

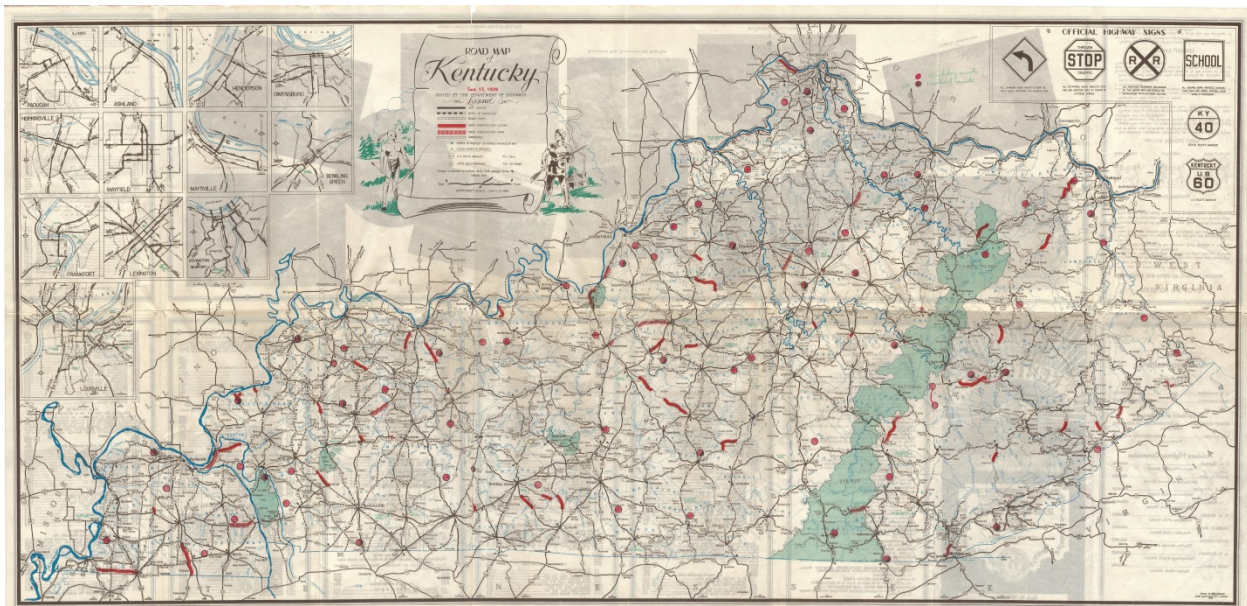
5 KEY INDUSTRIES AND SUPPLY CHAINS

Kentucky's major industries and their respective supply chains are vital drivers of Kentucky's economy. Supply chains are the pathways on which raw materials and production component parts move from their original sources to a production facility, warehouse, retail outlet, and end consumer. Kentucky industries rely on an efficient freight transportation system to meet these needs. This analysis will identify infrastructure crucial to Kentucky's economic future, including critical intermodal connectivity points. Often, these points are where most efficiency is gained or lost during transport. The analysis comprising this chapter was constructed using existing information and expertise including the KTC/KYTC Freight Generator Database, Freight Analysis Framework (FAF), and analysis completed by the Institute of Trade and Transportation Studies (ITTS).

5.1 HISTORY

Kentucky's economy has always been closely intertwined with its freight transportation system, beginning with the steamboat in the 1800s. While this provided many opportunities for riverside settlements, it left inland towns largely unconnected. During the Industrial Revolution, short line railroads began to connect many of these smaller communities, which provided major economic development opportunities for Kentucky. The success of the railroads allowed for the rapid expansion of the coal industry. **Figure 5-1** illustrates Kentucky's roadway system in 1939.

Figure 5-1: 1939 Kentucky Road Map



Source: Kentucky Transportation Cabinet, <http://transportation.ky.gov/Planning/Pages/Historical-Maps.aspx>

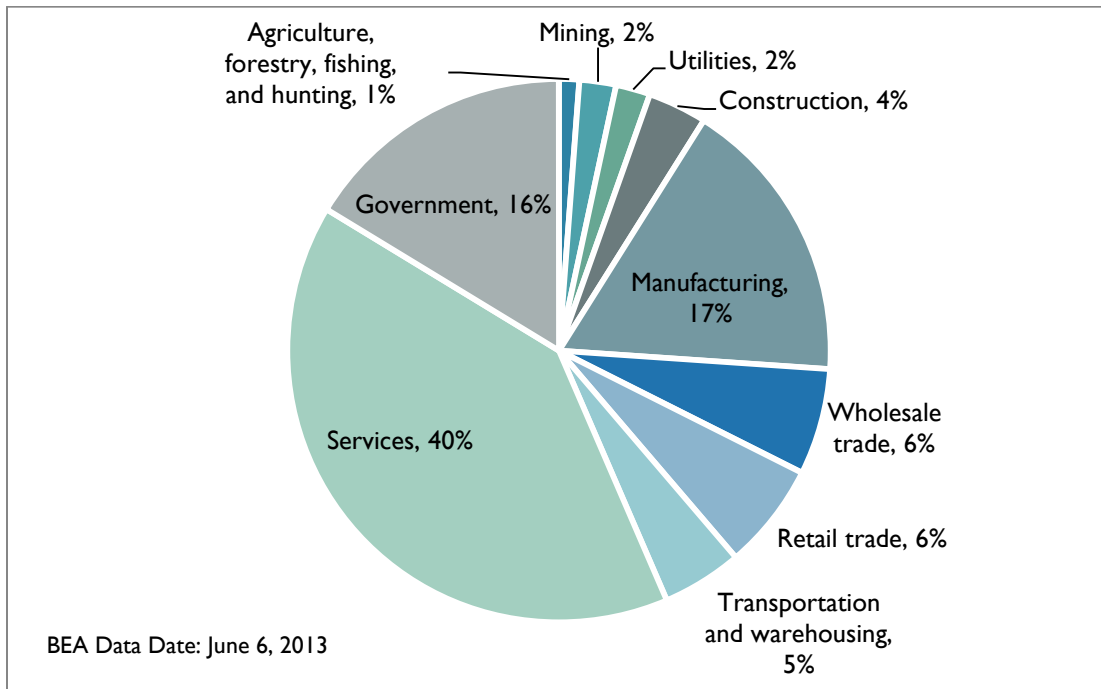
A century later, Kentucky is strategically located less than one-and-a-half day's truck drive from most of the nation's eastern and central manufacturing centers. While Kentucky's geography provides many

economic advantages, it also presents challenges with mountainous terrain, karst areas, and areas prone to flooding.

The commonwealth's industries, which have shifted in recent decades, are key players in freight transportation. In the 1990s, manufacturing became Kentucky's major industry. Key manufacturing industries include chemical and automotive. In present day, major employment generators are in the transportation equipment and automotive parts industries. In 2011, the services sector (which includes healthcare) exceeded manufacturing as a largest share of the overall Kentucky economy. In terms of employees, UPS has been Kentucky's largest employer since 2005, when it expanded its Louisville air cargo hub.

Figure 5-2 illustrates the industry share of Kentucky's economy by gross domestic product (GDP). Although coal is one of the top commodities transported by weight, mining only accounts for 2 percent of the total economic activity (in terms of GDP). According to FAF, coal accounted for 37 percent of the freight tonnage moved in Kentucky in 2007.

Figure 5-2: 2012 Industry Share of the Kentucky Economy (GDP)³⁹



Source: Bureau of Economic Analysis, 2013

³⁹ Bureau of Economic Analysis, 2012 State Gross Domestic Product by NAICS Code, 2013.

5.2 TRANSPORTATION FRAMEWORK FOR SUPPLY CHAIN DECISIONS

The factors utilized by site selectors when strategically locating new developments include the availability and capacity of the freight transportation system to move raw materials, manufacturing materials, and finished goods along the supply chain. For example, the location of a manufacturing or distribution center will be (in part) based on the presence of current or expected transportation infrastructure to meet these supply chain needs. An overall understanding of the role transportation plays in supply chain decision-making will support KYTC's planning efforts and strategic investment in the freight system.

As part of a National Cooperative Freight Research Program (NCFRP, Report #14) project, supply chain managers developed an overall framework for the selection of various routes and modes to carry freight throughout the product development process (**Table 5-1**). The criteria is balanced against the specific needs of the supply chain, and the best route, mode, or combination of modes is selected.

Table 5-1: Criteria for Analyzing Transportation in Supply Chain Decisions⁴⁰

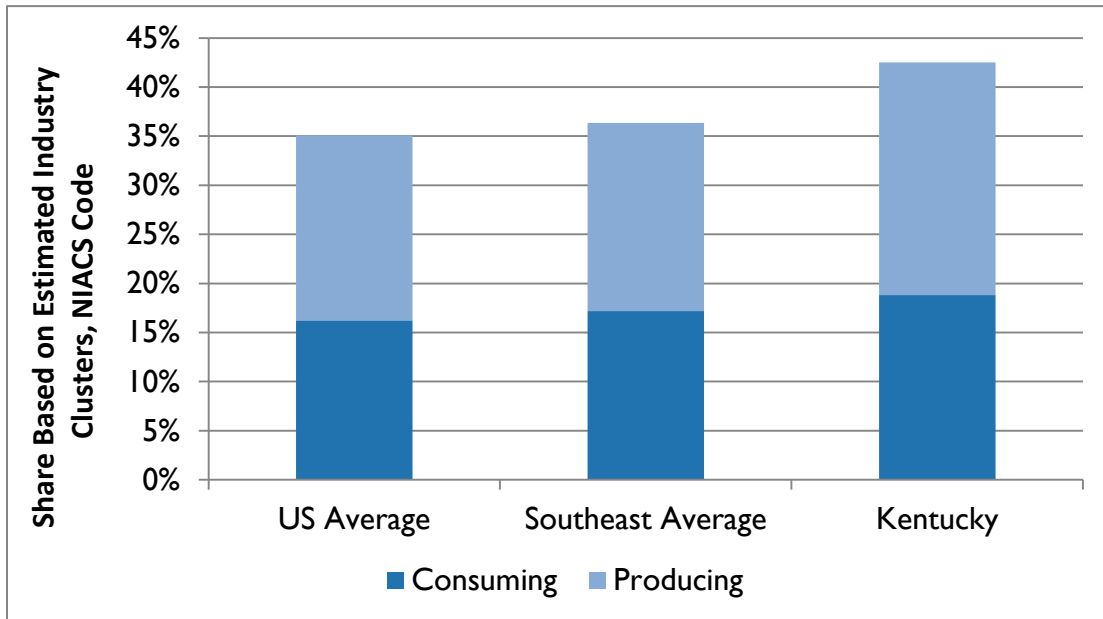
Criteria	Definition
Time	The time required for the movement of materials within the supply chain. This normally includes moving raw materials to production and then through a distribution network to the ultimate customer.
Network Reliability	The degree of predictability that the stated transportation time will be adhered to during shipping. Reliability is very different than predictable delays such as rush hour congestion. Unlike recurring congestion, this is measurement of risk that the shipment will be impeded by an unexpected delay.
Cost	The cost of transportation cannot produce or hinder the overall price competitiveness of the final product. Cost, along with time and reliability, provides the three major factors of the framework.
Capacity	Evaluation of the selected route/mode(s) capacity to move additional product if necessary.
Safety	The ability of a route/mode(s) to provide a level of confidence that shipped goods will be delivered in good condition.
Availability	Overall availability and accessibility of the route/mode(s). Companies must ensure that shipments are available to both the shipper and the receiver. They also must ensure that if a supply chain manager wishes to ship more goods, there would be available means to transport.

Kentucky's freight system is reliant on Kentucky's productivity and freight movements to maintain the quality of life for its residents. In 2011, researchers at ITTS identified that Kentucky both produces and consumes more freight than the national and Southeast averages (**Figure 5-3**). Overall, Kentucky is a net exporter of freight.⁴¹

⁴⁰ Rhodes, Suzann. *NCFRP Report 14: Guidebook for Understanding Urban Goods Movement, 2012, Pages 6-16.*

⁴¹ Lambert, Bruce. *Transportation Industries and Jobs, Institute for Trade and Transportation Studies, 2011, Slide 4.*

Figure 5-3: Comparison of Freight Dependency, 2011



Source: ITTS, Analysis Date: 2011

5.3 KENTUCKY FREIGHT CORRIDORS

The data driven identification of key corridors for Kentucky's freight system is needed to guide policy and investment decisions that impact the largest and most important freight users in the commonwealth. This identification was completed utilizing the KYTC Freight Generator Database and FAF.

The Freight Analysis Framework (FAF) integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. With data from the 2007 Commodity Flow Survey and additional sources, FAF version 3 (FAF3) provides estimates for tonnage, value, and domestic ton-miles by region of origin and destination, commodity type, and mode for 2007, and forecasts through 2040. Also included are state-to-state flows for these years plus 1997 and 2002, summary statistics, and flows by truck assigned to the highway network for 2007 and 2040.⁴²

5.3.1 Exports

In 2010, the commonwealth created the Kentucky Export Initiative⁴³ with the goal to increase international exports, which will ultimately lead to job growth. Since its creation, exports have grown from just over \$19 billion in 2010 to exceed \$22 billion, outpacing all previous years' exportation levels. These activities have created over 150,000 jobs. In 2013, Kentucky ranked second in the nation for export growth (11.3 percent). **Table 5-2** demonstrates the top nine international export categories for Kentucky in terms of weight and value.

⁴² Federal Highway Administration, Freight Analysis Framework, <http://faf.ornl.gov/fafweb/>

⁴³ Governor Beshear Press Release, Governor Beshear Announces Launch of Kentucky Export Initiative, December 3, 2010, <http://migration.kentucky.gov/newsroom/governor/20101203exportinitiative.htm>.

Table 5-2: Kentucky International Exports, 2007⁴⁴

	Ranked by Weight	Kilotons
1	Mining/Metals	1,628.35
2	Agriculture/Ag Products	983.33
3	Machinery	820.23
4	Petro/Chemical	739.33
5	Wood/Paper Products	392.12
6	Electronics	86.63
7	Other Manufacturing	70.76
8	Other Assoc. Freight	56.67
9	Precision Instruments	9.77

Source: FHWA FAF

	Ranked by Value (2007 Dollars)	Millions \$
1	Machinery	\$ 7,270.87
2	Electronics	\$ 2,229.27
3	Petro/Chemical	\$ 2,141.02
4	Mining/Metals	\$ 1,954.38
5	Precision Instruments	\$ 1,097.99
6	Other Manufacturing	\$ 811.89
7	Agriculture/Ag Products	\$ 763.35
8	Wood/Paper Products	\$ 450.40
9	Other Assoc. Freight	\$ 176.48

Source: FHWA FAF

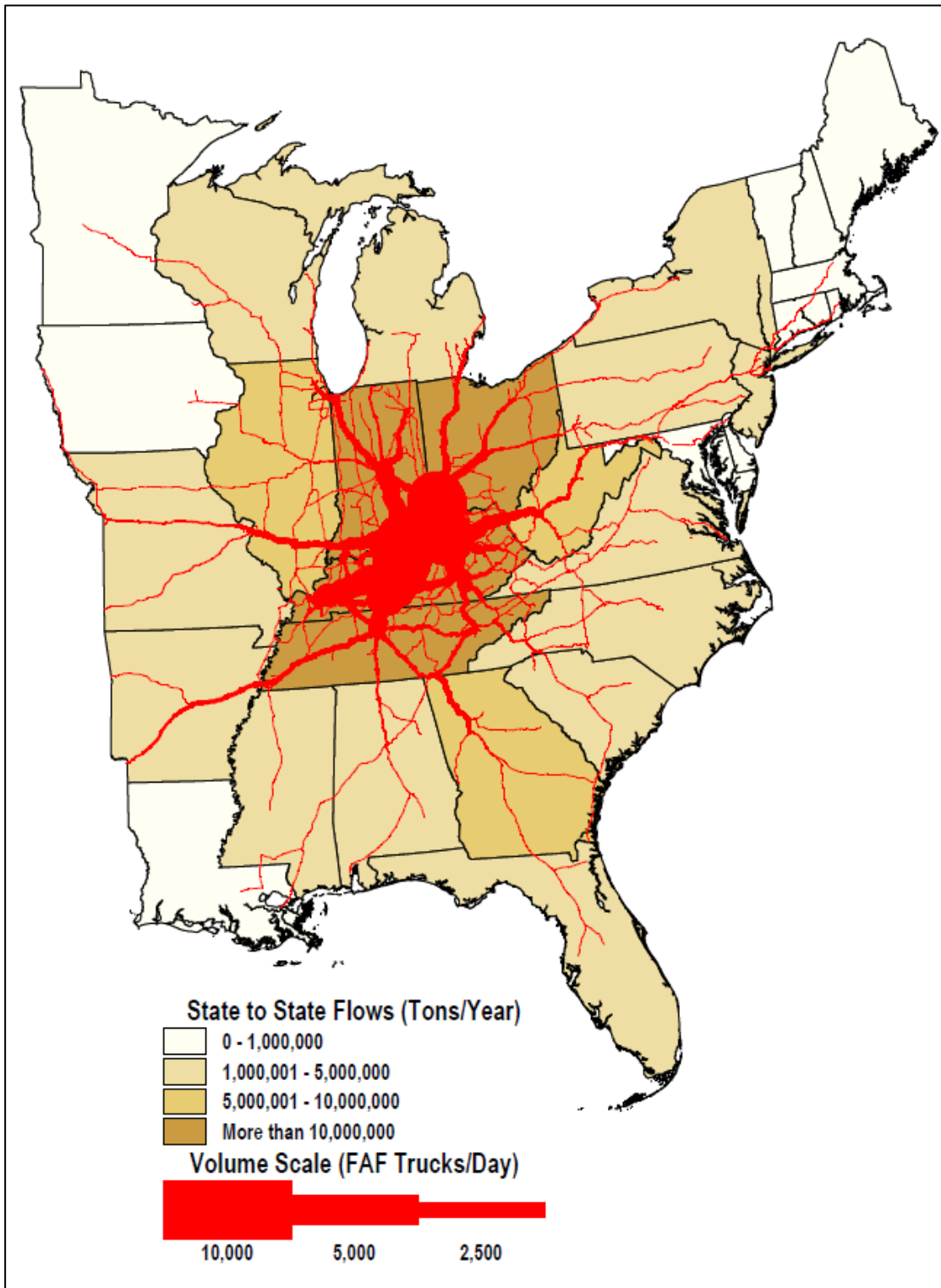
While the various exports are transported by air, truck, water, and rail, this document focuses on the exports on the highway network. These intermodal links are critical to the rapidly growing export market in Kentucky. According to the FAF network analysis and illustrated in **Figure 5-4**, I-75, I-71, I-64, and I-69 are critical highway links for Kentucky exports to Canada and Mexico.

5.3.2 National Flows

Kentucky serves as a major junction for the nation's freight network. As such, FHWA predicts significant growth through 2040. **Figures 5-4 and 5-5** demonstrate base year flows (2007) and forecasted flows in 2040. It is important to recognize the multijurisdictional nature of freight. Freight that travels in Kentucky travels throughout the eastern half of the U.S. and has key linkages to ports on the west coast. In 2040, freight volumes increase on these major corridors but also extend to reach smaller markets.

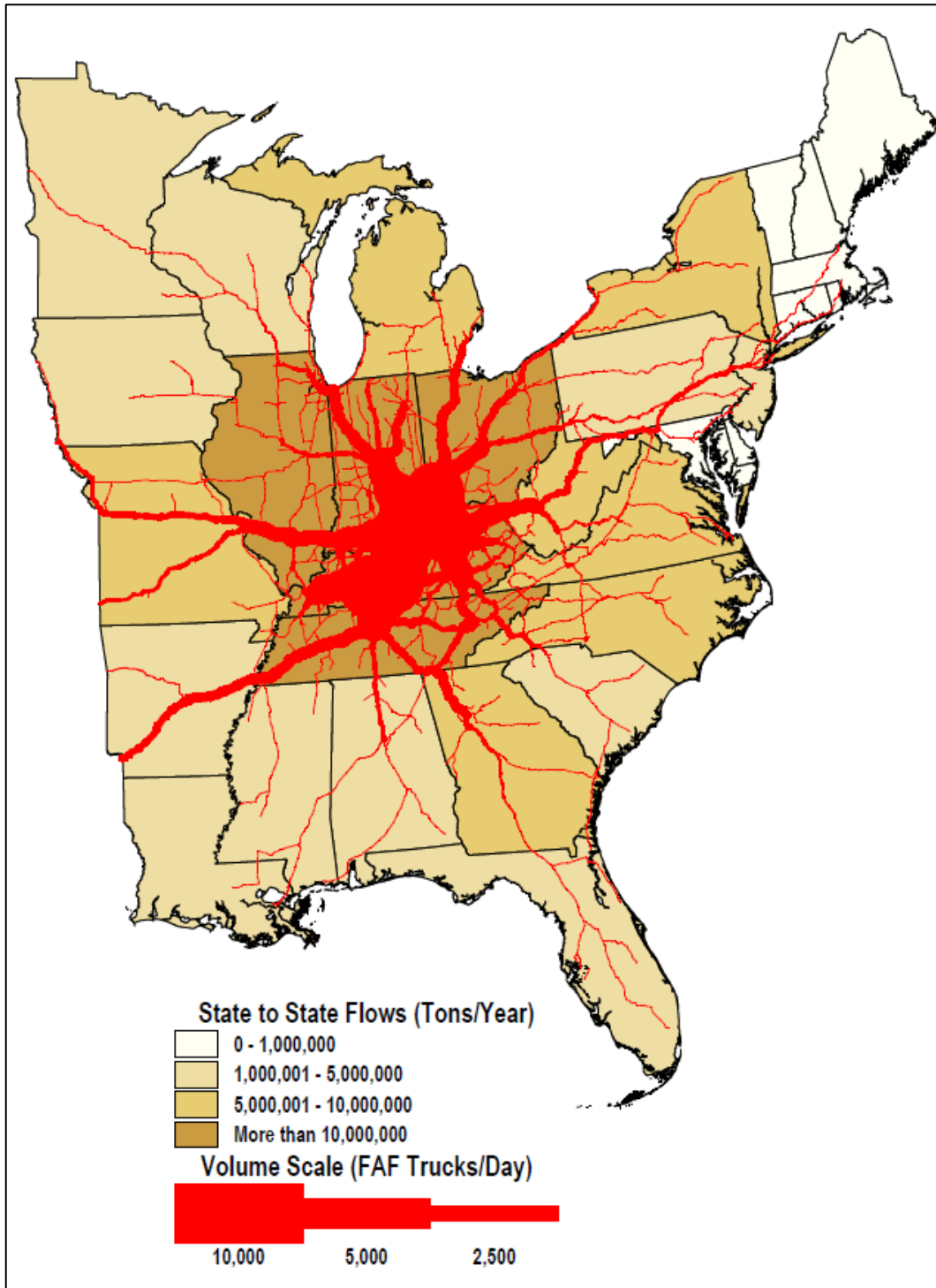
⁴⁴ Federal Highway Administration, *Freight Analysis Framework Version 3.4, 2013*, <http://faf.ornl.gov/fafweb/Extraction4.aspx>

Figure 5-4: Major Flows by Truck To, From, and Within Kentucky, 2007



Source: FHWA, Data Date: 2011

Figure 5-5: Major Flows by Truck To, From, and Within Kentucky, 2040

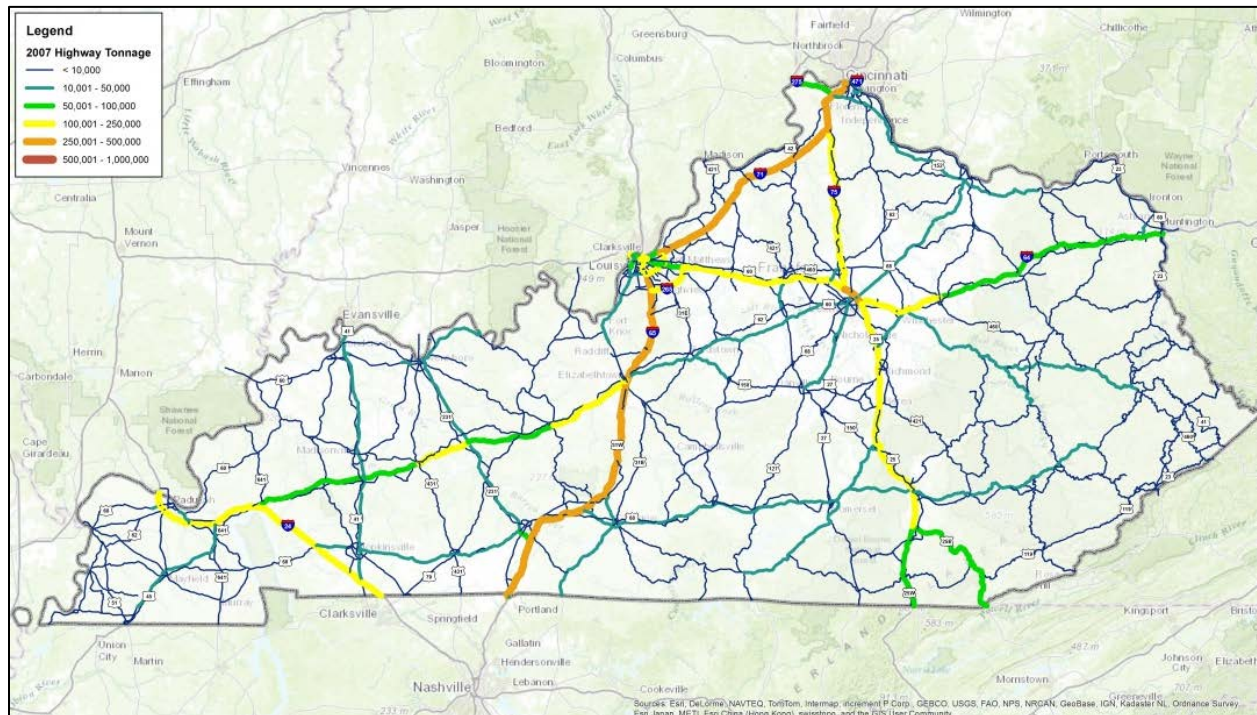


Source: FHWA, Data Date: 2011

5.3.3 Statewide Flows

While national analysis is important to understand how the bigger freight picture works, statewide analysis is particularly important to KYTC's planning process. The routes identified as critical freight corridors are within KYTC's span of control and are a known part of the planning process. **Figures 5-6 and 5-7** demonstrate the base flow year (2007) and forecasted flow in 2040.

Figure 5-6: Kentucky FAF Freight Tonnage, 2007

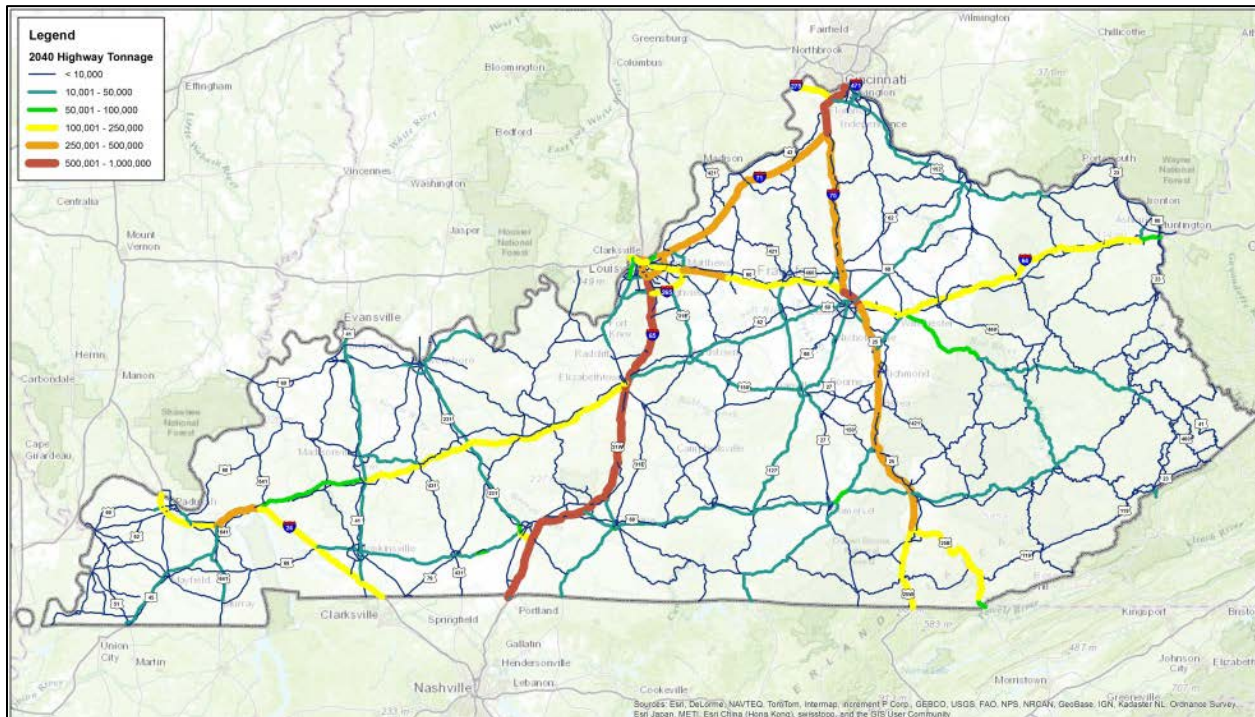


Source: FHWA, Data Date: 2013

The 2040 freight forecast uncovers significant freight challenges for many roads throughout the commonwealth. In particular, significant growth takes place on I-71/75 between the Brent Spence Bridge and the I-71/75 split (**Figure 5-7**). This corridor is particularly crucial for Kentucky's exports to Canada. Additionally, I-65 and I-64 see substantial growth. However, I-65 and I-75 see the highest tonnage on Kentucky's interstate highways. In addition, the impact of I-69 is not yet known and the full impact may be several years away, as adjacent states complete their segments of I-69.

Freight growth is not limited to the Interstate Highway System. Significant growth takes place on the NHS and some principle arterials, reflecting economic growth in rural areas of Kentucky. This is important because, to maintain the supply chain and economic growth throughout the commonwealth, freight investment in Kentucky must be balanced between heavy volume interstate highways and NHS highways that service local freight generators.

Figure 5-7: Kentucky FAF Freight Tonnage, 2040

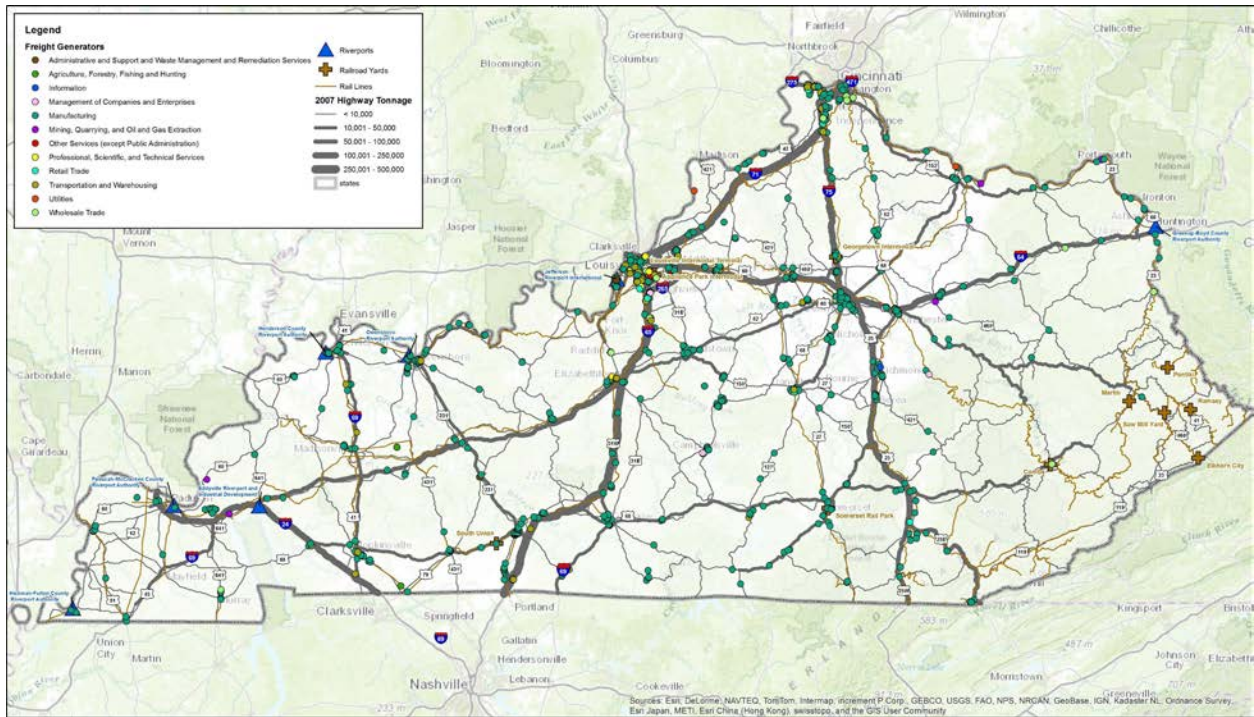


Source: FHWA, Data Date: 2013

5.3.4 Kentucky Supply Chain

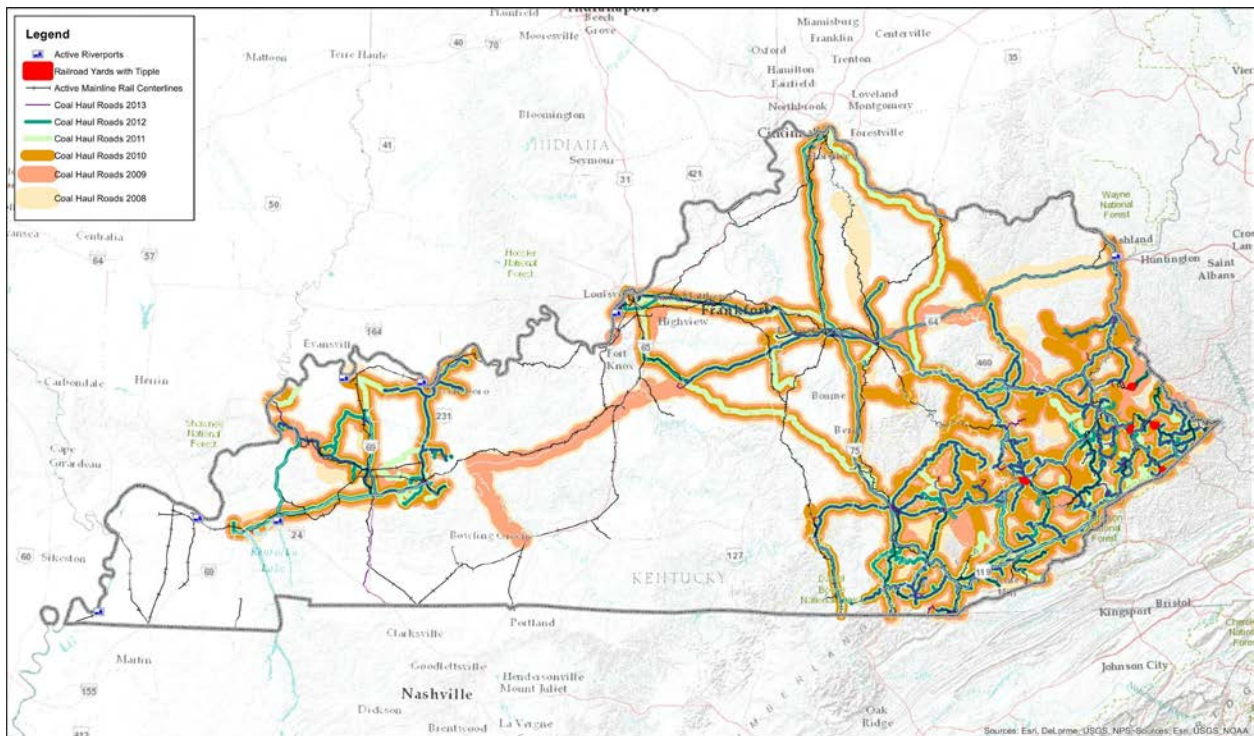
To retain and attract new economic development opportunities, one needs to understand how the supply chain and transportation system interact throughout Kentucky. Supply chains are the pathways that raw materials and production component parts move from their original sources to a production facility, warehouse, retail outlet, and the end consumer. There are significant data limitations when evaluating private companies' supply chains; simply stated, the chains are often proprietary information. However, KYTC and KTC have developed a robust freight generator database that, when used in combination with statewide FAF freight flows, can begin to give transportation planners a look into the relationship between freight generators and the highway network. This analysis is illustrated in **Figure 5-8**. Similarly, roads used for coal mining and key coal multimodal resources are in **Figure 5-9**.

Figure 5-8: Kentucky Freight Generators and Highway Tonnage



Source: FHWA Data Date: 2013, KYTC Trip Generator Data: 2014

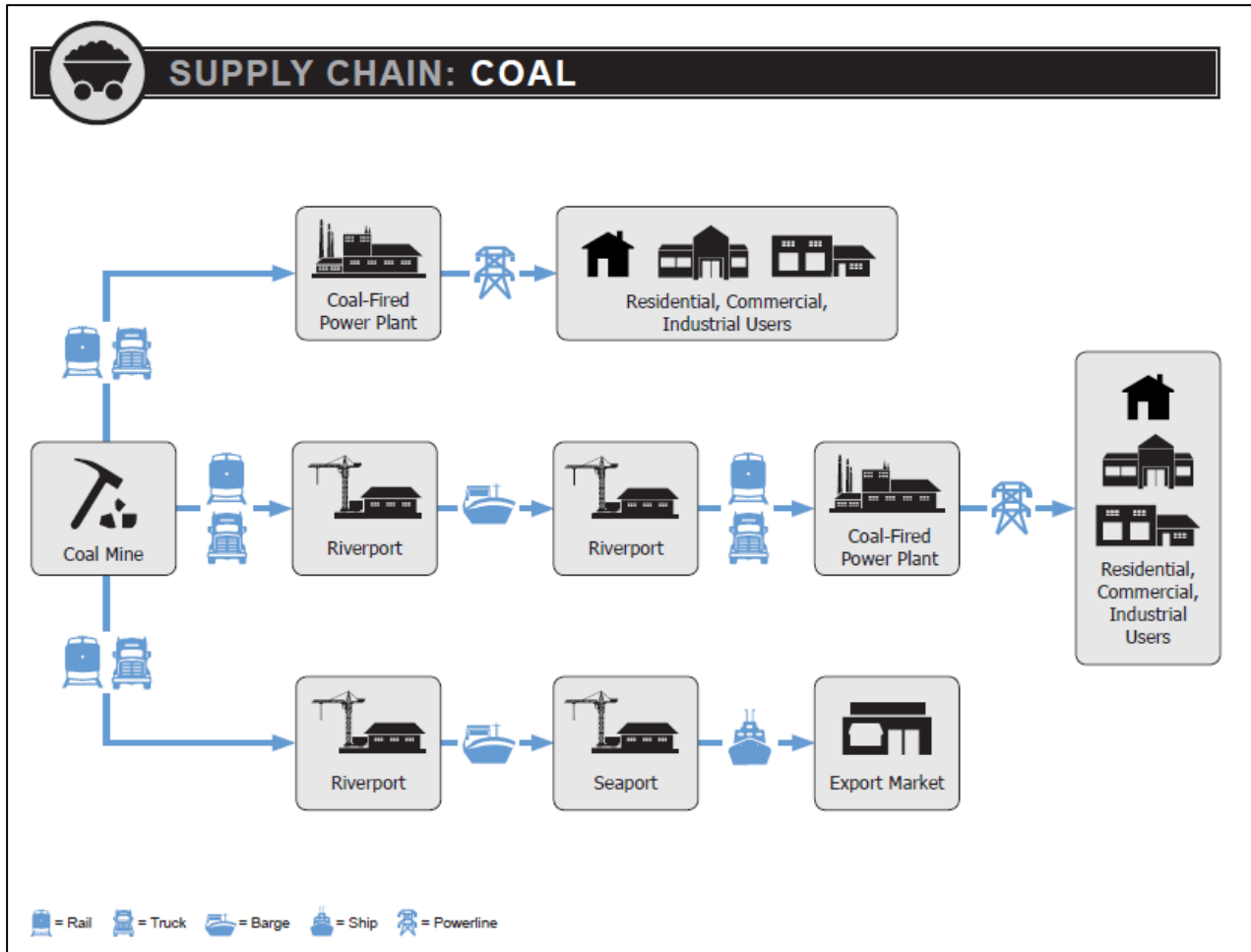
Figure 5-9: Kentucky Coal Highway Tonnage and Key Multimodal Resources



Source: KYTC, Data Date: 2014

As illustrated in **Figure 5-10**, the coal supply chain involves different modes of transportation to move this natural resource from the coal mines to coal-fired power plants and the export market. Kentucky's multimodal freight network plays a critical role in this supply chain, as shown in **Figure 5-9**. This figure depicts the various highways where coal was hauled in the state in 2014.

Figure 5-10: Kentucky Coal Industry Supply Chain



An overall understanding of the role transportation plays in supply chain decision-making will help to support KYTC's planning efforts and strategic investment in the freight system. As competition continues to grow to attract and retain business, these concepts will help Kentucky compete in the global marketplace.

5.3.5 Critical Connections and the First/Last Mile

As freight volumes grow, the ability of the multimodal freight system to be resilient and responsive to the freight community's needs will be increasingly important to Kentucky's economic future. Although KYTC is constitutionally limited on gas tax allocation and funding of modes other than roadways, it is important to maintain the important connectivity points with other modes of transportation. The connection points are where most efficiency is gained or lost during freight travel. In Kentucky, these

connection points are airports, rail, truck distribution centers, pipelines, and port facilities. The roads leading up to major connectivity points are designated NHS intermodal connectors by FHWA and KYTC. Kentucky's intermodal connectors are listed in **Table 5-3** and are updated biannually.

Intermodal connectors are often maintained by different entities and fall through the cracks in the planning and programming process. Investment in connectors is often in competition with other high-profile projects for ever decreasing transportation funding. Intermodal connectors often suffer geometric issues, pavement lifecycle, and other challenges that create inefficiencies and reliability issues for freight users.

Table 5-3: Freight NHS Intermodal Connectors⁴⁵

FACILITY	TYPE	CONNECTOR DESCRIPTION
Bells Lane Petroleum/Chemical Pipeline	Truck/Pipeline Terminal	KY 2056 from I-264 W to the Louisville-Ohio River Floodwall
Bells Lane Petroleum/Chemical Port	Port Terminal	KY 2056 - Louisville-Ohio Floodwall to I-264
Campground Rd Petroleum Pipeline	Truck/Pipeline Terminal	Campground Rd (Cane Run to Ralph), Kramers Ln (Cane Run to Campground), Ralph Ave (Cane Run to Campground Rd)
Campground Rd Petroleum Port	Port Terminal	Same as above
Cincinnati/N KY International Airport	Airport	KY 212 from I-275 S to the Airport Roadway System
Clark Elkhorn Coal Tipple	Truck/Rail Facility	KY 1441 (US 460 to Clark Elkhorn Tipple #1 Ent), KY 1789 (US 460 to KY 1441)
Golden Oak Mining CO.	Truck/Rail Facility	KY 7 (KY 15 to KY 931), KY 931 (KY 7 to Facility)
Ivel Coal Tipple	Truck/Rail Facility	County Rd 1020 - US 23 to Facility
Lexington Bluegrass Field	Airport	FS 8550 - US 60 to Facility
Louisville International Airport	Airport	Grade Ln (I-264 to UPS Feedor Truck Entrance), FS 8879 (I-264 to Facility)
Louisville/Ashland Oil/Chevron Dist. Center	Truck/Pipeline Terminal	KY 1681 - KY 4 Interchange to Facility
McCoy Elkhorn Coal Corp	Truck/Rail Facility	KY 194 - US 119 to Facility
Norfolk Southern Intermodal - Georgetown	Truck/Rail Facility	KY 620 - Facility to I-75 Interchange
Norfolk Southern Intermodal - Louisville	Truck/Rail Facility	Newburg Rd (I-264 to Bishop), Bishop Ln (Newburg to Jennings), Jennings Ln (Bishop to Facility)
Owensboro Riverport	Port Terminal	KY 331 (US 60 to Harbor Rd), Harbor Rd (KY 331 to Facility)
Praise Dock Coal Tipple	Truck/Rail Facility	KY 80 from US 460 to Facility
Truck to Barge Coal Dock Cluster, Boyd County	Port Terminal	KY 757 from US 23 near Lockwood to 2.3 Miles North

⁴⁵ Federal Highway Administration, *National Highway System: Intermodal Connectors*, June 18, 2012, http://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/kentucky.cfm

5.4 Kentucky Military Installations

The U.S. military has a significant presence in Kentucky. Military installations require efficient and reliable access to the freight transportation system for national defense purposes. The U.S. military depends on the Kentucky freight system to move cargo to not only support the installations, but also to deploy personnel and equipment for national defense. To meet this critical need, the Strategic Highway Network (STRAHNET) and the Strategic Rail Network (STRACNET) were developed by the Department of Defense (DoD) in coordination with FHWA.⁴⁶ The STRAHNET and STRACNET are networks of highways and rail lines, respectively, which provides the U.S. military access, continuity and emergency capabilities for defense purposes.

The state's military installations serve as major freight generators, consumer markets and need connectivity to the freight transportation system. At Fort Campbell, the U.S. Army has its highest concentration of rotary-winged aircraft and its fifth largest concentration of soldiers in the U.S., approximately 30,000. The 101st Airborne Division (Air Assault) is renowned for its unique warfighting capabilities and storied history. Fort Knox is home to a wide diversity of Army units, to include combat, logistics, combat-support, operations and administrative. Other key installations include the Blue Grass Army Depot and the Wendell H. Ford Regional Training Center (Kentucky National Guard). Also the Kentucky National Guard has numerous Army and Air Guard units domiciled throughout the state including the 123rd Airlift Wing based in Louisville. Diverse and complex supply chains are necessary to efficiently and reliably provide logistics support to these military sites. Enormous amounts of fuel, food, ammunition, maintenance, equipment & materials, and medical supplies are critical to maintaining these units in a combat-ready posture. Transportation infrastructure to include highways, rail, inland waterways and air are critical to supporting these supply chains and to support deployment of units.

⁴⁶ <https://www.fhwa.dot.gov/policy/2004cpr/chap18.cfm>