table 3.4). This indicates that a truck route network and freight/land use policy needs to pay particular attention to truck and land use activity within these subareas.

Additional analysis was conducted at each of the five freight-intensive subareas to determine paired trip ends with these locations. Figures 3.5 to 3.9 show the truck trips from each of these subareas to locations throughout the Nashville region. These figures indicate that the truck trips from the five freight-intensive areas tend to have both the origin and destination within freight-intensive subareas. This implies that truck trips between freight-intensive subareas in the region are the most common type of internal truck trips in the region.

There are also several medium-intensive truck trip generation zones in the Nashville region. These can be defined as generating between 50 and 1,000 truck trips per square mile. Most of these locations also are along the radial interstates and include Lebanon along I-40 east of Nashville, Goodlettsville along I-65 north of Nashville, Franklin along I-65 south of Nashville, and along I-40 west of Nashville.

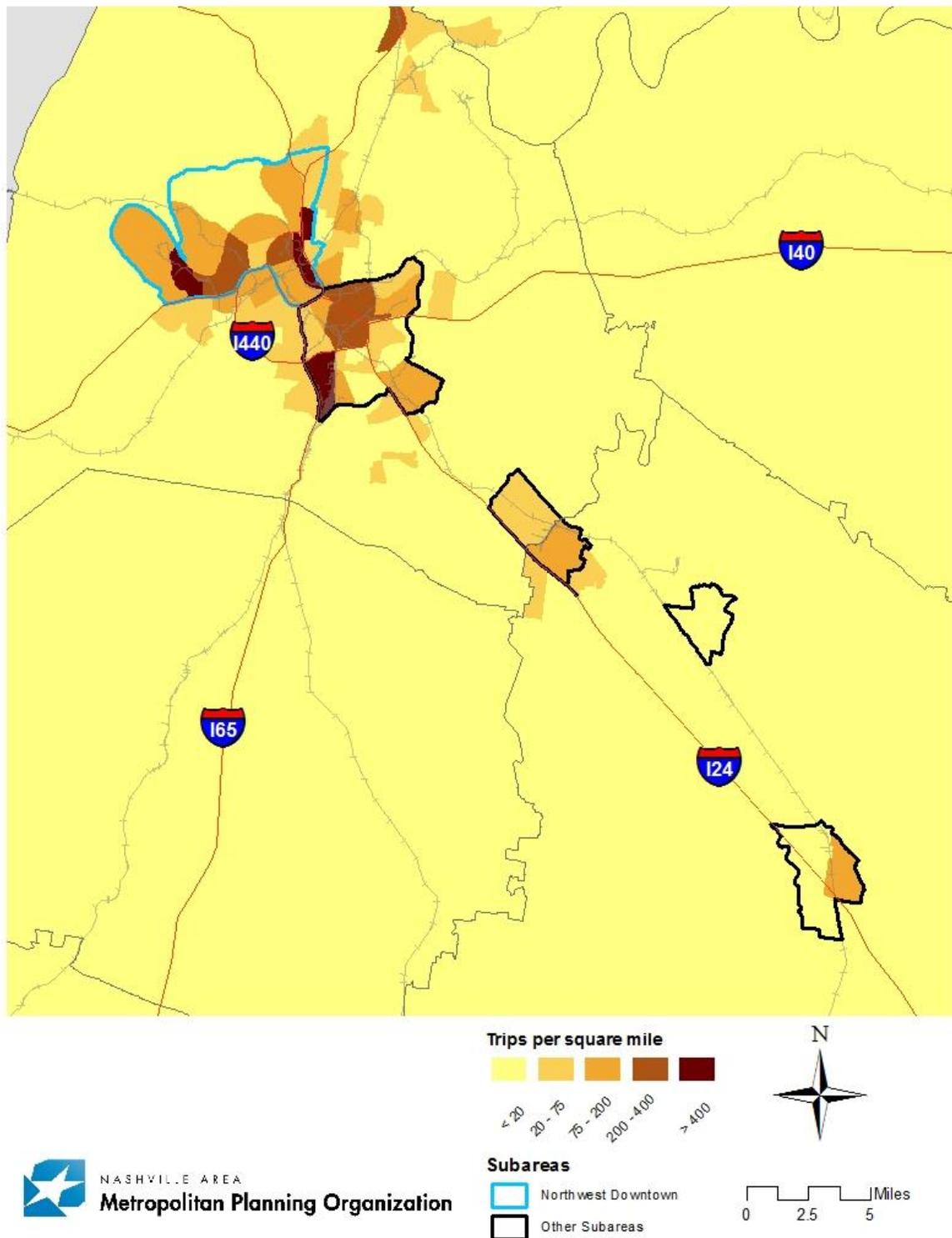
³ ATRI data includes both single and multi-unit trucks and does not provide information for each type, only the total truck traffic.

Table 3.4 Number of Truck Trips by Nashville Subarea

Subarea	Number of Total Truck Trips	Trips per Square Mile	Percent of Total	Number of Truck Trips Internal to Nashville Region	Percent of Total
Southeast Downtown	41,938	1,818	15.3%	14,192	16.4%
Northwest Downtown	25,170	689	9.2%	8,250	9.6%
La Vergne Industrial Subarea	22,247	2,673	8.1%	7,405	8.6%
Murfreesboro Industrial Subarea	10,973	1,141	4.0%	3,511	4.1%
Smyrna Industrial Subarea	10,360	2,242	3.8%	3,652	4.2%
Subtotal – Top Five Industrial Regions	110,689	1,347	40.5%	37,010	42.9%
Remainder of Davidson and Rutherford Counties	82,702	77	30.2%	24,335	28.2%
Combined Wilson, Sumner, Williamson, Maury and Robertson Counties	80,115	29	29.3%	25,021	29.0%
Total	273,506	69	100.0%	86,366	100.0%

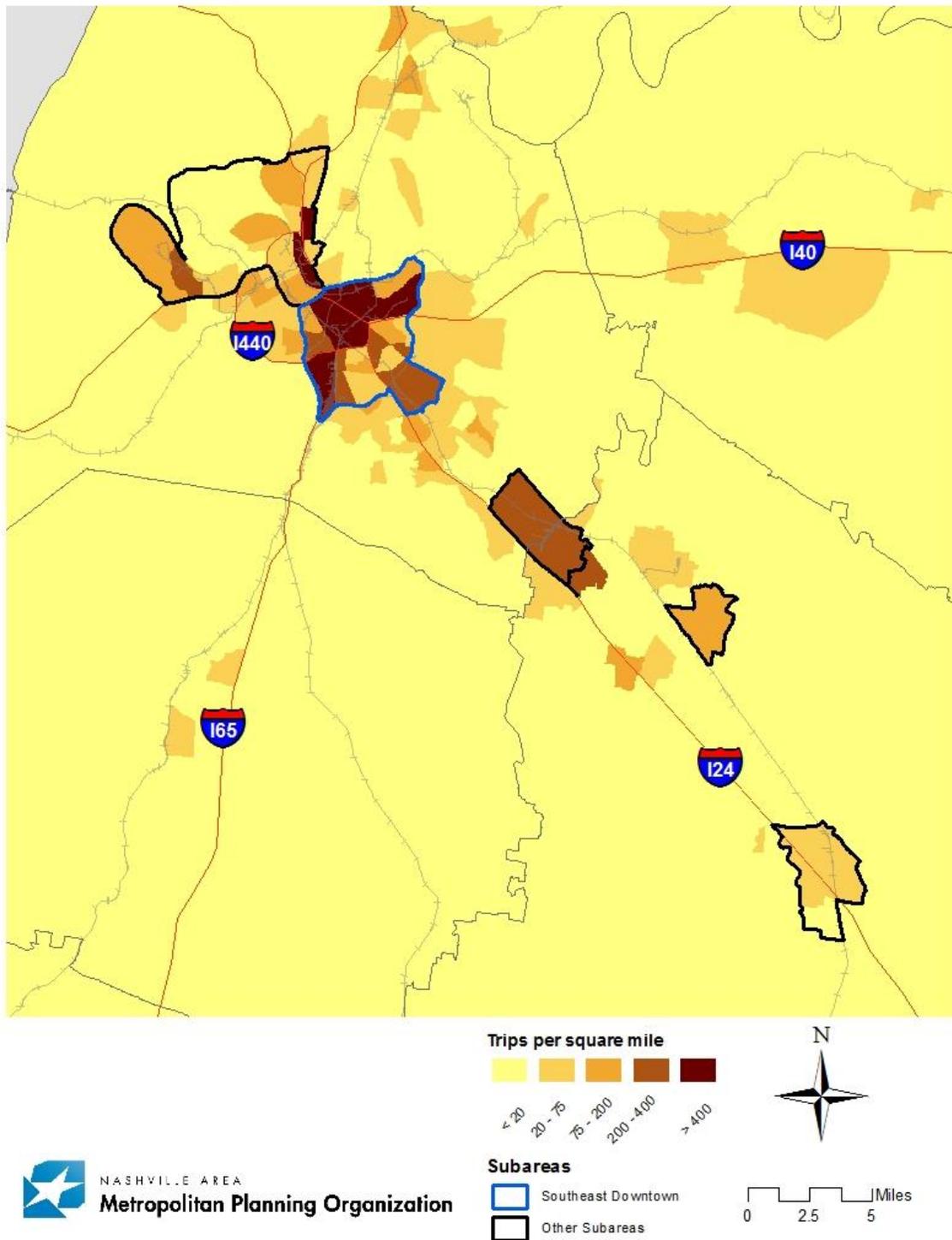
Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model

Figure 3.5 Truck Trip Ends in Northwest Downtown Nashville Subarea (Internal Trips Only)



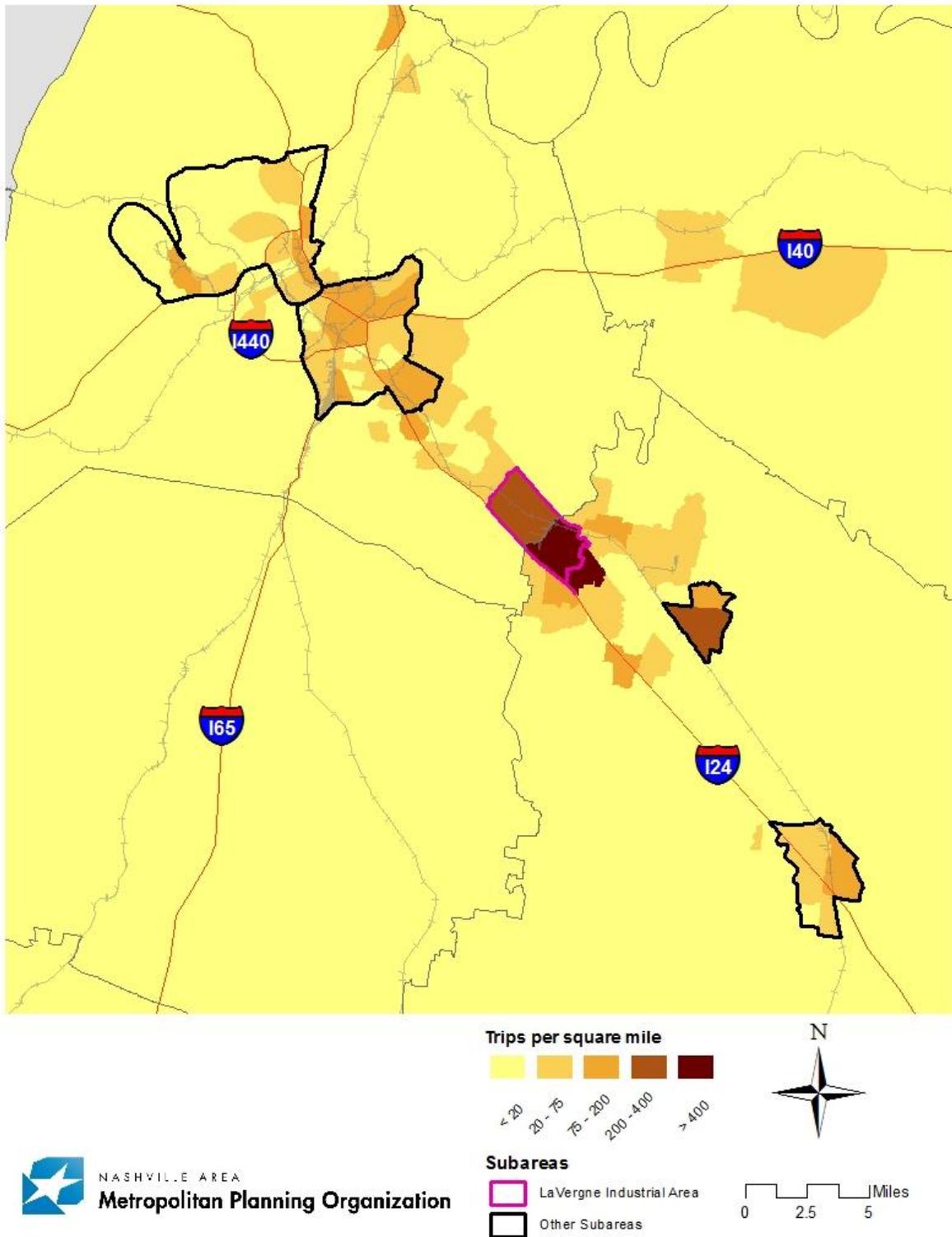
Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

Figure 3.6 Truck Trip Ends in Southeast Downtown Nashville Subarea (Internal Trips Only)



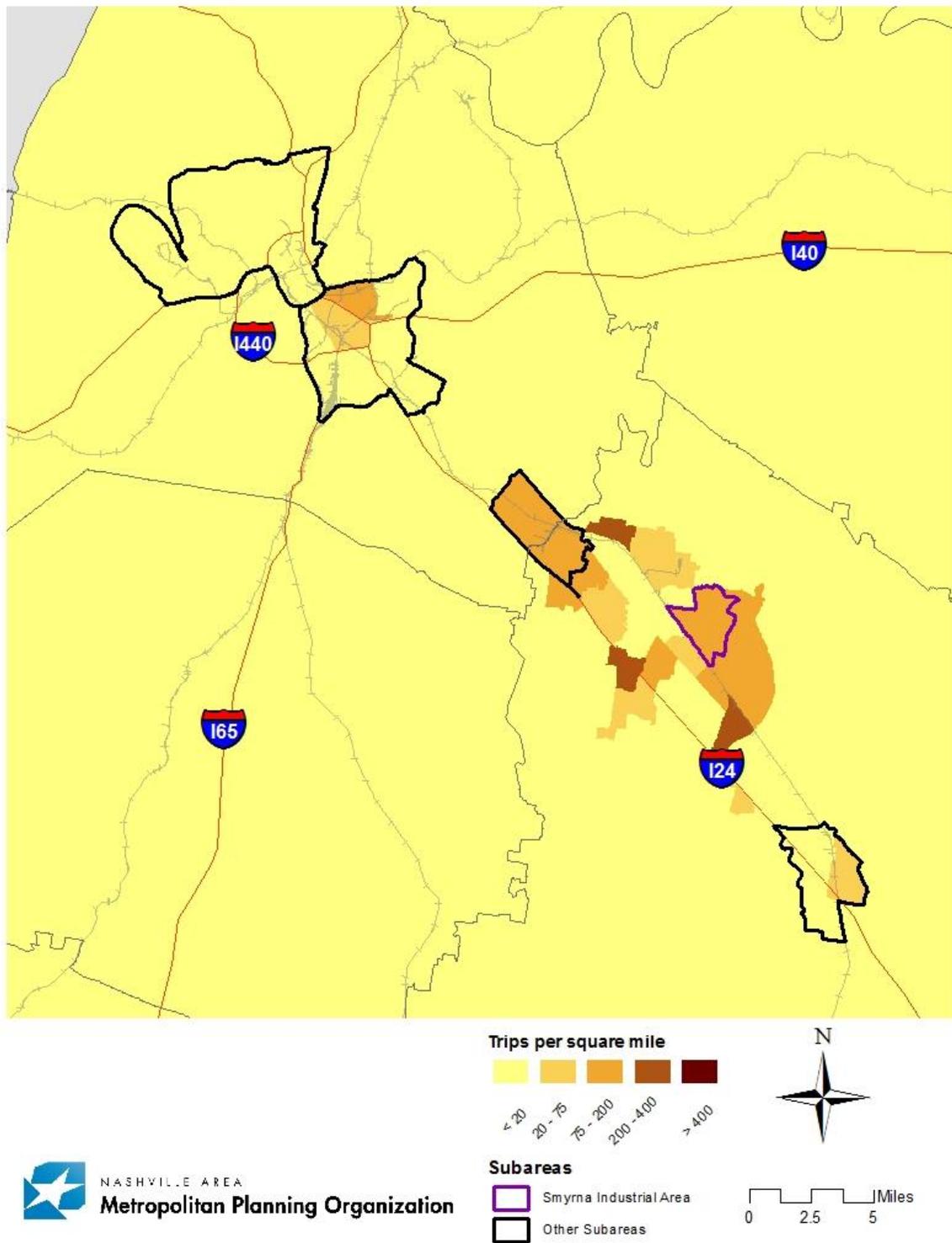
Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

Figure 3.7 Truck Trip Ends in La Vergne Industrial Subarea (Internal Trips Only)



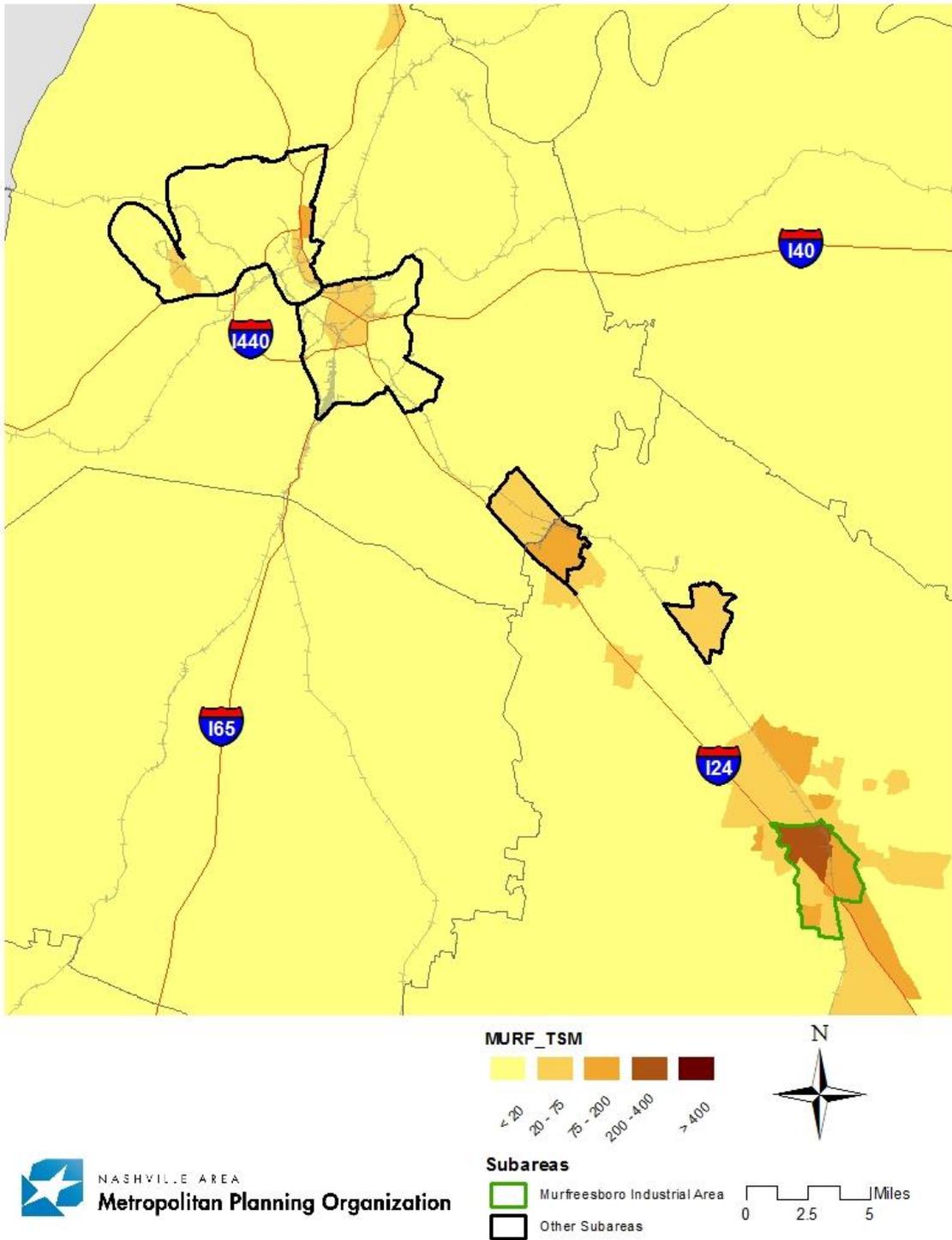
Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

Figure 3.8 Truck Trip Ends in Smyrna Industrial Subarea (Internal Trips Only)



Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

Figure 3.9 Truck Trip Ends in Murfreesboro Industrial Subarea (Internal Trips Only)



Source: American Transportation Research Institute Truck GPS data analyzed for development of TDOT Statewide Travel Demand Model.

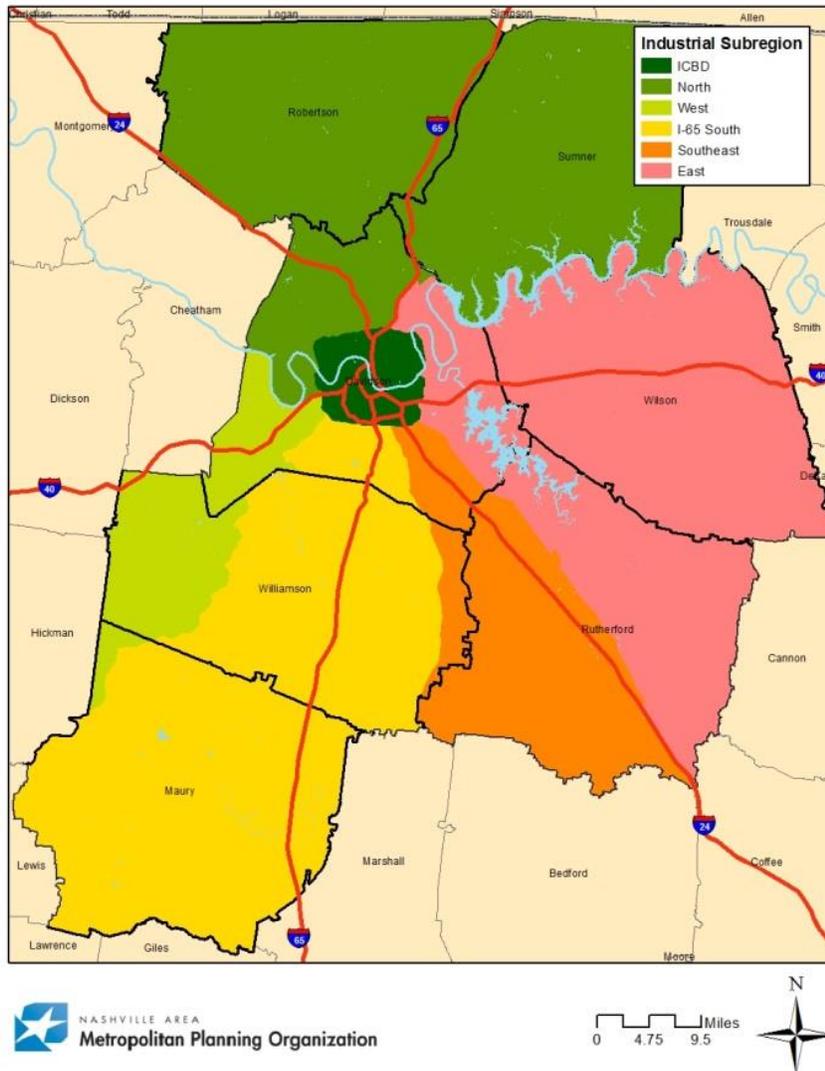
3.3 Industrial Warehouse Locations and Manufacturing Employment

Warehousing data and manufacturing activity can also be used to estimate freight flows, particularly truck flows, in a metropolitan region. Table 3.5 shows industrial facility square feet and vacancy by subregions defined by Cassidy Turley within the Nashville region.⁴ These subregions are predefined by industrial real estate brokerages and do not map exactly with subregions as defined by the Nashville Area MPO. As of the end of September 2014, there was just more than 195 million square feet of industrial space in the region spread across 2,546 buildings.

The southeast subregion is home to more than 55 million square feet of industrial space, approximately 28 percent of the region's total. Another 26 percent are located in Nashville's central business district (CBD) with more than 50 million square feet of industrial space. A map of the region, as defined for industrial real estate purposes, is provided below in Figure 3.10.

⁴ These regions are predefined for industrial real estate brokerages and do not map exactly with subregions as defined by the Nashville MPO.

Figure 3.10 Map of Industrial Warehouse Space Subregions



Source: Nashville Industrial Market Snapshot, Third Quarter 2014, Cassidy Turley.

In terms of the size of industrial facilities, the east subregion has the largest industrial buildings in the region, with an average size of 126,902 square feet. The southeast subregion has much larger buildings than the CBD, with an average size of 116,049 square feet compared to 50,099 square feet in the CBD. This reflects older industrial buildings in the CBD along with larger tracts of available industrial land in the southeast. Much of the expansion in industrial real estate is occurring at larger size facilities, such as e-commerce fulfillment centers that require 500,000 square feet or more in space. The larger average sizes of buildings in the east and southeast, along with their relatively low average asking rates, are an indication that growth in industrial facilities is likely to be clustered in these two subregions.

Table 3.5 Industrial Buildings in the Nashville Region by Square Feet

Subregion	Existing Industrial Square Feet	Total Number of Buildings	Vacancy Rate	Average Square Feet per Building	Average Asking Rates (per Square Feet)
Southeast	55,703,566	480	9.4%	116,049	\$3.66
CBD	50,600,040	1,010	3.7%	50,099	\$5.48
North	36,903,868	436	7.3%	84,642	\$3.01
East	23,730,708	187	10.2%	126,902	\$3.07
West	16,600,762	205	4.6%	80,979	\$5.59
65-South	12,375,336	228	9.4%	54,278	\$4.19
Total	195,914,280	2,546	7.2%	76,950	n/a

Source: Nashville Industrial Market Snapshot, Third Quarter 2014, Cassidy Turley.

A limited amount of county-level employment data for the region is available through data acquired in the process of developing the Nashville MPO travel demand model. Most notable is that manufacturing employment in the region is clustered in Davidson County (which includes the Nashville CBD) and Rutherford County in the southeast portion of the Nashville region (Table 3.6).

Figure 3.11 shows manufacturing employment in the region as extracted from the Nashville MPO travel demand model. This employment shows clustering around I-24 in Rutherford County and to the west of I-65 south of Nashville.

The large fraction of industrial buildings and manufacturing employment in the southeast and downtown regions is consistent with the clustering of truck trips in these regions as shown from using the truck GPS data in Section 3.3. It also indicates that a regional truck route network and freight/land use policy must pay particular focus on these two critical regions.

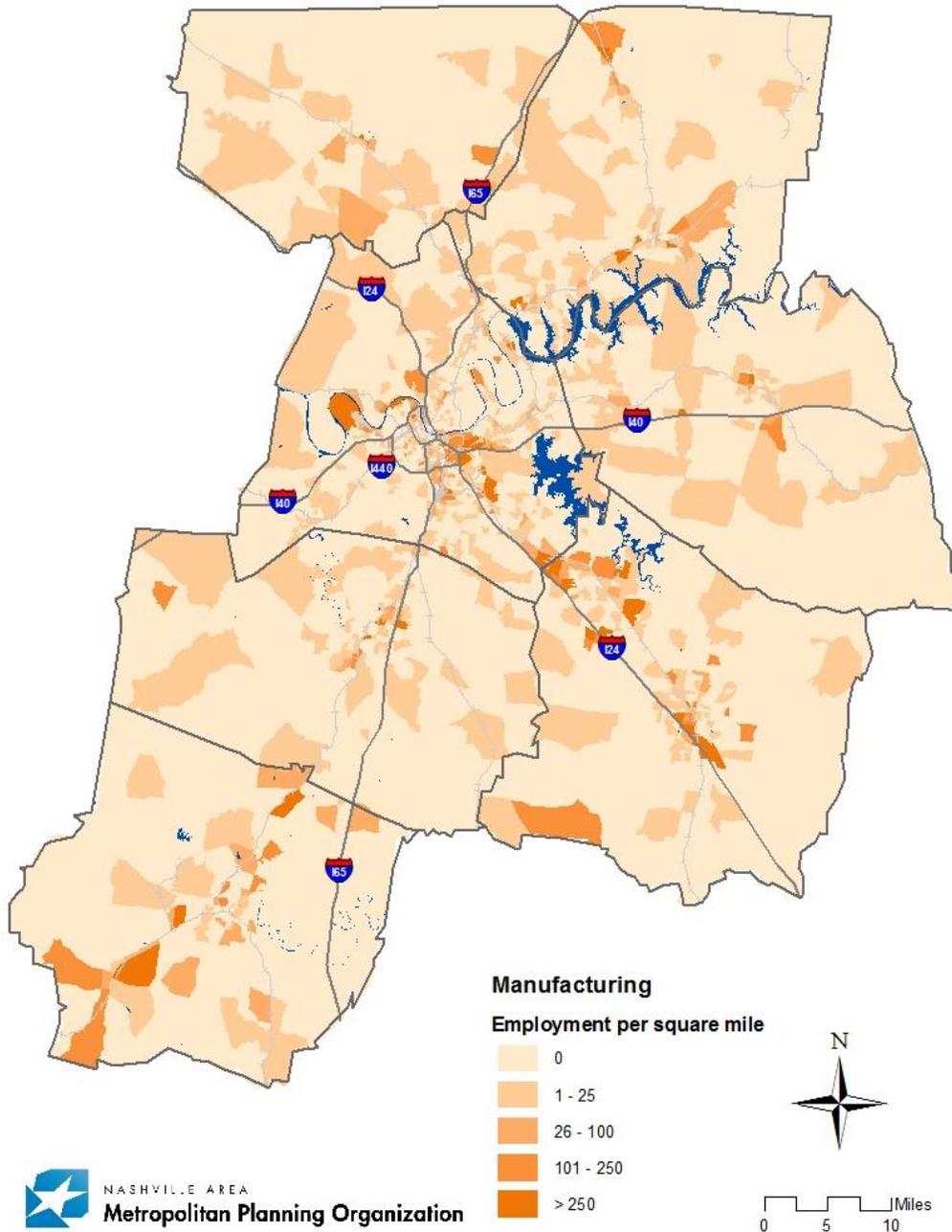
Table 3.6 Manufacturing Employees by County, 2010

County	Manufacturing
Davidson	21,156
Rutherford	17,587
Williamson	2,869
Wilson	4,356
Sumner	4,886
Maury	4,349
Robertson	4,505

Total	59,709
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Source: Nashville Area MPO Land Use Model, Woods and Poole, Economic Census, InfoUSA.

Figure 3.11 Manufacturing Employment in Nashville Region, 2010



Source: Nashville Area MPO Land Use Model, Woods and Poole, Economic Census, InfoUSA.

3.4 Trading Partners by Truck

A metropolitan-level analysis of Nashville’s truck flows indicates that there are a large fraction (almost eight percent) of flows which are remaining in the MPO region. Beyond this, an additional ten percent of truck tonnage goes to the Nashville region’s surrounding counties which are included in the Nashville Bureau of Economic Analysis (BEA) region, but outside of the Nashville Area MPO seven county region. The BEA region includes over 40 counties in the larger Nashville region including several counties in Kentucky.

The Memphis BEA is the single largest trading partner outside of the Nashville BEA region for the truck mode in terms of trucks with 4.4 million tons (Table 3.7). However, by combining metropolitan areas along the same corridor, there are several others that are more important than the I-40 corridor that connects Nashville and Memphis. Combining Chattanooga and Atlanta, there are actually 5.6 million truck tons traveling from Nashville on I-24 east of the region. Combining Huntsville and Birmingham in Alabama results in over 5.0 million truck tons moving along the I-65 corridor south of the Nashville region. The largest truck tons arise from combining metropolitan regions on the I-65 corridor north of the Nashville region including Louisville and Lexington in Kentucky, Evansville and Indianapolis in Indiana. Truck ton trade to these four metropolitan regions is more than 8.8 million tons. This reinforces the notion of I-65 is a key truck corridor for the Nashville region.

Table 3.7 Nashville Area MPO Top Trading Partners by Truck, 2012

BEA Region	To (Tons)	From (Tons)	Total (Tons)	Percent of Total
Nashville BEA Region (excluding 7-county MPO Area)	2,559,880	4,225,966	6,785,847	10.26%
Nashville Area MPO Region (7-county region)	5,220,954	–	5,220,954	7.89%
Memphis, TN	1,416,099	3,022,757	4,438,857	6.71%
Huntsville, AL	1,268,092	1,876,560	3,144,651	4.75%
Chattanooga, TN	887,576	1,977,289	2,864,866	4.33%
Atlanta, GA	1,179,988	1,623,224	2,803,212	4.24%
St. Louis, MO	819,062	1,692,551	2,511,613	3.80%
Louisville, KY	955,152	1,418,493	2,373,645	3.59%
Evansville, IN	1,216,741	1,119,548	2,336,289	3.53%
Birmingham, AL	1,018,019	981,950	1,999,969	3.02%
Knoxville, TN	816,089	1,124,902	1,940,990	2.93%
Lexington, KY	674,788	1,133,595	1,808,383	2.73%
Indianapolis, IN	526,458	1,254,110	1,780,569	2.69%
Paducah, KY	644,639	993,453	1,638,093	2.48%

BEA Region	To (Tons)	From (Tons)	Total (Tons)	Percent of Total
Cincinnati, OH	293,175	649,779	942,954	1.43%
Chicago, IL	381,219	534,664	915,883	1.38%
Little Rock, AR	263,636	575,262	838,898	1.27%
Tupelo, MS	322,668	505,577	828,244	1.25%
Detroit, MI	288,274	395,451	683,725	1.03%
Columbus, OH	242,428	433,709	676,138	1.02%
Other	8,777,109	10,843,028	19,620,137	29.7%
Total	29,772,046	36,381,869	66,153,915	100.0%

Source: TRANSEARCH Database.

3.5 Through Truck Trip Analysis

With Nashville's location at the junction of three major interstates: I-65, I-40, and I-24 and with Tennessee being on the border of states in the Midwest, Southeast and mid-Atlantic, there are a significant amount of through truck flows in the region. Additionally, Nashville is located within 250 miles of two major freight-intensive metropolitan regions (Memphis, Tennessee; and Atlanta, Georgia) which further increases the number of through truck trips for the Nashville region.

Roadside truck origin-destination surveys conducted by TDOT at many of the State's weigh stations can be used as a source to examine origin-destination patterns for long-haul trucks many of which are through trucks for the Nashville region. The locations of these surveys located close to the Nashville region are:

1. I-65 north of Nashville in Portland;
2. I-24 east of Nashville in Manchester;
3. I-40 west of Nashville in Brownsville; and
4. I-40 east of Nashville in Mt. Juliet.

Roadside truck surveys were also conducted in other areas of the state however they are less insightful for the Nashville region due to the quantity of available routes. Table 3.8 shows the distribution of truck trip ends in the Nashville region, in the rest of Tennessee, and in other states at each of the survey locations. This table shows that the vast majority of the truck trips at each location have their trip origins and destinations outside of the region. The Mt. Juliet location has just less than one-quarter of its truck trip ends inside the region for both origins and destinations, and this is the highest value of all four locations. At each location, at least one-half of the truck trip ends are from outside of the State, with the I-65 location in Portland having over three-quarters of all their trip ends outside off the State. This confirms the prevalence of through truck trips on Nashville's interstate.

Table 3.9 provides percentages of through Nashville truck trips at each survey location. They range from a low of 62 percent in Mt. Juliet to a high of 81 percent in Brownsville. Additionally, nearby truck count locations are provided to generate an estimate of through truck trips for the region using the intestates. This table indicates that 34,846 (6,792 + 5,522 + 10,479 + 12,053) trucks pass through the Nashville region on a daily basis. By multiplying this number by the 18,191 pound average payload per truck as taken from the roadside survey and multiplying by 365 (days per year) results in an estimate of 115.7 million through truck tons per year. This compares to 36.4 million inbound truck tons, 24.6 million outbound truck tons and 5.4 million internal truck tons in the Nashville region based on the Transearch data. Therefore, through trucks represent the largest fraction of total truck tons in the Nashville region.

Table 3.8 Distribution of Origins and Destinations at Roadside Truck Survey Locations

	Nashville Region				Outside of Region		
	I-24 E. of Nashville (Manchester)	I-40 E. of Nashville (Mt. Juliet)	I-65 N. of Nashville (Portland)	I-40 W. of Nashville (Brownsville)	I-81 E. of Knoxville	I-40 in Knoxville	I-75 E. of Chattanooga
Origins							
Nashville Region	23%	24%	14%	8%	1%	5%	0%
Other TN	15%	25%	8%	34%	22%	26%	32%
Outside State	61%	50%	78%	57%	77%	69%	68%
Total	100%	100%	100%	100%	100%	100%	100%
Destinations							
Nashville Region	14%	24%	15%	11%	4%	4%	0%
Other TN	17%	17%	8%	34%	25%	31%	51%
Outside State	70%	59%	77%	55%	71%	65%	49%
Total	100%	100%	100%	100%	100%	100%	100%

Source: TDOT Roadside Origin-Destination Surveys, 2009.

Table 3.9 Number of Trucks Through Nashville Region by Location

Interstate Location	I-24 East of Nashville	I-40 East of Nashville	I-40 West of Nashville	I-65 North of Nashville
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	Manchester	Mt. Juliet	Brownsville	Portland
Truck Counts at Nearest Location	10,781	8,906	12,937	16,740
Percent of Trucks That Are Through Trucks (not Nashville region trips)	63%	62%	81%	72%
Total Number of Through Truck Trips per Day	6,792	5,522	10,479	12,053

Source: TDOT Roadside Origin-Destination Surveys, 2009.

Tables 3.10 and 3.11 show specific state origins and destinations for truck trips through the Nashville region based on the roadside surveys. The tables show that Tennessee is the most common origin and destination for the Nashville region’s through truck trips. The neighboring states of Kentucky and Georgia are the most common trip ends outside of Tennessee for Nashville’s through truck trips. There also are several states that are further away that are key points of origin , such as Indiana which is 11 percent and 7 percent of through truck trips on I-65 and I-24, respectively; Ohio which is 14 percent of through truck trips on I-65; and Texas which is more than 10 percent of the through truck flows on I-40. Texas also is noted as a destination for 9 percent of through truck flows along I-65, which indicates that I-65 serves as a funnel of Midwest truck traffic to points further south in the U.S. Alabama also is a major point of origin for through truck traffic on I-65 with more than 10 percent of the truck traffic as well as a major destination with more than 14 percent of the truck traffic. Florida is the origin for 9 percent of through truck traffic on I-24 and the destination for 15 percent.

Table 3.10 Top Origin States for Through Trucks

Top Origin States	I-65 North of Nashville	I-24 East of Nashville	I-40 East of Nashville	I-40 West of Nashville	Overall
Tennessee	11%	17%	29%	38%	22%
Kentucky	20%	9%	2%	7%	11%
Georgia	5%	25%	1%	0%	11%
Indiana	11%	7%	1%	2%	6%
Ohio	14%	0%	0%	6%	6%
Texas	4%	1%	10%	13%	6%
Alabama	10%	2%	0%	0%	4%
Florida	1%	9%	1%	0%	4%
Illinois	4%	7%	1%	0%	4%
Arizona	2%	0%	7%	7%	3%
All Others	19%	24%	48%	26%	25%
Totals	100%	100%	100%	100%	100%

Source: TDOT Roadside Origin-Destination Surveys, 2009.

Table 3.11 Top Destination States for Through Trucks

Top Destination States	I-65 North of Nashville	I-24 East of Nashville	I-40 East of Nashville	I-40 West of Nashville	Overall
Tennessee	11%	14%	17%	37%	19%
Georgia	10%	25%	0%	0%	12%
Kentucky	15%	7%	3%	9%	9%
Texas	9%	0%	10%	15%	8%
Florida	5%	15%	0%	0%	7%
Indiana	7%	7%	4%	1%	5%
Alabama	14%	2%	0%	0%	5%
Illinois	3%	9%	3%	0%	5%
Arizona	1%	1%	5%	8%	3%
Ohio	6%	0%	0%	6%	3%
All Others	18%	21%	56%	24%	24%
Totals	100%	100%	100%	100%	100%

Source: TDOT Roadside Origin-Destination Surveys, 2009.

The commodity distribution of through trucks is different than that for overall trucks. Farm and food products represent nearly 20 percent of all of the through trucks in the four survey locations (Table 3.12). Machinery and parts is the second largest commodity ranging from 3 to 11 percent of the through trucks at the four locations. Metal and metal products, along with paper and paper products, represent about 5 percent each of the through truck flows. No other commodities represent more than 5 percent of the through truck flow distribution. Only approximately 15 percent of the trucks are traveling empty.

Table 3.12 Commodity Distribution at Roadside Truck Survey Locations

Commodity	I-24 East of Nashville	I-40 East of Nashville	I-65 North of Nashville	I-40 West of Nashville	Total
	Manchester	Mt. Juliet	Portland	Brownsville	
Farm Products	16%	15%	8%	11%	13%
Food Products	11%	6%	6%	4%	7%

Machinery and Parts	3%	5%	11%	10%	7%
Metal/Metal Products	6%	1%	11%	4%	6%
Paper/Paper Products	5%	6%	6%	8%	6%
Empty	14%	10%	10%	20%	14%
All Others	44%	56%	49%	43%	46%
Total	100%	100%	100%	100%	100%

Source: TDOT Roadside Origin-Destination Surveys, 2009.

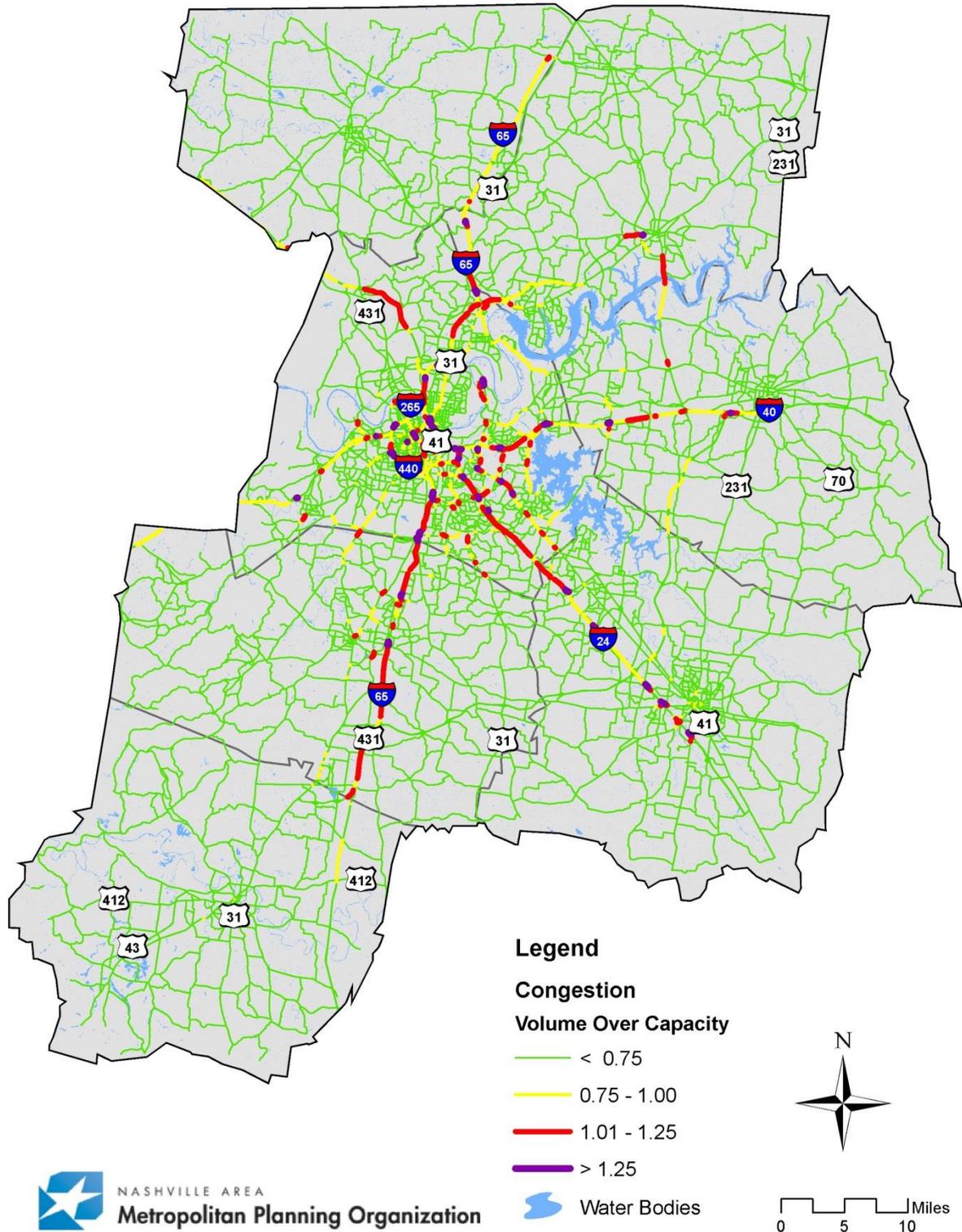
3.6 Highway Performance

The Nashville region features a significant amount of recurring commute congestion. Truck traffic contributes to this congestion; and trucking operations also are negatively impacted by congestion. In addition to the cumulative increased trucking costs that are a direct result of congestion, many companies alter their trucking operations specifically to avoid traveling during congested periods of the day. These changes in operating hours increases costs as nonpeak congested periods tend to shorter driver days and drivers are typically paid more for working before the morning peak or after the evening peak. This drives up supply chain costs and in turn tends to increase costs for the general public for the goods that they consume.

Figure 3.12 shows congested locations during the afternoon peak period in 2010 based on the Nashville MPO travel demand model. The interstates feature the most congestion with several locations where volumes exceed capacity. The longest stretch of congestion is along I-65 south of Nashville. The most freight-intensive portion of the region, along I-24 southeast of Nashville, has recurring congestion extending from downtown Nashville to La Vergne with spotty congestion locations in the Murfreesboro region.

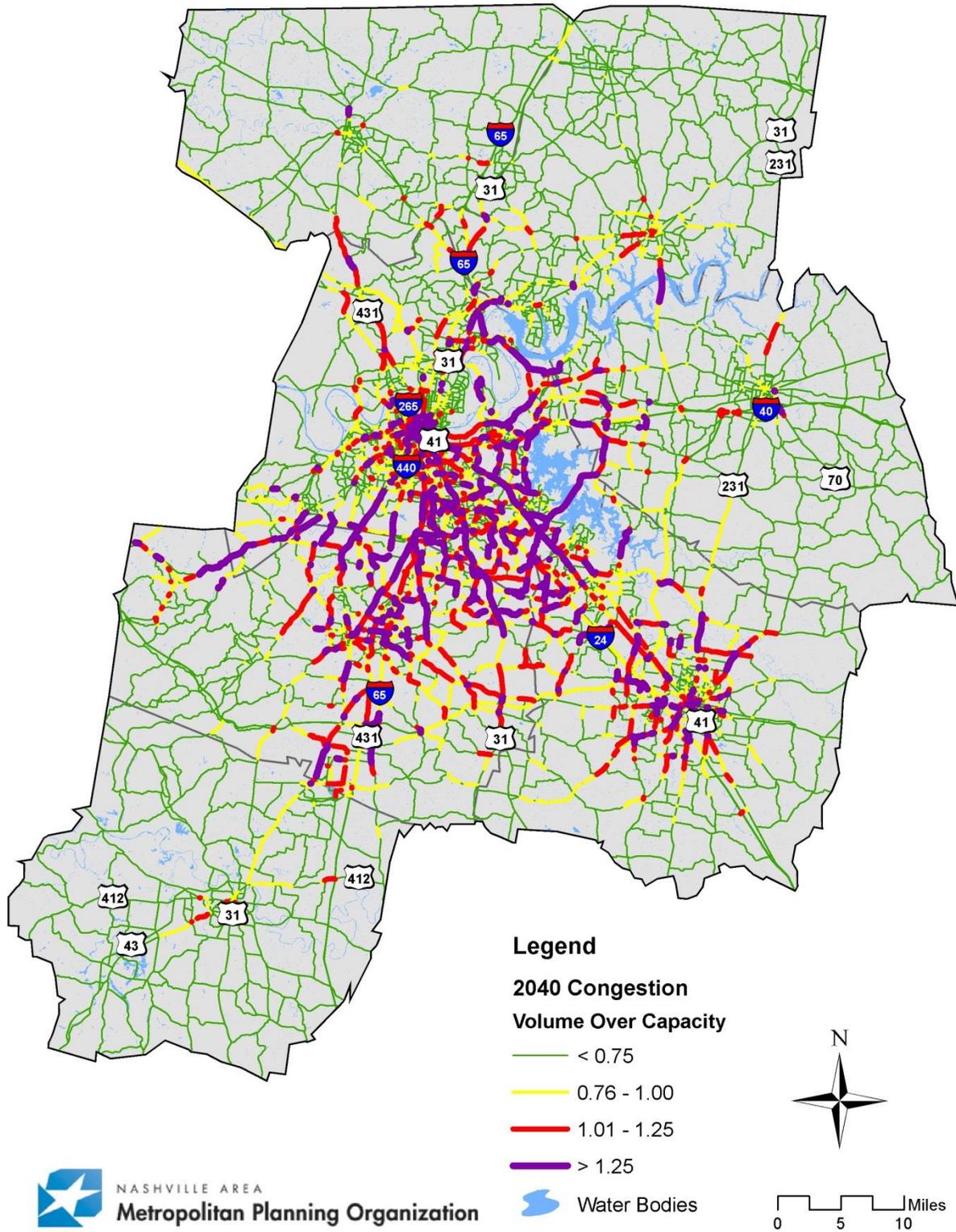
Figure 3.13 shows congested locations forecast for 2040, which includes projected traffic volumes and planned projects from the Transportation Improvement Plan (TIP) for the Nashville region. This figure shows that congestion will become extreme throughout the Nashville region. If this forecast were to come to fruition, it will have significantly negative impacts on trucking activity increasing costs to carriers, shippers, and ultimately for consumers in the Nashville region.

Figure 3.12 2010 Congestion Map for Nashville Region



Source: Nashville MPO Travel Demand Model, September 2014 version.

Figure 3.13 2040 Congestion Map for Nashville Region

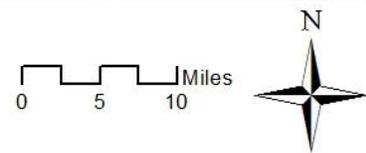
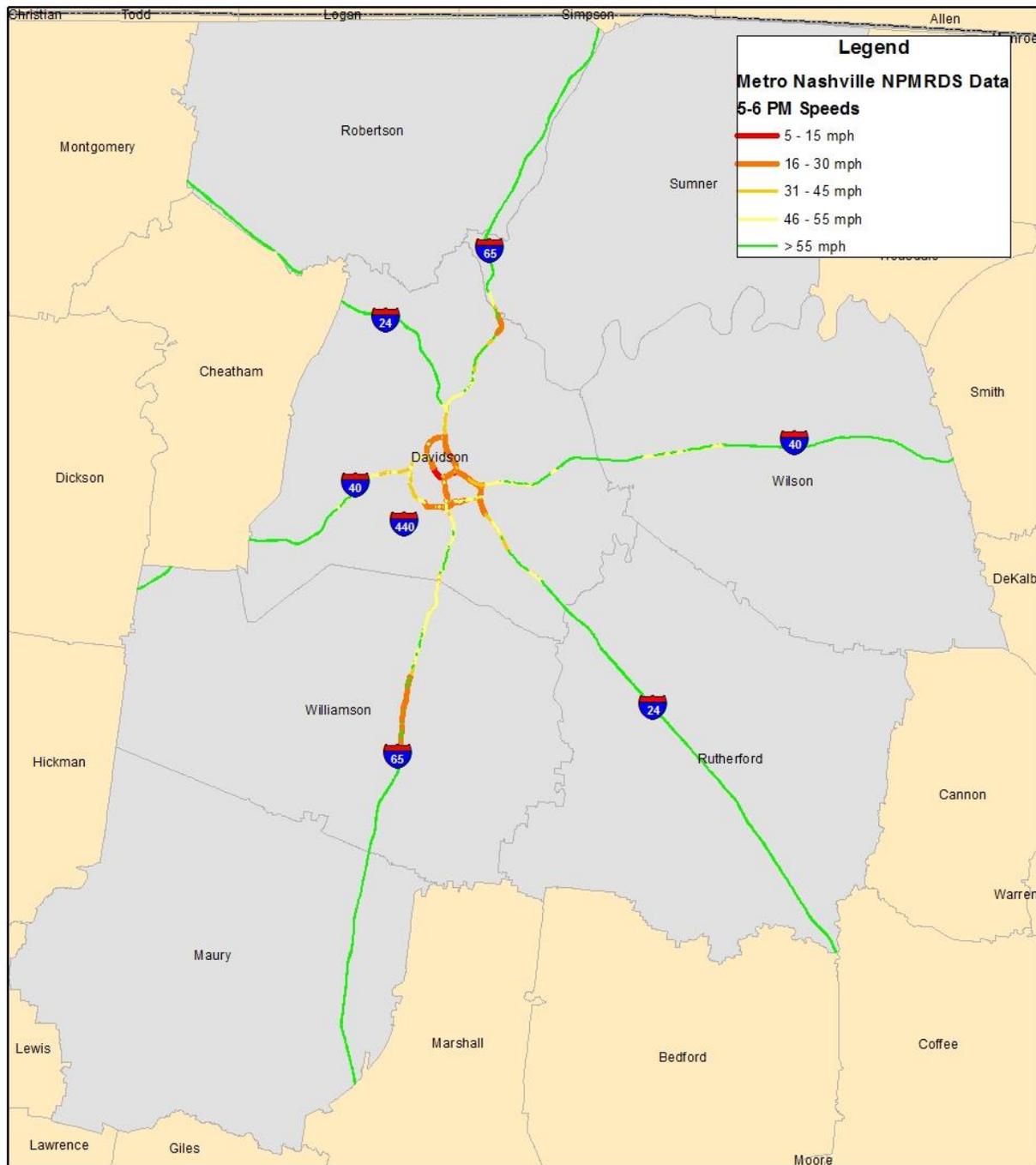


Source: Nashville MPO Travel Demand Model, September 2014 E+C version.

Truck GPS speed data can be used to provide another perspective on congestion in the Nashville region. The Federal Highway Administration (FHWA) maintains the National Performance Measures Research Data Set (NPMRDS), which is a speed database that captures truck and passenger car speeds on the National Highway System. For the Nashville region, the database currently is comprehensive only on the interstate system. Figure 3.14 shows the average truck speeds as captured by truck GPS data on the interstate system between 5:00 p.m. and 6:00 p.m. during weekdays between July and September of 2014. The figure shows that congestion is most extreme in the core downtown area of Nashville with average speeds typically below 55 miles per hour (mph) and often below 30 mph. Congestion due to the construction on I-65 in Wilson County is readily apparent from this data.

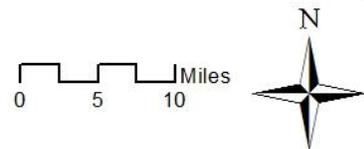
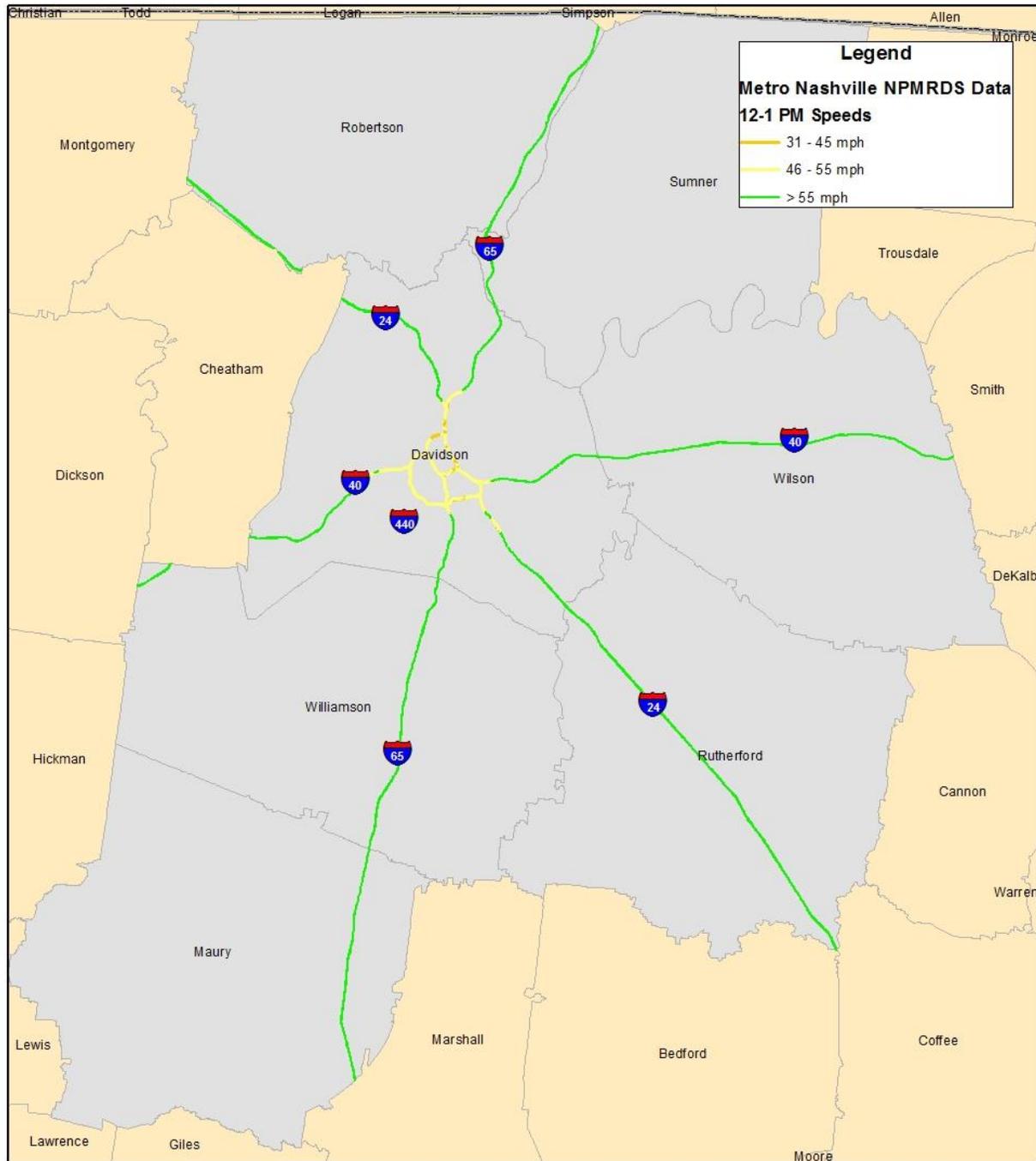
Comparatively, Figure 3.15 shows the average truck speed between 12:00 p.m. and 1:00 p.m. during weekdays between July and September of 2014. Congestion is still the most extreme in the downtown Nashville core. However, all speeds are reported as above 30 mph on average with the majority of the interstates in the Nashville region above 55 mph during this time period.

Figure 3.14 FHWA NPMRDS Truck Speed Data, Third Quarter 2014 – Nashville Region, 5-6 p.m. Speeds



Source: FHWA NPMRDS Database.

Figure 3.15 FHWA NPMRDS Truck Speed Data, Third Quarter 2014 – Nashville Region, 12 – 1 p.m. Speeds



Source: FHWA NPMRDS Database.

3.7 Roadway Safety

An analysis of truck-involved crashes was undertaken for the Nashville region using data obtained for the State of Tennessee from 2012 to 2040. Information from the crash database includes the route and the county where truck-involved crashes occur along with the severity of the crash over the period from 2008 to 2012. Table 3.13 shows that the number of truck-involved crashes during this period was 7,835. Approximately one-half of these occurred on the interstate and another 35 percent occurred on state routes. More than 70 percent of all truck-involved crashes were property damage only (PDO) crashes and had no injuries. About 2.3 percent of all crashes (184 crashes) were serious injury crashes; and 60 crashes (0.8 percent of all crashes) were fatal crashes. Crash rates were not estimated by route type, because the source data for VMT estimates would conflict with the HPMS source that is used below to calculate truck-involved crash rates by segment. Additionally, estimating VMT for roadways that are not state routes would be problematic, since they can not be estimated from the region's travel demand model or HPMS.

Table 3.13 Truck-Involved Crashes by Route Type and Severity

Route Type	Fatal	Serious Injury	Injury	Non-Injury (PDO)	Total
Interstates	31	91	974	2,748	3,844
State Routes	21	73	605	2,072	2,771
All Others	8	20	239	953	1,220
Total	60	184	1,818	5,773	7,835

Source: Tennessee Crash Database, 2008 to 2012.

Table 3.14 shows the top 30 non-interstate, truck-involved crash segments in the Nashville region based on the number of crashes. This table also includes truck-involved crash rates for each of these segments. Truck-focused safety projects tend to be most effective on roadways that have a high number of truck-involved crashes and a relatively high truck-involved crash rate.

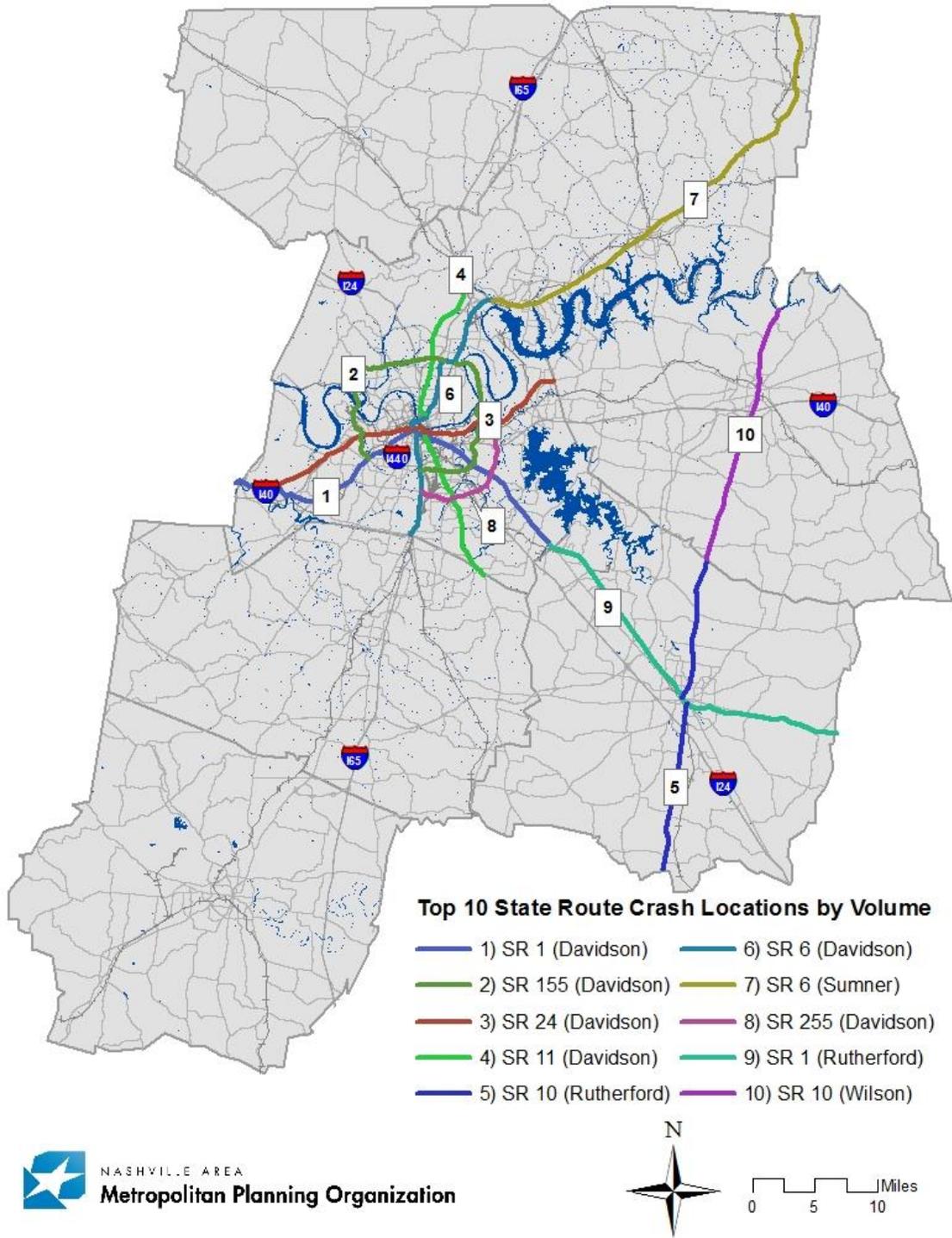
Figure 3.16 shows the location of the top 10 non-interstate, truck-involved crash segments in the region. Many of these locations also feature some of the highest truck counts in the region. Segments with high truck volumes and high truck-involved crash rates that are candidates for inclusion in the regional truck route network developed in later tasks should be considered for detailed safety analysis to determine specific locations, causes, and potential solutions to attempt to reduce crashes.

Table 3.14 Top Truck-Involved Crash Segments in Nashville Region

Rank	Route	County	Total Crashes	Estimated VMT (thousands)	Estimated Crash Rate (crashes per million VMT)
1	Memphis Bristol Highway (SR 1)	Davidson	223	329	678
2	Briley Parkway (SR 155)	Davidson	170	1,189	143
3	Charlotte Pike (SR 24)	Davidson	154	320	482
4	Nolensville Pike (SR 11)	Davidson	140	301	465
5	Murfreesboro Road (SR 10)	Rutherford	128	438	292
6	Columbia Avenue (SR 6)*	Davidson	107	n/a	n/a
7	Gallatin Pike (SR 6)	Sumner	98	456	215
8	Harding Place (SR 255)	Davidson	97	333	291
9	Memphis Bristol Highway (SR 1)	Rutherford	90	140	645
10	Murfreesboro Road (SR 10)	Wilson	86	110	781
11	SR 109	Wilson	84	301	279
12	Old Hickory Boulevard (SR 45)	Davidson	73	364	201
13	Old Hickory Boulevard (SR 254)	Davidson	59	676	87
14	Hillsboro Pike (SR 106)	Davidson	58	130	447
15	Whites Creek Pike (SR 65)	Davidson	54	11	4935
16	SR 6	Maury	50	289	173
17	SR 109	Sumner	50	317	158
18	Hobson Pike (SR 171)	Davidson	46	63	727
19	Murfreesboro Road (SR 96)	Rutherford	46	272	169
20	Jefferson Pike (SR 266)	Rutherford	46	127	363
21	Sparta Pike (SR 26)	Wilson	40	80	499
22	Horton Highway (SR 11)	Robertson	39	226	173
23	Rosa L Parks Boulevard (SR 12)	Davidson	38	15	2618
24	Tom Austin Highway (SR 65)	Robertson	34	35	967
25	Pulaski Highway (SR 7)	Maury	32	89	361
26	Hampshire Pike (SR 99)	Maury	31	2	13835
27	Hartsville Pike (SR 25)	Sumner	31	47	655
28	Mt . Juliet Road (SR 171)	Wilson	30	270	111
29	Almaville Road (SR 102)	Rutherford	29	93	311
30	Dickerson Pike (SR 41)	Sumner	29	6	4613

Source: Tennessee Crash Database, 2008 to 2012. Calculated based on HPMS values for truck counts and corridor length. Information not available for SR 6 (Columbia Avenue)

Figure 3.16 Top 10 Non-Interstate, Truck-Involved Crash Locations



Source: Tennessee Crash Database, 2008-2012.

3.8 Bridge Height and Weight Restrictions

Additional concerns for the safe operation of truck traffic emerge from through the prevalence of bridges with either a low vertical clearance or a low weight limit. An analysis of these types of bridges was conducted in order to determine where such conditions would impede truck traffic.

In terms of vertical clearance, most trucks require a clearance of at least 13' 6". Any bridges with a lower clearance than this will prevent the movement of goods into or out of an area. Deviations in truck height, particularly in the case of oversize loads, will cause further routing restrictions. Should drivers ignore posted limits, they pose a risk to the safety of the load, the bridge infrastructure, and the facility carried by that bridge.

To illustrate how much this may hinder freight movements, bridges in the Nashville region with a posted clearance of less than 14 feet are detailed in Table 3.15 with the locations shown in Figure 3.17. The majority of these low clearances are due to railroad infrastructure in the region, with a high concentration in Davidson County. However, most of the facilities carried under these bridges are not major roadways which would experience high volumes of truck traffic. In no area is there such a large concentration of low clearance bridges that access is made impossible. Rather, drivers must be cognizant of route choices and make appropriate decisions in order to avoid a bridge hit.

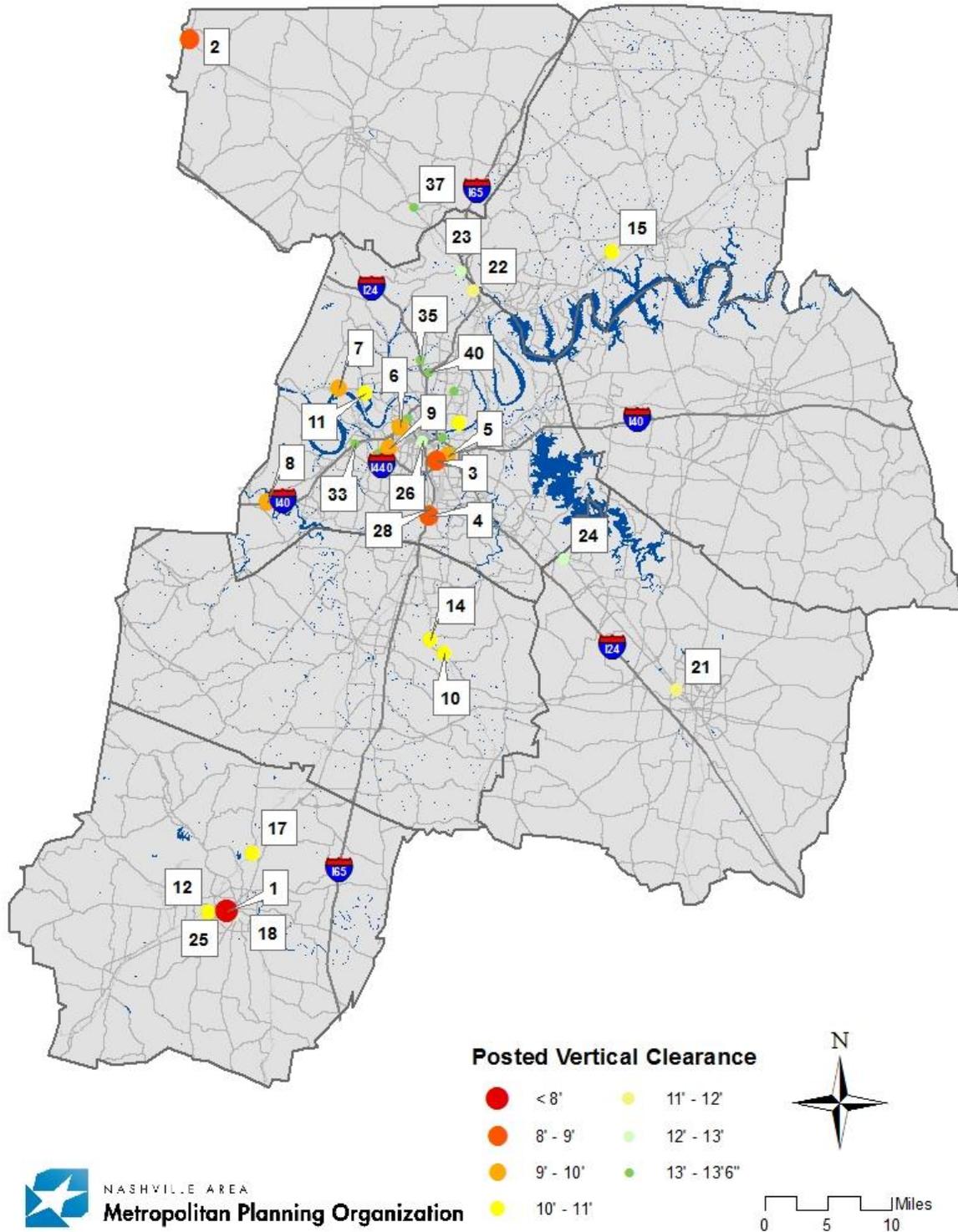
There are two locations on this list which may cause confusion for drivers. Gallatin Pike (#34) and Murfreesboro Pike (#39) have differing clearances depending on the direction of travel. For Gallatin Pike, southbound clearance is 13' 7" and northbound clearance is 14' 2". On Murfreesboro Pike, westbound traffic has a clearance of 13' 9" whereas eastbound traffic has a clearance of 14' 0". While all of these clearances are above the 13' 6" threshold, they may pose a problem for oversize loads. If for instance, a driver were to travel northbound on Gallatin Pike, they may be able to easily pass under this bridge. This would encourage the driver to follow the same route on the return trip. However, with a clearance difference of seven inches, the truck may not fit under the bridge in the southbound direction.

Table 3.15 Low Clearance Bridges in Nashville Region

Rank	Roadway Carried	Intersection	County	Posted Clearance
1	Billy Lee St	Railroad	Maury	7' 10"
2	Bryant Rd	Railroad	Robertson	8' 2"
3	Seminole Ave	Railroad	Davidson	8' 2"
4	Hogan Rd	Railroad	Davidson	8' 4"
5	Woodycrest Ave	Railroad	Davidson	9' 2"
6	Alameda St	Railroad	Davidson	9' 4"
7	Old Hydes Ferry Pike	Railroad	Davidson	9' 5"
8	Newsom Station Road	Railroad	Davidson	9' 5"
9	Nebraska Ave	Railroad	Davidson	9' 9"
10	Wilson Pike	Railroad	Williamson	10' 4"
11	Stewart's Lane	Railroad	Davidson	10' 0"
12	Lion Parkway	Railroad	Maury	10' 0"
13	Huntleigh Drive	Railroad	Davidson	10' 2"
14	Wilson Pike	Railroad	Williamson	10' 5"
15	St Blaise Road	Railroad	Sumner	10' 5"
16	Meharry Blvd	Railroad	Davidson	10' 6"
17	Carter's Creek Pike	Railroad	Maury	10' 10"
18	School Street	Railroad	Maury	11' 0"
19	37th Ave North	Railroad	Davidson	11' 0"
20	Albion St	Railroad	Davidson	11' 0"
21	W College St	Railroad	Rutherford	11' 1"
22	E Cedar St	Railroad	Davidson	11' 4"
23	Old Springfield Pike	Railroad	Davidson	12' 0"
24	Old Nashville Hwy	Railroad	Rutherford	12' 6"
25	S Main St	Railroad	Maury	12' 7"
26	8th Ave South	Railroad	Davidson	12' 7"
27	4th Ave North	Railroad	Davidson	13' 0"
28	Farrell Pkwy	Railroad	Davidson	13' 4"
29	Stanley Street	Railroad	Davidson	13' 4"
30	Arthur Ave	I-65 N	Davidson	13' 5"
31	Arthur Ave	I-65 S	Davidson	13' 5"
32	Cherokee Rd	Railroad	Davidson	13' 5"
33	American Rd	I-40	Davidson	13' 6"
34	Gallatin Pike*	Railroad	Davidson	13' 7"
35	Brick Church Lane	I-24	Davidson	13' 7"
36	18th Ave North	Dr Db Todd Jr Blvd	Davidson	13' 7"
37	Old State Hwy 11	Railroad	Robertson	13' 8"
38	Foster Ave	Railroad	Davidson	13' 8"
39	Murfreesboro Pike*	Railroad	Davidson	13' 9"
40	Ewing Lane	I- 65	Davidson	13' 9"

Source: National Bridge Inventory, Google Street View.

Figure 3.17 Low Clearance Bridge Locations in Nashville Region



Source: National Bridge Inventory, Google Street View.

For bridges which hinder truck movements due to weight restrictions, those with posted weight limits that had an annual daily traffic count over 500 vehicles in 2012 were determined. In the Nashville region, there are 17 such bridges which meet this criteria. These bridges are detailed in Table 3.16 with Figure 3.18 illustrating where they are located. Different types of weight restrictions exist. Some bridges, such as the one on Sawyer Brown Rd, limit weight regardless of the type of truck. Others, such as Foster Ave, limit weight based on the type of vehicle. Those with longer configurations can carry more weight on these structures due how much pressure is applied by this weight at a given time.

Table 3.16 Weight Restricted Bridges in Nashville Region

Rank	Route	Feature Crossed	Posted Weight Restriction	Design Load	ADT	Status
1	Sawyer Brown Rd	Flat Creek	12 Tons	M 13.5	12,240	
2	Foster Ave	CSX Railroad	10T/18T	MS 18	10,150	Functionally Obsolete
3	Beechcroft Rd	Mccutcheon Creek	13T/23T	M 13.5	9,560	Functionally Obsolete
4	Leipers Creek Rd	Pinewood Branch	N/A	MS 18	3,420	
5	Stop 30 Rd	Drakes Creek	13 Tons	M 9	2,380	Functionally Obsolete
6	Weakley Ln	Stones River	15 Tons	M 13.5	1,890	
7	Jackson Blvd	Richland Creek	18,000 lbs	M 9	1,770	
8	Westland Dr	Branch	11T/20T	Other	1,150	
9	Arno College Grove Rd	Hurricane Branch	10T/18T	M 13.5	1,000	
10	Mccreary Rd	Branch	N/A	Other	1,000	Functionally Obsolete
11	Beasleys Bend Rd	Cedar Creek	10T/18T	Other	870	Functionally Obsolete
12	Woodmont Ln	Sugartree Creek	5 Tons	MS 18	860	
13	Lynnwood Blvd	Richland Creek	20 Tons	M 13.5	730	
14	Sowell Mill Pike	Duck River	15T/15T/15T	M 13.5	710	Functionally Obsolete
15	Harlan Rd	Carters Creek	10T/18T/18T	Other	710	
16	Trinity Rd	Harpeth River	10T/18T	M 9	530	
17	Seavy Hight Rd	Fountain Creek	10T/18T	Other	520	Structurally Deficient

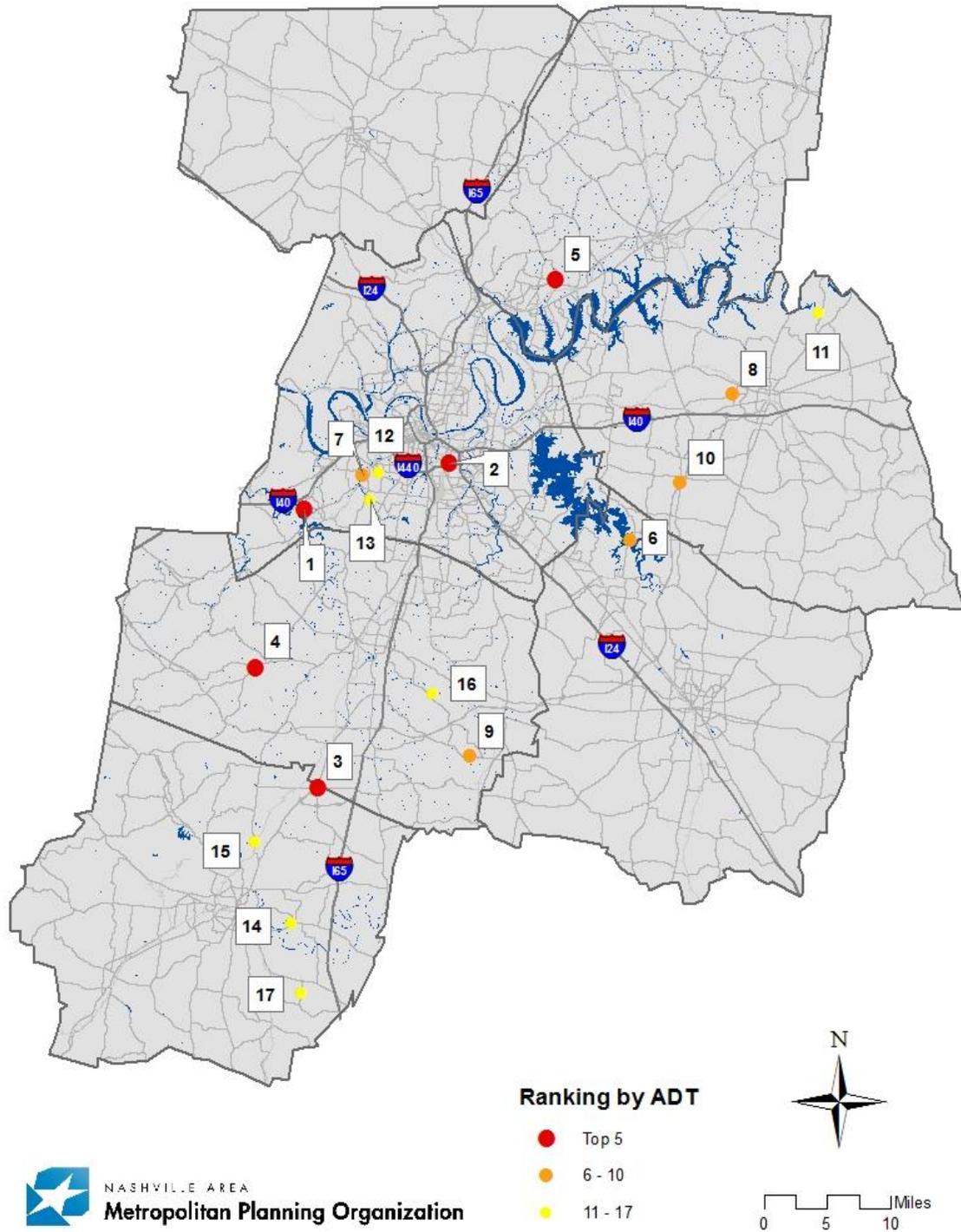
Source: National Bridge Inventory, Google Street View.

Many of these bridges are well over 50 years old with an average age of 58 and would require significant investments to improve their condition to present day design standards. The oldest bridges on this list, on Jackson Blvd and Sowell Mill Pike, were built in 1925. Due the age of these structures, six of the identified bridges are classified as functionally obsolete with one other classified as structurally deficient. In order to be classified as functionally obsolete, the following criteria must be met: 1) An appraisal rating of three or less for deck geometry,

underclearances, or approach roadway alignment and 2) an appraisal rating of three for structural condition or waterway adequacy. To be classified as structurally deficient, the following criteria must be met: 1) A condition of four or less for deck, superstructures, substructures, or culvert and retaining walls and 2) an appraisal rating of two or less for structural condition or waterway adequacy. Any bridge classified as structurally deficient is excluded from the functionally obsolete category.

Similar to the vertical clearance restrictions, the scarcity of these weight restrictions in the region does not severely restrict truck movements or access. Rather, drivers must be aware of their route choices. One of the most difficult to navigate in the region is the bridge located on Foster Ave in Davidson County. This bridge is located to the north of the intersection of Glenrose Ave and Foster Ave. Trucks headed eastbound on Glenrose Ave that arrive at this intersection are faced with limited options. Trucks are not permitted on Glenrose Ave east of Foster Ave nor are they allowed on Foster Ave south of Glenrose Ave. As such, trucks headed eastbound on Glenrose Ave must turn left onto Foster Ave, where this bridge is located. Should a truck be over the posted weight limit, they pose a threat to other vehicles on the roadway and the structural integrity of the bridge if the driver chooses to continue north on Foster Ave.

Figure 3.18 Weight Restricted Bridge Locations in Nashville Region



Source: National Bridge Inventory, Google Street View.

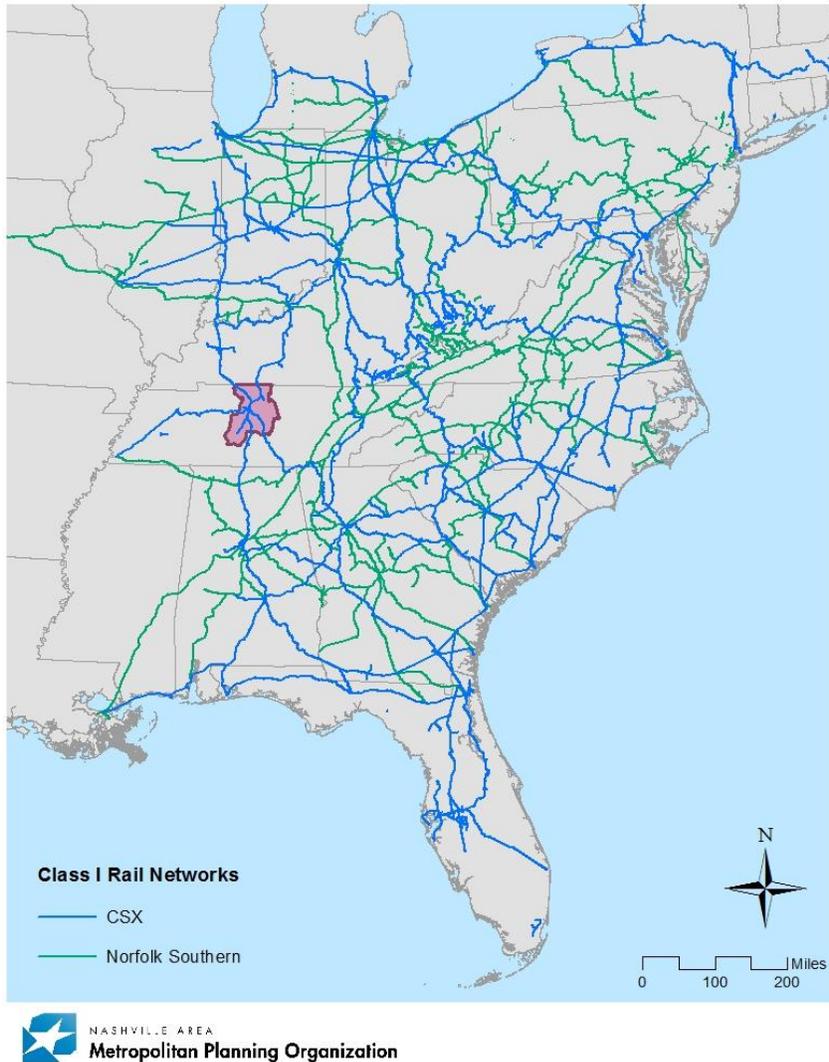
4.0 Freight Rail Analysis

4.1 Major Freight Rail Infrastructure

The majority of freight rail traffic originating in and destined for the Nashville region is carried by the region's sole Class I railroad, CSX. Figure 4.1 shows the CSX rail network, as well as the Norfolk Southern (NS) Class I railroad. The network through Nashville is primarily north-south and connects Nashville with cities in the Midwest, cities in the southeast, and Memphis. The CSX railroad network in Tennessee carries both carload and intermodal rail.

NS is the other Class I railroad in the eastern half of the U.S. While NS does not serve Nashville directly, it runs an east-west rail line through Tennessee that parallels I-40 and connects Knoxville, Chattanooga, Huntsville (Alabama), and Memphis (Figure 4.1). This corridor is in the process of undergoing significant improvements as part of the NS Crescent Corridor program.

Figure 4.1 CSX and Norfolk Southern Rail Networks



Source: National Transportation Atlas Database, 2014.

Within the Nashville region, the freight rail infrastructure consists of the CSX Class I track running primarily north-south. There are also two short line railroads in the Nashville region. The Nashville & Eastern extends from Nashville eastward toward Monterey. The Nashville & Western operates between Nashville and Ashland City.

The major rail yard in the Nashville region is the Radnor Yard operated by CSX. This yard is used for intermodal truck-to-rail transfers along with carload operations in the Nashville region. The primary truck access routes to Radnor Yard are using Sidco Drive to connect to SR 255 to the south of the facility or using Sidco Drive to connect to Armory Drive and then to I-65 north of the facility.

The nearest Norfolk Southern intermodal yard to Nashville is the Huntsville intermodal rail yard, located about 115 miles south of Nashville along I-65. Additionally, Nashville is located just more than 200 miles from six intermodal yards and several carload yards in the Memphis region, which includes direct connections to railroads that serve the western half of the U.S., Canada, and Mexico.

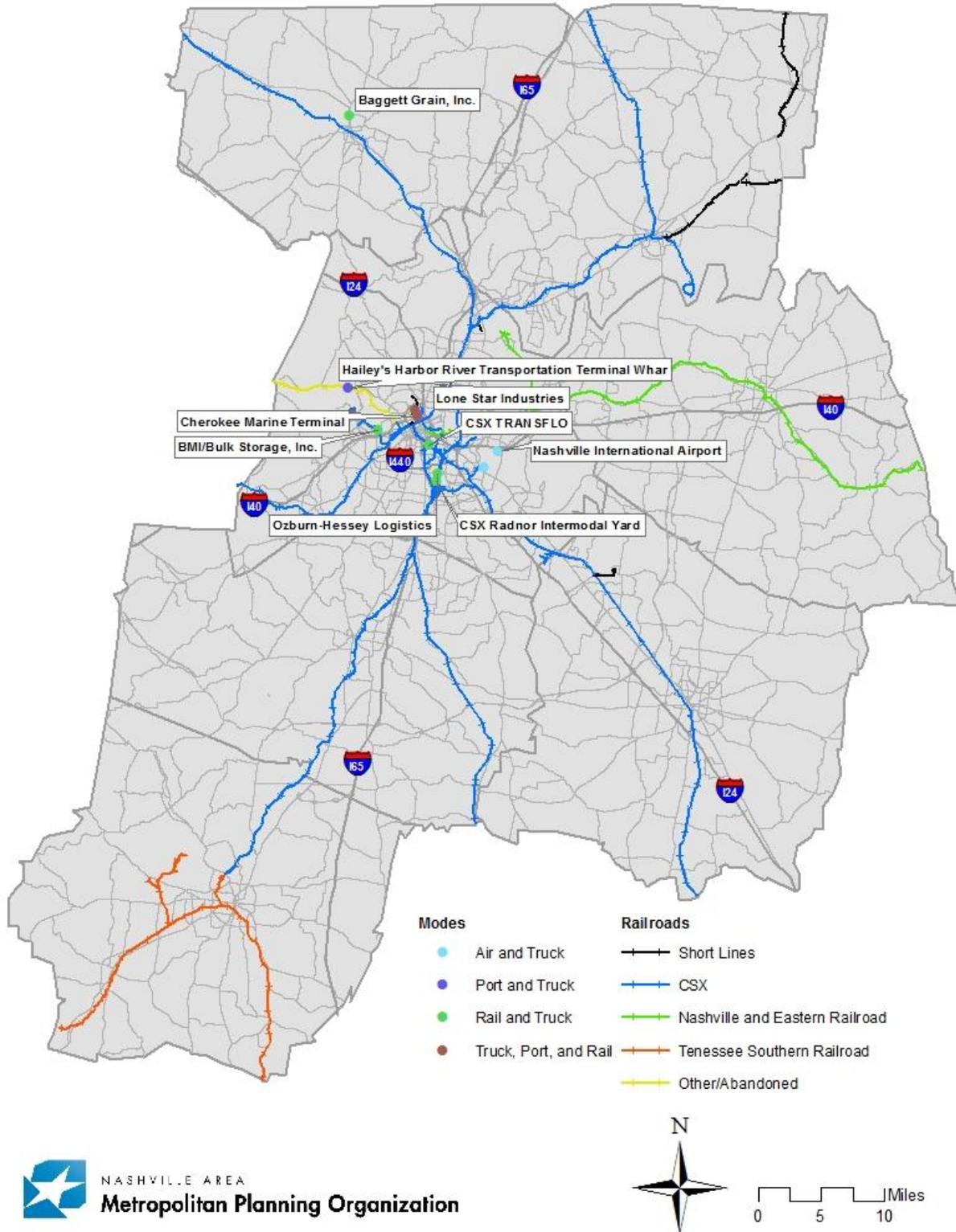
CSX operates a TRANSFLO facility in downtown Nashville near 2nd Street and Chestnut Street. TRANSFLO facilities transfer bulk materials from railcars to truck and containers. Additionally, CSX operates two Total Distribution Services, Inc. (TDSI) auto distribution terminals; one in Smyrna and one in Spring Hill to service the Nashville region's two automotive plants.

There are a handful of riverport-to-rail facilities in the Nashville region. Cherokee Marine Terminal Inc. operates a bulk dock in the Port of Nashville for shipping and receiving dry bulk commodities that include sand and gravel, coke, salt, ferroalloys, and dry bulk fertilizers. One surface rail track serves the storage area and connects with [CSX Rail Transport](#). The Cherokee Marine Terminal is located along the Cumberland River just west of I-24 between the I-65 Bridge and the Jefferson Street Bridge. The Cherokee Marine Terminal, Steel Dock, and Fleet Mooring in the Port of Nashville are used to receive and occasionally ship general cargo that includes machinery, steel products, and packaged goods.

Lone Star Industries handles bulk and break-bulk materials along the western side of the Cumberland River between the I-65 Bridge and the Jefferson Street Bridge. It primarily develops hydraulic cement used for construction activities. Additionally, Bulk Cementitious Materials (BMI) is part of the Lafarge Group of companies and specializes in the supply of cementitious materials to the cement and construction industries. Products include blast furnace slag, fly ash, bottom ash, gypsum, silica fume, and copper slag. These are cementitious materials used in building and road construction. This facility is located along the Cumberland River west of downtown Nashville just south of Briley Parkway.

Figure 4.2 shows the primary rail infrastructure in the Nashville region

Figure 4.2 Freight Rail Infrastructure in Nashville



Source: U.S. Bureau of Transportation Statistics National Transportation Atlas.

Table 4.1 List of Rail and Intermodal Facilities

Number	Name	Facility Type
1	CSX Radnor Intermodal Rail Yard	Rail-Truck
2	CSX TRANSFLO	Rail
3	Cherokee Marine Terminal	River Port-Rail
4	Lone Star Industries	River Port-Rail
5	BMI/Bulk Storage, Inc.	River Port-Rail

Source: U.S. Bureau of Transportation Statistics National Transportation Atlas.

4.2 At-Grade Rail Crossings

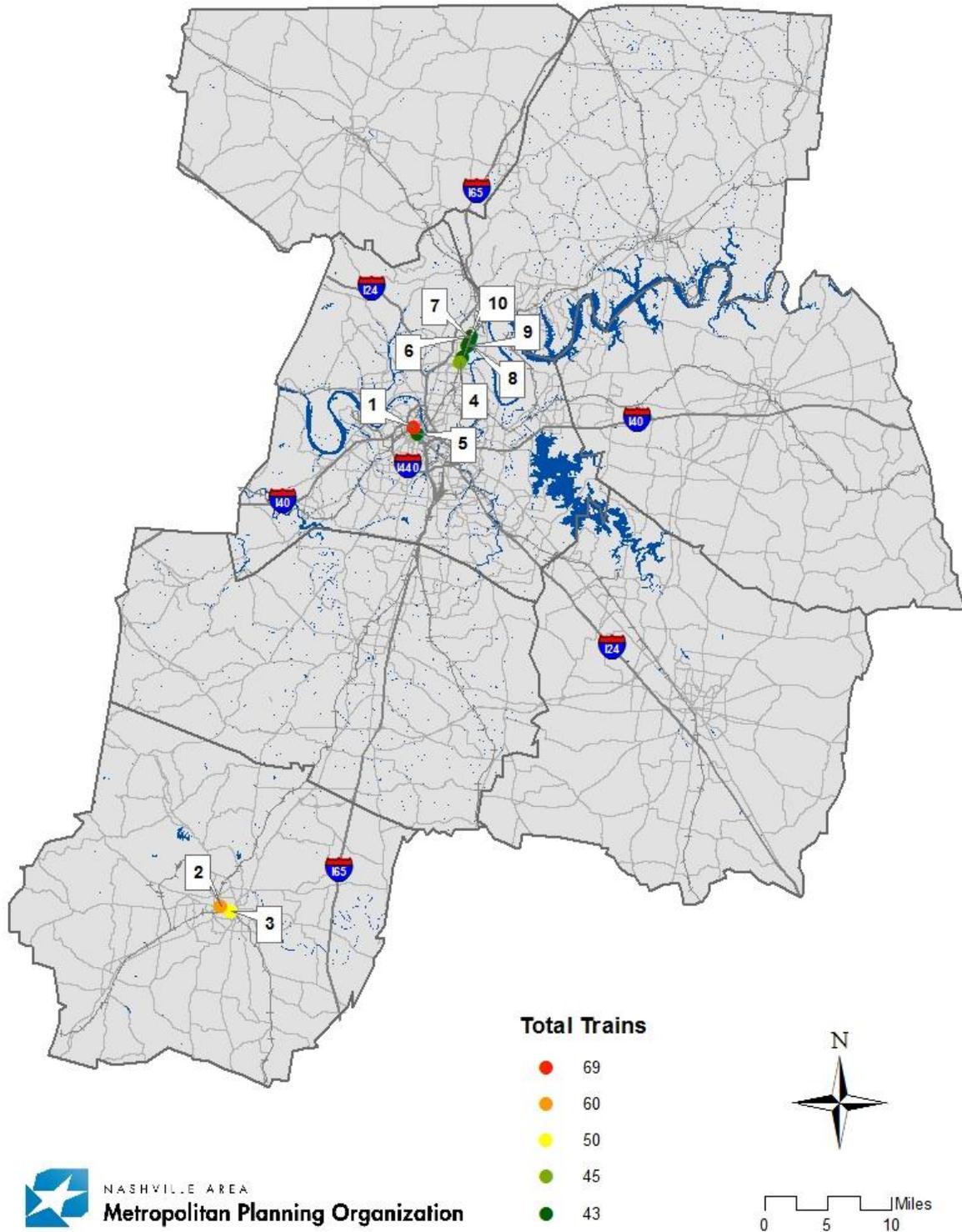
The Federal Railroad Administration (FRA) maintains information on the volume of trains, trucks, and passenger cars at the nation's at-grade highway-rail crossings. Tables 4.2, 4.3, and 4.4 provide the information on the top railroad crossings for the Nashville region based on total trains, total AADT, and truck AADT, respectively. The Map ID in each of these tables corresponds to the resulting locations in Figures 4.3, 4.4, and 4.5. The tables indicate that the CSX north-south line running northeast out of Nashville has the crossings with the most trains per day ranging from 69 trains close to downtown Nashville decreasing to 43 trains at the southern border of Davidson County. The locations of the rail crossings with the highest total AADT and the highest truck AADT are much more dispersed throughout the region. The locations of these crossings along with the amount of delay experienced will be factors in the development of the truck route network for the region. Additionally, at-grade highway-rail crossings are a significant factor in the determination of local freight and land use policies.

Table 4.2 Top 10 At-Grade Rail Crossings by Total Trains, 2013

Rank and Map ID	Route	City	Total Trains	Truck AADT	Total AADT
1	Tenth Ave North	Nashville	69	428	3,056
2	SR 99/7th St	Columbia	60	757	7,572
3	Galloway St	Columbia	50	43	1,074
4	Cemetery Rd	Nashville	45	n/a	n/a
5	Church St	Nashville	43	n/a	n/a
6	Nesbitt Lane	Nashville	43	71	1,782
7	Williams Ave	Nashville	43	33	1,096
8	SR 45/Old Hickory Blvd (1)	Nashville	43	n/a	n/a
9	Woodruff	Nashville	43	n/a	n/a
10	Due West Ave	Nashville	43	No count	No count

Source: U.S. Federal Railroad Administration Office of Safety.

Figure 4.3 Top At-Grade Rail Crossings by Total Trains, 2013



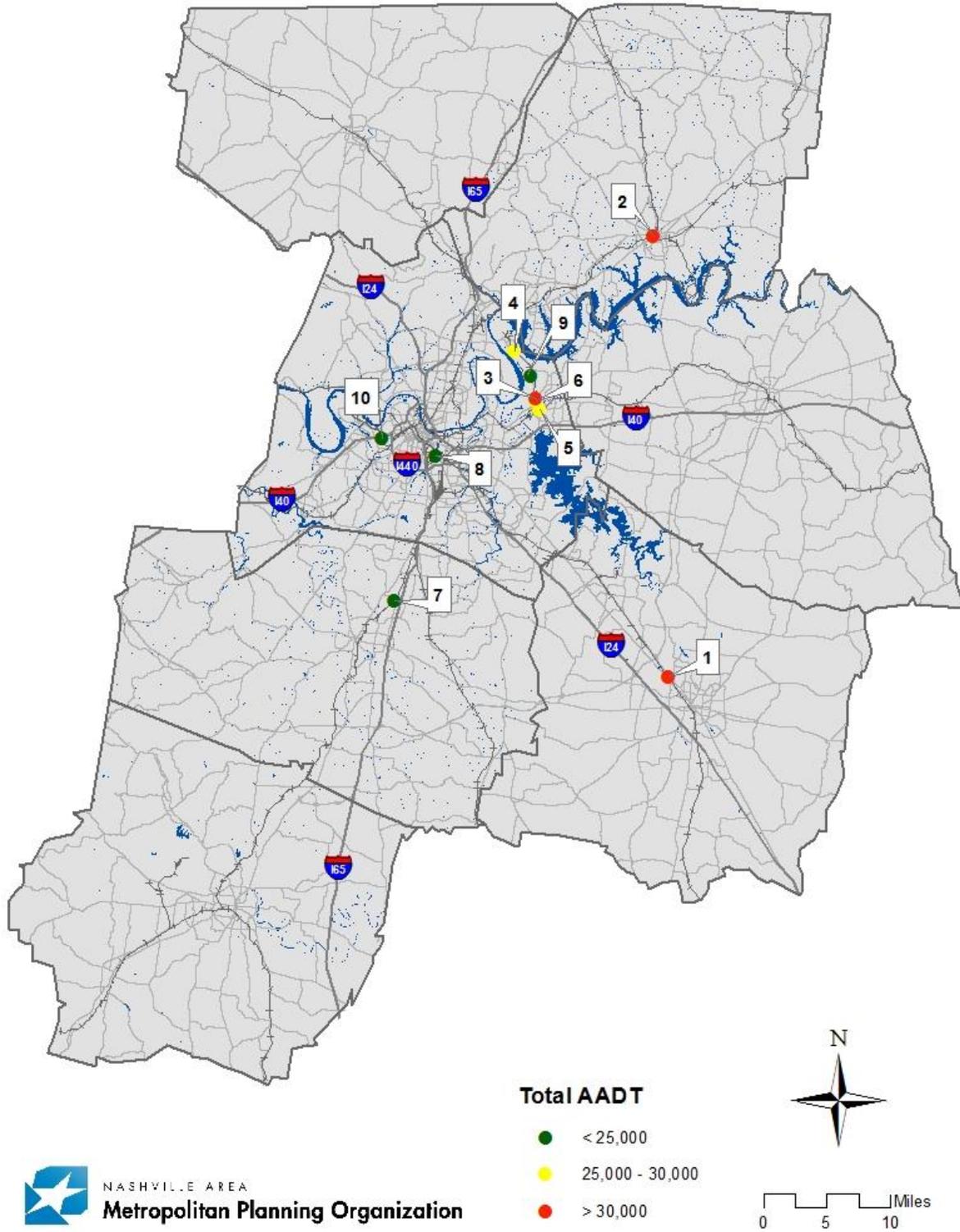
Source: U.S. Federal Railroad Administration Office of Safety.

Table 4.3 Top 10 At-Grade Facilities by Total AADT, 2013

Map ID	Route	City	Total Trains	Truck AADT	Total AADT
1	U.S. 41/SR 1/NW Broad St.	Murfreesboro	2	n/a	36,547
2	U.S. 31 E/Nashville Pike	Gallatin	14	2,624	32,797
3	U.S. 70/Lebanon Road	Nashville	2	1,505	30,097
4	SR 45/Robinson Rd	Nashville	2	1,300	25,993
5	SR 45/Old Hickory Blvd (2)	Nashville	14	1,503	25,053
6	SR 45/Old Hickory Blvd (3)	Nashville	2	1,503	25,053
7	SR 441/Moores Lane	Spring Hill	1	1,453	24,224
8	U.S. 31/U.S. 41/Nolensville Rd	Nashville	4	669	22,306
9	SR 45/Old Hickory Blvd (4)	Nashville	1	841	21,021
10	U.S. 70 S/Charlotte Ave	Nashville	4	626	20,871

Source: U.S. Federal Railroad Administration Office of Safety.

Figure 4.4 Top At-Grade Rail Crossings by Total AADT, 2013



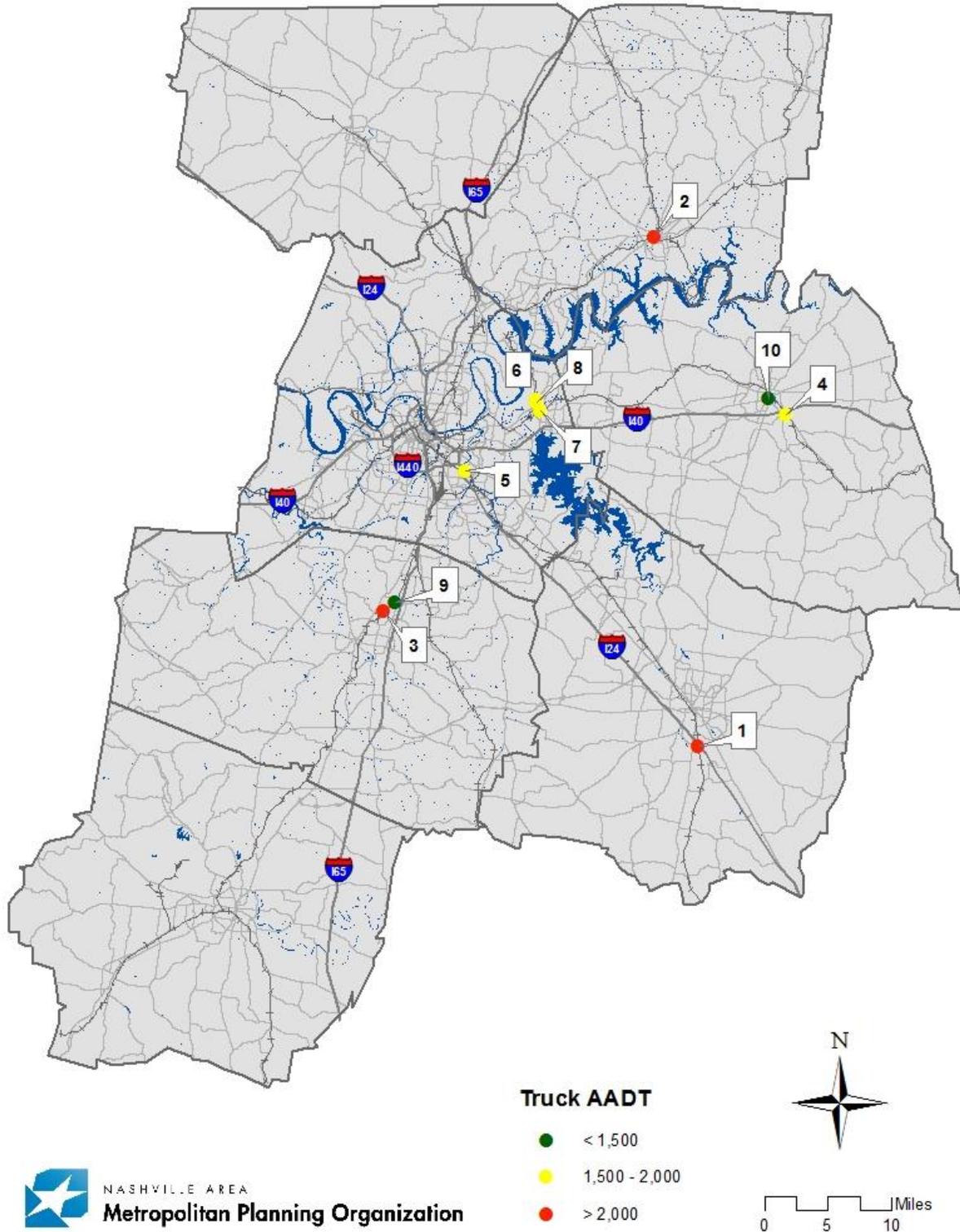
Source: U.S. Federal Railroad Administration Office of Safety.

Table 4.4 Top 10 At-Grade Facilities by Truck AADT, 2013

Map ID	Route	City	Total Trains	Truck AADT	Total AADT
1	Butler St	Murfreesboro	17	3,039	6,077
2	U.S. 31 E/Nashville Pike	Gallatin	14	2,624	32,797
3	Mallory Station Road	Spring Hill	1	2,395	11,973
4	Maddox-Simpson Pkwy.	Lebanon	2	1,699	5,664
5	Thompson Lane	Nashville	19	1,561	15,614
6	U.S. 70/Lebanon Road	Nashville	2	1,505	30,097
7	SR 45/Old Hickory Blvd	Nashville	14	1,503	25,053
8	SR 45/Old Hickory Blvd	Nashville	2	1,503	25,053
9	SR 441/Moores Lane	Spring Hill	1	1,453	24,224
10	U.S. 231/SR 10/Cumberland St.	Lebanon	5	1,445	14,454

Source: U.S. Federal Railroad Administration Office of Safety.

Figure 4.5 Top At-Grade Rail Crossings by Truck AADT, 2013



Source: U.S. Federal Railroad Administration Office of Safety.

4.3 Nashville Region Rail Flows

CSX operates about 70 trains per day in, out, and through the region. Assuming the pass-through traffic is a consistent percent of the overall traffic today as it was 10 years ago, then roughly 58 of those trains are passing through the region. The remainder of these trains are “hubbed” in a classification yard, with the majority of railcars sent out again on a different train set.

In 2012, the leading commodity shipped in the Nashville region in terms of tonnage is motor vehicles and automotive parts with nearly 800,000 tons, representing 25 percent of the region’s rail traffic (Table 4.5). These are shipped along CSX’s rail lines to the Nissan plant in Smyrna and the GM plant in Springhill. Shipments of these products are expected to more than triple by 2040 to more than 2.4 million tons in part due to automotive plant expansions that have already occurred in these facilities. This will have a significant impact on both congestion along the region’s freight railways and the at-grade highway-rail crossings.

Another 25 percent of rail tonnage is mixed loads, which are primarily goods that are shipped in intermodal containers through Radnor Yard. As shown in Table 4.6, many of these rail flows are connecting Nashville to East Coast ports. In particular, the top location for these goods is the Port of Savannah, and the second most common location is the Port of Charleston. These two ports comprise 66 percent of the intermodal rail tonnage for the Nashville region. Chicago is the third largest intermodal rail trading partner with 22 percent of the goods.

Table 4.5 Nashville Region Forecast 2040 Freight Rail Flows by Commodity

Commodity Name	2012 Tons	Percent of 2012 Total	2040 Forecast Tons	CAGR	Total Growth
Motor Vehicles and Parts	793,080	25.2%	2,443,729	4.1%	208%
Mixed Loads	780,800	24.8%	1,185,253	1.5%	52%
Base Metal	258,600	8.2%	127,427	-2.5%	-51%
Pulp and Paper Products	206,720	6.6%	297,220	1.3%	44%
Plastics and Rubber	161,760	5.1%	274,779	1.9%	70%
Waste and Scrap	161,264	5.1%	238,007	1.4%	48%
Basic Chemicals	153,080	4.9%	355,050	3.1%	132%
Fertilizers	139,636	4.4%	193,267	1.2%	38%
Milled Grain Prod. and Bakery Products	102,788	3.3%	165,805	1.7%	61%
Other Prepared Food Stuffs, Fats and Oils	72,600	2.3%	127,225	2.0%	75%
Wood Products	49,240	1.6%	77,032	1.6%	56%
Stone and Sands	49,160	1.6%	91,287	2.2%	86%
Animal Feed and Products of Animal Origin	47,816	1.5%	75,087	1.6%	57%
Non-Metallic Mineral Prod.	32,120	1.0%	67,863	2.7%	111%
Other Chemical Products	31,932	1.0%	55,571	2.0%	74%
Agricultural Products	29,920	1.0%	25,733	-0.5%	-14%
Transportation Equipment	21,513	0.7%	46,004	2.8%	114%
Alcohol and Tobacco	12,600	0.4%	28,315	2.9%	125%
Other Non-Metallic Minerals	12,480	0.4%	22,764	2.2%	82%
Articles of Base Metal	9,200	0.3%	16,857	2.2%	83%
Cereal Grains	7,800	0.2%	12,175	1.6%	56%
Other Coal and Petroleum Products	6,520	0.2%	5,961	-0.3%	-9%
Machinery	2,920	< 0.1%	8,327	3.8%	185%
Paper or Paperboard Articles	2,360	< 0.1%	3,348	1.3%	42%
Misc. Manufactured Prod.	1,200	< 0.1%	3,106	3.5%	159%
Logs, Other Rough Wood	760	< 0.1%	1,035	1.1%	36%
Furniture and Lighting	200	< 0.1%	320	1.7%	60%
Pharmaceutical Products	40	< 0.1%	119	4.0%	198%
Total Tons	3,148,109	100.0%	5,948,667	2.3%	89%

Source: TRANSEARCH Database.

Table 4.6 Top Trading Partners by Rail Intermodal Tonnage for Nashville Region (Tons)

Metropolitan Area	To	From	Total	Percent of Total
Savannah, GA	248,480	100,320	348,800	39.6%
Charleston, SC	155,040	72,880	227,920	25.9%
Chicago, IL	38,280	155,760	194,040	22.0%
Other	73,360	36,360	109,720	12.5%
Total	515,160	365,320	880,480	100.0%

Source: TRANSEARCH Database.

For carload rail, more than 20 percent of the flows are within Tennessee (Table 4.7). The remaining carload rail flows are consistent with Nashville's status as a trading partner with both the Midwest and the southeast. Ohio, Illinois, Indiana, and Michigan represent a total of 27 percent of the carload rail trading partners. Florida, Alabama, North Carolina, Louisiana, and Texas represent another 25 percent of the carload rail flows.

Table 4.7 Top Trading Partners by Rail Carload for Nashville Region

State	To	From	Total	Percent of Total
Tennessee (outside of MPO region)	234,440	222,800	457,240	20.2%
Ohio	29,720	193,520	223,240	9.8%
Florida	104,800	69,440	174,240	7.7%
Illinois	11,556	142,520	154,076	6.8%
Indiana	3,600	131,084	134,684	5.9%
Alabama	42,836	90,160	132,996	5.9%
North Carolina	7,440	99,940	107,380	4.7%
Michigan	3,600	102,920	106,520	4.7%
Pennsylvania	59,720	35,320	95,040	4.2%
Louisiana	-	82,976	82,976	3.7%
Texas	-	69,760	69,760	3.1%
Partners with 2-3% of Total Tonnage	88,296	32,360	120,656	5.3%
New York	57,920	7,120	65,040	2.9%
Mississippi	30,376	25,240	55,616	2.5%
Partners with 1-2% of Total Tonnage	97,200	87,740	184,940	8.2%
Ontario	7,200	34,280	41,480	1.8%
Maryland	24,200	14,880	39,080	1.7%
Georgia	6,080	31,580	37,660	1.7%

State	To	From	Total	Percent of Total
New Jersey	30,640	7,000	37,640	1.7%
Massachusetts	29,080	-	29,080	1.3%
Partners with 0.5 - 1% of Total Tonnage	29,684	126,565	156,249	6.9%
Kentucky	8,112	12,365	20,477	0.9%
Arizona	-	18,760	18,760	0.8%
South Carolina	-	18,120	18,120	0.8%
British Columbia	-	18,080	18,080	0.8%
Washington	-	17,280	17,280	0.8%
Tennessee (Nashville)	14,372	-	14,372	0.6%
Quebec	7,200	6,200	13,400	0.6%
Minnesota	-	12,560	12,560	0.6%
Virginia	-	12,040	12,040	0.5%
Alberta	-	11,160	11,160	0.5%
All Others With Less than 0.5% of Total Tonnage	5,752	61,880	67,632	3.0%
Total	718,644	1,548,985	2,267,629	100.0%

Source: TRANSEARCH Database.

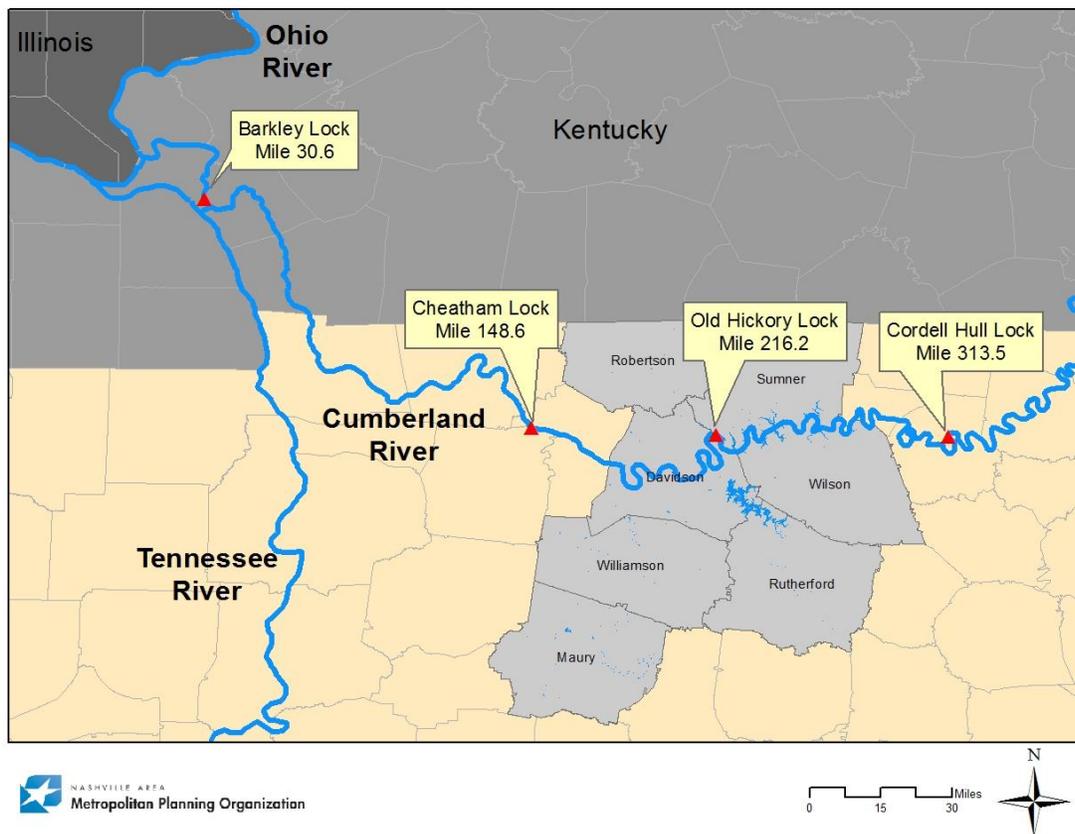
5.0 Waterways Analysis

The Cumberland River flows for more than 700 miles and bisects the Nashville region running in a windy east-west path 180 miles above the point, where the Cumberland and the Tennessee join the Ohio River at Paducah, Kentucky (Figure 5.1). The Cumberland River is navigable upriver and east to Celina in Tennessee, and downriver into the Midwest and the Gulf of Mexico.

There are two single-chamber locks along the Cumberland River in the Nashville region: Hickory Lock and Dam upstream between the City and Gallatin, and Cheatham Lock and Dam downstream. These locks were both built in the 1950s and have been operational since that time. Port facilities in the Nashville region tend to have a channel depth of 9 to 10 feet.

The Port of Nashville is an official Port of Entry for the United States, including operating fully bonded customs capabilities. Most of the port facilities along the Cumberland in the Port of Nashville are privately owned and operated. The inland waterway system, including the lock and dam structures, is maintained by the U.S. Army Corps of Engineers. There are dozens of facilities located along the Cumberland in the Nashville region. Table 5.1 lists the facilities and the primary commodities that are carried.

Figure 5.1 Map of Nashville Waterway Facilities



Source: U.S. Army Corps of Engineers.

Table 5.1 Description of Nashville Region Waterway Facilities

Facility Name	Commodities
Adelphia Stadium	All Manufactured Equipment, Machinery and Products
Ashland Petroleum Co.	Petroleum and Petroleum Products, Fuel Oils, Coke, Asphalt, Naptha and Solvents/Fertilizers/Other Chemicals
Bethlehem Steel	Iron Ore/Iron/Steel Waste & Scrap
Buzzi Unicem USA, LSI	Building Cement & Concrete; Lime; Glass
Buzzi Unicem USA, Signal Mountain	Building Cement & Concrete; Lime; Glass
C S & W Main Dock	Petroleum and Petroleum Products
Cemex Inc.	Building Cement & Concrete; Lime; Glass
Cherokee Marine Terminal Inc	Coal, Fertilizers, Other Chemicals, Sand, Stone, Iron Ore, Iron, Steel Waste & Scrap, Iron and Steel Products, Fabricated Metal Prods, Manufactured Equipment, Machinery and Products
Cherokee Marine Terminal, Bulk Dock	Coal, Lignite, Coke/Sand, Gravel, Stone, Rock, Limestone/Sulphur (Dry), Clay & Salt
Cherokee Marine Terminal, Steel Dock and Fleet Mooring	Primary Iron and Steel Products/Manufactured Equipment, Machinery and Products
Dundee Cement Co	Building Cement & Concrete; Lime; Glass
E I Dupont De Nemours & Co Old Hickory	Distillate, Residual & Other Fuel Oils; Lube Oil & Greases/Chemicals/Other Chemicals
Ergon, Inc.	Petroleum Pitches, Coke, Asphalt, Naptha and Solvents
Exxon Company, USA	Petroleum and Petroleum Products, Fuel Oils, Chemicals and Related Products
Gallatin Steam Plant Dock Upper Fuel Oil Receiving Wharf	Distillate, Residual & Other Fuel Oils; Lube Oil & Greases
Garrott Brothers Inc.	Sand, Gravel, Stone, Rock, Limestone/Sulphur (Dry), Clay & Salt/Slag
Hailey's Harbor River Transportation Terminal	Coal, Fertilizers, Other Chemicals, Sand, Stone, Iron Ore, Iron, Steel Waste & Scrap, Iron and Steel Products, Fabricated Metal Prods.
Holnam, Inc.	Building Cement & Concrete; Lime; Glass
Hunter Marine	Coal, Fertilizers, Other Chemicals, Sand, Stone, Iron Ore, Iron, Steel Waste & Scrap, Iron and Steel Products, Fabricated Metal Prods.
Hunter Marine Transport, Nashville Lower Cargo Dock	Coal, Lignite, Coke/Forest Products/Primary Iron and Steel Products
Hunter Marine Transport, Nashville Upper Cargo Dock	Forest Products/Sulphur (Dry), Clay & Salt/Primary Iron and Steel Products
M Choen Iron Metals Co	Iron Ore, Iron & Steel Waste & Scrap
Marathon Oil	Petroleum products
Metal Management	Fertilizers/Other Chemicals/Iron Ore, Iron, Steel Waste & Scrap

Facility Name	Commodities
Metro Ready Mix Concrete, Inc.	Sand, Gravel, Stone, Rock, Limestone
Mid-South Wire Co.	Primary Iron and Steel Products/Primary Non-Ferrous Metal Products; Fabricated Metal Prods.
Nashville Cumberland River Terminal	Fertilizers/Sand, Gravel, Stone, Rock, Limestone/Building Cement & Concrete; Lime; Glass/Primary Iron and Steel products
Nashville Municipal Wharf	Primary Iron and Steel products
Nashville Ready Mix Sand & Gravel	Fertilizers
Nashville Riverside Park	Ferried Autos, Passengers, Railway Cars/Fertilizers
Old Hickory Lock & Dam	Coal, Fertilizers, Other Chemicals, Sand, Stone, Iron Ore, Iron, Steel Waste & Scrap, Iron and Steel Products, Fabricated Metal Prods, Manufactured Equipment, Machinery and Products
Opryland USA, Inc.	Ferried Autos, Passengers, Railway Cars
Pine Bluff Materials, LLC	Sand, Gravel, Stone, Rock, Limestone
Southern States Asphalt Co.	Distillate, Residual & Other Fuel Oils; Lube Oil & Greases/Petroleum Pitches, Coke, Asphalt, Naptha and Solvents
Springhouse Golf Course	Ferried Autos, Passengers, Railway Cars
Steiner-Liff Iron & Metals Co.	Iron Ore and Iron & Steel Waste & Scrap/Primary Non-Ferrous Metal Products; Fabricated Metal Prods.
Tennessee Valley Authority Gallatin Lower Coal Receiving Wharf	Coal, Lignite & Coal Coke/Distillate, Residual & Other Fuel Oils; Lube Oil & Greases
Domtar Nashville; Shell Oil Corporation; Gulf Oil Corporation; Mobil Oil; Bassichis; Belle Carol of the Cumberland; Namolco; Demonbreun Cave; Mile 248; American Oil Company; Lion Oil; Intermodal Services Inc.; Triangle Refineries; Hunter Marine Transport	Facilities with no commodity information provided. These facilities may be inactive or primarily used as passenger facilities.

Source: U.S. Army Corps of Engineers.

Coal is the dominant inbound commodity along the Cumberland waterway. It is estimated that 5.7 million tons of coal were brought into the region on barge in 2012 (Table 5.2), primarily from Kentucky and Illinois (Table 5.3). The coal is delivered directly to power plants in the Nashville region. The next three largest commodities are sand and gravel, along with other aggregates that are used for construction. These commodities are generally stored in facilities along the river, and then delivered to final destinations by truck within 20 to 30 miles of the river.

A handful of the facilities, such as the Cherokee Marine Terminal, have dockside rail services that allow for moving bulk commodities by rail. In particular, the Illinois Central serves many facilities and connects locally to the CSX system. The three public terminals in Nashville

loading and unloading freight for Cumberland barges are at Robertson Avenue (Milepost 174 on the river), Amy Lynn Drive (Milepost 180), and Cowan Street (Milepost 190).

Table 5.2 Top Waterway Commodities in Nashville Region

Commodity Name	2012 Tons	2040 Tons	CAGR	Total Growth
Coal	5,680,763	9,869,901	2.0%	74%
Gravel and Crushed Stone	740,331	819,399	0.4%	11%
Non-Metallic Mineral Prods.	430,050	762,596	2.1%	77%
Natural Sands	372,944	517,459	1.2%	39%
Waste and Scrap	215,357	131,012	-1.8%	-39%
Non-Metallic Minerals	129,760	175,664	1.1%	35%
Coal and Petroleum Prod.	126,553	132,223	0.2%	4%
Articles of Base Metal	121,087	161,217	1.0%	33%
Base Metal	118,083	157,182	1.0%	33%
Fertilizers	107,447	191,342	2.1%	78%
Other	40,803	43,278	n/a	6%
Total	8,083,178	12,961,273	1.7%	60%

Source: TRANSEARCH Database.

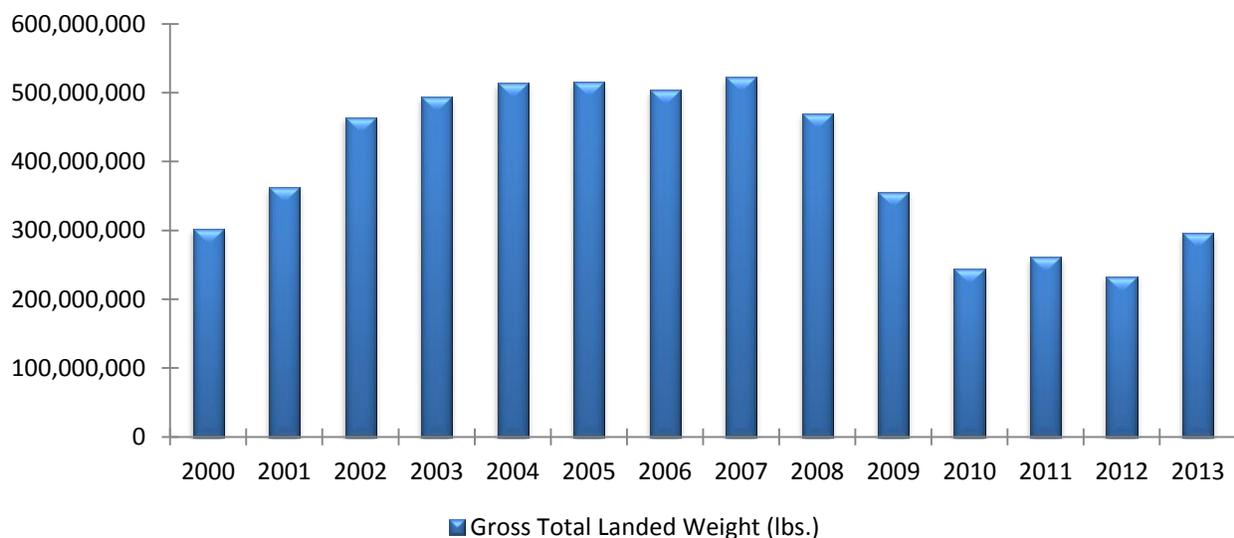
Table 5.3 Top Trading Partners by Waterways for Nashville Region

State	To	From	Total	Percent of Total
KY	76,423	3,610,613	3,687,036	45.6%
IL	5,379	3,210,424	3,215,804	39.8%
MO	5,023	441,371	446,394	5.5%
LA	28,609	205,578	234,187	2.9%
AL	110,329	79,705	190,034	2.4%
TN (Nashville)	138,395	-	138,395	1.7%
OH	1,670	52,025	53,695	0.7%
Other	43,967	73,666	117,633	1.5%
Total	409,795	7,673,383	8,083,178	100.0%

6.0 Air Cargo Analysis

There are two airports in the Nashville region that service significant amounts of air cargo: the Nashville International Airport (BNA) and the Smyrna/Rutherford County Airport. The BNA is by far the largest airport in the Nashville region in terms of moving air cargo. The total landed weight of air cargo in Nashville in 2013 was just less than 300 million pounds (Figure 6.1). The air cargo volumes at BNA peaked in 2007 with more than 500 million pounds of air cargo tonnage landed, and then bottomed out at 230 million tons in 2012 as a result of the most recent recession.

Figure 6.1 Year 2000 to 2013 Air Cargo Total Landed Weight at BNA (in Pounds)



Source: Federal Aviation Administration.

The most recent volume estimate for the Smyrna/Rutherford County Airport was 80 million pounds of air cargo in 1998. The 2003 Tennessee Aviation System Plan estimates 2003 air cargo at this airport to be 85 million pounds. This makes it the third largest air cargo airport in Tennessee behind Memphis and Nashville.

The BNA air cargo operations include both air cargo carried in the belly of passenger aircraft and dedicated air cargo carriers that operate out of the Airport's all-cargo complex. Air cargo activities include daily operations from air cargo integrators, charter cargo airlines, and air express companies. Table 6.1 lists the operators and equipment for these services.

Table 6.1 Air Cargo Service Available at BNA

Air Cargo Air Service	Equipment (Planes)
BAX Global (Scheduled Freighter Toledo)	Boeing 727/DC-8
ASTAR (Cincinnati)	Boeing 727
FedEx (Scheduled Freight Memphis and Indianapolis)	A-300/310; Boeing DC-10-MD-11
FedEx Express (Scheduled)	n/a
Baron Aviation	Cessna 208B
Mountain Air Cargo	ATR-42
Emery/Menlo Worldwide/UPS Supply Chain	(Trucking Operation)
Charter Air Cargo	Airnet System; Ameistar Jet Charters; Cherry; IFL; McNeely; Royal; Special Aviation Services; USA Jet

Source: Metropolitan Nashville Airport Authority.

Table 6.2 lists the top air cargo commodities in the Nashville region. The vast majority of the freight (71 percent) is listed as mixed cargo, which is likely to be cargo that is carried by dedicated air cargo carriers, along with third-party logistics operators that occasionally move goods through the belly of passenger aircraft. Mixed freight can be any type of goods. The largest specific commodities identified as air cargo in the region include electronics, machinery, and vehicles/parts. Combined, these commodities represent 11 percent of the air cargo in the region and 26 percent of the identifiable freight in the region.

Table 6.3 shows the trading partners for Nashville’s air cargo. The largest single state trading partner is Texas, which includes air cargo from several metropolitan regions, most notably El Paso and Dallas. The second largest trading partner is the rest of Tennessee with all of the tons coming from the Memphis International Airport. The tons are distributed amongst a large number of states with only nine state trading partners with more than 3 percent of the total air cargo.

Air cargo in the Nashville region is forecast to grow by 2.5 percent annually between 2012 and 2040. This would result in a doubling of air cargo in the region by 2040. The operator of the BNA, the Metropolitan Nashville Airport Authority, has dedicated 113 acres for the expansion of air cargo facilities at BNA to ensure the ability to handle increased air cargo flows.

Table 6.2 Air Cargo Tons in Nashville Region, 2012 and 2040 Forecast

Commodity Name	2012	2040	CAGR	Total Growth
Mixed Freight	28,225	44,480	1.6%	58%
Electronics and Electrical Equipment	2,942	9,116	4.1%	210%
Machinery	1,856	5,436	3.9%	193%
Vehicles and Parts	1,561	3,735	3.2%	139%
Misc. Manufactured Prods.	720	2,446	4.5%	240%
Pharmaceutical Prod.	661	2,761	5.2%	318%
Plastics and Rubber	632	1,597	3.4%	153%
Printed Products	506	746	1.4%	47%
Articles of Base Metal	425	1,321	4.1%	211%
Precision Instruments and Apparatus	404	1,973	5.8%	388%
Textiles, Leather and Associated Articles	378	443	0.6%	17%
Basic Chemicals	358	1,202	4.4%	236%
Chemical Prod. and Preparations	355	1,250	4.6%	252%
Transportation Equipment	243	555	3.0%	128%
Other	449	1,263	3.8%	181%
Total	39,715	78,324	2.5%	97%

Source: TRANSEARCH Database.

Table 6.3 Top Domestic Trading Partners by Air Cargo for Nashville Region

State	To	From	Total	Percent of Total
Texas	2,725	2,133	4,858	12.2%
Tennessee (remainder)	2,209	1,622	3,831	9.6%
Florida	1,934	1,709	3,643	9.2%
California	1,525	1,125	2,650	6.7%
Pennsylvania	1,170	1,028	2,198	5.5%
New York	1,192	911	2,103	5.3%
Colorado	1,018	745	1,764	4.4%
Missouri	963	790	1,753	4.4%
North Carolina	791	480	1,271	3.2%
Michigan	654	605	1,259	3.2%
Other	8,657	5,728	14,385	36.2%
Total	22,839	16,876	39,715	100.0%

Source: TRANSEARCH Database.

Appendix Stakeholder Interview Summaries

Overview of Survey Process

To support the outreach efforts of the Nashville Area MPO Freight & Goods Movement Study, Cambridge Systematics interviewed 13 freight stakeholders around the region. These stakeholders are listed in Table 1. Table 2 shows agencies where interviews were requested by CS, but no follow-up was provided by the agency to secure an interview. The primary topics discussed in the interviews were:

- Emerging and future industrial locations
- Freight related land use issues
- Regional truck route network and associated issues
- Truck congestion and safety hotspots

The interview guide is provided at the end of this document.

Summary Results of Interviews

There were some common themes that arose through the interview process. In general, the Nashville area is seen as a welcoming environment for business development. Not only is Nashville an attractive place to live, but development agencies also understand the importance of logistics facilities and their impact on the community. Few, if any, stakeholders mentioned restrictions on freight movement or development in the region. For the most part, those overseeing zoning and land use are willing to work with the industry in order to best accommodate business and residential alike.

In some areas, growth is more limited than others. The common obstacles discussed include the availability of land and the availability of an adequately trained workforce. Some areas, such as Clarksville, have a lot of open land owned by the city which allows for more flexibility for the city to incentivize companies to locate in the Middle Tennessee Region. Others have less control over available land and must depend on developers to attract companies to the region.

Related to land availability is the connectedness of utilities on potential industrial land. Locations with existing access to water and electricity are far more attractive as they allow for more immediate development opportunities. Workforce development is also a key component of the ability to compete with other regions. While not a pressing issue now, the capability to employ a 1,000+ employee facility is an important consideration for a company looking to build a new facility. Several areas have existing training facilities to serve this purpose or are looking at opportunities to create such an endeavor.

From a transportation perspective, the Nashville transportation network suits the needs of the industry well. When a significant need has been identified, TDOT has worked to accommodate needs and alleviate stresses on the system, such as with the new interchange off of I-65 in Portland to better serve the Macy's logistics center located there along with several other companies. However, few stakeholders identified specific areas of improvement which would aid truck movement.

Capacity tends to be the most common constraint over geometric concerns across both interstate and local roadways. There is a feeling that while the network works in its present form, Nashville needs to ensure that it stays ahead of future growth. As more companies locate into the region and employees and families along with them, the level of service of the transportation network will decrease. Whether this demand is met through capacity increases on the roadways or an increase in public transportation will need to be determined in order to assure that the Nashville area remains a well connected community.

Detailed notes for each of the interviewees is provided following Tables 1 and 2.

Table 1 - Completed Interviews

Organization	Contact	Position
Cheatham County Joint Economic & Community Development	Daryl Phillips	Director of Economic & Community Development
City of Goodlettsville	Jeff McCormick	Director
City of Portland	Denise Geminden	Community/Economic Development Director
Clarksville-Montgomery County EDC	Cal Wray	Executive Director of the Partnership
Dickson County Chamber of Commerce	Joseph Graves	President/CEO Economic Development Director
Gallatin Economic Development Agency	James Fenton	Executive Director
JECD of Wilson County	G.C. Hixson	Executive Director
Maury Alliance	Wil Evans	President
Maury Alliance	Travis Groth	Economic Development Director
Mayor's Office of ECD	Matt Wiltshire	Director of Economic and Community Development
Nashville Chamber of Commerce	Jeff Hite	Vice President of Business Recruitment
Robertson County Chamber of Commerce	Margot Fosnes	President & Chief Economic Development Officer
State of TN	Reggie Mudd	Northern Middle Tennessee Regional Director

Table 2 - Contacted But Not Completed

Organization	Contact	Position
CSX	Grant Chaney	Regional Development Manager
Forward Sumner	Jimmy Johnston	President and CEO
MTIDA	Bill Shuff	Executive Director
Nashville Chamber of Commerce	Judith Hill*	Vice President of Business Retention & Expansion
Nashville Chamber of Commerce	Courtney Ross*	Chief Economic Development Officer
Rutherford County Chamber of Commerce	Brian Hercules	Vice President of Economic Development
Tennessee Central Economic Alliance	Charly Lyons	Executive Director
TVA	John Bradley	Senior Vice President, Economic Development
Williamson Chamber of Commerce	Matt Largen	President and CEO

*Other contacts with this organization were reached for input

Name: Daryl Phillips

Date: December 5, 2014

Organization: Cheatham County Joint Economic & Community Development

- Concentration is better for infrastructure, including transportation, can't get away from the population
- Downtown – Ashland City
- Cheatham – 4 towns, <5,000 people
 - Split in half by the Cumberland River
- South served by I-40/Kingston Springs
- Ashland – A. O. Smith (water heaters), about 1,500 employees and 210 trucks/day
 - TN Watts Parkway (SR 455) – Few trucking companies
 - Dillon (<1 mile) – transfer area/parking
 - Industrial Park – HWY 12 between Ashland City and Cheatham line
- Trinity Marine – shortline rail delivering steel
- 100 people, concrete panels to go on buildings
- West Office/terminal in industrial park – A.O. Smith affiliation
- Company moving in from Nashville – small product, 5 trucks/day
- Pleasant View – not freight intensive, one trucking company with A.O. Smith
- Kingston Springs – light industrial
- Congestion problems – capacity issues on I-40/24
 - “official” or “non-official” detours – Kingston Springs/Highway 70
- Smaller road not designed for traffic in planning stages not addressed as well
- I-40 common accidents near mile marker 150 (from Hickman County)
- Traffic goes through square – cannot make turn and swing out into oncoming traffic
- Kingston Springs to HWY 70 (40 mph state highway) – no shoulder, very little guard rail
- Pleasantville – 41A parallels I-24, not uncommon for trucks to use this route
- Exit 188 on I-40 to Exit 24 on I-24 – Ashland City is not a good truck route
- Companies are looking at this more, has to be a problem within
- Hwy 49/49A in the northern part of the county is designed for how traffic was 40 years ago
- Commuting traffic is concentrated in rush hour
- Will always be a conflict with other users
 - Cheatham has a lot of outdoor recreational activities and it will take a cultural change for traffic to be understanding of bike needs
 - Need to understand that roadways are not just for one user
- Interstate System
- Hwy 12 to Ashland City – 4 lane divided, SR455 bypass (has some issues)
 - Trucks should be on interstates
 - Replacing bridges could use upgrade
- HWY 49 – Ashland to Pleasantview
 - I-24 – issues for sight distance at intersections (part of current plan)
 - Will increase before fix
- Not a tremendous amount of growth (topography does not allow this)
- Workforce is not industrial anymore
- Not a lot of people live in county AND work there
- Industries focuses – more “backoffice” type things
 - Advanced manufacturing (skill intensive) vs product intensive
- Rail – concerned about rail lines in US
 - Manufacturers need rail, can't use barges
- Properties on market – has to be the right fit, land on rail is in flood plain
- Trucking companies interested in Ashland City but require hard surface for parking lots

- Trailer on lot cannot be gravel so development of truck parking would be cost prohibitive
- Several bridges have been replaced on state highway
- Concerns (rural development)
 - Congestion in downtown Nashville
 - Rural communities have 4 lane highways, resources should have been used elsewhere
- Trying to recruit – sometimes may take 3 hours to go through Nashville resulting in huge delays
- Plus side for residential in Cheatham – better to be in Ashland and commuting than Brentwood
 - Companies will start to look at this

Name: Jeff McCormick

Date: December 10, 2014

Organization: City of Goodlettsville

- Largest employer is Tyson Foods – Case ready facility
 - Expanding to become the largest of its kind in the world
 - Don't kill animals here – beef/pork cut up/packaged
- AWG (Associated Wholesale Grocers)– grocery/distribution warehouse
 - Lots of truck traffic
- Limited on available land
 - Can only expand into Sumter
- 2 major industrial parks – Stonebridge Industrial and Space Park North on I-65
 - Nearly always full
- Also have Dollar General Corporate Headquarters – some distribution associated with this
- Main Street – Dickerson Road – US 31/41/I-65 are bottlenecks
- -I-65 is 3 or 4 lanes south of Goodlettsville and then narrows to 2 in Goodlettsville
 - Looking to 6 lanes on the north side to Kentucky
- Tyson (Long Haul Pike) – Can't make turns
- US 31 N – There's a RR bridge choking traffic to 2 lanes (4 to 2 to 4)
 - Main line for CSX
 - Looked at reversible lanes here but TDOT did not approve this strategy
- Trucks – Tysons going wrong way
 - Working on bike, have funds to redo main street and include bike lanes
 - Working to interconnect the bike lanes
- Nashville is behind on traffic congestion and infrastructure improvements are playing catchup
- SR 840 – Never came through with northern loop
- I-65 N/S – has a lot of congestion
 - I-40 is not as bad as I-65
- Tysons expansion
 - All freezer space (output capacity)
 - Incoming/outgoing material
- Problem with queuing – trucks get there early and can't unload
 - Overnight parking – Ordinance restrictive to parking
 - Not enough parking, pushing it out
- No trouble with land use

Name: Denise Geminden

Date: December 11, 2014

Organization: City of Portland

- 2 sections with the majority of the manufacturing/distribution facilities
 - TN Business Park and North Industrial Park
- TDOT constructing new interchange to be complete in February 2015
 - Will serve Macy's and other industries located there
- Now and before June is the "hot time" for the area – Full time temps for Christmas deliveries
- West end of parkway being resurfaced
- Hatch Stamping is ready to start hiring as of the first of the year
 - Purchased building, looking to hire about 100 people
- Kroger plant supplies candy so Christmas and Easter are the busiest times
- New interchange will connect at 109 near Kirby Rd – help connectivity between North Industrial Park and Tennessee Business Park
- All Japanese companies are growing due to Nissan manufacturing
- For awhile, scheduling issues were causing conflicts on the roadway
 - Truckers' timing was off and they would take up an entire lane of the road (Western Drive) as well as park on the side of the road – this has been resolved through scheduling
- Watching the northwest corridor – improvements to Hwy 109 except through downtown
 - 1,200 trucks/day over 8 hour period
 - Working on safety project with TDOT but waiting for environmental clearance for bypass
- Hwy 109 T-bones with 31W
 - Kentucky took ownership of improvements here
 - In the early morning peak, left turns onto 31W creates a huge bottleneck but don't want to do an extensive study yet due to the new interchange
 - 1 project affects the other and this is dependent on Kentucky
- Also a project with Robertson County partnership
 - Exit 117 – several industries located here
- Mostly automotive industries – workforce issues throughout the 7 county area
 - Need to keep people trained
 - Technical Training Center/High School/Middle School education efforts
- 50-60 industries in Portland
- No ordinances impeding truck movements
 - Want to encourage freight movements
- Working on Hwy 109
- US 31 W corridor runs parallel to I-65 and serves as a good alternative if there is traffic on I-65
- Land is not an issue
 - Local developer has the mentality of "If I build it, they will come"
- Good competition and good partnerships
- Need to be ready for when the growth hits
 - Stay ahead of traffic needs (i.e. Nissan thought they would add 200 employees and ended up adding 600) and keep arms around the growth
 - Everything happens very quickly

Name: Cal Wray

Date: December 10, 2014

Organization: Clarksville-Montgomery County EDC

- 2,000 acre industrial site
 - Hankook Tire building a 1.5 million square foot facility and will employ about 1,800 persons
- Hemlock Semi-Conductors - \$1.2 billion facility (UPDATE – Announced on December 17, 2014 that this plant will be permanently closed)
- Between exits 4 and 8 on I-24 – all industrial park
 - East is mostly industrial, retail is to the West
 - Commercial AC (Trane) facility in the middle of the retail area (1,400 employees)
- Hemlock Semiconductor located between exits 1 and 4
 - Donated 833 acres of land back to Clarksville
 - Major developments are looking at this area
- Over 2,500 acres in the seven mile stretch are available
- No zoning issues/No limitations locally
- Developing a new barge port with RJ Corman (railroad) and TDOT – should be ready by Quarter 1 2015
- Truck parking is an issue
- Truck routing/designation of route
 - Should be “priority routes” and encourage proper engineering along them for trucks
- Exit 4 is the main route for trucks as well as Hwy 76 east of the interstate
 - College Street also used downtown
- Rossvie Road (Exit 8) needs to be updated
- Warfield Blvd should be updated (currently 2-3 lanes, should be 5)
- Atlanta has bigger problems – transportation isn’t as much of an issue here
 - Recruit against places based on our transportation and performance
- Volumes will continue to increase
 - In the last 5-10 years, only one street was been constructed
 - Dependent on state funding
- Fort Campbell is also an important consideration
 - Technically in Kentucky but many people live in Tennessee
 - About 31,000 active duty (largest employer in TN/KY)
 - Between Exit 1 and Exit 4 in TN and Exits 86/89 in KY
 - Not all soldiers live on post

Name: Joseph Graves

Date: December 19, 2014

Organization: Dickson County Chamber of Commerce

- Industrial – CSX Railroad and shortline
- I-40 is the main driver for tourism and manufacturing
 - 960 hotel rooms in the county – most near interstate
 - More of a commercial hub of west Nashville – a lot of shopping opportunities
- 1 Facility under development – 1.8 million sq ft
 - Dal Tile (Mohwak Industries)
 - Looking at going into production in Quarter 1 of 2016
 - Ceramic tile which is mostly trucked from the New Johnsonville port on the Tennessee River
 - 500,000 sq ft of this is warehouse/distribution
 - 40-60 trucks/day
- Working with TDOT on an extension of Sanker Drive to connect to Hwy 96 in Bruens
 - Opens park to two access points on I-40
- SR 840 is a great asset but there isn't necessarily any growth tied to it
 - Extending further north to Hwy 96 or Hwy 70 would be better
 - Area is still very rural, not a single interchange off of SR 840 into Dickson
 - County mayor continuing discussions with TDOT to connect to Hwy 96
- Other competition was with Arkansas
 - Tennessee is closer to population centers
 - On 150 acres, 2 sites which were pad ready, bought outright
 - Had to make some modifications but moved quickly on construction
- Some issues with land to have "ready" access
 - 500 acre tract of land south of the interstate (currently a farm) – have submitted for several projects but haven't been successful yet
 - Property located off of Hwy 46, already has sewer/water, but would require about 2 years for electricity
 - Off of a rail spur but would require upgrades to Hwy 46
 - Hwy 46 is currently terribly congested but should have a major renovation next year (additional stoplights, etc)
- Not a very walkable community – no bike lanes or sidewalks
- Could be improvements
 - I-40 needs to be additional lanes all the way to Memphis
 - Need to be more walkable/bikeable
- Dal Tile employing 360 people
- Other facility coming online in Q1 hiring about 100 employees
- One plant (Dickson Quad/Graphics) with 115 employees is closing
- Can show site consultants that there is a trainable workforce

Name: James Fenton

Date: December 15, 2014

Organization: Gallatin Economic Development Agency

- MPO attendee until about 2 years ago
- Gap – 3.2 million square foot facility
 - Largest one they have in North America
 - Located off of SR 386
- SR 109 bypass – 4 lanes now, looking at extending this to I-40
 - New bridge is 4 lanes now
 - Dealing with right of way acquisition now
 - Takes traffic to I-65 in the north and helps with the SR 840 loop
- Originally SR 840 was around the entire city
 - Working on SR 109 to complete the NE quadrant
- Industrial complex in the west announced - \$200 million investment and 1,100 jobs (18-24 months)
- Looking at 31E truck bypass (right of way acquisition)
 - Help traffic get on SR 109 to go north
- Received SIA grant to widen airport road (bid in spring)
- Sumner County Regional Airport – 6,300 linear feet now (recent expansion)
- SR 386/Vietnam Veterans Blvd is basically a parking lot during the morning peak period because of all the traffic
 - Truckers try to avoid this as it disrupts deliveries
 - Getting out of the area and onto SR 840 is important
 - 2 dedicated buses in the morning/evening to help ease congestion
- Beretta (from Maryland) is investing \$45 million into a new manufacturing facility, creating 300 jobs
- American Colors building new 30,000 sq ft manufacturing facility and creating 31 new jobs
- ABC Technologies expanding with an additional 180,000 sq ft and creation of 230 jobs
- Hoeganaes considering another expansion
- Manufacturing competition comes from Louisville and Savannah
- Alpine – only one in Tennessee
- Buffalo – All of TN, ceramic tile, halfway between 2 places
- City purchased land about 6 years ago – almost all is sold or under contract
- Looking at buying more land to allow room for growth
 - Effort at the county level as well for more land
- Workforce, as well as transportation issues, holds back growth
 - Expansion of ABC Technologies almost didn't happen since Spring Hill was worried about delivery times
- Limited truck restrictions
 - No trucks in downtown (SR 109) – prohibit + ticket
 - Airbrake restrictions – must work well
 - No time restrictions
 - Hopefully bypasses will help
- Hwy 25 to Vietnam Veterans – over railroad tracks the trucks scrap on the hill (some work has been done on this)
 - Some other crossings are in bad shape
- TVA steamplant is mostly barge traffic
- CSX main line goes through the area
 - Rail lines cross some of the major roadways
- 31 E – major road through downtown – re-did industrial crossing
- Hwy 109 Bypass

- Hwy 25 – Goes to Whitehouse, TN
 - Lots of traffic but 2 lane undivided roadway
 - Supposed to have bike lanes but it really doesn't
 - Hilly with poor sight distance
- 31E out of Gallatin north
 - Bumper to bumper traffic
 - Has a walking path (about 5 miles) – good separation
- Truck route is Hwy 109
 - Long term → 31 E North
 - Access to NE part of county
- Would like to have Airport Road widened
- 1,100 jobs coming online
- 31 E – been looking at a bypass/widening
- Traffic can hurt workforce attraction
 - Expansion/relocation taken off of agenda due to traffic issues
- Lacking major multi-modal port
- Cheatham County rail to Clarksville
 - Needs help, transportation possibility (passenger?)
- Gallatin jammed up
 - CSX won't let them add anything because they are at capacity

Name: G. C. Hixson

Date: December 10, 2014

Organization: JECD of Wilson County

- 2002 – “super speedway” of SR 840 completed
- Halfway between I-24/40
- Took Lebanon sewer service
 - Development started
 - Central Pike, Duke, IDI
- 4.5-5 million square feet of warehousing space
- Gone from 25-3,000 logistics industries on 840 in a 10 year period
- I-40 interchange –Lebanon/Mt. Juliet
- Under Armour developer – 1 million square feet + an additional million in 5 years
- FedEx hub in development – I-40/SR 840
- SR 199 on SR 40
- Commerce Farms – 3 million sq ft
- Development follows interchanges and where sewer service available
- 5 years ago, most developments were a lot smaller
 - Now moving towards larger buildings, 1 million sq ft
 - Amazon – 1.2 million
 - Under Armour – 1 million
 - Starbucks – 680,000
- Brian Hercules would say the same, compete some
- Plenty of land w/utilities
 - Cost of rural property to make more marketable
- Murfreesboro doesn't own public land so everything is developer driven
- Land prices have nearly doubled
- Major developers' model is to build and have long term income – don't want to sell
 - Build buildings and then make small term leases
- Difficult for communities to buy the land
 - Some other cities still have some control (Gallatin, Columbia, Clarksville)
- Have zoning officials who understand the importance of manufacturing jobs and are comfortable with it
- No routing issues that they are aware of
 - One complaint they have heard about is truckers getting lost going to Starbucks (Commerce Way vs Commerce Lane)
- Bottleneck in Lebanon Square – intersection of US 231 and US 70
 - Tractors still go through the square – a route for trucks needs to be worked on
 - Area still needs to be able to manage deliveries and there are no appropriate alternate routes
- Central Pike interchange is still 5-7 years away
- Not a lot of issues with bike/pedestrian conflicts
- Roads aren't wide enough – occurs across county
 - SR 109 makes the northern loop of SR 840
 - Bridge over Cumberland is only 2 lanes (scheduled for 4 lanes) but much of this roadway is only 2 lanes
- As Nashville gets more congested, will see higher traffic counts on SR 840 and SR 109 will get more traffic
- There's a reason that companies keep coming here – can easily serve a large market from the region
- Infrastructure is adequate for now (Music City Star for transit is an advantage since it helps with the I-40 congestion)

- Still a fairly marketable area. Prices are higher than in some other similar places (i.e. Knoxville, Chattanooga, Charlotte) but the land is already developed so it's about the same in terms of product
- Increasingly difficult to locate a major 1,500+ employer due to labor constraints
 - Need people to fill the jobs
 - Affects how much growth is possible
 - High turnover in some areas
 - May see natural slowdown

Name: Wil Evans and Travis Groth

Date: December 15, 2014

Organization: Maury Alliance

- Industrial areas of concentration – beginning to pose a problem
 - 3 municipalities (each has some industrial)– Spring Hill, Columbia, and Mt. Pleasant
- Spring Hill
 - GM
 - Northport Development – on Beechcroft Road, one mile from GM Plant
 - One building occupied in early January, the other in March
 - About 50 trucks/day on a 2 lane roadway, with 9 foot lanes and no shoulder
 - TDOT funding SIA to widen to 12 ft lanes along with turning lane and curb/gutter
 - Recruiting more suppliers, about 100 more acres to develop
 - Without further upgrades the project is dead in the water
- Saturn Parkway Extension to SR 840 (help with 840 traffic)
- Commercial growth w/some industrial parks, etc through there
- Good access
- What is the vision for the area?
- Columbia area – pressure off of 31
 - Trucks in supplier park routed through downtown Spring Hill on 31
 - Direct connection 396 – parkway to site would help
- Existing project to improve 412/I-65 interchange
 - On-ramp not a good design, traffic does not move smoothly
- Hwy 43 fell off the radar → Port of Florence to downtown Columbia
 - Stops and becomes a 2 lane highway at Hwy 412/Bear Creek Pike
 - Shortsighted to not improve road (could help traffic on Hwy 31)
 - Access to international material via barge
 - Other industrial sites also along Hwy 43 including an existing one in Columbia
- Mt Pleasant park beginning to see activity and generate truck traffic
- County looking to identify additional properties
 - About 200 acres at I-65 and Bear Creek Pike
 - Another area near Hwy 50 Interchange
 - Large property off of Hwy 43
- Competition – Ohio, Alabama, Georgia, Kentucky
- In state – Wilson, Clarksville, Gallatin
- Workforce will be a problem moving forward
- Transportation – 840 will help
- Spring Hill traffic is pretty bad – eye on road development
 - Beechcroft Road is an issue
- Hwy 31 and Northpoint
 - Not a lot of movement until this year (heavy loaded trucks)
 - Plans by TDOT to redo entrance but has fallen on backburner
 - Need to make a left but without a left/guarded turn it is difficult (different experience going to work vs leaving work) → concerns businesses
- Bike/pedestrian is not as much of a conflict now
 - James Campbell Blvd/Hwy 50 and Hwy 243 intersection to add sidewalks
 - East on Hwy 50 is the main retail corridor and there are no sidewalks/bike lanes
 - Growth will cause issues, need to keep an eye on this
- No restrictions on industry that they know of
 - New park with residential across the way

- With the exception of Beechcroft, everything is clustered with solid access
 - With Northpark, on 31 if traffic grows, it could be disruptive
- Connection Road from 396 to 840 would be powerful
 - Keep traffic out of downtown
- If 412 could be expanded, this would ease commuter traffic from 31
- Other main truck routes include Hwy 99, 412, 43, Bear Creek, 396, 31
 - 43 is beginning to see a lot more
- Transportation is driving people to the area
 - Addresses from counties directly touching Davidson
- Upgrades still to be made, such as I-65 widening
- Mass transit/light rail is a long term need, particularly in the metro area
- In particular, for Maury County, there is a single point of entrance (396) – need to create a connector road to the interstate system
- For industrial roads, the state has frozen funds connected to industrial projects for communities
 - What funds are available?
 - Losing 1,000 jobs because they can't get the road
- Want to connect with MPO, need enhancements and don't want to be left behind

Name: Matt Wiltshire

Date: December 19, 2014

Organization: Mayor's Office of ECD

- Office development focus
- Industrial centers in
 - -SE Davidson/LaVergne, NW Rutherford/Smyrna on I-24
- I-40 – Eastern Davidson/ W Wilson (Juliet)
- Hendersonville near 24/65 split
- Some around Briley to the west
- Most significant are in Mt. Juliet with FedEx and Under Armour
- Competition differs based on the project, most recently areas have included Austin, Raleigh/Durham and occasionally Indianapolis, Charlotte, and Chicago
 - They have not competed head to head with Memphis before, it's a different vibe
- Cost of living is lower and average wages are higher than the national average which makes Nashville an ideal place to live
 - Transportation costs higher due to commute times
 - No income tax
- Nashville is a college town with about 112,000 college students
 - About 17,000 graduate each year and about 10,000 will stay in Nashville
- Smallish town with a music scene and various professions
 - Not so different from Austin or Raleigh (blue dots in red states)
 - Austin is focused on technology while Nashville has healthcare
- From a freight perspective, Austin is more geographically centered but Nashville is population-centric with about 50 percent of the U.S. population accessible within a day
- Nashville is a good place to live and work, land is cheaper than a lot of other places but home and commercial prices are rising quickly
- Large IT workforce, unemployment rate in Davidson county is about 5% which makes employment tight across certain industries
 - Net migration helps with this but the labor pool is not as deep
 - Driver shortage from freight movement is nationwide and Nashville is no exception
- -SR 840 stands out as a significant corridor
 - What is the breakeven point time-wise when traveling from W of Dickson to E of Lebanon on SR 840 versus driving through downtown
 - Looked up current split between these two routes and was only about 11 minutes longer to take SR 840 at 2 PM, would be interested to see the time during rush hour
- I-40 going east has a lot of traffic and where the three interstates combine is also particularly bad
- Not aware of any zoning restrictions
- Space was limited (about three years ago), when you have to fix permitting/zoning then it is easier to do development elsewhere
- Easier to buy one farm than to assemble several parcels in order to have a lot of available land
- Geographically central position can be more useful
- North of Titan Stadium is underdeveloped
- PSC metals (Scrap metal) – Across the river, 80 acres used by warehousing/scrap metal
- E of 65, N of 440, S of 40 Loop (Greer Stadium) – office development
- Freight areas continue to be 40E, 24SE
- Some topographic challenges (24 NW) – lots of land, but attributes are not conducive to development
- Briley Loop – West, trucking company out there

- Not a lot of conflict with trucks and other types of traffic
 - The main issue right now is the construction which causes a lot of congestion
- Not been sensitive to a significant complains about clogging up the roads
- Nashville Next
 - Plan update (20 years since last plan)
 - Subareas plan – goals for zoning
- Decent framework (840 + 3 interstates) – maintenance/capacity separate issue
- Relatively low residential density – commuting patterns (live out and commute in)
- Will delay development of mass transit yet makes it imperative to develop
- Goal is to have more development along the line

Name: Jeff Hite

Date: January 15, 2015

Organization: Nashville Chamber of Commerce

- Amazon – Wilson/Rutherford
 - Added 200,000 sq ft sorting center in Davidson
- Under Armour is the big discussion at the moment
 - Phase 1 starts with 1 million sq ft (about 1,500 employees)
 - Phase 2 would be an additional 1 million sq ft
 - Other locations are in Baltimore and Southern California
 - Competition between Georgia (near Savannah) and Tennessee
 - Final pieces to win the project were based on the site and speed to market
- Big boxes like Wilson/Rutherford
 - 40E/840/24 Triangle
 - Available sites and good access
 - Can get to NE/SE easily
- Labor – don't want to tap out, need to support existing and future
- Sites are available to develop and have a good foundation but can easily tap out the \$12 - \$15/hour market
 - Coming close to saturation and there is a lot of activity/interest, state looking at tech centers
 - Gallatin – logistics program to feed this area
 - Middle Tennessee Council of Supply Chain Professionals – talk to high schools
- Tennessee has good infrastructure and good roads/highways, not really an issue
- SR 840 is a great alternative and is used more and more very day
 - A lot of development near SR 840/I-40 on the east side – could this be duplicated at the SR 840/I-40 junction on the west side of town? Demand may not be there just yet
- Zoning commission understands importance of industry to the region so there haven't been any real issues with this – easily adaptable
- 24/7 operations near residences
- 109 Expansion – 40/65 has interest as the northern leg of SR 840
- Plan for an additional interchange on I-65 N (Macy's)
- Most development are in industrial areas but some conflicts may arise as residential/commercial creep into the industrial areas
- Strong market, little vacancy
- Transportation is currently working but if the population grows as expected there will be a lot more congestion
- Nashville – net migration of 30-32,000/year
 - A lot of people are coming here and they have to be able to handle the growth
 - Want to avoid the "Atlanta model"

Name: Margot Fosnes

Date: December 23, 2014

Organization: Robertson County Chamber of Commerce

- -Bordered by I-24/I-65
- 11 Municipalities
 - Primary ones are Springfield and along I-65 in Portland
- Some in White House area
- Several sites along I-24 at exit 19/24
 - Private land, undeveloped, still working on infrastructure (i.e. fire suppression is not strong enough)
- New Developments
 - -Airtech International (from California) – working on development (main competition for this development came from South Carolina, won out based on location/workforce)
- Hatch Stamping – new production facility
- Expansion of existing companies as well
- Workforce is beginning to see issues
 - Macy's employees 1,500 year round and increased to 4,000 over the holidays – experienced hiring issues during this time
 - Electrolux employees about 3,300
- Issues in Springfield for existing businesses – don't have good interstate connections
 - SR 431 is 2 lane
 - SR 41 is 4 lane but has heavy traffic, school zones, etc
 - Hwy 49 to I-24 is 2 lane
 - Hwy 76 to White House (several curves) or Hwy 49 to Cross Plains – both 2 lanes
- Hwy 76 has some difficult curves
 - Near Sulphur Fork Creek/Whitehouse Road
 - Just past Whispering Oaks/Savage Branch
- Just improved the bridge on 49 in Cross Plains area
 - No bridge issues
- Rather, 2 lane road issues
 - Huge agricultural economy (corn, wheat, soybeans) – harvesting equipment proves problematic for other traffic
- No restrictions on development
 - In Springfield, Hwy 49 goes through and connects with 431 and 41 which results in a lot of traffic going through the square
 - Discussions about having traffic reroute to Central Avenue (wider roadway) however, it is not a state highway so it has not been pursued.
- Yes there are conflicts with bike/ped
 - No dedicated bike lanes, a lot of bicyclists in Springfield
 - Many are on lower roads but 5th/431/41 are key
- Nashville does a little bit better on the north part of the city but there is still a lot of congestion at I-65/I-24
 - High commuter population drives this
- Commute – 431 is the most heavily used but there are some safety issues
 - 4 lanes in some parts but quite a few curves in the roadway
- -Still space in Whitehouse/Portland for development but interest along I-24
 - Places are right at interstate exits
- Rail in county – not a lot using it, no intermodal connector
 - A couple spurs but no rail served properties, could be utilized more
 - Some industries might be willing to switch if they had the opportunity

Name: Reggie Mudd

Date: December 9, 2014

Organization: State of Tennessee

- Montgomery/Clarksville influence everyone else, one or two are on the cusp
- One is 2,000 jobs
- Clarksville – I-24 W of Nashville – Hankook Tire (1,800 jobs)
- Main corridor is 840 corridor in Wilson to Murfreesboro (Amazon)
- Under Armour – 1,800 jobs (Mount Juliet) along I-40
- 840 is not yet at capacity
- -Rutherford – Nissan and Nissan supplies
 - -Continues to be an attractive community
- I-65 in Franklin – very congested, more so than anywhere else
 - More “white collar” employment, continued growth
- -I-40 in Mt Juliet – huge residential growth above 840
 - Local road congestion
- Downtown thriving
 - UBS with 600 jobs
 - Bridgestone Downtown – 1,000 (office growth)
 - HCA – 600 employees
- TDOT has more projects than there is funding for
 - Raise in gas tax? 1980’s was the last time this was discussed
 - Becoming more of a “maintenance only” organization
- Mass transit issue
 - Rather spread out so traffic is not as concentrated
- FedEx near VA – couple hundred trucks
- more clumping in the future
- Constraint is workforce – who will work there?
 - Dry labor market forces companies to look elsewhere
- Historically the largest concentration has been in Smyrna and La Vergne (west of Murfreesboro)
 - Access to Nissan, etc but outside of downtown
- Everyone has the same challenges
 - Intense workforce development to help locals get jobs
- Nashville is an attractive place and is not the only one with congestion problems
- I-65 south of Nashville has more congestion
 - Commute times growth worst in nation
- (on truck geometric issues) – location in Lebanon where they kept hitting a guardrail, TDOT heard about it
 - If it is an issue, they would hear about it
- (on improving roadways for economic development) – People are so hungry for development that they will push the improvements though
 - 2,000 job employer in Clarksville – Governor involved with the Revenue department
- Macy’s in Portland was promised an interchange
- Hankook tire – working on roadway for them
- Vacant locations have no infrastructure (water, sewer, gas, power)
- Robertson/Cheatham – dual county project
- Availability of rail sites
- Weaknesses of the region are due to workforce and the availability of good sites (rail, etc.)
- Companies coming in looking for 250 acres of open land, but there was none available
 - Need to be able to accommodate at least 500,000 sq ft.

- Positives – situated on three major interstates, no state income tax, welcoming business climate, 27 colleges
- Land issues- where would the need to be? Rail optional?
 - Rail is better – 50% of major manufacturers need rail
- South is more office space, not a lot of industrial land left in Davidson
 - Maybe to the north but they don't have the facilities
- Trucking issues – availability of drivers, high turnover
- Talk to Tennessee Trucking Association to get layman's perspective

Stakeholder Interview Guide – December 2014

Provide introduction and background on study.

Emerging Industrial Locations

Truck traffic and industrial facilities in the Nashville region are highly concentrated at a handful of locations such as downtown, clusters around I-24, and a few other locations around the region. Do you think these concentrated freight locations are good for the region or would a more dispersed distribution be beneficial in terms of moving goods?

What are some of the locations of industrial development in the Nashville region? This includes locations where large industrial facilities are recently completed, under construction, or planned. Are these facilities manufacturing sites, warehouses, distribution centers and/or e-commerce?

Are any of these emerging industrial locations problematic in terms of truck operations or access?

Future Industrial Locations

What other regions does Nashville compete with in terms of recruiting and retaining industrial businesses?

What are some of the strengths and weaknesses of the Nashville region relative to its regional competitors in terms of recruiting and retaining industrial businesses?

How does Nashville's freight transportation system performance compare to the non-transportation strengths and weaknesses in terms of recruiting and retaining industrial businesses?

Are there industrial locations currently with a significant amount of vacant space or is it likely that more industrial space will be needed? If vacant space exists, where is it located and why are those vacancy rates high?

What locations have been targeted by local economic development officials for future industrial usage in the Nashville metropolitan region? How do these locations compare to locations being marketed by industrial real estate brokers?

Are any of the future locations problematic in terms of truck operations or access?

Freight-Related Land Use Issues

Are there any locations in the Nashville region that you are aware of where truck traffic and other types of traffic (e.g. auto, bus, bicycle, and pedestrian) are not interacting safely or efficiently? What types of solutions can be used to address this?

Are there any local codes or zoning ordinances that are negatively impacting truck traffic? This would include time of day restrictions on industrial uses, noise restrictions, and truck prohibited routes.

Are any new local codes or zoning ordinances needed to improve freight interaction with other modes or non-freight land uses?

Regional Truck Route Network Issues

The Nashville Area MPO is in the process of developing a truck route network that covers the entire region. This truck route network will likely include the entire interstate system along with a number of state and local roads. What key roadways in your jurisdiction do you think should be included on this network?

Are there any locations in the Nashville region that are particularly problematic in terms of road geometry or other operating restrictions such as bridge height, weight limits, lane widths, or turning radii?

Truck Congestion/Safety Hotspots

Which bottlenecks in the Nashville region have the most negative impact on truck traffic? What types of solutions can be used to address these bottlenecks or reduce their impact on trucking operations?

Have you heard any comments from truck drivers or fleet managers regarding their use of SR-840 as an alternative to I-40 for conducting east-west through trips across the Nashville region?

Are there any specific locations that you are aware of which present significant safety concerns (e.g. high crash rate, roadway geometry)?

Wrap-Up Question

Are there any other freight, land use or truck route issues that are important for the Nashville Area MPO to address?