

# REGIONAL FREIGHT AND GOODS MOVEMENT STUDY - PHASE III

## TECHNICAL MEMORANDUM #4 - FREIGHT AND GOODS MOVEMENT STRATEGIES



*prepared for*  
**Nashville Area Metropolitan Planning Organization**

*prepared by*  
**Cambridge Systematics, Inc.**

**April 2016**



*technical memorandum*

# Regional Freight and Goods Movement Study - Phase III

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**Cambridge Systematics, Inc.**

730 Peachtree Street, NE, Suite 1000  
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*date*

**April 2016**





NASHVILLE AREA

**Metropolitan Planning Organization**

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## Memorandum

**Date:** April 21, 2016  
**To:** MPO Members  
**From:** Mary Connelly, Senior Transportation Planner  
**Re:** Regional Freight and Goods Movement Study - Technical Documentation

As part of Phase III of the **Regional Freight and Goods Movement Study**, the MPO along with consultants spoke with members of the rail industry, motor carriers, shippers, local city planning staff, local elected officials, as well as state and federal agencies about the issues they face related to freight and goods movement. A consultant team led by Cambridge Systematics, with Volkert and RPM Transportation Consultants, created a variety of technical documents that helped gain understanding of the existing and future conditions of freight and goods movement within the Middle Tennessee region and provide information and recommendations on best practices for coordinated freight and land use planning. These efforts also included the development of a set of recommended strategies, objectives, and actions for improving freight and goods movement customized to the Middle Tennessee region. Together, these consultant deliverables provide the necessary background in the creation of a regional vision for freight.

**Tech Memo #1 - Historic, Existing, and Future Conditions Report** – Uses historic, current, and future data to describe the conditions and trends related to the regional freight economy and the travel patterns and flows that associated with these trends. Includes information on economic and market conditions, freight generators, commodity flows, truck speeds, rail movements, and water and airport movement.

**Tech Memo #2 - Performance of Freight Systems Report** – Discusses the implications of future trends on freight and goods movement. Introduces a regional designated truck route network as a strategy to help address changes based on the region’s current trajectory.

**Tech Memo #3 - Land Use Planning and Urban Design Recommendations Report** – Reviews national best practices and local plans, policies, and regulations for land use and urban design to develop a set of recommendations to improve the efficiency of goods movement across and within the region while minimizing its impact on local quality of life.

**Tech Memo #4 - Freight and Goods Movement Strategies** – Describes strategies that may be used in coordination with a regional freight vision for the Nashville Area MPO, and is focused on three primary strategies: implementing a regional truck network, optimizing the location of rail operations, and coordinating economic development and land use decisions with planned investments.



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# 1.0 Introduction

Given anticipated growth and development patterns across the region, as well as the importance of freight to the regional and national economies and livelihoods of the region’s residents, it is important to plan for potential deficiencies and challenges related to our transportation network. Previous technical memorandums produced as part of this study have discussed existing and future conditions as well as the impacts that future network performance will have on the region’s supply chain and economy. Using this information, this document includes a number of strategies and objectives that the region may consider to help mitigate existing and future conditions and help freight travel through the region with greater efficiency. These strategies may be used in coordination with a regional freight vision for the Nashville Area MPO. Three primary strategies are highlighted: implementing a regional truck network, optimizing the location of rail operations, and coordinating economic development and land use decisions with planned investments. These strategies are associated with a number of objectives that are focused on identifying preferred locations for freight-intensive land areas, preferred freight transportation networks, and key connections within the region and to the rest of the United States.

Beyond this, a freight vision should be established as part of the MPO’s planning efforts that lays out a big picture view of the region’s preferred locations for major freight generators and their associated movements on the regional networks. This freight vision must be connected to the broader guiding principles of the MPO. Table 1.1 describes the MPO’s guiding principles and the relationship of freight transportation to each.

**Table 1.1 Nashville Area MPO Guiding Principles and Relationship to Freight Transportation**

Guiding Principle	Description	Relationship to Freight Transportation
<b>Livability</b>	Enhance quality of life by prioritizing initiatives that increase opportunities for housing, learning, employment, recreation, and civic involvement while maintaining affordability.	Over 20 percent of the region’s employment is in freight-dependent sectors including industrial, transportation, and retail. An efficient freight transportation system increases the competitiveness of the region’s employment base. It also ensures that finished goods are available to residents at affordable prices.
<b>Sustainability</b>	Encourage growth and prosperity without sacrificing the health, natural environment, historical and cultural assets, or financial stability of this or future generations.	It is necessary to reap the economic benefits of goods movement while also addressing potential negative impacts to communities’ air quality, safety, and overall livability.

<b>Guiding Principle</b>	<b>Description</b>	<b>Relationship to Freight Transportation</b>
<b>Prosperity</b>	Contribute to the region’s economic well-being by targeting solutions that attract talent, connect the workforce with jobs, reduce the cost of doing business, and leverage additional investment.	An efficient freight transportation system is a key component in reducing the region’s cost of doing business.
<b>Diversity</b>	Respect the multitude of backgrounds and the variety of perspectives of Middle Tennesseans by pursuing an array of strategies that are customized to local community needs and character.	Goods movement occurs in several different settings across the region. Local freight transportation networks need to be consistent with local community needs and character.

## 2.0 Highlights of Nashville Area MPO Freight System

As part of this study, the Nashville Area MPO developed a number of technical memoranda that provide information on the region’s freight system. This section summarizes the information from the previous technical work.

### 2.1 Current Freight System Infrastructure and Flows

The Nashville Area MPO freight network consists of roadways, railroads, waterways, and air cargo facilities.

#### **Road**

The designated truck route network presented in an earlier task of this study represents the preferred roadways for both regional and through truck trips. This network supports economic goals as well as freight as a good neighbor policies. The truck route network allows for connectivity to major freight generators and identifies key roadways for long haul movements. This network built upon previously identified freight intensive roadways, national networks, and local ordinances to develop both a base and expanded truck route network that serves regional freight activity centers and the large volume of through truck trips occurring within the region.

#### **Rail**

Rail plays a very significant role for both freight transportation and economic development opportunities. 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. There are also three short line railroads in the Nashville region: Nashville and Eastern extending from Nashville eastward toward Monterey, Tennessee, Nashville and Western operating between Nashville and Ashland City, and Tennessee Southern Railroad (TSRR) operating from Columbia to Pulaski, TN and from Columbia to Florence, Alabama.

There are several existing freight facilities that are not located within the preferred locations for freight-intensive activities. One strategy to consider for improving goods movement in the region is to relocate some of these existing freight-intensive facilities to the preferred locations. This may include potential relocation of CSX’s Radnor Intermodal Yard. This strategy has the potential to reduce overall truck travel, separate truck traffic from non-compatible activities, and free up existing industrial land for non-industrial purposes.

Ideal characteristics of new locations would include a suitable amount of available acreage that allows for future expansion, easy access to the designated truck route network, a customer base within close proximity, and minimal impact on residential areas. A discussion of relocation opportunities and challenges included as part of Strategy 2.

## **Water**

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. Coal is the primary inbound commodity along the Cumberland waterway. A handful of the facilities, such as the Cherokee Marine Terminal, have dockside rail services that allow for moving bulk commodities by rail. 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).

The Old Hickory Lock is the only single chamber lock in the MPO region and has not been expanded since its opening in the 1950s. The channel depth of nine to ten feet is sufficient for a standard barge that measures 195 feet long and 35 feet wide. But today, this is considered a shallow draft waterway. Larger rivers such as the Mississippi River have a minimum of 12 feet draft and can handle the largest barges including 290 feet long by 50 feet wide barges that can handle double the capacity of the earlier, standard barges. An increase in barge capacity on the waterways would increase productivity for companies that use the Cumberland River to ship goods. Allowing for larger barges to utilize the Cumberland River would also require updating and expanding the lock and dam system.

## **Air**

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. BNA is by far the largest airport in the Nashville region with regard to moving air cargo. Air cargo in the Nashville region is forecast to grow by 2.5 percent annually between 2012 and 2040 with a doubling in air cargo in the region by 2040 (see Existing Conditions and Trends report). The Metropolitan 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.

## **Routing**

Nashville's location at the junction of three major interstates, bordering states in the Midwest, Southeast, and mid-Atlantic, and being within 250 miles of two freight intensive metropolitan regions (Memphis and Atlanta) has resulted in the region's roadways carrying a significant number of through truck trips. The region experiences a significant amount of recurring commute congestion, which negatively impacts not only residents, but also costs for trucking operations, which drives up supply chain costs overall. As part of this study, the region has begun to explore opportunities to improve the efficiency of travel for both trucks as well as passenger vehicles. Strategy 1, discussed below, explores opportunities to separate truck and passenger vehicle operations to improve regional mobility and enhance safety through the implementation of a designated truck route network. Additionally, further utilizing rail and water facilities for freight travel can further improve conditions on our region's roadways.

## Land Use

The Nashville region benefits from having existing clusters of freight-intensive activity. The three types of freight-intensive facilities are manufacturing facilities, warehouses, and distribution centers. Roughly 56 percent of the land in the MPO region with an industrial land use categorization is already developed. This leaves 44 percent undeveloped. Freight in the Nashville region is forecast to increase by roughly 92 percent between 2012 and 2040. Therefore, the amount of undeveloped land is sufficient to match with projected demand for freight-related facilities. However, much of this area is located far from the interstate system and may not be preferred land by industrial facilities seeking to locate or expand their operations in the Nashville region. Additionally, many of these locations are off of the regional truck route network, and therefore may require newly designated truck route segments or new roadways to be constructed. It is important that the region begin considering coordinating land use policies with planned freight-intensive developments and siting opportunities.

Particularly noteworthy locations for consideration of future freight and industrial activity are along the I-24 corridor to the southeast and along SR 840 between I-65 eastward through Rutherford County and north to Wilson County. The I-24 corridor features freight clustering activity and a significant amount of existing truck activity. There is also a significant amount of developed and undeveloped industrial land that can be utilized. SR 840 runs through the middle of this area. SR 840 is located away from dense population centers, so it would minimize truck and industrial conflict with other types of vehicles and land uses. One complication to locating future industrial activity along SR 840 is that many locations along SR 840 do not have access to adequate water and sewer capabilities. This implies that SR 840 is a good location for transportation, warehousing and distribution types of facilities, but may not be optimal for other types of industrial land uses that actually produce goods. Maury County also has a significant amount of undeveloped industrial land adjacent to Tennessee Southern Railroad.

## 2.2 Efforts Impacting the Future Freight System

The region currently features a significant amount of clustering of freight facilities. Freight stakeholders interviewed for this study identified that the preferred locations are already amongst the most desirable for locating future industrial facilities. The completion of the southern portion of State Route 840 has also provided a significant alternative for through truck and auto trips to bypass the region, particularly during commute peak periods. Additionally, the region has had recent success in multijurisdictional cooperation and public-private partnership with the ongoing operation of passenger rail on freight rail lines; Nashville's Music City Star passenger rail service operates through several cities and multiple counties and utilizes a short line rail track for its operations.

### Coordinated Planning Efforts

There are some significant gaps in terms of achieving the strategies and objectives under consideration for freight in the region, however. These include the lack of previous coordinated efforts to conduct freight planning at the municipal level in the region, particularly

related to land use. Currently, there is a mix of roadways at the local level that are included as either truck routes or truck-prohibited roadways. No regional consensus on design standards that need to be applied to locally-designated truck routes exists. Additionally, each municipality has its own local land use regulations for industrial activity that are unique to its locality and not based on regional integration or best practices for freight facilities.

## **Funding**

Similar to many other regions, funding for freight infrastructure improvements is constrained. There are limited funds available for pursuing the more costly elements of the freight vision such as relocating freight facilities, improving additional potential bypass routes, and making improvements to freight infrastructure that would improve the sharing of freight and passenger movements. Capturing the desired freight-related improvements the region should prioritize positions the region to take advantage of as broad a set of funding opportunities as possible.

## 3.0 Middle Tennessee Freight Strategies

A number of strategies and actions have been developed and customized for the Middle Tennessee region based on earlier technical documents, outreach, and input from several sources. Inputs on existing freight conditions were taken from the Existing Conditions and Trends report. Inputs on the efficiency of goods movement in the Nashville Area MPO were taken from the Performance of Freight Systems report. Information on the relationship between freight, land use, and design of roadways was extracted from the Land Use Planning and Urban Design Recommendations report. Additionally, there was extensive outreach to regional stakeholders, including the Nashville Area MPO Freight Advisory Committee, city and county planners and economic development professionals, the trucking industry, and MPO staff and members. Through this process, in conjunction with an examination of the broader transportation goals for the MPO region, three strategies have been identified to help improve the efficiency of freight and goods movement, and protect freight-related industries as a valuable tool for economic growth and prosperity:

- 1. Implement a regional truck network.**
- 2. Optimize the location of rail operations.**
- 3. Coordinate economic development and land use decisions with planned investments.**

Each strategy contains a number of objectives and associated actions that can help guide the region toward achieving an established freight vision. Table 3.1 shows specific strategies, objectives, timeframes, costs, challenges, and solutions associated with each strategy. The remainder of this section describes each of the strategies and discusses various objectives and actions associated with each.

**Table 3.1 Strategies for Achieving Nashville Region Freight Vision**

Strategy	Objectives	Actions	Timeframe	Costs (\$ millions)	Drawback/Challenge	Offset/Solutions to Challenges
<b>Implement a Regional Truck Route Network</b>	Provide incentives for freight and logistics companies to do business in Middle Tennessee	Policy: Formally designate regional truck network	Short	0.025	State and local government buy-in and implementation; community concerns over increased truck traffic on the designated routes	Time of day/ scheduling to minimize impact; noise ordinances; landscape buffers
		Policy: Adopt truck network design standards	Short	0.1	State and local government buy-in; Coordinated timing of implementation; Enforcement/ follow-through	Education campaign with local municipalities
	Improve the safety and efficiency of local freight operations	Policy: Adopt performance measures and targets	Short	0.025	Data availability/ freshness; Assigning responsibility for monitoring	Maximize consistency between measures and available data; Funding for data collection; MOUs; Incorporation into existing planning process
		Project: Upgrade existing routes to design standards	Mid to Long	170	Cost/ disruption of construction; some ROW acquisition; community concerns over changing character; multi-modal safety; environmental impacts	Leverage all existing funding sources, including TIGER grants and funding from new national legislation; Include customized mitigation in each design element
	Minimize impact of heavy truck movements on local communities	Project: Expand network to meet future demand	Mid to Long	750	Cost/ disruption of construction; lots of ROW acquisition; community concerns over changing character; multi-modal safety; environmental impacts	Leverage all existing funding sources, including TIGER grants and funding from new national legislation; Include customized mitigation in each design element
		Policy: Regulate/Incent. use of designated network	Short to Mid	TBD	State/local legislative buy-in for regulations/ordinances; Signage/wayfinding; Costs of incentives	Education/outreach partnership with trucking industry
Shepherd pass-thru truck travel through the region	Policy: Restrict the use of key commuter routes by trucks	Short to Mid	TBD	Enforcement; Extra mileage (costs) or rescheduling for some operators; Increased truck traffic on alternate routes; impact to trucks stops along restricted routes	Fully estimate benefits of separating truck and auto traffic	
<b>Optimize the Location of Rail Operations</b>	Better access to existing and potential customers within region	Policy: Establish long-term vision for freight rail alignments	Short	100	CSX agreement	Identify win-win opportunities where the region can assist with CSX meeting its regional operational goals
		Policy: Identify desired rail transit movements/station areas	Short	300	CSX buy-in; TN legislature/TDOT buy-in; Local community buy-in	Conduct comprehensive rail transit corridor study that includes all stakeholders and specific transit service
	Improve safety and speed/efficiency of rail movements	Project: Upgrade existing short-line rail lines Class I standards	Mid to Long	TBD	Costs; disruption to existing services	Conduct benefit-cost analysis to identify specific track with most return on investment from improving infrastructure
		Project: Improve or upgrade at-grade rail crossings	Short to Long	TBD	Costs; CSX agreement	Incorporate projects into long range planning funding considerations
	Help manage heavy truck movements throughout region	Project: Expand capacity of existing rail lines	Mid to Long	\$8 million/mile + Right-of-Way	Costs; environmental impacts	Identify win-win opportunities where government assistance with CSX can assist with meeting the region's rail goals
	Minimize conflicts with existing neighborhoods and emerging mixed-use development	Project: Realign existing rail lines	Mid to Long	\$8 million/mile + Right-Of-Way	CSX agreement, Cost, funding eligibility; NIMBY-community concerns; environmental impacts	Identify win-win opportunities where government assistance with CSX can assist with meeting the region's rail goals
	Provide increased opportunity for use of existing rail lines/ROW for public transit and TOD	Project: Relocate Radnor Yard	Mid to Long	200 to 600	CSX agreement; cost; funding eligibility; land availability; NIMBY-community concerns; could be further away from existing customers; environmental mitigation; employee access; increased truck traffic in new location; environmental impacts	Identify specific development path for current Radnor Yard location and fully describe non-freight benefits to the region for relocation
Project: Implementation of transit service on rail lines		Mid to Long	TBD	CSX agreement; rail acquisition/lease costs; ongoing cost of operations; scheduling of operations; safety/security	Consider low volume rail lines for initial transit service	
<b>Coordinate Economic Development and Land Use Decisions with Planned Investments</b>	Enhance Middle Tennessee's attractiveness as a freight/logistics hub	Policy: Establish criteria for siting industrial/logistics companies	Short	TBD	Achieving consensus between local municipalities that make land use decisions; state and local economic development agencies that focus on attracting and retaining businesses to Middle Tennessee; and property owners that have expectations about how they will utilize their property and the monetary return that they will receive from their property	Education campaign with local municipalities on the benefits of coordinating land use decisions with infrastructure investments  Ongoing dialogue with economic development agencies to understand real-time industry needs  Consideration of compensation to property owners who are negatively impacted through zoning changes
		Policy: Designate regional freight/logistics industrial zones	Short	TBD		
	Identify infrastructure-ready sites for industrial recruitment or expansion	Policy: Update local land use policies and zoning ordinances	Short to Mid	0.2		
		Policy: Implement restrictions for the location of freight-intensive land uses	Mid	TBD		
	Maximize locational efficiencies of industry clustering	Policy: Identify economic incentives for company recruitment and siting	Short to Mid	TBD		
Protect freight-intensive areas from incompatible land development/uses	Project: Augment/extend freight infrastructure to optimal zones	Mid to Long	TBD			

## Strategy 1 – Implement a Regional Truck Route Network

A key strategy for the Nashville Area MPO is the development of a regional truck route network that will serve several purposes, including:

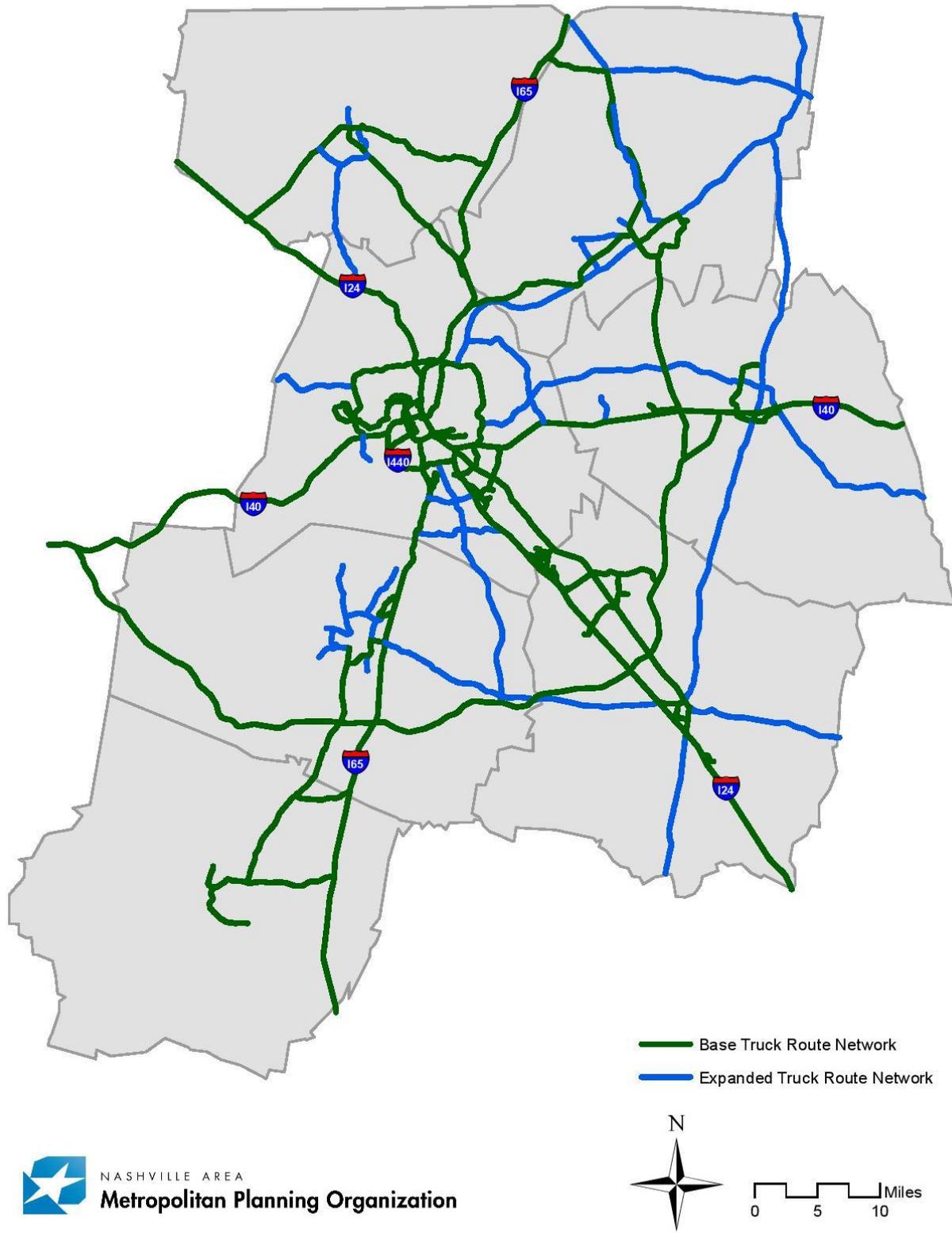
- Ensure connectivity to intermodal rail, air cargo, and waterway facilities throughout the Nashville region;
- Protect local delivery access for trucks, particularly in areas of rapid urbanization and infill-redevelopment;
- Demonstrate the region’s commitment to the economic development of freight-dependent sectors to assist in business attraction and retention;
- Enhance the separation of truck activity from incompatible activities by designating a set of roads that are targeted to attract truck activity and thereby 1) reduce trucks on other roads, 2) encourage passenger car drivers to use other roads, and 3) provide information to developers about the types of activities that are best suited for land uses adjacent to different roadways.

There are two components to the regional truck route network. The first component is the base truck route network which provides connectivity to the major freight generators in the region. The base truck route network also includes key roadways for long haul movements. This includes long-haul movements with a trip end in the Nashville region and truck trips passing through the region.

Previous planning efforts that developed truck route networks at the state and municipal levels in Tennessee identified many roadways that overlap with the base truck route network. However, there are a few roadways which are included in these previous efforts that are not included in the base truck route network. An expanded regional truck route network was developed to identify roadways that are included in state and municipal efforts, but not included in the base network. Some roads were added to the expanded network to provide redundancy in case of severe corridor congestion on parallel roadways.

The base and expanded networks are shown in Figure 3.1. Detailed information on the development of the truck route network and its relationship to other features in the region is provided in the Performance of Freight Systems report for this study.

**Figure 3.1 Nashville Regional Truck Route Network**



Source: Nashville Area MPO.

## *Objective 1 – Provide incentives for freight and logistics companies to do business in Middle Tennessee*

### **Policy: Formally designate truck route network**

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 Area MPO region were directly related to the four key freight-dependent sectors: manufacturing, construction, wholesale trade, and retail trade. There are approximately 36,000 additional jobs in transportation and warehousing as well. The Nashville region’s population is forecast to grow from 1.6 million residents in 2014 to over 2.6 million in 2040. This increased population will in turn increase demand for goods movement. Freight flows in, out, and around the Nashville region are forecast to grow from 77 million to 149 million tons between 2012 and 2040, a 92 percent increase.<sup>1</sup> Accommodating the future volume of freight traffic will require additional capacity to the region’s freight infrastructure.

The Nashville region is also well-positioned to capture outsized employment and economic opportunities in freight-related sectors. The location of Nashville between the Midwest and the Deep South provides an opportunity for the region to increasingly serve as a distribution hub for goods that are distributed throughout the southeast. Additionally, there is an opportunity to attract additional manufacturing companies to the region building off of recent expansions of Nashville’s automobile manufacturing facilities and reshoring of manufacturing from overseas locations back to the U.S. Both of these development opportunities will benefit from having a formally designated truck route network in the region and design standards for the truck route network that are conducive for truck movements.

### **Policy: Adopt truck network design standards**

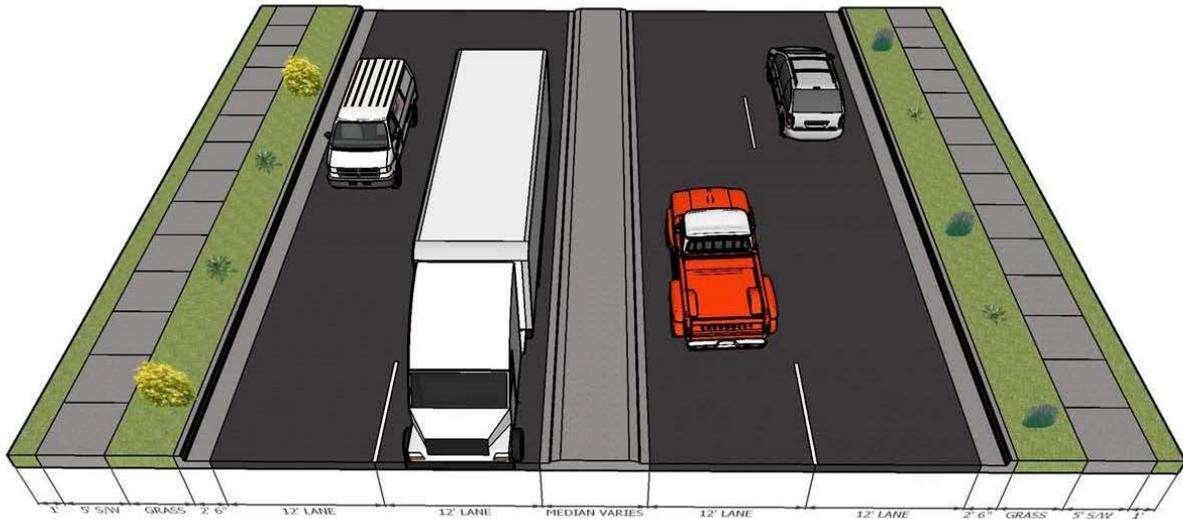
The long-term goal for the regional truck route network is for it to meet standards in terms of roadway design, pavement section, and operational characteristics. Figure 3.2 shows the ideal typical section for urban arterials on the truck route network in urban areas. Figure 3.3 shows the ideal turning radius characteristics for intersections that involve two roadways on the truck route network. Additional details on the design elements of the truck route network are described in more detail in the Performance of Freight Systems report.

These two policies can be adopted at a cost of less than \$100,000 and can be done in the short-term (one to three years). It will require local government participation for designation and implementation and there may be some community concerns regarding increased truck traffic on designated routes. Local support can be improved by incorporating design features such as buffers, noise ordinances, and time of day considerations into the truck operations on the network.

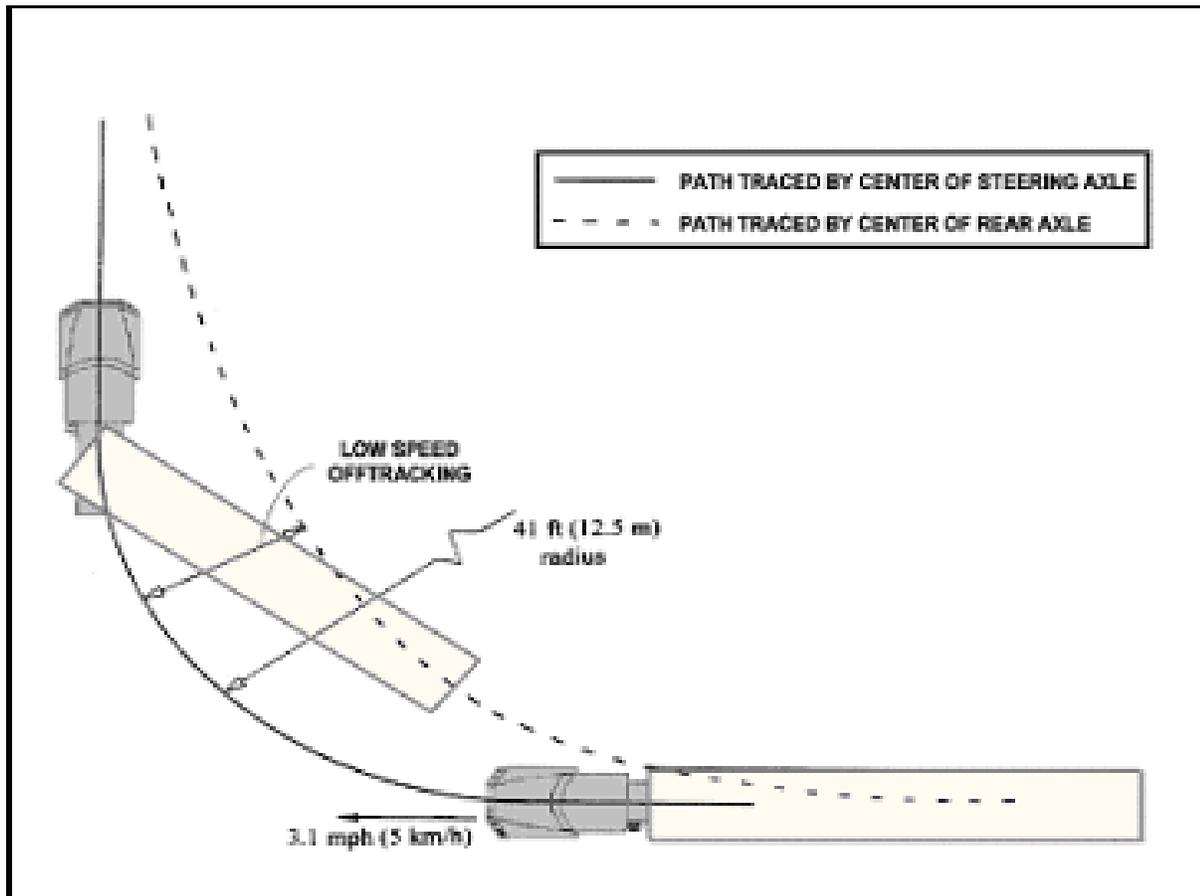
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<sup>1</sup> IHS/Global Insight TRANSEARCH Data, purchased by Tennessee Department of Transportation, 2014.

**Figure 3.2 Urban Area Arterial Typical Section for a Roadway on an Identified or Designated Truck Route**



**Figure 3.3 Large Truck Turning Radii Example**



*Objective 2 – Improve the safety and efficiency of local freight operations*

**Policy: Adopt performance measures and targets**

The progress that the region makes towards implementing a regional truck network can be monitored and tracked using a number of performance measures. Performance measures related to the implementation of the truck route network are provided below.

**Table 3.2 Performance Targets for Measuring Efficiency of Truck Route Network**

Strategy	Performance Measure
Implement a regional truck route network	<ul style="list-style-type: none"> <li>• Percent of truck route network mileage that is adopted by local municipalities</li> <li>• Estimated truck VMT on truck route network</li> <li>• Percent of regional truck VMT on truck route network</li> <li>• Truck VMT percentage on major arterial roads not designated as part of the regional truck route network</li> <li>• Percent of total truck VMT on congested roads</li> <li>• Percent of truck route network mileage operating below V/C ratio of 1.0 during commute periods</li> </ul>

**Project: Upgrade existing routes to design standards**

The steps for upgrading the regional truck route network have two primary thrusts:

1. Identify major deficiencies in the designated truck route network that are most detrimental to its operations. Develop infrastructure improvement projects to address these specific needs.
2. Educate municipal, MPO, and state transportation planners about the designated truck route and associated standards, so that as maintenance or improvement projects are conducted along its roadways, designs are developed that incorporate the upgrades needed to fully bring the roadways up to the standards.

The following two major infrastructure recommendations for the truck route network in the near-term that are targeted towards safety are:

- Add a median barrier on Nolensville Pike in Davidson County; and
- Intersection improvements at Nissan Drive and Enon Springs Road.

A preliminary estimate to make these improvements is \$40 million based on cost estimates from similar improvements made in the Nashville region, the Tennessee DOT standard drawing for a typical section, and the American Road & Transportation Builders Association.

The non-interstate, non-SR 840 portion of the expanded truck route network is roughly 300 miles in length. Based on a driving tour of the network combined with observations from online mapping tools, the following concerns must be addressed to bring the truck route network up to the design standards:

- 25% to 33% of truck route network mileage with lane widths that are less than what is recommended;
- 5% to 10% of truck route network mileage requiring median barriers;
- 10% to 25% of truck route network mileage requiring buffers between sidewalks and parks; and
- 30 to 50 locations requiring additional signage to notify students about truck lanes.

The estimated cost to make all of these improvements and bring the truck route network up to design standards would be between \$110 million to \$170 million. This is exclusive of locations that would need right-of-way acquisition for intersection improvements or turning radii purposes.

### *Objective 3 – Minimize impact of heavy truck movements on local communities*

#### **Project: Expand network to meet future demand**

The Nashville region features a significant amount of recurring commute congestion. With truck traffic forecast to grow by 92 percent between 2012 and 2040, truck-related congestion will increase significantly over the long-term. While design and safety-related improvements will help to alleviate some of this added congestion and travel time, strategic expansions to the designated truck route network will be necessary in an effort to meet future demand. Further study into locations along the network in greatest need of expansion should be conducted and should be informed by current travel and congestion patterns as well as planned freight-related and manufacturing development that supports an overall regional freight vision.

#### **Policy: Regulate and incentivize use of designated network**

The long-term goal for the regional truck route network is also for it to have sufficient capacity to handle projected truck and auto traffic. This will provide additional incentive for trucks to use the truck route network as opposed to alternative roadways. The following two major infrastructure recommendations for the truck route network in the near-term that are targeted towards expanding the network to meet future demand are:

- Add two lanes to Jefferson Pike between Sam Ridley Parkway and SR 840 making it four lanes and adding a median barrier;

- Add two lanes to SR 109 between U.S. 70 and Gallatin (ultimately extending to I-65).

A preliminary estimate to make these improvements is \$58 million based on cost estimates from similar improvements made in the Nashville region, the Tennessee DOT standard drawing for a typical section, and the American Road & Transportation Builders Association.

Use of the truck route network will also be increased if there is sufficient enforcement of truck route restrictions throughout the region. This enforcement relies upon local communities monitoring and citing truck drivers that use restricted routes.

#### *Objective 4 – Shepherd pass-thru truck travel through the region*

##### **Policy: Restrict the use of key commuter routes by trucks**

The Nashville region carries a significant amount of truck traffic as a result of its large population, large manufacturing base, and its location in the mid-South. Additionally, the region experiences a significant amount of recurring congestion that negatively impacts both passenger vehicles and trucking operations. One method of improving vehicular flow in a region is to implement policies that separate truck and auto traffic. Exploring opportunities to build on the designated truck route network should include considerations of separating truck and passenger vehicles in an effort to improve congestion, regional mobility, and safety for all roadway users.

An example of an area where this might be most effective is the Inner Loop in downtown Nashville. Restricting trucks from using the Inner Loop has the following benefits:

- Increase capacity for auto movements, particularly during peak commute periods; and
- Improve safety by minimizing dissimilar vehicles on a roadway.

Potential negative impacts of this restriction include trucks taking longer alternative routes and the reduction of freight-related businesses in the region altogether through increasing costs and reduced regional competitiveness.

The traffic impacts of a truck restriction on the Inner Loop may include increased truck volumes on alternative routes such as Briley Parkway and I-440. Even a restriction that was limited to peak commute periods would require extensive re-routing and additional VMT during peak periods or re-timing of truck trips which is likely to incur additional costs in logistics supply chain. These alternative routes may need significant additional capacity to be able to handle truck traffic.

Based on preliminary estimates, this type of restriction has the potential to increase A.M. peak period average travel speeds on the Inner Loop from 37 mph to 39 mph and decrease truck VMT on the inner loop from 193,150 to 120,336, a decline of over 33 percent (Table 3.3).

Another potential benefit of restricting truck traffic from using the Inner Loop is that it may allow for narrower lanes, thereby allowing for a new lane to be added to the Inner Loop. This

new lane could be a managed lane that included high occupancy toll capabilities, express bus service, or other features favorable to commute traffic.

**Table 3.3 Traffic Impacts of Inner Loop Truck Restrictions**

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<b>Impact Category</b>	<b>Current Use</b>	<b>Use With Inner Loop Restrictions</b>
Inner Loop Truck VMT	193,150	120,336
Inner Loop AM Average Speed (mph)	37	39
Inner Loop Mileage below 70% of Free Flow Speed	14.2	13.3

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## Strategy 2 – Optimize the Location of Rail Operations

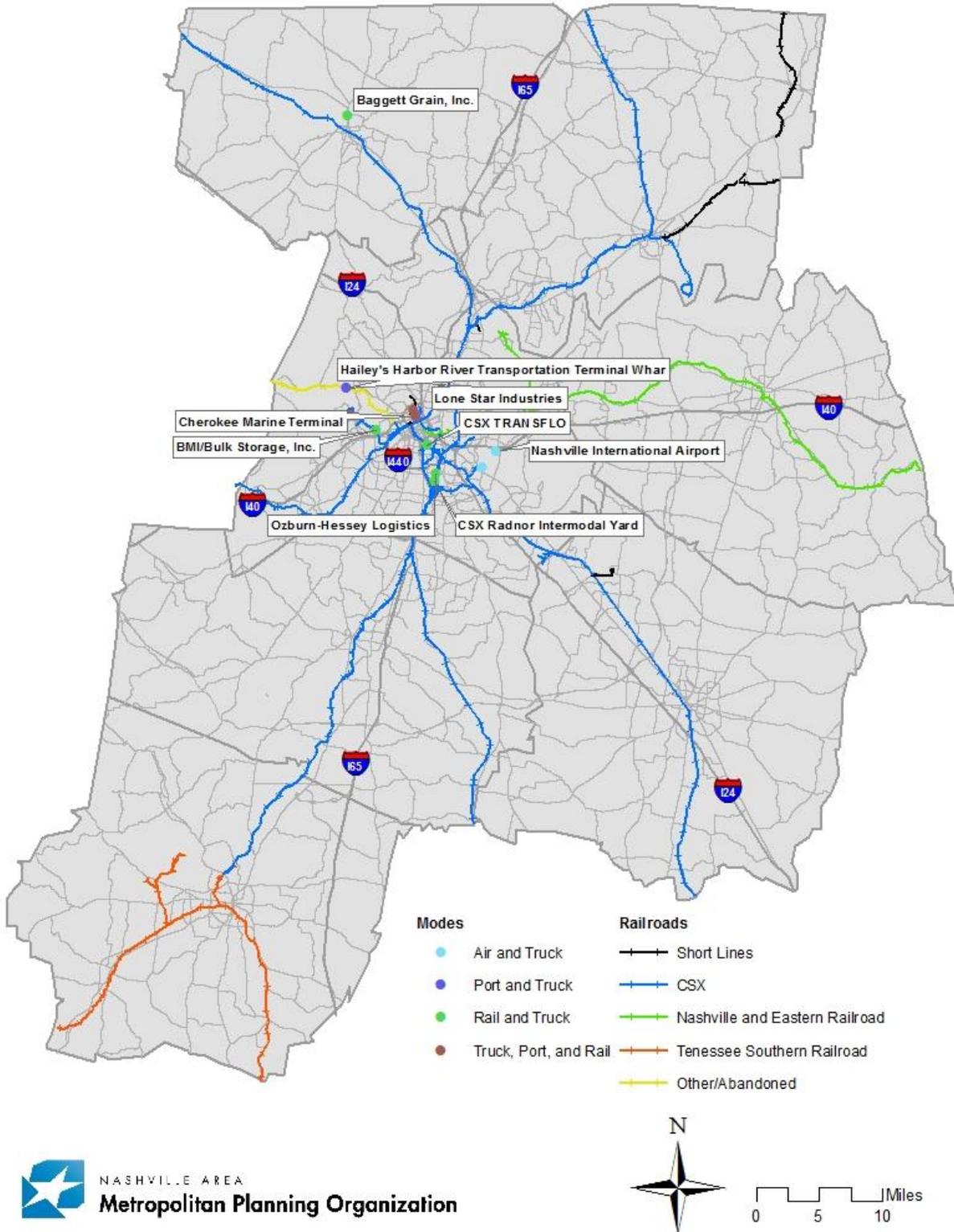
There is extensive freight rail infrastructure in the Nashville region. The network through Nashville is primarily north-south and connects Nashville with cities in the Midwest, cities in the southeast, and Memphis. Within the Nashville region, the freight rail infrastructure consists of CSX Class I track which primarily runs north-south. There are also three 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. Tennessee Southern Railroad (TSRR) operates from Columbia to Pulaski, Tennessee and from Columbia, Tennessee to Florence, Alabama. 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. There are also several smaller yards scattered throughout the region as shown in Figure 3.4.

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. CSX operates about 70 trains per day in, out, and through the region with an estimated 58 of those trains passing through the Nashville 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. The other Class I railroad in the eastern half of the U.S., Norfolk Southern, does not serve Nashville directly. It does operate an east-west rail line through Tennessee that parallels I-40 and connects Knoxville, Chattanooga, Huntsville (Alabama), and Memphis. This corridor is in the process of undergoing significant improvements as part of the Norfolk Southern Crescent Corridor program.

Nashville’s freight rail infrastructure is a critical component of the economic vibrancy of freight-related businesses in the region. The rail infrastructure also serves to carry goods that would otherwise travel by truck causing further strain and congestion on the region’s road network. Improvements to the region’s rail network will help the region’s competitiveness in terms of attracting and retaining freight-related businesses. It will also help existing businesses to reach more customers, receive supplies more cost-effectively, thereby increasing opportunities to expand existing operations located in Nashville.

Rail operations do have community impacts as well. The rail infrastructure in the Nashville region is very dense in the downtown portion of the region. This means that the rail infrastructure is located on relatively high value land. It also results in a significant number of at-grade rail-highway intersections that have negative congestion, safety, and efficiency impacts on rail movements, truck movements, and for the general public. Given all of these conditions, outlining objectives as well as potential policies and projects that help optimize the location of rail operations in the region will assist in ensuring not only the efficiency of rail operations into the future, but also the incorporation of rail operations with broader regional needs and goals.

**Figure 3.4 Freight Rail Infrastructure in Nashville**



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

Performance measures that may be useful in monitoring and tracking progress of this strategy are listed in Table 3.4, below.

**Table 3.4 Performance Targets for Measuring Freight**

Strategy	Performance Measure
Optimize the Location of Rail Operations	<ul style="list-style-type: none"> <li>• Total rail tonnage moved in Nashville region</li> <li>• Truck-rail modal split for freight in and through the Nashville region</li> <li>• Number of trucks and autos using the top ten at-grade rail crossings</li> <li>• Number of passenger rail line feasibility studies completed</li> <li>• Number of agreements on passenger rail services with host railroads</li> </ul>

*Objective 1 – Better access to existing and potential customers within region*

**Policy: Establish long-term vision for freight rail alignments**

Creating better access to existing and potential customers within the region would result in increased trade opportunities for Nashville’s businesses. Developing a long-term vision for freight rail alignments involves aggregating the needs of local freight-related businesses within the region and connecting their shipment needs to the existing and planned rail infrastructure along with the desired locations for rail terminals and movements in the Nashville region. While current alignments have played a significant role in the development and present day clustering of these businesses, there are a number of potential conflicts between freight rail facilities and community growth patterns that will become of greater significance as the region continues to grow. Taking into account the growth and development patterns of the region as well as connections to trading partners outside of the region are important factors in any long-term freight rail planning effort. Over 500,000 tons of goods were shipped by rail to the Savannah and Charleston regions, primarily to connect with overseas markets. Rail is also used to connect Nashville to the rest of the U.S. with nearly 200,000 rail tons between Nashville and Chicago, and another near 200,000 tons between Nashville and Florida. Prioritizing key freight rail alignments and exploring opportunities to provide freight-related facilities access to rail that they don’t currently have access to will provide increased mobility and trade opportunities for Nashville region business.

**Policy: Identify desired rail transit movements/station areas**

Comprehensive rail transit corridor studies are needed in order to fully address desired rail transit movements and station areas for the Nashville region. Currently, RTA operates one commuter rail line, the Music City Star, between Nashville and Lebanon. Additionally, the MPO’s transit vision calls for the development of commuter rail connecting Nashville and

Clarksville. RTA is currently conducting the Northwest Corridor Transit Study to help identify a preferred alternative for transit service connecting these two cities, which is likely to include commuter rail along the corridor. Similar efforts throughout the region will help to identify preferred modes and ideal station areas for rail transit into the future. Extensive discussion with CSX as well as short line railroads in the region is needed to foster agreement and consensus as to the path the region must take to most effectively serve both freight and passenger service with rail. This may include use of existing infrastructure, creating an additional track in existing right of way, additional sidings, safety agreements, and liability agreements, for starters.

### *Objective 2 – Improve safety and speed/efficiency of rail movements*

#### **Project: Upgrade existing short line rail track to Class I standards**

The Nashville region features three short line railroads – the Nashville & Eastern Railroad, the Nashville & Western Railroad, and the Tennessee Southern Railroad. Much of the existing track for these railroads suffers from deferred maintenance. Additionally, the mainline rail system has advanced from the use of 263,000 lb. railcars to 286,000 lb. railcars to improve efficiency. Much of the Nashville short line track is unable or underequipped to efficiently and safely handle these car sizes at sufficient operating speeds. Upgrading Nashville’s existing short line track will enable the short line railroads to experience benefits in terms of reduced capital costs from fewer locomotive and car requirements, reduced fuel costs, and reduced crew costs.

#### **Project: Improve or upgrade at-grade rail crossings**

Tables 3.5 and 3.6 show the region’s top, at-grade rail crossing locations in terms of the number of trains and the number of total vehicles. These combined 20 locations are the most problematic in the region in terms of efficiencies in rail, truck, and auto movement. They are also problematic in terms of safety of vehicles and passengers. Upgrades to these crossings would improve the safety and efficiency of transportation in the Nashville region. Upgrades may include removing level crossings by creating underpasses or overpasses as well as signal and signage upgrades.

**Table 3.5 Top 10 At-Grade Rail Crossings by Total Trains, 2013**

Rank	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.

**Table 3.6 Top 10 At-Grade Facilities by Total AADT, 2013**

Rank	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.

### *Objective 3 – Help manage heavy truck movements throughout region*

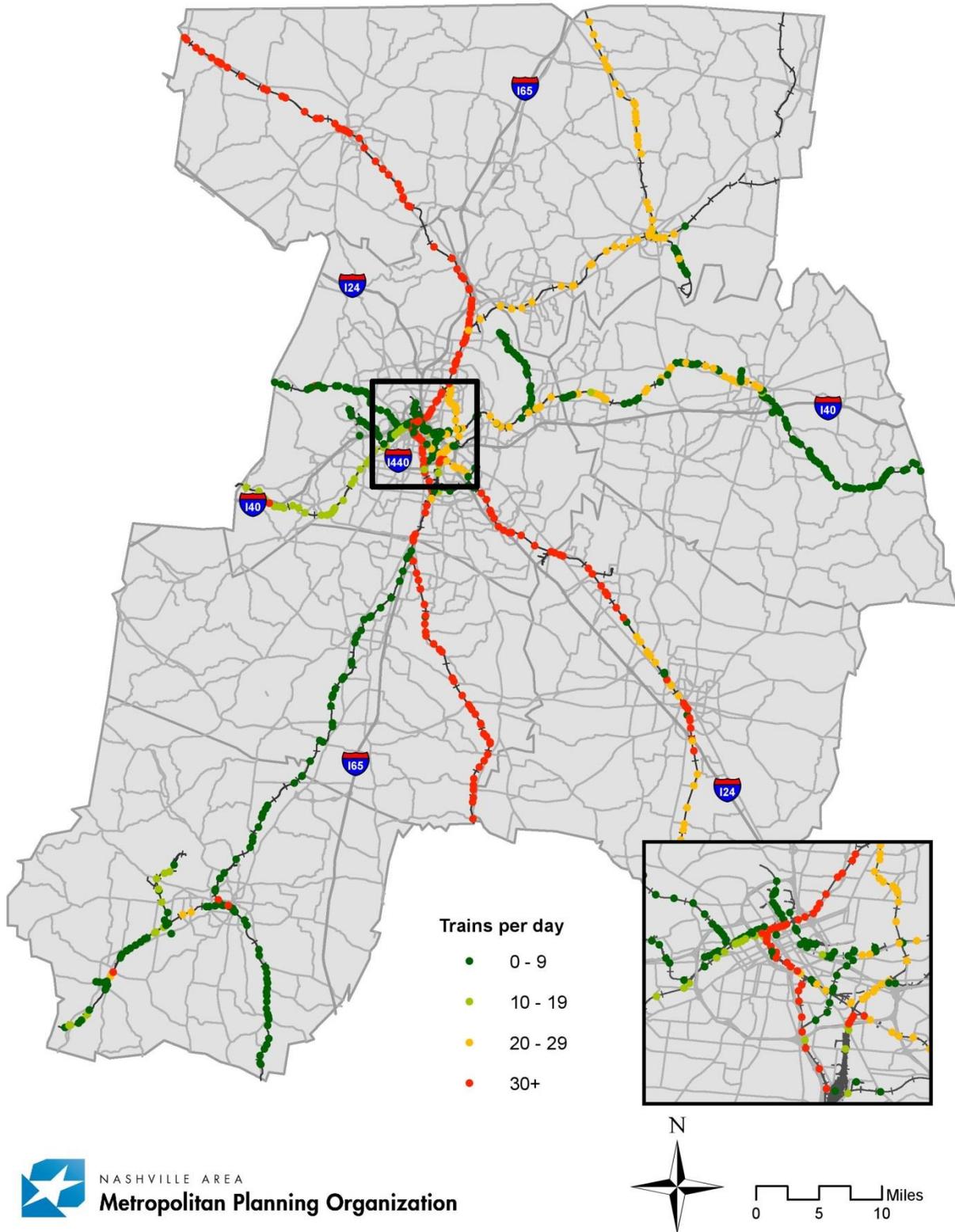
#### **Project: Expand capacity of existing rail lines**

Freight that cannot make use of rail infrastructure often travels by truck instead. Therefore, an efficient freight rail system in the Nashville region also assists in managing heavy truck movements. This is of particular importance to the Nashville region, because of the large amount of through freight movements that the region experiences.

Some of the east-west through traffic in Tennessee that would use I-40 through Nashville is diverted to freight rail using the Norfolk Southern Crescent Corridor that runs between Knoxville, Chattanooga and Memphis. Therefore, as the Crescent Corridor continues to be built out, the Nashville region will benefit from reductions in truck traffic on I-40. Some of the through freight traffic in the region is absorbed by the CSX mainline that runs through Nashville, particularly the north-south tracks.

Figure 3.5 shows the projected number of trains on Nashville’s rail infrastructure in 2040. Capacity of rail track segments is dependent on a great number of factors. However, 30 trains per day is a generally accepted estimate for when capacity on a single track can start becoming an issue. Based on this estimate, the mainline north-south track through Nashville is forecast to have congestion issues by 2040. Expanding the capacity of this freight rail line will ensure that the Nashville region can continue to receive efficient freight rail service over the long-term. This expansion can include additional siding, use of increased industry track, or full double tracking in key locations along the line. Expanding existing rail lines may also be part of the development of rail transit service along key corridors in the region.

**Figure 3.5 Forecast Trains Per Day in Nashville Area, 2040**



Source: FHWA Freight Analysis Framework rail forecast applied to FRA base year train data.

## *Objective 4 – Minimize conflicts with existing neighborhoods and emerging mixed-use development*

### **Project: Realign existing rail track**

Realigning freight infrastructure to best serve existing businesses while also minimizing the conflicts between existing neighborhoods and emerging mixed-use development will help work towards a long-term freight vision by improving the efficiency of the freight rail network to access and obtain customers and by supporting the preferred locations for freight-related developments. Providing freight-related businesses with rail access may help ease congestion by reducing the number of truck trips made by these businesses. Realigning existing rail track or relocating rail terminals should be considered as part of the region’s overall vision for rail alignments identified earlier.

### **Project: Relocate Radnor Yard**

The potential relocation of Radnor Yard is a worthwhile consideration due to its proximity to downtown and the potential ability to utilize its existing location for residential and commercial purposes. The relocation of an intermodal rail yard is a major undertaking. It involves moving track, equipment (such as cranes), utilities, administrative buildings and other essential support facilities and services. It also typically involves significant roadway work, traffic re-routing, and extensive environmental studies/permitting.

There have been two recent intermodal rail yard relocations in the southeast. In late 2013, Norfolk Southern relocated their intermodal yard from downtown Charlotte, North Carolina to six miles west of downtown at the Charlotte-Douglas International Airport between the second and third runway. The new facility is 200-acres and cost \$92 million to develop. It had an opening day capacity of 140,000 containers and the ability to expand to 200,000 container capacity. The second relocation is the Norfolk Southern intermodal facility in Rossville, Tennessee which at full build-out will cover 400 acres, include six loading tracks, 2,200 parking spaces and is estimated to cost \$112 million. However, Radnor Yard is an intermodal yard as well as a classification yard, requires between 400 and 800 acres, and would cost significantly more. Ideal characteristics of a new location for Radnor Yard include the following:

- Suitable amount of available acreage to operate an intermodal yard and allow for future expansion;
- Along existing rail track to limit additional mainline track needed;
- Easy access to interstate and major state highway network;
- Heavily industrial area consistent with intermodal yard customer base and ability to handle large number of trucks;
- Limited nearby residential areas to minimize truck and rail conflict with other land uses; and

- Ability to accommodate co-locating industrial and transportation companies, including providing transportation for employees.

Based on these characteristics, one location for consideration of relocating Radnor Yard is in Rutherford County along the I-24 and SR 840 interchange. The location has a large amount of undeveloped industrial land and already features freight-intensive activity. Alternatively, somewhere along the CSX rail line between the Nissan Plant in Smyrna and Murfreesboro may be desirable.

The potential benefits of relocating Radnor Yard are:

- Developing a large amount of undeveloped industrial land with the ability to assemble additional undeveloped land into industrial uses;
- Adjacent to SR 840 with easy access to I-40 and I-65;
- Proximity to existing freight-intensive clusters and matching infrastructure;
- Fewer potential conflicts given low population densities; and
- Opening up land closer to downtown for residential and commercial uses.

Truck traffic generated by a 200,000 container capacity facility equates to around 800 trucks in an average weekday. This would have impacts on local roads nearby a relocated Radnor Yard, but it would not significantly impact interstates or major highways such as SR 840 which already carry more than 10,000 trucks per day. A move to Murfreesboro for Radnor Yard would increase truck VMT for many of the railyard's customer base. For those located in Davidson County, roundtrip truck VMT to Radnor Yard could increase by 50 miles per container. If the railyard's proportion of customers in Davidson County is estimated at 43 percent (based on the truck cluster analysis described in the Existing Conditions and Trends report), then daily truck VMT could increase by 17,200 due to the relocation. Given the costs associated with moving Radnor Yard, a relocation seems to be most reasonable if CSX requires more land to expand or a developer is interested in the current Radnor Yard location for other purposes.

*Objective 5 – Provide increased opportunity for use of existing rail lines/ROW for public transit and transit-oriented design*

### Project: Implementation of transit service on rail lines

The existing freight rail lines emanating from the downtown Nashville region connect to most of the major suburbs in the region. The region has conducted a number of studies analyzing the potential for passenger rail in Middle Tennessee. Passenger rail service would provide an additional mobility option for Nashville residents and reduce congestion during peak period commute traffic. Currently, the region has one passenger rail service, the Music City Star, which operates between Nashville eastward to Lebanon. The Music City Star operates on the Nashville & Eastern Railroad Authority freight rail line. It spans 32 miles, has six stops and was built at a cost of \$41 million, putting it among the most cost-effective commuter rail start-

ups in the country. The service has maintained steady ridership of about 250,000 passenger trips per year over the last three years.

The infrastructure alignment is consistent with what is needed to support Nashville’s potential passenger rail operations. However, virtually all of the Nashville freight rail lines are single track. Single track facilities tend to have a maximum capacity of between 30 and 40 trains per day. Successful passenger rail services tend to have between 10 and 20 trains per day. Therefore, rail lines with more than 20 freight trains per day will likely have capacity issues if passenger services are introduced. The primary opportunity for operating passenger rail on freight rail lines is to identify rail tracks that are forecast to have less than 10 trains per day over the long term planning horizon. Opportunities for adding double tracking and additional sidings may also make passenger rail more feasible.

Figure 3.5 shows the projected number of trains on Nashville’s rail infrastructure in 2040. The figure shows that the southwest rail line connecting downtown Nashville, Columbia, Spring Hill, and Franklin is forecast to have less than 10 trains per day in 2040. This indicates that these lines are good candidates for further examination of passenger rail on existing infrastructure. An additional passenger rail line for consideration is from downtown Nashville to the middle of Cheatham County. This line is also forecast to have less than 10 trains per day in 2040. All of the other rail lines are projected to carry over 10 freight trains per day by 2040, so the addition of passenger services would lead to capacity issues.

There are several mechanisms for structuring passenger rail service on freight rail lines. For starters, a region may negotiate access to the freight railroad corridor. Another option is to purchase the rail corridor. Purchasing a rail corridor makes sense if the existing corridor is not a key freight corridor (such as the Nashville-Franklin line and the Nashville Cheatham County line) and passenger volumes are at a minimum 8 to 10 round trips per day. The freight railroad would continue to have access for freight rail service. The advantage of this arrangement is that passenger operator access is guaranteed. One example is the Florida DOT SunRail Service in the Orlando metropolitan region. The Florida DOT purchased 61 miles of track from CSX railroad for \$173 million to operate this passenger service, while CSX retained the right to operate freight rail service on the track. The first phase of the Orlando SunRail service opened for operation in 2014 and includes a 25-mile passenger rail line between DeBary and downtown Orlando. The second phase is under construction and will include a 30-mile passenger rail line between Poinciana and downtown Orlando.

Regions may also consider purchasing or leasing space on existing freight railroad rights-of-way and building parallel track. This option is available where the right-of-way is wide enough and the freight railroad does not expect to need the space for additional sidings or running tracks. The advantage of this option is that it provides unrestricted access to rail infrastructure and piecemeal right-of-way acquisition is avoided. This option has been used most often for commuter service such as in Salt Lake City and Denver. These arrangements can be hampered by freight railroad concerns about accident liability requiring high minimum lateral separation between passenger rail operations and active freight lines, or restrictions on the kinds of equipment that the passenger operation can use.

Another opportunity for developing passenger rail services in the Nashville region is to identify rail lines that are projected to have very high levels of congestion and would likely need to get double tracked to support freight rail services. There is the potential for interest by the freight rail operator in a public-private partnership to jointly fund the additional infrastructure and using it to operate both passenger and freight rail services. While this is more expensive than running on an existing line, it is much less expensive than the public sector funding double tracking on its own. The northwest line between downtown Nashville and Robertson County, highlighted in the Nashville MTA's Northwest Corridor Study, is a candidate for this type of operation. Similarly, the southeast line between downtown Nashville and Sumner County would be an opportunity to explore this type of arrangement.

Other communities have been able to take advantage of their freight rail assets by first identifying a specific corridor for passenger rail services, then conducting a detailed feasibility study on the service with the cooperation of the operating railroad. The feasibility study will include defined service goals of the passenger rail service (e.g. trains per day, speeds); a staged plan for the introduction and growth of the proposed service; a list of needed infrastructure investments; plans for station locations and facilities; initial estimates for capital costs, operations and maintenance; and requirements for passenger cars and locomotives. After the feasibility study is complete, the next step is to enter into negotiations with the existing operating freight railroad.

Under ideal conditions, the construction of a rail track costs approximately \$8 million per mile, not inclusive of any needed right-of-way costs. A 30-mile passenger rail service (such as what would be needed between Nashville and Murfreesboro) on new track would cost at least \$240 million. If this track were built within existing Class I right-of-way, then land acquisition costs would be avoided. However, the Class I railroad would want to be compensated for this loss of right-of-way which will include a determination of whether this right-of-way would be needed for any future double tracking of freight rail services. Realigning freight routes tends to not be cost-effective as there would be costs associated with acquiring new right-of-way, the development of new tracks (at \$8 million per mile), and the removal of existing tracks.

Other issues beyond costs associated with operating passenger rail on freight railroads include:

- Negotiating liability limits for rail incidents. Specific clauses must deal with the potential for personal injury, damage to rail cars, and damage to freight;
- Determining if the passenger rail agency will set up an operating entity or contract with service provider to operate and maintain the service;
- Whether the commuter rail agency is contracting with the host freight railroad for services other than access, infrastructure maintenance and dispatching;
- Procedures for periodic revisions or renegotiations and mechanism to resolve disputes;
- Planning for special trains for a one-time event or recurring special events; and
- Developing clauses for performance monitoring and service quality.

## Strategy 3 – Coordinate Economic Development and Land Use Decisions with Planned Investments

A third strategy is to coordinate economic development and land use decisions with planned investments. As noted in the Land Use Planning and Urban Design report, the coordination of land use and freight transportation activities through land use policies helps to ensure that freight-related facilities are compatible with adjacent land uses and that land use decisions are consistent with freight mobility and operational needs. It requires that local stakeholders assess and evaluate how land use decisions at the county and municipal level affect the freight transport system as a whole. When freight planning and land use decision-making activities are well integrated, both the public and private sector will benefit through reduced congestion, improved air quality and safety, enhanced community livability, improved operational efficiency, reduced transportation costs, and greater access to freight facilities and markets.

The coordination of economic development and land use decisions with planned investments is achieved primarily through the implementation of changes in existing land use and zoning codes along with development of new codes. The cost of changing land use codes is minimal and most of the changes can occur in the short to medium term. The key challenge is achieving consensus between three key stakeholder categories:

1. Local municipalities that make land use decisions;
2. State and local economic development agencies that focus on attracting and retaining businesses to Middle Tennessee; and
3. Property owners that have expectations about how they will utilize their property and the monetary return that they will receive from their property.

To offset anticipated challenges, the following actions should be considered:

- An extensive education campaign with local municipalities on the benefits of coordinating land use decisions with infrastructure investments, including how it can help municipalities achieve broader community goals.
- Maintaining an ongoing dialogue with state and local economic development agencies to understand focus industries for economic development, the land and infrastructure needs of these industries, and how these are evolving over time.
- Consideration of compensation to property owners who are negatively impacted through changes in how their property will be used.

Performance measures that may be useful in monitoring and tracking progress of this strategy are listed in Table 3.7, below. Following that, four primary objectives that can help focus efforts within this strategy are profiled.

**Table 3.7 Performance Targets for Measuring Strategy**

Strategy	Performance Measure
Coordinate economic development and land use decisions with planned investments	<ul style="list-style-type: none"> <li>• Number of local municipalities that adopt regional land use guidance</li> <li>• Percent of occupied industrial land in preferred locations</li> <li>• Acreage of land use conversions from residential or commercial to industrial inside preferred locations</li> <li>• Acreage of land use conversions from industrial to other designations outside of preferred locations</li> </ul>

*Objective 1 – Enhance Middle Tennessee’s attractiveness as a freight/logistics hub*

**Policy: Establish criteria for siting industrial/logistics companies**

The Land Use and Urban Design report of this study highlights a number of criteria employed in other regions that assist in the siting of industrial and logistics companies in a way that aims to reduce conflicts among various uses while also more safely and efficiently moving both freight and passenger vehicles. One potential criteria profiled is requiring industrial uses have close access to roadways that are most capable of handling trucking activity. This site access requirement typically reduces the use of local roads by truck traffic. Beyond this, encouraging industrial uses be close to railroads increases the opportunity to utilize rail and reduce the total number of trucks generated at an industrial location. Morristown County Division of Transportation in New Jersey also produced a report that presents information geared toward local officials about land use planning considerations and code practices. Municipal land use code practices may also provide insight into industrial site design techniques that are environmentally sensitive, and prioritize safety related to highway-railroad grade crossing operations in the development approval processes for industrial and nonindustrial land served by rail. Additional information on siting criteria and related policies can be found in the Land Use and Urban Design report.

**Policy: Designate regional freight/logistics industrial zones**

The Land Use and Urban Design report outlines a number of policies related to preserving industrial land. Zoning overlays may assist local jurisdictions in protecting locations that feature industrial activity and ensuring they are not rezoned for other purposes. Additionally, industrial corridor programs can be used to develop specific growth plans for freight intensive corridors. While much of the freight development that presently exists in the region occurs in clusters, freight-related development and activity will continue to grow along the I-24 corridor. Further, SR 840 has been identified as a future industrial corridor for the region. Utilizing zoning and corridor programs to both preserve developable industrial land and identify optimal freight-related development zones into the future is a critical tool to consider in achieving the freight vision. Figure 3.6 shows preferred locations for industrial activity in the region.

## *Objective 2 – Identify infrastructure-ready sites for industrial recruitment or expansion*

### Policy: Update local land use policies and zoning ordinances

Local land use policies and zoning ordinances will help minimize conflicts caused by the proximity of incompatible land uses near major freight facilities or generators including conflicts between truck and auto movement, noise pollution, heavy wear on roadways in residential streets, and increased burden for freight delivery.

Policies must consider three important elements: 1) the potential need to accommodate additional and larger parcels at preferred freight facility locations due to requirements of expanding and relocating facilities, 2) vacant industrial land that is not preferred for locating freight facilities due to location or lack of suitable access to utilities, and 3) conversion of industrial land to non-industrial uses based on near-term price dynamics in land and development markets. To mitigate these issues, the following site development standards should be considered:

- An industrial overlay to preserve key parcels of land as industrial development;
- Development of specific future freight land use conversions needed to accommodate desired growth trajectory at preferred future freight locations;
- The use of context sensitive standards to alleviate the negative externalities of noise, light, particulates, and/or odor in order to help achieve the highest level of compatibility between freight-intensive uses and other surrounding areas; and
- Targeted use of landscaping, both in the form of screening and buffering, to provide separation of uses and a visual barrier.

Based on the work conducted in the Land Use and Urban Design report, a set of local industrial land use policies were developed. The policies will help guide local municipalities as they consider changes to land use planning. Additionally, the policies serve as a framework to help standardize freight and land use planning in the region. A summary of these policies is presented in Table 3.8 and described in more detail in the Land Use and Urban Design report.

**Table 3.8 Municipal-Level Recommendations for Freight-Related Land Use Policies**

Land Use Zoning Topic Area	Recommendation
Permitted Uses	Subdivide Industrial Land Use category into Manufacturing, Transportation, and Warehousing/Distribution Center to specify different on-site activities and truck trip generation levels.
Access Management	Require access to industrial facilities from arterial or collector street. Driveway separation between property and street shall be appropriate for adjacent uses.
Industrial Overlay District	Develop districts to preserve areas for future industrial activity.
Setback Standards	Side or Rear Yard Adjacent to Residential Use: 50 feet. Front yard: 50 feet.
Landscape and Buffer Standards	Industrial buildings located in close proximity to residential neighborhoods must maintain minimum 10 feet planting and vehicular use areas shall be screened from public streets and adjacent uses.
Performance and Context Standards	Industrial buildings shall have requirements to avoid nuisances of noise, air pollution, hazardous waste, and odor requirements on adjacent land uses.
Parking, Loading, and Circulation Standards	Parking and loading requirements shall be consistent with facility usage. Major industrial facilities must conduct a traffic impact analysis.
Truck Route Standards	A regional truck route network should be incorporated into local truck route designation. Municipalities can add supplemental roads based on local needs including truck prohibited routes. Designated truck routes should have adequate pavement depth and material. Designated truck routes should be designed appropriately based on urban, suburban, and rural designations. Additional design features should be considered for truck designated routes that are adjacent to bicycle lanes, sidewalks, schools, and hospitals.

**Policy: Implement restrictions for the location of freight-intensive land uses**

If not properly planned for, freight movements and freight-related uses can have negative impacts on residents including but not limited to noise and light pollution, odors, vibrations, safety concerns, and increased truck traffic. Requiring industrial land uses be near the designated truck route network, the fewer miles trucks will need to move on local roads, for example. This can also be said for intermodal facilities. Facilities generating a large amount of truck traffic should be located away from residential and other conflicting uses. While a zoning overlay may be used to preserve existing industrial land uses, as mentioned in an earlier action, it may also be applied to historic or residential neighborhoods in order to preserve the scale and design of development. Form-based zoning and performance zoning are complementary tools that can preserve the aesthetic and intensity of activity occurring in an area.

Additionally, there are potential environmental impacts of poorly planned freight-related developments. These may include increased VMT and emissions impacts, conversion of land from greenspace to industrial land increasing the amount of impervious surfaces, and potential impacts to water supplies. Brownfield development and freight villages are effective ways to reduce the sprawl of impervious surface while also increasing land uses dedicated to industrial and manufacturing needs.

### *Objective 3 – Maximize locational efficiencies of industry clustering*

#### **Policy: Identify economic incentives for company recruitment and siting**

The Nashville Area MPO should work with state and local economic development agencies to identify appropriate locations for key industries across the region and to identify economic incentives to coordinate company recruitment and siting to appropriate locations. Rail industrial access programs, tax reductions, and sales tax exemptions on purchases of materials to construct or renovate facilities are some mechanisms that may be used to help recruit long-term manufacturing and industrial presence in identified freight-intensive locations throughout the region. It is optimal for future freight and land use activity to occur close to existing freight-intensive clusters throughout the region. Providing economic incentives to encourage the recruitment and retention of businesses to these areas is a critical component to coordinated freight and land use planning needed to achieve the freight vision.

### *Objective 4 – Protect freight-intensive areas from incompatible land development/uses*

#### **Policy: Augment/extend freight infrastructure to optimal zones**

Improved infrastructure to existing freight-intensive regions will assist in further intensifying freight activity and serving as a natural buffer from non-compatible land uses. One specific project to consider includes the development of an additional rail spur in Murfreesboro to connect the long-standing and newly developed freight facilities with the CSX mainline that runs parallel to I-24. Additionally, access to adequate water and sewer capabilities is a necessity for certain industrial land uses.

It is important for local jurisdictions to protect locations that feature industrial activity and ensure that they are not rezoned for other purposes. It is also important for local jurisdictions to identify locations for future industrial uses and ensure protections are in place for these future locations. The industrial locations in the Nashville region that are most likely to suffer from encroachment from other types of uses are downtown Nashville and land located just northwest of downtown along the Cumberland River. The proximity to the river is desirable both for freight facilities that incorporate marine transport and for residential or mixed use areas where waterside views and access have the potential to add value to the development. Recently, there has been some interest in redeveloping some of this industrial land as high-density residential and commercial uses. If this displacement were to occur, it would be important for the Nashville region to understand where displaced industries are likely to relocate and how this relocation will affect traffic patterns and potential freight conflicts at

these new locations. Additionally, it will be important for the region to understand how new non-industrial land uses would mix with the remaining industrial land use and its associated truck traffic.

## 4.0 Next Steps

A key next step for this study is the establishment of the freight vision for the Nashville Area MPO. The freight vision will be built around the strategies and objectives that are described in this document. The freight vision also lays the groundwork for the incorporation of the strategies and objectives into ongoing and future Nashville Area MPO planning efforts. It will also be available to the Tennessee DOT and municipalities with the region, so that planning efforts that impact freight can more easily be coordinated.

A significant challenge to implementing these strategies is identifying funding sufficient to implement the recommendations. To overcome this challenge, it is recommended that the region start with low cost actions. Then, use the momentum generated from successful implementation of the low cost actions to develop consensus about proceeding with some of the higher cost solutions.

The region should continue to track opportunities in the FAST Act and future Federal transportation legislation to fund freight-specific and transit-specific projects. The FAST Act includes freight-specific funding grants programs similar to the current U.S. DOT Transportation Investment Generating Economic Recovery (TIGER) program. The FAST Act also includes formula funding targeted towards freight which should be considered as potential funding sources for freight projects and programs proposed for the Nashville Area MPO.