
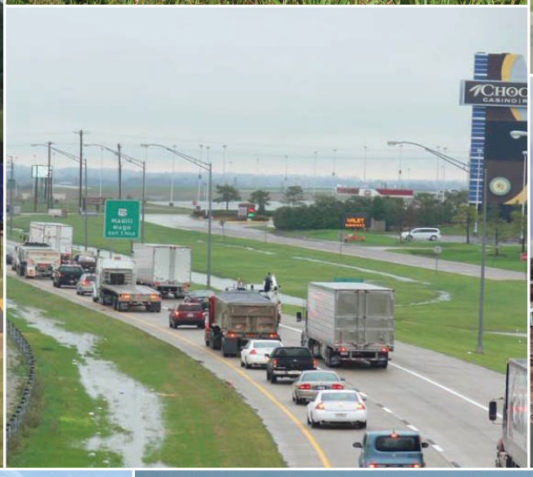


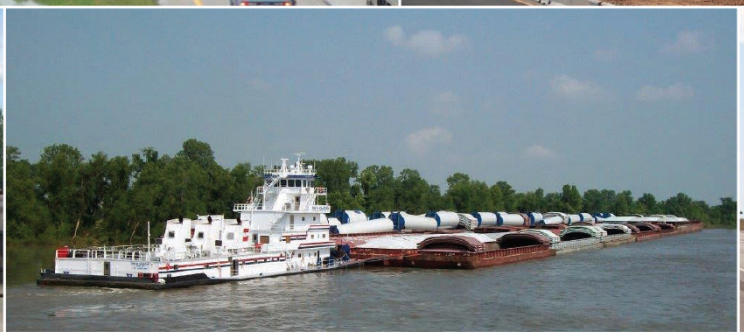


DRAFT PLAN DOCUMENT | OCTOBER 2017

Oklahoma Freight Transportation Plan 2018–2022

Oklahoma Department of Transportation

Oklahoma Department of Transportation
Strategic Asset and Performance Management Division
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Oklahoma City, OK 73105
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CONTENTS

TABLES

FIGURES

ACRONYMS

AADTT ..... Average Annual Daily Truck Traffic
ACOG ..... Association of Central Oklahoma Governments
BNSF ..... Burlington Northern Santa Fe Railway
CRFC ..... Critical Rural Freight Corridors
CUFC ..... Critical Urban Freight Corridors
DC ..... Distribution Center
DMS ..... Dynamic Message Signs
FAC ..... Freight Advisory Committee
FAST Act ..... Fixing America's Surface Transportation Act
FHWA ..... Federal Highway Administration
GDP ..... Gross Domestic Product
GNBC ..... Greenbelt Corporation Railroad
HPMS ..... Highway Performance Monitoring System
INCOG ..... Indian Nations Council of Governments
INFRA ..... Infrastructure for Rebuilding America
ITS ..... Intelligent Transportation System
KCS ..... Kansas City Southern Railway Company
KRR ..... Kiamichi Railroad Company
LRTP ..... Long-Range Transportation Plan
MKARNS ..... McClellan-Kerr Arkansas River Navigation System
MPO ..... Metropolitan Planning Organizations
NHFN ..... National Highway Freight Network
NHFP ..... National Highway Freight Program
NHS ..... National Highway System
NMFN ..... National Multimodal Freight Network
NPMRDS ..... National Performance Management Research Data Set
ODOT ..... Oklahoma Department of Transportation
OFTP ..... Oklahoma Freight Transportation Plan
OSOW ..... Oversize/Overweight Loads
PHFS ..... Primary Highway Freight System
POE ..... Ports of Entry
SKOL ..... South Kansas & Oklahoma Railroad
SLWC ..... Stillwater Central Railroad
SS ..... Sand Springs Railway
TRB ..... Transportation Research Board
TSU ..... Tulsa-Sapulpa Union Railway Company
TTTR ..... Truck Travel Time Reliability
U.S. DOT ..... U.S. Department of Transportation
UP ..... Union Pacific Railroad
USACE ..... U.S. Army Corps of Engineers
VMT ..... Vehicle-Miles Traveled

1.0 Introduction

1.1 BACKGROUND

The Oklahoma Department of Transportation (ODOT) is charged with planning, constructing, and maintaining Oklahoma's surface transportation infrastructure, including the interstate system, the U.S. highway system, and the Oklahoma highway system. ODOT also manages state-owned freight railroads, and administers other multimodal programs, including passenger rail, rural public transit, and the waterways program.

Oklahoma is located in the South Central plains of the United States and is characterized by a diverse and growing demographic and economic base. Major industries in Oklahoma include oil and gas, agriculture, aerospace, and manufacturing. The state's population in 2016 was 3.9 million and is projected to exceed 4.2 million in 2025. The population growth is expected to be strong in Oklahoma City and Tulsa, the state's two large metropolitan areas. Low to moderate growth is forecast in the remainder of the state.[1] Employment growth is forecast in much of the state. Freight miles of travel are expected to fall in line with U.S. Department of Transportation (U.S. DOT) projections and grow at a rate of slightly over 1 percent per year.[2]

1.2 PURPOSE

ODOT is developing this Oklahoma Freight Transportation Plan (OFTP or Plan) in order to provide a safe, reliable, and productive freight transportation system that will support the growing economy and population in the state. It will accomplish the following outcomes:

- Increase attention and focus on freight needs and opportunities.
- Improve coordination of freight planning across multiple modes.
- Provide guidance for other state and regional/metropolitan freight planning efforts.
- Obtain input from the public and private stakeholders regarding state freight planning.

This Plan was developed in a manner consistent with the Fixing America's Surface Transportation (FAST) Act and implementing guidance issued by U.S. DOT. The FAST Act establishes a new funding category dedicated to freight—the National Highway Freight Program (NHFP)—and requires that states identify the use of NHFP funds within a state freight plan, which includes certain specified elements, and that is approved by U.S. DOT by December 4, 2017.

A statewide freight plan is required to address the following components (summarized from the FAST Act):

- Freight trends, needs, and issues
- Freight policies, strategies, and performance measures to guide investment
- When applicable, a list of critical rural and urban highway corridors; critical multimodal rural facilities and corridors
- Improved ability to meet national freight goals
- Intelligent transportation systems and other technologies and strategies to improve freight safety and efficiency
- Improvements that are required to reduce deterioration on heavy-vehicle routes

- Inventory of, and strategies for, facilities with freight mobility issues (e.g., freight bottlenecks)
- Strategies for congestion or delay caused by freight
- Freight investment element with priority projects
- Consultation with a Freight Advisory Committee

1.3 VISION AND GOALS

1.3.1 Guiding Freight Vision Statement

This OFTP is part of a broad policy context. ODOT has a set of established transportation goals, policies, and strategies—formulated in the state's long-range transportation plan (LRTP) and in other documents—which this OFTP supports. Additionally, this OFTP must conform to and demonstrate the achievement of national freight goals as set forth in federal legislation. To accomplish both missions—and as an expression of purpose for the management of the freight system in the state—this OFTP embraces the following Freight Vision Statement for Oklahoma:

> Oklahoma will continue to provide for the safe, reliable and productive performance of our multimodal freight system as a mainstay of our economy and an essential supplier of goods to our people.

This Freight Vision Statement recognizes that Oklahoma's freight transportation system is multimodal in nature, and is important for supporting the state's economy and supplying the essential needs of its residents, workers, and visitors.

1.3.2 Freight Plan Context

This OFTP exists in a broad planning context. In addition to the national freight plans and goals, this OFTP was guided by the Oklahoma LRTP. It was also informed by the Statewide Transportation Improvement Program, which incorporates metropolitan Transportation Improvement Programs, ODOT's 8 Year Construction Work Plan, and numerous regional and metropolitan transportation plans from around the state. Finally, this OFTP was developed in coordination with the Oklahoma State Rail Plan: 2018–2021, which is expected to be completed by the end of 2017.

1.3.3 ODOT Responsibilities and Freight Partners

As mentioned earlier, ODOT is responsible for Oklahoma's surface transportation infrastructure, including the interstate system, the U.S. highway system, and the Oklahoma highway system. The network that encompasses these three highway groups is sometimes referred to as the State Highway System, and this network is the beginning framework for developing this OFTP. As this Plan proceeds, certain highways will be highlighted for their importance to freight transportation. In the freight arena, ODOT also oversees state-owned freight railroads and administers the waterways program. In relation to freight, ODOT works closely with railroad and port owners and operators to support intermodal connectivity and mobility for goods movement.

ODOT is an active partner in additional transportation functions that involve various federal and state agencies, local jurisdictions, and private businesses. Numerous public- and private-sector organizations must fulfill their roles and cooperate with each other to address the state's transportation needs.

Federal and state agencies that are critical to supporting freight transportation efforts in Oklahoma include the Federal Highway Administration (FHWA), the Federal Railroad Administration, the Federal Motor Carrier Safety Administration, and the U.S. Army Corps of Engineers (USACE), the Oklahoma Corporation Commission, the Oklahoma Highway Patrol, and the Oklahoma Turnpike Authority. For freight transportation planning purposes, other critical agencies and organizations include, but are not limited to, airports, metropolitan planning organizations (MPO), Native American tribal entities, port authorities, railroad companies, and private-sector freight transportation businesses.

1.3.4 Oklahoma Freight Goals

National Freight Goals

National goals for freight are enumerated in the FAST Act and are summarized in **Table 1**. The Oklahoma freight goals are consistent with the national goals, as discussed next.

Table 1. National Freight Goals

1. Policies, operational improvements and investments for economic competitiveness; congestion and bottleneck reduction; reduced costs and improved year-round reliability; and productivity gain, especially by high-value job generators
2. Safety, security, efficiency, and resilience – urban and rural
3. Network state of good repair
4. Economic efficiency and productivity of networks
5. Improve short- and long-distance freight movement – across rural, rural-urban, and port/airport/gateway connections
6. Flexibility for multistate corridor planning and organization
7. Reduce environmental impacts
8. Avoid burdens to state and local governments

Source: WSP adapted from *https://www.fhwa.dot.gov/fastact/legislation.cfm*

Truckers regard highways as their factories and trucks as their work tools. We need highways to be improved so that the channels of commerce can work effectively.
—Oklahoma Trucking Association member

Consistency with State and National Freight Goals

Table 2 lists Oklahoma's freight goals in the priority order determined by the Oklahoma Freight Advisory Committee (FAC). The table shows how freight goals correspond to an established LRTP goal area and to established national freight goals listed in Table 1.

Table 2. Oklahoma's Freight Goals and Correspondence to Long-Range Transportation Plan Goals and National Freight Goals

LRTP Goal Area	OFTP Freight Goals	National Freight Goal #
Safe and Secure Travel	▪ Improve the safety and efficiency of freight movement and its interaction with other vehicles. ▪ Ensure the ability of urban and rural highways to safely accommodate growth in freight traffic.	2
Infrastructure Preservation	▪ Meet freight transportation needs by maintaining the Oklahoma State Highway System in a state of good repair. ▪ Support the preservation of Oklahoma multimodal freight networks through appropriate polices and initiatives.	3, 5
Mobility: Choice, Connectivity and Accessibility	▪ Ensure the competitive performance of the Oklahoma freight system. ▪ Foster a diverse portfolio of modal choices for Oklahoma's freight shippers and receivers in urban and rural areas. ▪ Support end-to-end operations of industry supply chains in Oklahoma markets for Oklahoma's industries.	1, 4
Economic Vitality	▪ Promote competitive access to domestic and international markets for Oklahoma's industries. ▪ Direct freight-related transportation investments to support the state's economy.	1, 4
Environmental Responsibility	▪ Support the growth of Oklahoma clean energy by promoting clean fuel use by freight providers. ▪ Avoid, minimize, or mitigate adverse environmental impacts related to freight transportation.	7
Efficient Intermodal System Management and Operation	▪ Capitalize on federal funding and finance programs to aid investment in the freight transportation system. ▪ Coordinate freight corridor development programs with neighboring states. ▪ Safeguard industry supply chains by improving resiliency of the freight transportation system to withstand disruptions.	2, 6, 8

Source: Oklahoma Freight Advisory Committee

1.4 OVERVIEW OF THIS PLAN

This Plan's base year is 2015. This means that much of the research and trend review looks back to the year 2015 as a consistent reference point. This Plan looks forward to a short-term (2018 through 2022) and long-term future (2023 through 2045) view. This Plan's products include a review of highway, freight rail, and waterway facilities, a bottleneck analysis, and a freight investment element identifying projects to be funded with NHFP funds. This OFTP is organized into the following chapters:

- **Chapter 1 – Introduction**
  - Describes the purpose, requirements, and context for this Plan.
  - Outlines this Plan's vision and goals.
- **Chapter 2 – Oklahoma's Freight Story Today**
  - Reviews Oklahoma's current freight flows, major commodities and facilities by mode (highway, rail, marine and air).
  - Describes Oklahoma's multimodal freight assets.
  - Identifies conditions and challenges confronting Oklahoma's freight system today.
- **Chapter 3 – Outreach**
  - Describes stakeholder and public involvement in this Plan.
- **Chapter 4 – The Freight Future**
  - Outlines major economic, demographic, technology, and transportation trends affecting freight.
  - Reviews long-range freight forecasts.
  - Describes implications of transportation trends for the future of freight in Oklahoma.
- **Chapter 5 – Freight Bottlenecks and Mobility Issues**
  - Summarizes the results of analysis of truck bottlenecks, safety, maintenance and other issues affecting freight movement for all modes.
- **Chapter 6 – Moving Freight**
  - Presents proposed performance measures, improvement priorities, policies and strategies and projects.
  - Recommends projects for use of freight formula funds, 2018 through 2022.
  - Identifies freight-related projects expected to be underway, 2018 through 2022.
  - Recommends freight network designations.
- **Chapter 7 – Conclusion and Next Steps**
  - Outlines Oklahoma's commitment to incorporating freight into its decision-making process going forward.

A series of technical reports provides more details on the data analysis and results, and these reports will be available on ODOT's OFTP website *http://www.okstatefreightplan.com*.

2.0 Oklahoma's Freight Story Today

The first part of this chapter summarizes current state freight flows, direction of flow, and mode. Details on commodities, freight modes and facilities, and origins and destinations follow. This chapter closes with an assessment of current needs and challenges facing the Oklahoma freight system.

2.1 OVERVIEW

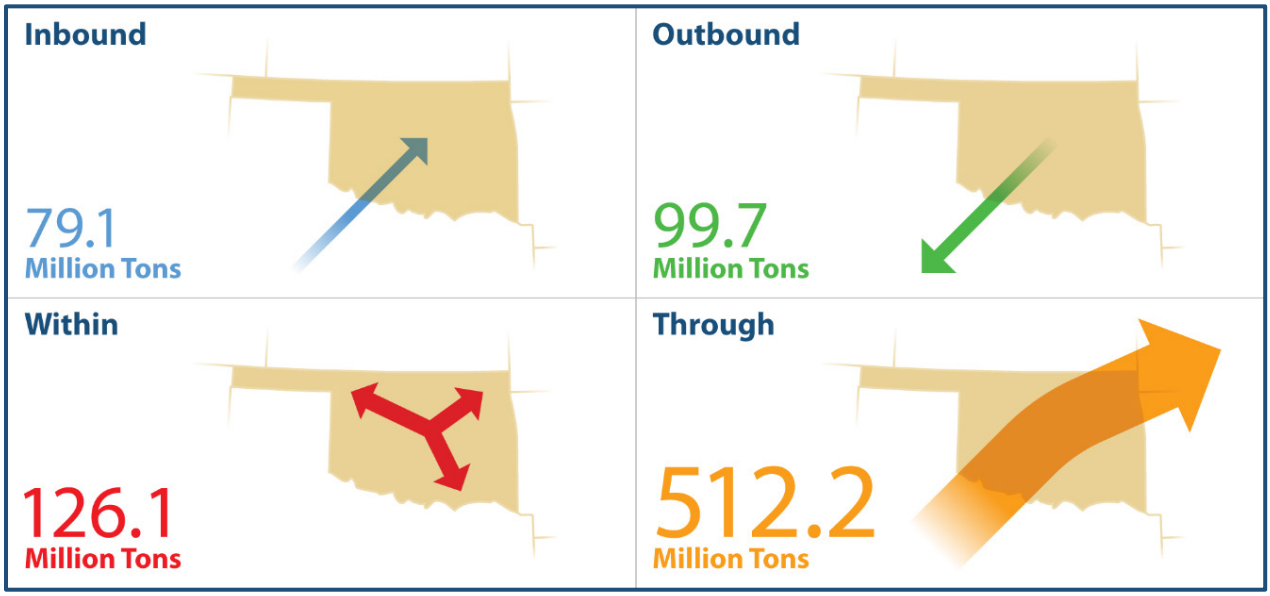
Freight is important to the transportation system and to the economy. Over 800 million tons of freight are transported annually in, out, within, and through Oklahoma. The value of goods transported annually is estimated at $1.3 billion.[3]

The freight flow data presented in this chapter is based on profiles from the IHS Markit Transearch database, and supplemented with the FHWA's Freight Analysis Framework 4 (FAF 4) data. The latest year for which these historical data are available is 2014, and they were escalated to the base year of 2015.

2.2 FREIGHT FLOWS

Figure 1 shows total freight flows by direction (inbound, outbound, within state and through). Through freight relates to shipments that begin out-of-state, pass through Oklahoma, and continue to a destination out of the state.

Figure 1. Oklahoma Freight Flows (2015) by Direction



Source: IHS Transearch, WSP analysis, 2017

All other traffic has an origin and/or destination in Oklahoma, and can be referred to as Oklahoma-based freight. The distinction is important because through freight imposes a burden on Oklahoma infrastructure, while having little connection to its economy; whereas state-based freight directly serves Oklahoma's businesses and people. For that reason, most of the discussion in this chapter will focus on Oklahoma-based freight. Nevertheless, through traffic is significant, representing 63 percent of total tonnage and 83 percent of total value.

Oklahoma has trading relationships throughout the world. Its principal trading partnerships are within the U.S. Of all freight that travels in, out, within, or through Oklahoma, nearly 90 percent of the tonnage is domestic. **Figure 2** shows some examples of top origins and destinations for selected commodities that flow in or out of Oklahoma. Texas is Oklahoma's foremost trading partner, but other major origins and destinations include California, Arkansas, Kansas, Louisiana, and Wyoming among others.

Figure 2. Example Commodities Flowing Into, and Out of, Oklahoma

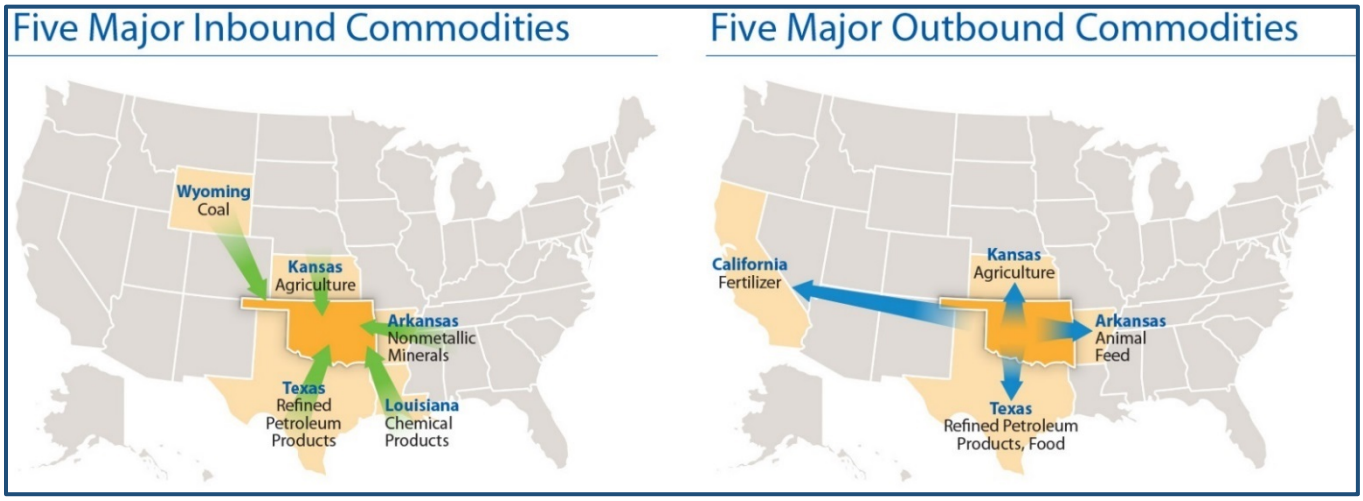


Table 3 displays aggregate freight flows broken down by direction and by mode. Most of the volume of through tonnage is moved by rail.

Table 3. Oklahoma Freight Flows

Tonnage 2015 by Mode and Direction (millions)					
Mode	Inbound	Outbound	Within	Through	Total
Truck	46.5	78.5	123.6	224.3	**472.9**
Rail	29.5	18.0	2.5	287.9	**337.9**
Water	3.1	3.2	0.0	0.0	**6.3**
Total	**79.1**	**99.7**	**126.1**	**512.2**	**817.1**

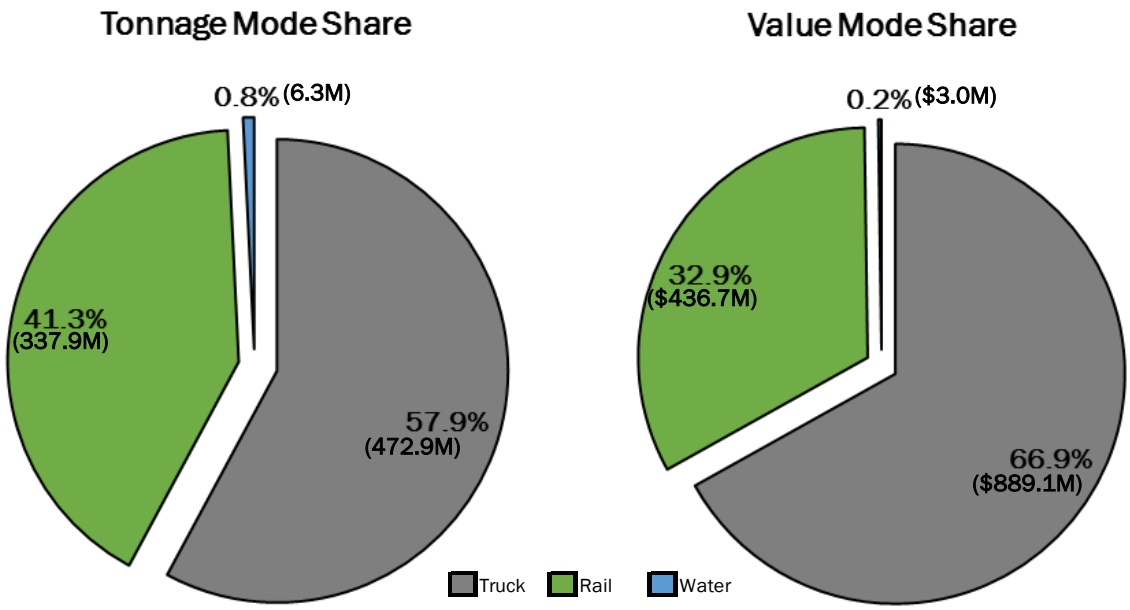
Source: IHS Transearch, WSP analysis, 2017

Of total freight tonnage and value, most is transported by truck, with most of the remainder moved by rail. Trucking is especially predominant for Oklahoma-based traffic. The third freight mode represented in Oklahoma is water, and the McClellan-Kerr Arkansas River Navigation System (MKARNS) classified as Marine Highway 40 (M-40) carries barge traffic into and out of the state.

Freight tonnage is slightly imbalanced into and out of the state with approximately 79 million tons inbound and 100 million tons outbound per year (**Table 3**). A total of approximately 126 million tons is moved within state. Through movement is by far the largest, at approximately 512 million tons. **Figure 3** shows the mode split for freight traveling in Oklahoma by tonnage and by value. As shown in the figures:

- Trucking predominates, especially for value.
- Rail also provides a substantial amount of freight transport in the state, accounting for nearly 33 percent by value but over 40 percent by weight.
- Waterways account for 6.3 million tons of freight annually, and, while representing less than 1 percent of the total by tonnage and value, are the mode of choice for many heavy and large commodities that are not time sensitive.

Figure 3. Oklahoma Freight Mode Share by Tonnage and Value

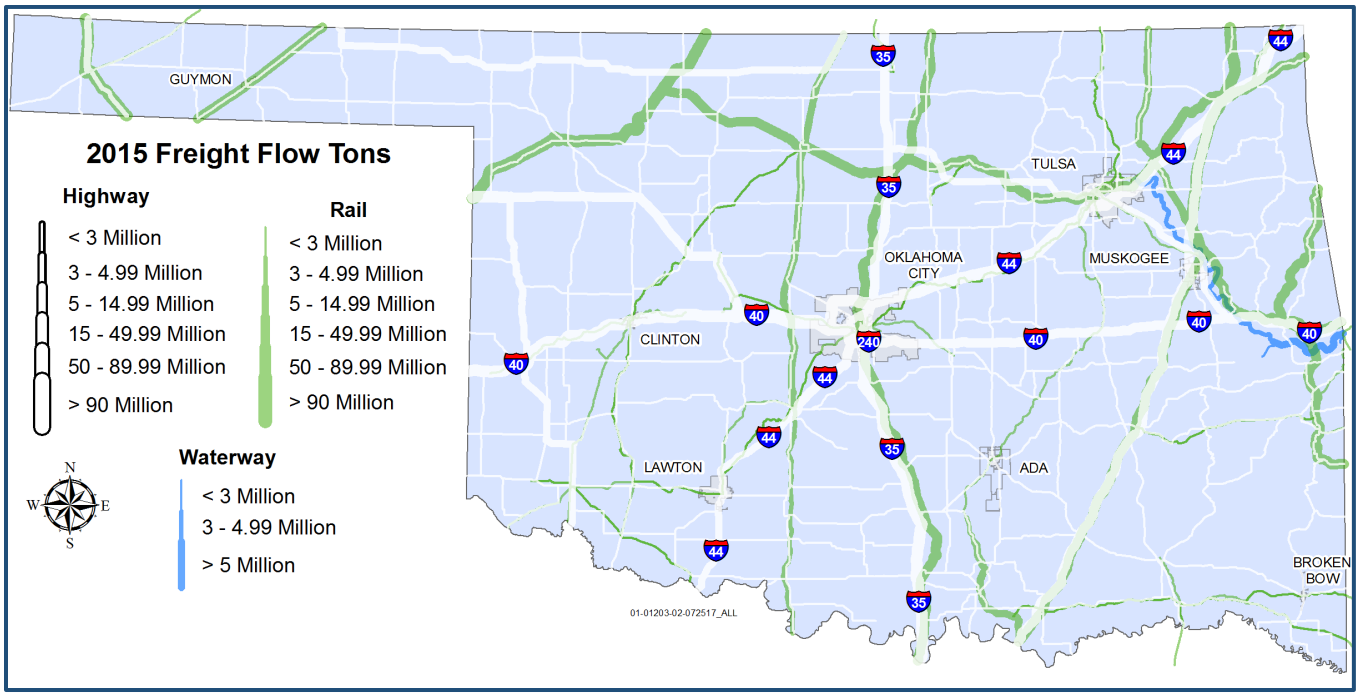


Source: IHS Transearch, WSP analysis, 2017

Relatively little freight is transported by air in Oklahoma,[4] and the primary role of ODOT in relation to airport freight transport is to provide adequate highway access to airports.

Figure 4 shows the total freight flows throughout Oklahoma for 2015. As shown, trucking predominates with the largest flows along I-35, I-44, I-40, I-240 and U.S. 69. Rail traffic flows principally in the north-south direction, with products moving to and from Texas or the Gulf of Mexico. The major east-west transcontinental railroad routes either bypass Oklahoma entirely (Union Pacific Railroad or UP) or pass through a corner of the state (Burlington Northern Santa Fe Railway or BNSF). Water represents a much smaller tonnage and is carried exclusively on the MKARNS system. Oklahoma's transportation facilities are described later in this section.

Figure 4: Oklahoma Freight Flows – All Modes

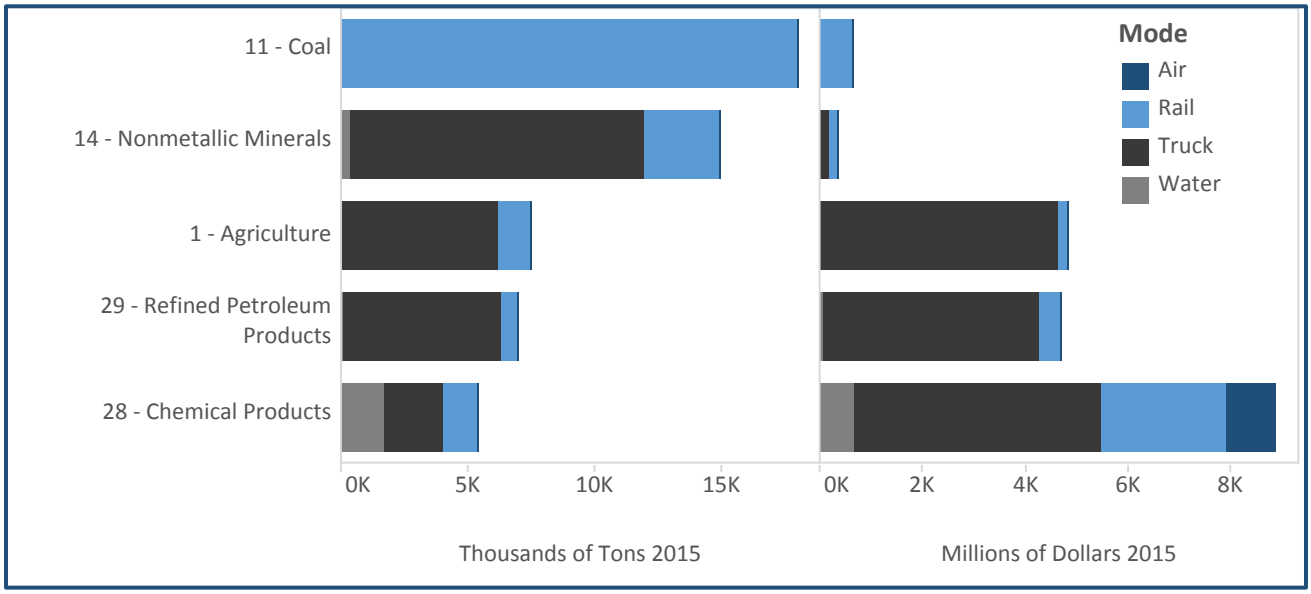


Source: IHS Transearch, WSP analysis, 2017

2.2.1 Inbound Commodity Movements by Mode

Oklahoma's top inbound commodity group[5] (**Figure 5**) ranked by tonnage is coal, at 18 million tons. Coal is consumed mainly by public utilities to generate electricity and is transported almost entirely by rail. The second-largest inbound commodity group is nonmetallic minerals, at 14 million tons. Examples of nonmetallic minerals include limestone, granite, stone, sand and gravel, potash, phosphate, and other fertilizer minerals. Nonmetallic minerals are largely transported by truck, but rail and water transport are also used.

Figure 5. Top Inbound Commodity Groups Ranked by Tons (2015)

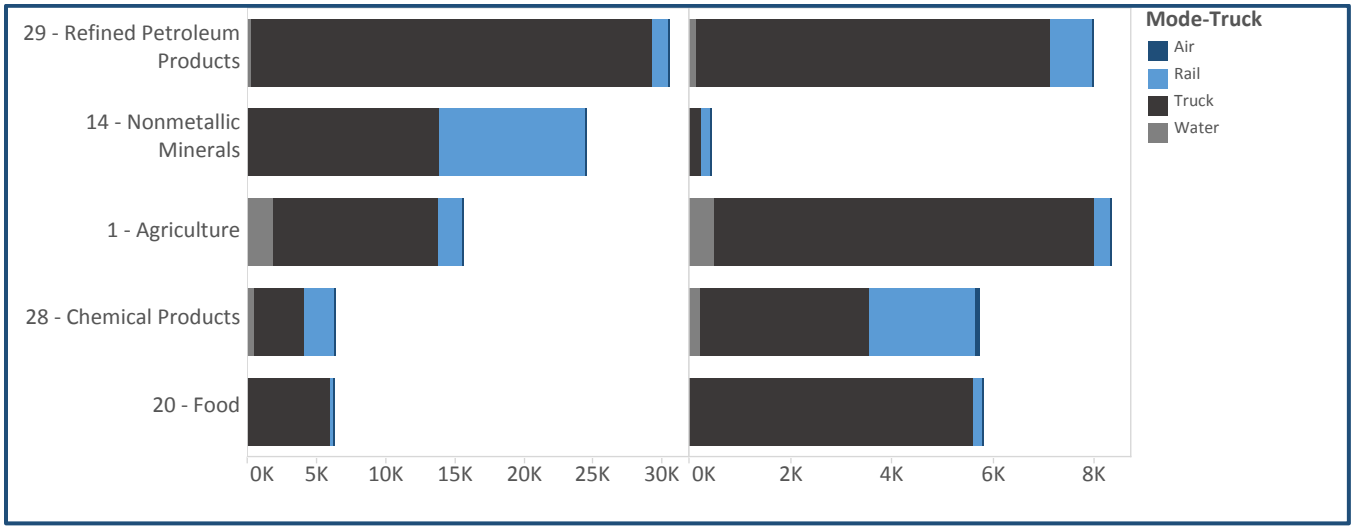


Source: IHS Transearch, WSP analysis, 2017

2.2.2 Outbound Commodity Movements by Mode

The top outbound commodity group by volume is refined petroleum products, at 30 million tons (**Figure 6**), which is transported mostly by truck. The second-largest commodity by weight is nonmetallic minerals. Most of these volumes are transported by truck, but a significant share is moved by rail. The third commodity group ranked by weight is agriculture.

Figure 6. Top Outbound Commodity Groups Ranked by Tons (2015)



Source: IHS Transearch, WSP analysis, 2017

Agriculture is the top outbound product by value. Other outbound commodities with high value include refined petroleum products, chemical products, and food.

2.3 THE HIGHWAY SYSTEM

2.3.1 Oklahoma Highways and Truck Freight Flows

ODOT is responsible for 12,255 highway miles in the state; the Oklahoma Turnpike Authority system covers 597 miles – for a total of 12,852 miles of highway network. Cities, towns, and counties are responsible for the remainder of the public road system; these roads are primarily minor collectors and local streets.

The State Highway System serves industries and population centers as well as freight passing through Oklahoma that originates and terminates in other states. By virtue of its location, Oklahoma is a crossroads of highway commerce. **Table 4** summarizes the ODOT highway mileage by type.

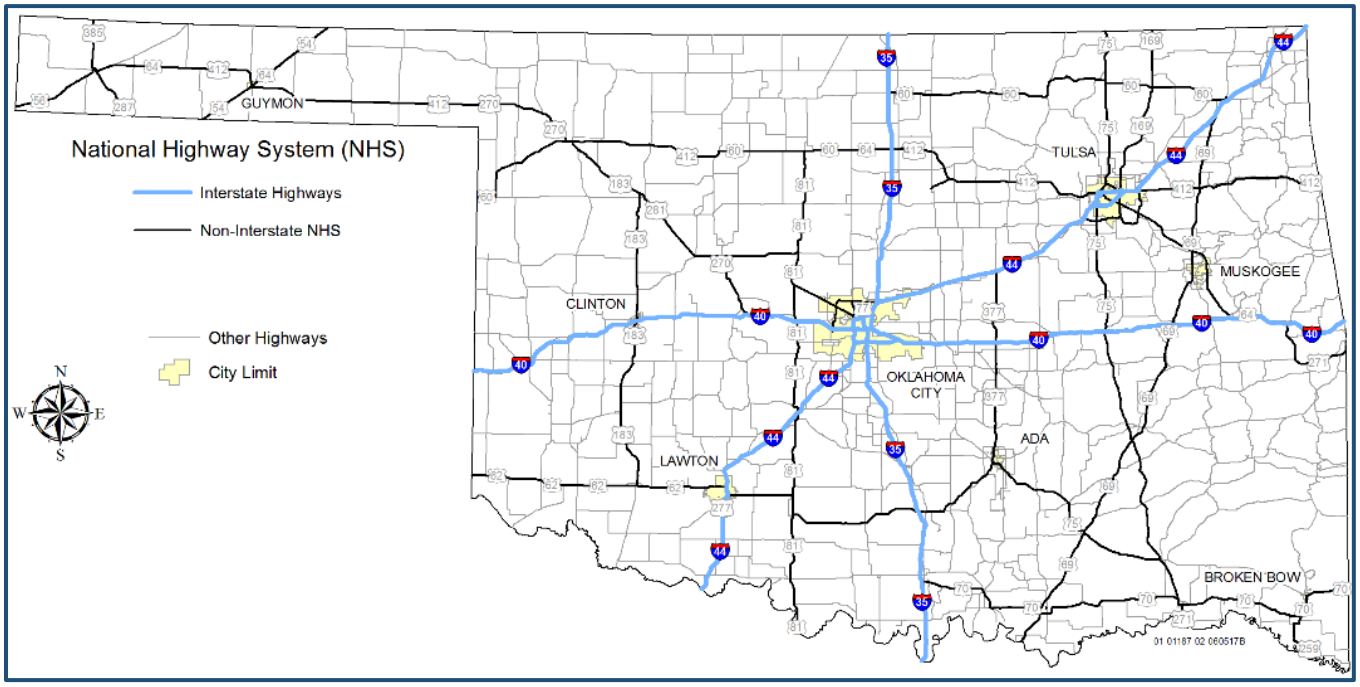
Table 4: Oklahoma Highway Mileage by Classification (2016)

Interstate	Other Freeways and Expressway	Other Principal Arterial	Minor Arterial	Major Collector	Total
933	195	2,982	2,886	5,856	**12,852**

Source: Federal Highway Administration, 2017

Figure 7 shows the Oklahoma highway network.

Figure 7. Oklahoma State Highway System

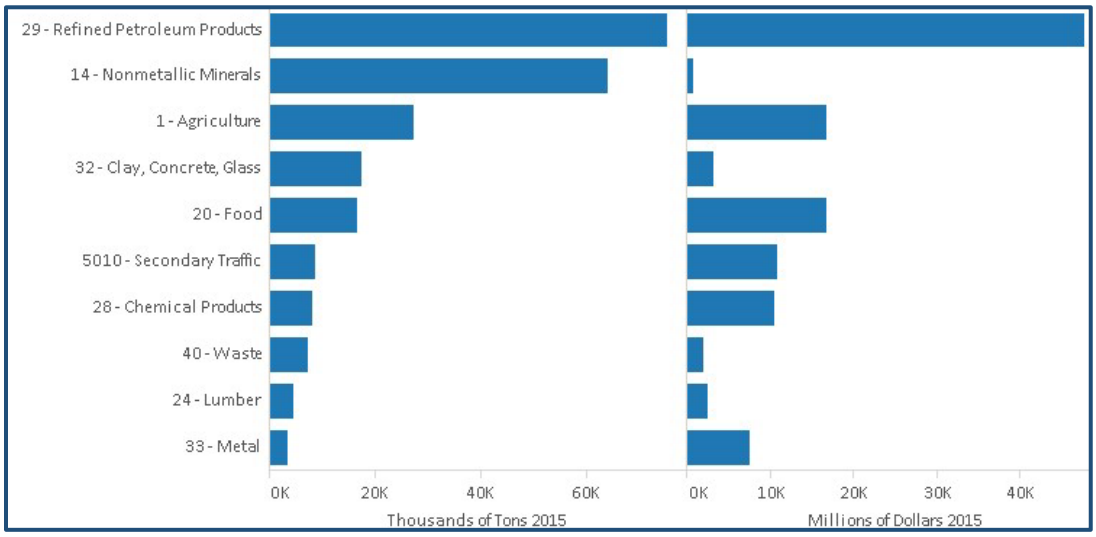


Source: IHS Transearch, Oklahoma Department of Transportation, and WSP analysis, 2017

2.3.2 Top Commodities by Truck Into, Out Of, Through and Within Oklahoma

The top commodity group for both tonnage and value transported by truck (**Figure 8**) is refined petroleum products. The second commodity group for tonnage by truck is nonmetallic minerals. Agricultural products and food are also highly ranked commodities by tonnage and value.

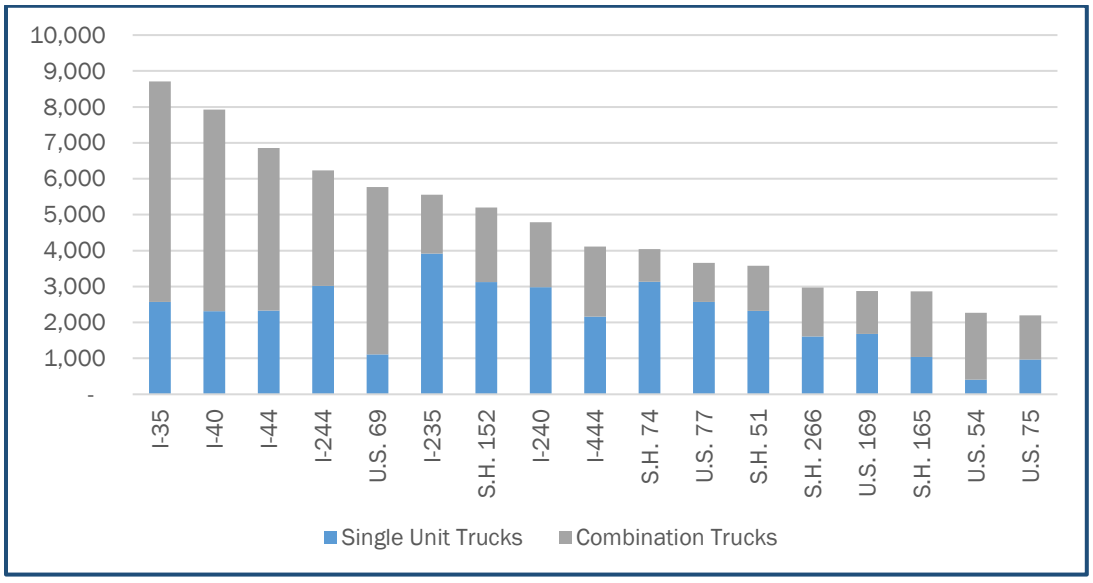
Figure 8. Top Oklahoma-Based Commodity Groups by Truck, Ranked by Tons (2015)



Source: IHS Transearch, WSP analysis, 2017

Figure 9 shows the Oklahoma highways that have the greatest truck volumes. I-35 and I-40 have the most trucks, followed by I-44 and I-244, with each of these facilities carrying more than 6,000 trucks per day. U.S. 69 carries approximately 6,000 trucks per day and represents a key north-south route that runs from Minnesota to Texas, forming an important connection between the Midwest and Dallas. It also intersects I-44 and I-40 in Oklahoma.

Figure 9. Major Oklahoma Truck Traffic Highways (2015)



Source: Oklahoma Department of Transportation, Traffic Analysis Branch, 2016.

2.3.3 ODOT Intelligent Transportation System Program

The ODOT Intelligent Transportation System (ITS) program employs and maintains technologies that benefit freight and is planning to expand its effort. This program works in parallel with project development to improve operations on the State Highway System. ITS improvements will benefit freight transportation considerably; and support this OFTP's goals of safety, infrastructure preservation, mobility, economic vitality environmental responsibility, and efficient system management and operation.

The chief ITS initiatives include the following:

- Dynamic message signs
- Land mobile radio for first responders
- Road weather information system
- Bluetooth sensors to provide commercial motor vehicle origin and destination data
- Vehicle-to-infrastructure communications

ODOT manages 2,600 linear miles of fiber optics and has 64 dynamic message signs (DMS) installed statewide. While these ITS technologies help trucks and general traffic, ODOT has freight-specific applications. For example, ODOT is adding permanent full-size DMSs in both directions near the Ports of Entry (POE) around the state. The POE personnel will be able to view and control the cameras. In addition, ODOT is installing more DMSs and cameras around the state—typically in metropolitan areas.

ODOT is expanding the Land Mobile Radio system to be statewide on a mesh network of Multiprotocol Label Switching equipment. In terms of traffic incident management, ODOT is replacing its static, public facing map with one that will report the latest road and weather conditions in real-time.[6]

The Road Weather Information System expansion project will add 16 new sites at critical bridges along I-35 (border to border) to supplement six existing sites. The system will provide pavement, bridge deck, and subsurface temperatures, as well as moisture and air temperatures. This data will be available to field divisions to inform decisions about deployment of roadway maintenance personnel. In addition to being more efficient, it will improve roadway operations and safety—a significant factor for trucking.[7]

ODOT has a contract with state universities to explore the use of Bluetooth sensors along I-35 and I-44, and in the Oklahoma City and Tulsa metropolitan areas. This will allow determination of origin-destination for trucks. Another demonstration project will use technology applications to develop computer recognition of vehicle classification.

These technologies allow ODOT to obtain and disseminate more up-to-the-minute information about highway conditions, which improve efficiency of operations and vehicular travel.

2.3.4 Heavy Cargo, Heavy Loads

Better ways to manage heavy cargo is a growing need in every state. For the purposes of developing a FAST Act-compliant freight plan, the definition of heavy loads includes regulation-size vehicles carrying heavy cargo, oversize/overweight loads (OSOW), and superloads. Harmonization of regulations and processes across state lines is an important topic in most states, and especially those like Oklahoma, which are in the middle of the country and experience a great deal of interstate transport.

Heavy Cargo

Various industries—including construction, energy, and agriculture—use fully loaded regulation-size vehicles carrying heavy cargo. Heavy cargo includes construction aggregates, water furnished to well sites, and heavy farm or oil rig equipment.

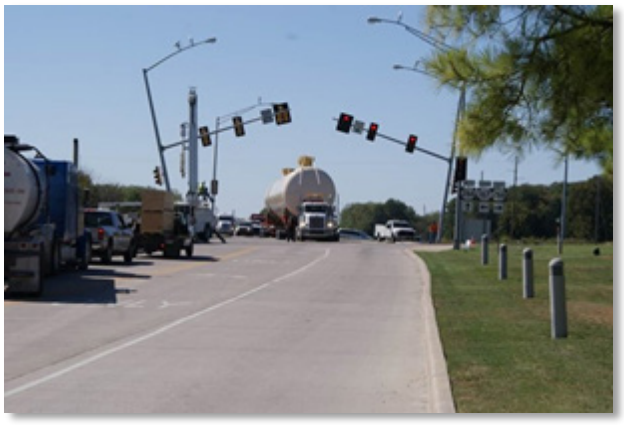
Oversize/Overweight Loads

Oklahoma's highways support the movement of regular and OSOW loads in accordance with state and federal statutes. OSOW loads are trucks whose dimensions and/or weight limits exceed legal limits, and with some exceptions, cannot be split into multiple smaller loads. The Oklahoma weight threshold for the common tractor trailer combinations is 80,000 pounds on interstate highways and 90,000 pounds on non-interstate highways. Many states, including Oklahoma, have automated permit processes and capture data for reference and planning. The automated permitting and routing system in Oklahoma is managed by the Oklahoma Department of Public Safety. Known as OKiePROS[8] and the first of its kind, the system speeds the approval process even for loads wide enough to affect two lanes, Creation and maintenance of databases from such systems is an important component to improving the efficiency of interstate operations.

Superloads

Loads or vehicles that are 16 feet wide x 21 feet high and 180,000 pounds or more are considered superloads in Oklahoma. When a load extends beyond the maximum dimensions or weight of a routine single-trip permit, it is subject to additional permitting requirements.

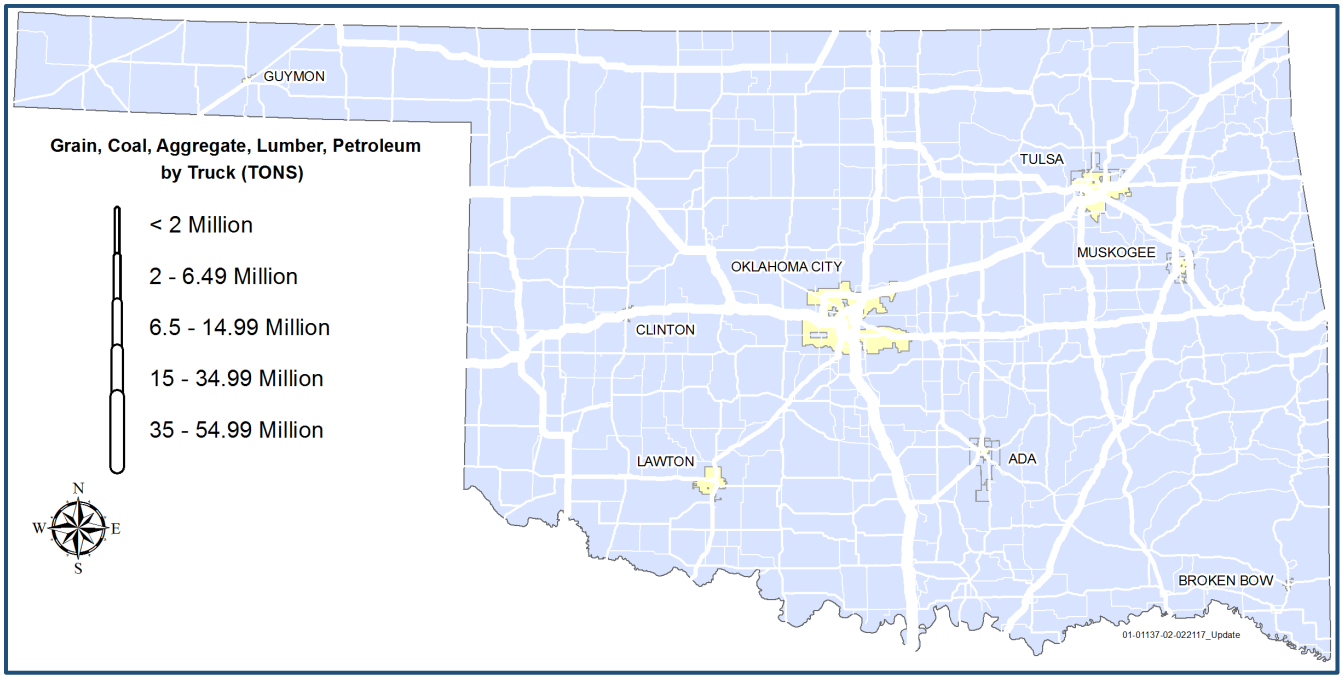
Energy-related businesses rely on this type of shipment, and wind energy components and drilling and mining equipment are moving in regions not previously traversed by this type of cargo. Agricultural equipment—implements of animal husbandry—forms a special class of OSOW requirements. The axle ratios on this equipment differ from trucks and can present special challenges for complying with bridge restrictions.



Oversize truck on S.H. 266

Figure 10 maps the flow of trucks with heavy loads traveling over the Oklahoma State Highway System, based on the Transearch freight flow analysis. The largest total freight volumes, for all modes combined, occur in the north-south corridor that includes the I-35 truck and the parallel BNSF rail corridor. Several corridors surrounding the ports in northeast Oklahoma also exhibit the transport of heavy loads.

Figure 10. Heavy-Loaded Truck Flows



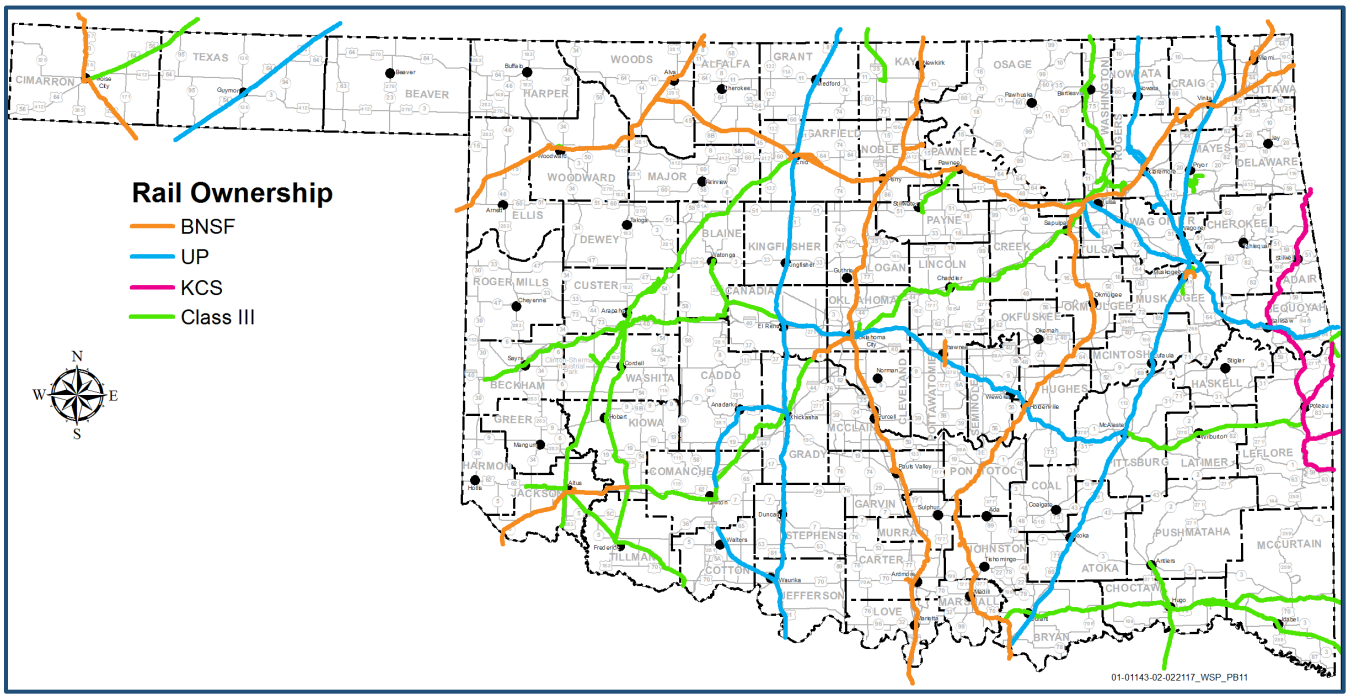
Source: IHS Transearch, Oklahoma Department of Transportation, and WSP analysis, 2017

2.4 RAIL

2.4.1 Oklahoma's Railroads

Figure 11 shows the location of the railroads within the state. The three Class I railroads[9] in Oklahoma are the BNSF Railway (BNSF) which owns 966 route-miles in the state, Union Pacific Railroad (UP) with 894 route-miles, and Kansas City Southern Railway Company (KCS) with 152 route-miles. Class I railroads serve multiple markets and population centers in the state as well as handling through traffic.

Figure 11. Oklahoma Rail Network



Source: Oklahoma DOT, 2017

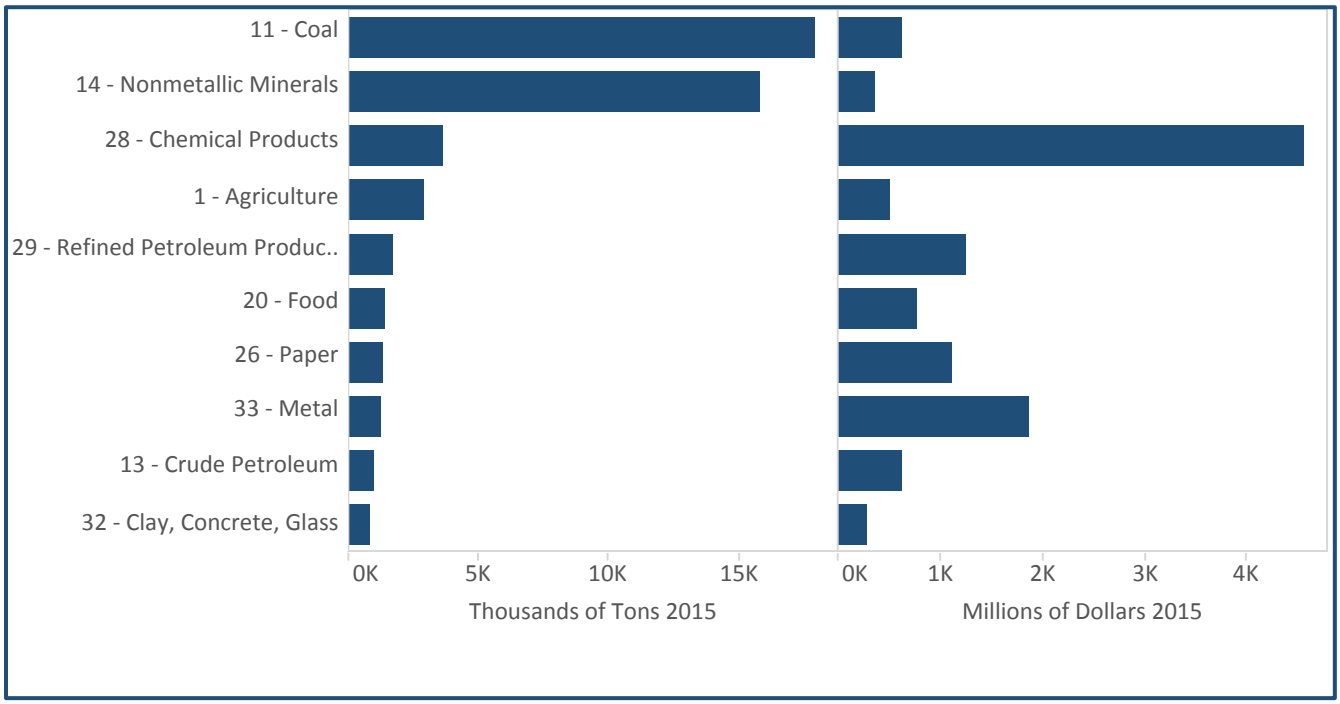
Oklahoma has 18 short-line railroads that provide critical connection to businesses in various parts of the state and play an important role in local economies.

Wichita, Tillman and Jackson Train

2.4.2 Commodity Flows by Rail Into, Out of, Through, and Within Oklahoma

The top weight commodity group transported by rail is coal, followed by nonmetallic minerals. Chemical products are the largest commodity group by value, with metal products following in second place (**Figure 12**).

Figure 12. Top OK-Based Commodity Groups by Rail, Ranked by Tons (2015)



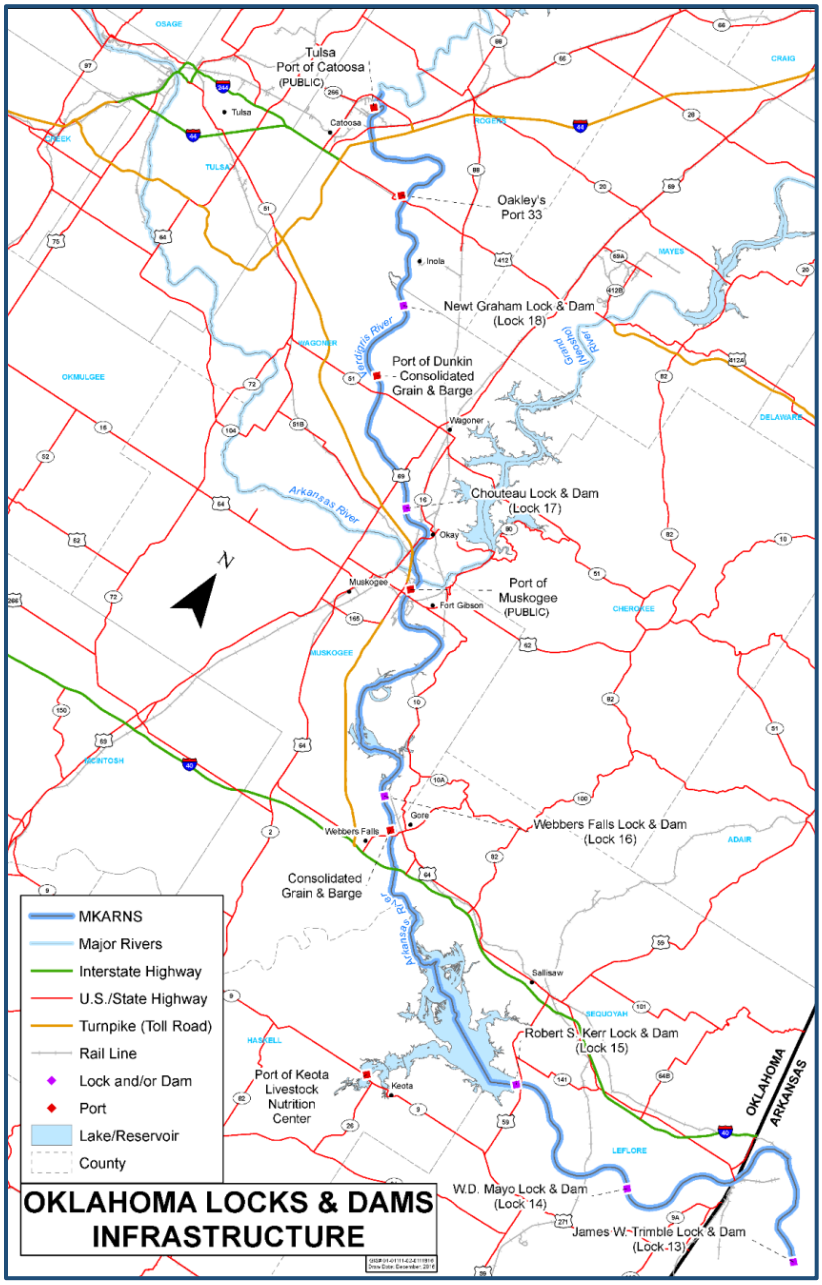
Source: IHS Transearch, WSP analysis, 2017

BNSF bridge over the Oklahoma River, south of downtown Oklahoma City

2.5 OKLAHOMA WATERWAY SYSTEM

Figure 13 displays the MKARNS system in Oklahoma and identifies each lock and/or dam. The MKARNS connects through the Arkansas and Mississippi Rivers to the Gulf of Mexico, the Great Lakes, the nation and the world.

Figure 13. McClellan-Kerr Arkansas River Navigation System

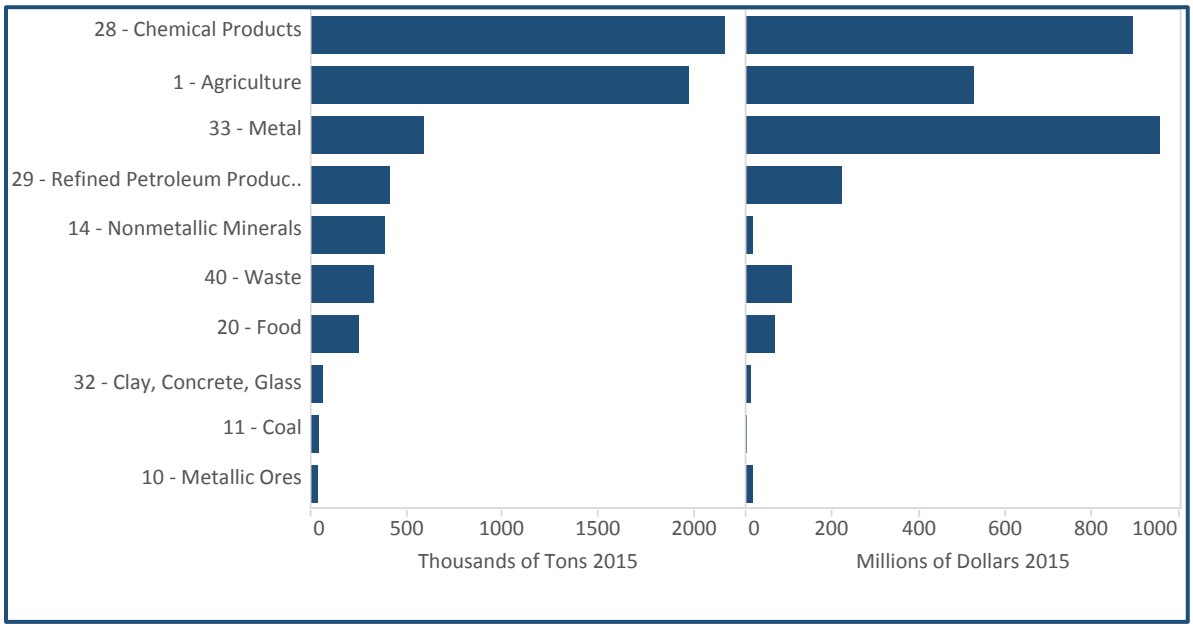


Source: Oklahoma Department of Transportation, 2017.

2.5.1 Commodity Flows by Water Into, Out of, Through, and Within Oklahoma

The top four commodity groups in both tons and value transported by waterways in Oklahoma are chemical products, agriculture, metal products, and refined petroleum products (**Figure 14**).

Figure 14. Top OK-Based Commodity Groups by Water, Ranked by Tons (2015)



Source: IHS Transearch, WSP analysis, 2017

2.5.2 Waterway System and Volume

Oklahoma's waterborne freight traffic is handled entirely via the MKARNS, which connects Oklahoma to the Lower Mississippi River, providing access to states along the Mississippi/Missouri/Ohio river system, the Great Lakes, the Gulf of Mexico, the U.S. Intracoastal Waterway system, and deep-draft open-ocean shipping lanes, and linking Oklahoma with global waterborne trading partners.

Waterborne transport plays a critically important role in allowing Oklahoma to ship and receive fertilizer, grain, metal products, large machinery and equipment, and other cargo that is physically or economically impractical to move by other modes. Oklahoma's ports also serve freight shippers and receivers in Kansas and other states via landside truck and rail connections.

The MKARNS is a 445-mile navigation channel that includes the Verdigris, Arkansas, and White Rivers. From the Mississippi River, the channel follows the Arkansas River across the Oklahoma state line to the Port of Muskogee; from there, the navigation channel follows the Verdigris River, running 51 miles upstream to the Tulsa Port of Catoosa.

RELIABILITY

The MKARNS is an all-season, ice-free system offering high reliability. There have been no closures due to low water events. In 2015, operations were suspended for 90 days due to heavy rains.

2.5.3 Key Facilities

Tulsa Port of Catoosa

The Tulsa Port of Catoosa is located at the head of the MKARNS in northeast Oklahoma. The port is situated on approximately 2,500 acres, accommodating an industrial park with 63 facilities, primarily including manufacturing, distribution, and goods processing companies. Along its 1.5-mile channel, the port offers a diversified set of cargo handling facilities, including unique capabilities for the handling of oversize/overweight "project cargo." Port facilities handled more than two million tons of waterborne freight in 2016.

Tulsa Port of Catoosa

Port of Muskogee

The Port of Muskogee is located near the confluence of the Arkansas, Verdigris, and Grand Rivers. The port is situated on approximately 450 acres. The port also owns the John T. Griffin Industrial Park, which consists of 527 acres. In 2015, the port handled 689,000 tons of cargo.

Port of Muskogee

In addition to terminals, mooring and dock facilities, and a 94,000-square-foot warehouse, the port has overhead and mobile cranes for transloading between barge, rail, and truck, including a 100-metric-ton marine travel lift. The Port of Muskogee provides extensive rail service (via UP) to its users. In 2015, the port was served by 2,210 railcars handling 205,054 tons of freight. The port cannot accommodate unit trains due to track curvature issues, and has submitted a Transportation Investment Generating Economic Recovery grant application to extend tracks and reduce curvature.

OAKLEY'S PORT 33

Oakley's Port 33 is a privately owned port located in Catoosa, southeast of the Tulsa Port of Catoosa and east of Tulsa, just north of the U.S. 412 bridge over the Verdigris River. Formerly named Johnston's Port 33, Bruce Oakley purchased the port in 2014. Port 33 handles over 2.7 million tons of dry bulk annually.

Oakley's Port 33, Catoosa

The original facility consisted of 35 acres, and includes six transfer docks and warehousing for 10 different fertilizer companies. In 2009, a 90-acre expansion area (Port 33 South) was added, which will allow the port to double its capacity. Collectively, Port 33 offers eight docks and five 70-foot truck scales, with fleeting for around 100 barges. Port 33 is entirely truck-served; there is no direct rail service to the site. The nearest rail service is the Burlington Northern Santa Fe, which is seven miles away in Catoosa.

2.6 OKLAHOMA AIR CARGO SYSTEM

Access to reliable air freight services is important to many businesses with high-value products or those requiring rapid transport. This includes medical instruments and advanced manufacturing components as well as many other commodities. Many manufacturers also utilize air freight for repair parts and stock outs. Adequate air service is an integral part of the capabilities necessary to support robust supply chains in the state. Oklahoma is fortunate to have air cargo access through Oklahoma City and Tulsa, and through its proximity to Dallas, TX.

There are three primary commercial service airports in Oklahoma: Lawton-Fort Sill Regional in Lawton, Will Rogers World in Oklahoma City, and Tulsa International in Tulsa. A primary service airport enplanes more than 10,000 people annually with scheduled service. There are two secondary commercial service airports at Enid and Ponca City. There are numerous regional and small private airports throughout the state for general service aviation and chartered freight service.

2.7 OKLAHOMA MULTIMODAL FREIGHT ASSETS

An important element of the freight system is the multimodal freight transfer of assets. These are facilities where freight is transferred from one mode to another. They may also provide storage capacity as well as services that add value to the product being shipped.

Oklahoma is fortunate to have options for several modes of freight transportation, including truck, rail, air and waterways. In addition, multiple modes are often involved in goods movement by using transload facilities. Transload freight occurs because of delivery or financial advantages, and constitutes a growing trend for freight

shipments in Oklahoma. In particular, there is an increasing demand for shipments that travel on Oklahoma rail or water systems, and use truck for "last mile" transport.

For purposes of this OFTP, three types of multimodal assets are addressed:

- Truck-rail container and trailer-transfer terminals (intermodal terminals)
- Transload terminals
- Grain elevators

2.7.1 Intermodal Terminals

Freight transportation planning has historically been mode-oriented. Increasingly, planning is shifting to a supply-chain focus with network connectivity being as important as the individual modal structure. Oklahoma's ability to reach markets outside the state and the nation depends on the interaction of the different modes and the way in which shippers can access the network.

Oklahoma has not had an intermodal terminal since 2005, when BNSF closed its intermodal terminal near Oklahoma City due to lack of demand. Container service for Oklahoma shippers and receivers is provided outside the state by way of Dallas, TX, Kansas City, MO, or Memphis, TN, depending on the location of the shipper in the state and the direction of the shipment. While some state development agencies might hope for new container services within the state, the realities of market costs make that nearly impossible. With relatively short distances to three major metropolitan areas with major intermodal terminals, Oklahoma is at a disadvantage for having one of the major railroads establish a new intermodal terminal in the state.

BNSF Cherokee Yard in Tulsa

The railroads and the asset-based intermodal service providers are engaged in efforts to increase the productive use of their equipment and improve levels of service in selected markets. This is true of all intermodal equipment but particularly for domestic, 53-foot containers. This need for efficiency in turning equipment pushes the services away from areas with a lower density of freight traffic. This is generating a move toward consolidating service to select terminal locations. The current intermodal service network fostered by this trend toward consolidation has a direct impact on the access that Oklahoma shippers have to localized container facilities.

2.7.2 Transload Terminals

Transloading is another form of transfer of freight from one mode of transportation to another; however, it pertains to non-containerized freight. It is used by railroad customers who do not have direct access to a rail line or who want a competitive option to a railroad that directly serves the shipper.

Transload operations involve products shipped in liquid or dry bulk or as break-bulk, dimensional cargo. Dry bulk commodities are shipped in unpackaged quantities. When direct truck-rail transfer is not possible, dry bulk commodities can be stored in an open stockpile (aggregates, minerals, ore, etc.) or in covered storage such as silos (grain). Liquids (petroleum, chemicals) are stored in tanks.

Oklahoma has over 40 transload terminals that handle a spectrum of products including sand, aggregates, grain, bulk, and dimensional products.

2.7.3 Grain Elevators

Grain elevators are a special form of a transload facility. Grain is delivered to the elevator by truck, stored, and then loaded into grain cars. The elevator provides storage capacity not available on the farm, but also aggregates smaller shipments into train-sized lots, reducing transportation costs to the shipper.

There are 101 grain elevators, located in 29 of Oklahoma's 77 counties. Garfield County, with Enid as the County Seat, has the largest number with 12 elevators. This is no surprise since western Oklahoma produces the state's largest crop—wheat, and Enid sits at the intersection of the UP, BNSF, and Grainbelt railroads. The Oklahoma State Rail Plan: 2018–2021 covers the topic of elevators and rail service in greater detail.

2.8 CURRENT CONDITIONS AND CHALLENGES

2.8.1 Truck Operations Concerns and Needs

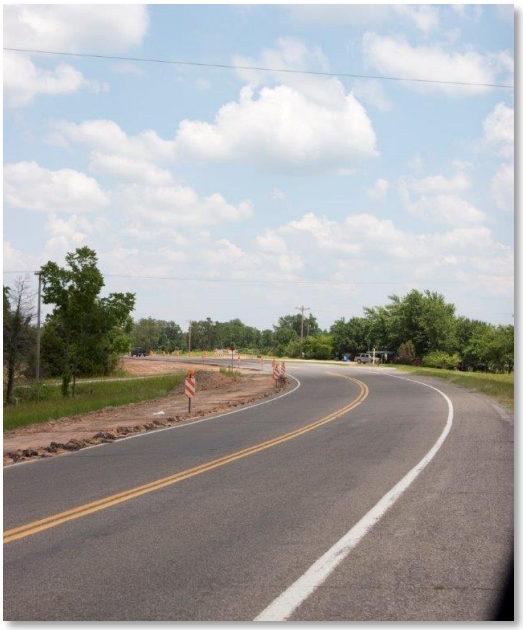
There are some specialized concerns affecting truck freight operations that warrant further consideration.

AGRICULTURAL EQUIPMENT ON ROADWAYS

As small family farms have given way to larger agricultural operations, equipment size has grown. It is necessary for this equipment to travel on local roads in order to move from field to field, or to deliver commodities to other locations, such as grain elevators using farm trailers and trucks. Off-highway equipment, such as combines, has different axle ratios that do not necessarily match that of regular trucking equipment. Load-posted bridges can require equipment to travel significant out-of-route miles to move on a single property.

NEED FOR SHOULDERS

Given that agriculture is one of Oklahoma's largest industries, this situation requires full consideration in infrastructure planning. One particular issue is the lack of shoulders on rural two-lane highways, which makes passing less safe, and affords no provision to pullover when breakdowns occur.



Constructing Shoulder on Rural Highway

> We need to work on providing adequate shoulders on our rural state highways for the safety of our employees and for rural residents.
> *—Oklahoma construction material supply company communications director*

HAZARDOUS MATERIALS

Just as OSOW cargo is increasing in volume, so is the amount of hazardous material, which includes chemicals and petroleum products that are part of the Oklahoma economy. Railroads are limiting their availability for some commodities, thereby pushing the haulage to truck. In Oklahoma, U.S. 69 is heavily used by the military to transport explosives. This is another example of the need for planning for hazardous routing and public safety.

MILITARY USE

An economic impact report produced by the Oklahoma Department of Commerce describes five military installations in Oklahoma employing 69,190 military personnel, military trainees, federal civilian personnel, and contractors. The economic impact in fiscal year 2010 was $9.6 billion to the gross domestic product (GDP) of Oklahoma (7 percent of the state's economy).[10]

> The Interstate and National Highway System is very important to assist the military in meeting their required response times. The combination of rail and highway transport options allows us to meet this portion of our mission.
> *—Engineer, Major Military Installation in Oklahoma*

The military uses commercial vehicles to provide the necessary military materials as well as the consumer goods required to support the base population. The facility at McAlester Army Ammunition Plant receives supplies and equipment, and produces armaments, with raw materials and products shipped by truck and rail. All the installations have rapid deployment needs that require a surge in capacity from commercial providers. The volume of traffic on U.S. 69 associated with the munitions depot is already high. A deployment surge would severely push the limits of that highway. This corridor has national significance and is designated as part of the Strategic Highway Network.

OVERSIZE AND OVERWEIGHT

It is important that states plan for and develop effective infrastructure on a network of routes that can accommodate the OSOW needs. This includes incorporating bridge limits and height restrictions. In Oklahoma, superload permits often trigger additional requirements, and can be more expensive than routine OSOW permits.

The agricultural bulk-transport sector has long been a proponent of higher weight limits, as have the logging and steel industries. Oklahoma has most of these commodity groups at the top of its economy. The higher weight limits reduce the number of trucks and improve hauling capacity. However, as weight increases, so does roadway deterioration.

RELIABILITY

Congestion has a direct economic impact on business. More equipment is required when transport times are longer; inventory requirements increase when deliveries are unreliable and additional distribution centers are needed to quickly meet market demand.[11] Restricted traffic flow in the highway network contributes to a higher cost of goods for business and consumers. Congestion affects transport time in two ways: reducing speed and

decreasing reliability. The reliability of travel time is more important to the planning of capacity and on-time service than is overall speed.

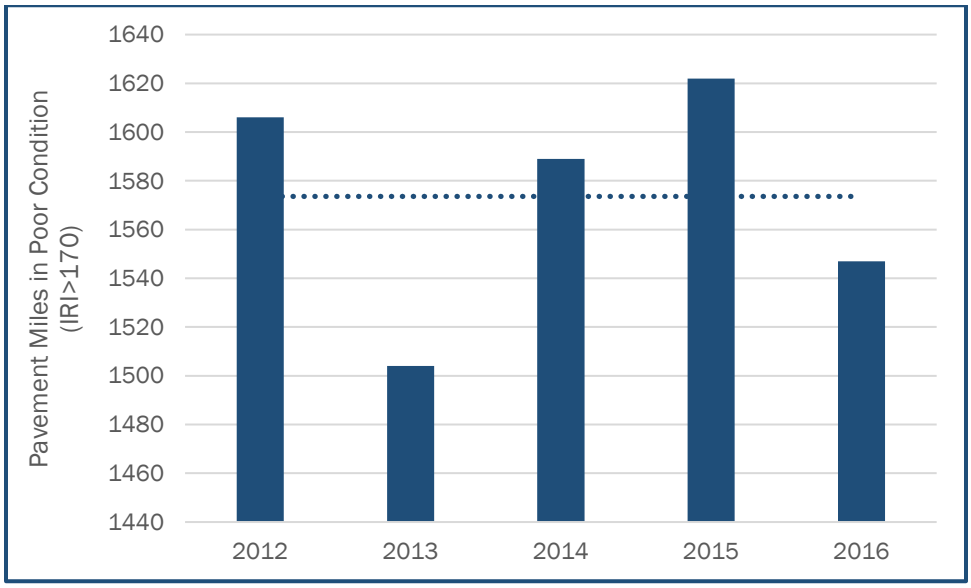
An analysis of delay and reliability was conducted as part of this planning process.[12] As would be expected, deteriorations in reliability occur in the more populated metropolitan areas. Chapter 5 presents details of these findings.

Pavement Condition

For the most part, the major highways are in fair to good condition with segments of the network northeast of Tulsa and in the Oklahoma Panhandle rated as poor. The challenge ODOT faces is to maintain pavement condition with current funding levels while addressing pavement deterioration from increased weight and volumes of vehicles, weather, and infrastructure age.

Figure 15 displays the number of miles of pavement on the State Highway System that were rated poor throughout the state between 2012 and 2016, using the International Roughness Index (IRI). As shown, poor pavement mileage increases and decreases, but the overall trend is relatively flat.

Figure 15. Pavement Condition



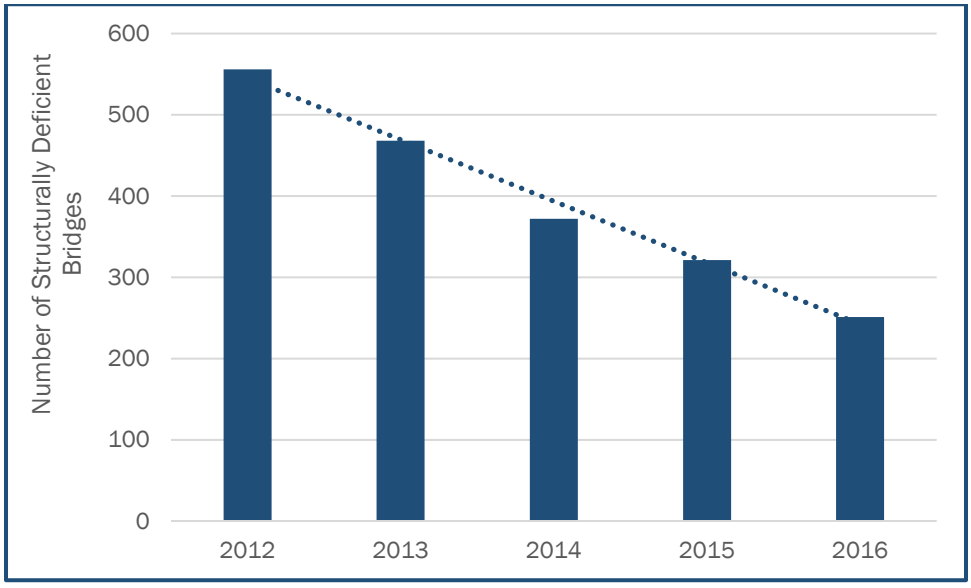
Source: Oklahoma DOT

Bridge Condition

ODOT has a very aggressive bridge repair program in place. **Figure 16** shows the rapid decline in the number of structurally deficient bridges on the State Highway System between 2012 and 2016. The number of structurally deficient bridges is targeted to drop to less than 1 percent by the end of the decade.

S.H. 15 in Woodward County

Figure 16. Bridge Condition



Source: Oklahoma DOT

2.8.2 Freight Railroad Concerns and Needs

The 2012 Oklahoma Statewide Freight and Passenger Rail Plan identified four broad needs. Preliminary stakeholder discussions for the Oklahoma State Rail Plan: 2018–2021 covered many of the same issues:

- The need to support and promote rational growth of the short-line industry and passenger rail service in the state
- The need to find new sources of funds to replace lease revenues lost as rail lines owned by the state revert to the rail operators as part of the lease-purchase program
- The need to exploit the economic and public benefits of rail transportation
- The need to inform the public of the benefits of rail transportation.

NEED TO SUPPORT SHORT-LINE RAIL INDUSTRY

Oklahoma's short-line railroads are important to the economy of the state. They provide rail service to some of the state's smaller economic centers and communities. Several needs have been identified to preserve and grow the role of the short-line railroads:

- **Track Upgrades** – Upgrading all critical lines to accommodate the higher capacity, heavier weight freight cars will permit Oklahoma's rail customers to remain competitive. A number of Class III (short-line) railroads are unable to accommodate industry-standard 286,000 pound gross weight. In some cases, track infrastructure limits railcar size; other times bridges are inadequate to withstand the weight of these heavier railcars.
- **Unit Train Capacity** – The rail industry has also shifted toward handling unit trains, which typically include at least 110 cars and travel as one unit between origin and destination. The other common train type is "manifest" trains, which are constituted at classification yards with railcars of multiple origins and destinations. But not all of Oklahoma's rail infrastructure can accommodate unit trains. For example, connections between Class I (large) railroads and the regional Class III railroad at Enid, OK, limits train size to 50 cars, which is smaller than most unit trains.

- **Rail Corridor Preservation –** A rail corridor preservation program to retain abandoned rail lines for future rail use (even in those instances where the tracks have been removed) should be considered. Some Oklahoma rail lines are underutilized, which is a cause for concern.

NEED FOR RAIL-SERVED INDUSTRIAL PARKS

The need to establish more rail-served industrial parks has been identified. The industrial parks would generate new rail business not only for the short-line and Class I railroads but also additional economic development in smaller communities. There is need for rail spurs and industrial rail leads connecting Oklahoma's industrial properties to the Oklahoma rail network.

Both Oklahoma City and Tulsa have been cited as areas where additional transload facilities could enhance economic development. Additional team tracks would provide alternatives to shippers that are not directly served by rail in rural areas. In some cases, multimodal facilities need to be upgraded. For example, the track geometry at the Port of Muskogee prevents use by six-axle locomotives and long blocks of 286,000 pound railcars. As opportunities for new industries arise, rail improvements need to be addressed.

HIGHWAY-RAIL GRADE CROSSING IMPROVEMENT

When asked about freight bottlenecks for the Oklahoma State Rail Plan: 2018–2021, stakeholders cited impeded highway freight mobility attributable to at-grade highway-rail crossings. These included crossings in Claremore, Moore, Owasso, and Thomas.

At-Grade Rail Crossing

ELIMINATION OF BOTTLENECKS AND OTHER IMPEDANCES

A critical need, which will be examined and addressed in more detail in later sections, is the elimination of operating hindrances due to capacity restrictions or physical obstructions. Capacity restrictions include track and facility capacity. Physical obstructions limit the ability to use larger profile freight cars, particularly in transporting containers or automobiles.

2.8.3 Waterways Concerns and Needs

MKARNS MAINTENANCE BACKLOG

While the MKARNS offers strong performance and high reliability, it also faces a significant maintenance backlog. Although Oklahoma's ports have different individual plans and needs, there is agreement that the single most important priority is to preserve the safe, reliable, and productive operation of the MKARNS itself.

Like the rest of the U.S. Inland Waterway system, the MKARNS has a substantial list of unfunded "critical backlog" projects, above and beyond routine maintenance. "Critical backlog" is defined as an estimated 50 percent chance of component or asset failure within a five-year period.

MKARNS DEEPENING

The MKARNS has a 9-foot controlling navigation depth, while most of the Inland Waterway system offers at least 12-foot depths. The shallower 9-foot depth means that barges cannot be as heavily loaded. This, in turn, means

that the costs of barge shipment must be spread over less tonnage, producing higher cost-per-ton rates for shippers.

Plans to deepen the MKARNS to 12 feet have not been advanced due to the significant capital and maintenance costs. While deepening would benefit freight shippers, it is not clear that the cost savings would result in significant additional freight being attracted to the MKARNS, since barge shipping is already significantly more cost effective than truck or rail on a per-ton basis. Ports might see some increase in traffic—and in revenues—but they might not, and their return on investment might actually decline.

MARKET GROWTH AND CHANGE

The total volume of freight on the MKARNS, and the mix of commodities making up the total, is constantly changing. Since 2004, Oklahoma's MKARNS traffic has fluctuated between 3.8 and 6.2 million tons annually. Chemical fertilizer volume has been remarkably stable, showing consistent year-over-year growth; grains have been more variable, while energy products and building materials have been highly variable.

There is now some uncertainty about the future of the chemical fertilizer market as well. Exploring and developing new markets for upbound MKARNS commodities should be a priority for Oklahoma, since this will not only increase overall freight tonnage, but also help ensure that empty barges are available for downbound traffic.

MODAL LINKAGES AND LANDSIDE ACCESS

Each of Oklahoma's ports depends on efficient connections with truck and rail, but they have very different types of needs:

- For the Tulsa Port of Catoosa, rail access is very strong, but the accommodation of OSOW freight moving by truck has been identified as a need to support the port's heavy-lift project cargo opportunities.
- For the Port of Muskogee, the primary identified need is for rail improvements that would allow long unit trains to call directly at the port, reducing costs for current rail users and potentially attracting new rail business.
- For Port 33, the provision of the connector road between the original facility and Port 33 South addressed a major need. Given the port's exclusive dependence on trucking, the primary need is to ensure that critical truck access routes can accommodate future growth in a safe, efficient, reliable manner.

2.8.4 Challenges for All Freight Modes

Freight transportation requires smooth pavement, structurally sound bridges, and ongoing railroad and waterway infrastructure improvements to deliver products safely and efficiently. Highways need to be maintained and interchanges need to be reconstructed. Growth needs to be accommodated without deterioration in freight service performance. Freight rail systems require track repair and bridge rehabilitation, and rail-highway crossings must be safe. The MKARNS needs to address deferred maintenance on its locks and dams.

The financial challenges for ODOT are increasing as it seeks to maintain and improve the state transportation system. Revenue growth is minimal and costs are escalating. Based on fiscal year 2015, ODOT's total budget was about $1.9 billion, with a capital budget of $1.1 billion, which was broken down as follows:

- About 50 percent from federal revenue—mostly federal highway funds
- About 15 percent from state motor fuel tax
- The remaining 35 percent from a combination of bonds and other state and local revenues

With vehicle fuel efficiency increasing, and accelerating demands on the system, Oklahomans must address transportation funding issues. Oklahoma's 2015 through 2040 LRTP shows that the expected funding gap averages $360 million per year over 25 years, if current trends continue. Needs exceed expected available revenues by nearly 20 percent annually. Clearly a major component of addressing Oklahoma's freight needs is the challenge of finding additional funding.

3.0 Outreach

Outreach to industry stakeholders and to the public has played a significant role in developing this OFTP. Multiple channels were used to gather information. Each method was important for gathering information from different perspectives and supporting the research and informing this Plan.

I appreciate the opportunity to learn more about how our company can participate in managing our transportation future.
—Construction Equipment Manufacturing Company Manager

3.1 WEBSITE

A website was created to facilitate outreach and maintain a repository for plan reports and other pertinent information available to the interested public (*http://www.okstatefreightplan.com*). Relevant reports and other details were maintained on the site and were updated as this OFTP progressed through approval and implementation.

3.2 SURVEY

The website was also a vehicle to access a survey developed for this OFTP. The survey results helped to gauge interest in different modes of freight transportation. The survey included questions regarding safety, OSOW vehicles, intermodal freight, truck parking, and the informed and efficient delivery of the freight transportation program in Oklahoma. In addition to the electronic posting, the survey was made available to freight industry professionals and other stakeholders in various meetings and presentations.

Freight Advisory Committee Meeting, January 2017

3.3 FREIGHT ADVISORY COMMITTEE

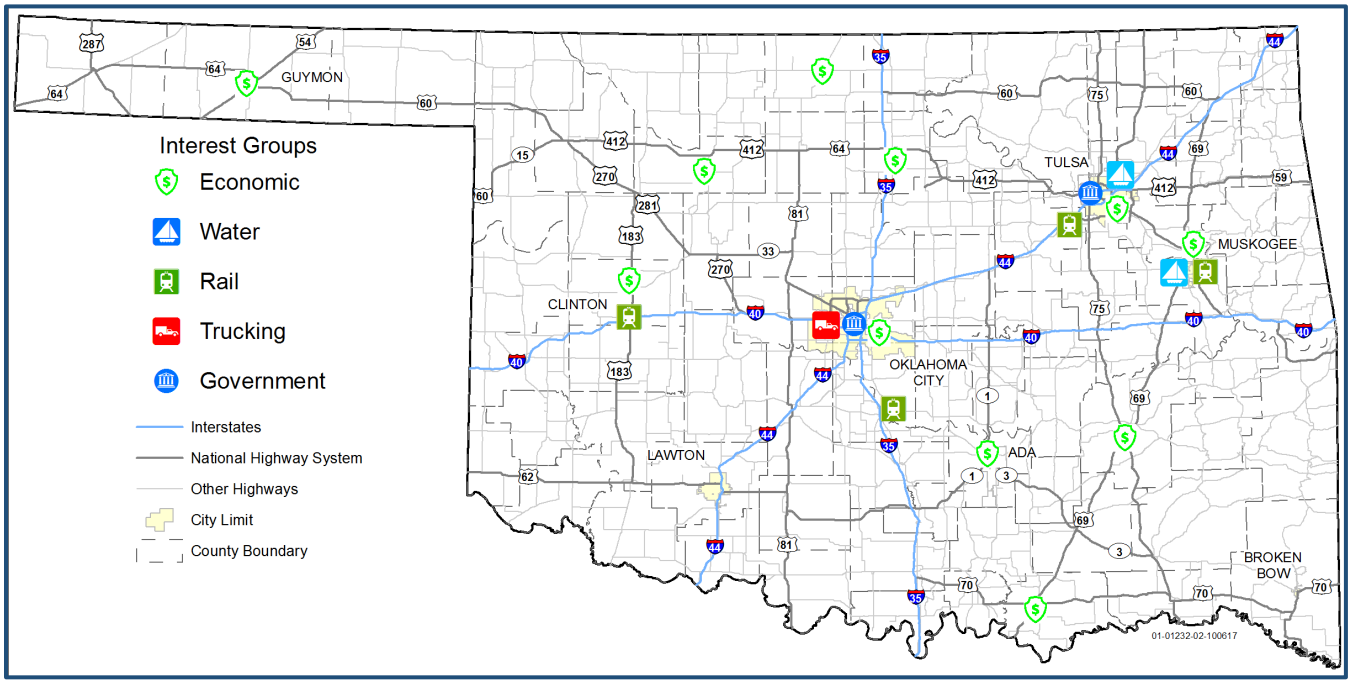
An FAC was created to assist in the OFTP process by helping to prioritize goals and identify concerns around particular operational issues such as bottlenecks. The FAC was important to sharing information related to industry, regulatory, and public priorities, and providing input on proposed strategies and projects. Members of the FAC included representatives from industries critical to the state's economy, representatives of transportation service providers, and multimodal facilities such as ports (**Table 5**). Safety enforcement, planning organizations, tribal governments, and other state and federal agencies were also included. Four FAC meetings were held beginning in November of 2016 and extending through October of 2017.

Table 5. Freight Advisory Committee Members

FAC Members	Entity/Agency
John Sharp	Association of Central Okla. Governments
Paul Cristina	BNSF Railway
Jake Kimery	Chesapeake Energy
Brad Williams	Chickasaw Nation
Wayne Wylie	Choctaw Nation
Ryan Emery	Consolidated Grain and Barge
Ethan Nall	Devon Energy
Rodney McCaul	Ditch Witch
Kermit Frank	Dolese Brothers Co.
Troy Rigel	Equity Marketing Alliance
Judy Petry	Farmrail System, Inc.
Winford Navreth	Fed Ex
Larry Ramsey	Federal Motor Carrier Safety Administration
Richard Jurey	FHWA – OK – Performance Management
Isaac Akem	FHWA - OK - Planning
Huy Nguyen	FHWA - OK - Safety
Viplav Putta	Indian Nations Council of Governments
Andrew Scherman	McAlester Army Ammunitions Plant
David McCorkle	McCorkle Trucking
Mitch Surrett	ODOT Legal
Matt Swift	ODOT Strategic Asset & Performance Management
Craig Moody	ODOT Rail
David Glabas	ODOT Traffic Engineering
Deidre Smith	ODOT Waterways
Jim Rodriguez	Oklahoma Aggregates Association
Lynne Jones	Oklahoma Corporation Commission
Jim Reese	Oklahoma Department of Agriculture
Jon Chiappe	Oklahoma Department of Commerce
Lt. Kirby Logan	Oklahoma Highway Patrol
Lori Peterson	Oklahoma Railroad Association
Jim Newport	Oklahoma Trucking Association
David Murdock	Oklahoma Turnpike Authority
Derek Sparks	Oklahoma City Chamber of Commerce
David Yarbrough	Port of Catoosa
Chris Williams	Port of Muskogee
Darrin Karley	Seaboard Foods
Brad Beam	Tinker Air Force Base
Mike Kerr	Tulsa Airport
Brandon Morris	Union Pacific Railroad
Richard Kincade	UPS
Shane Charlson	U.S. Army Corps of Engineers

FAC members cover a diversity of interests and locations as shown in **Figure 17**.

Figure 17. Headquarters or Major Business Locations of Freight Advisory Committee Members



3.4 INTERVIEWS

Seventeen interviews were completed with freight industry professionals both in person and by phone. The purpose of the interviews was to learn about freight issues from the perspective of industry stakeholders. Questions centered on the ways the industries rely on the Oklahoma freight network, the various modal needs, along with the state of the infrastructure critical to their operations. Concerns regarding policy and regulatory issues were also expressed in the interviews. The selection of candidates was designed to provide a distribution across commodity groups, transportation modes, and geographic locations, both urban and rural.

3.5 PUBLIC MEETINGS

In addition to the FAC and interviews, other meetings were held around the state to solicit input and to disseminate information about this OFTP and the development process. There are nine rural regional planning organizations, and four MPOs in Oklahoma. Staff and board members from these organizations shared information with ODOT and the freight plan consulting team at various stages in this OFTP process.

In June 2017, midway through this OFTP process, three community meetings were held in the western, central, and eastern parts of the state. These meetings were open to the public and like the planning organization meetings were designed to provide information to, and receive feedback from, individuals interested in the freight plan process.

Plan Open House in Tulsa, June 2017

Moore Open House, June 2017

Greeting People at the Weatherford Open House, June 2017

3.6 COORDINATION WITH OTHER STATES

Oklahoma is bordered by Kansas, Missouri, and Colorado to the north, Arkansas to the east, New Mexico to the west, and Texas to both the south and west. ODOT regularly communicates with the neighboring state departments of transportation. More frequent and focused communications occurred during the development of this OFTP. The topics of interest across state lines concerned areas where water, rail, or highway freight corridors affected multiple states and where the states share the economic impact of freight transport.

4.0 The Freight Future

This chapter describes trends that affect the demand for and provision of freight transportation services in the state. The text outlines the implications that these trends pose for the current freight system in Oklahoma. It closes with a discussion of long-term forecasted freight flows and needs.

4.1 TRENDS

Freight transportation has always responded to changes in the economy and goods movement patterns. In recent years, the freight transportation process has undergone significant transformation. This section describes the trends that will affect freight transportation in the future.

4.1.1 Energy Trends

Energy in Oklahoma is seen both as a major industry, and as an important national and international commodity. Because the state is heavily involved in oil and gas production, the international picture is highly valued in Oklahoma. Oklahoma produces crude oil, refined petroleum products, and natural gas, a more environmentally viable option over other fossil fuels. Wind energy is growing in importance as a resource to the state.

Vehicle-related emissions are a concern associated with increased rail and truck traffic. Oklahoma is in compliance with U.S. Environmental Protection Agency air quality standards, in part because of efficient travel patterns, relatively low-emission rail service, and promotion and use of alternative fuels.

THE BAKKEN REGION-IMPACT ON OKLAHOMA

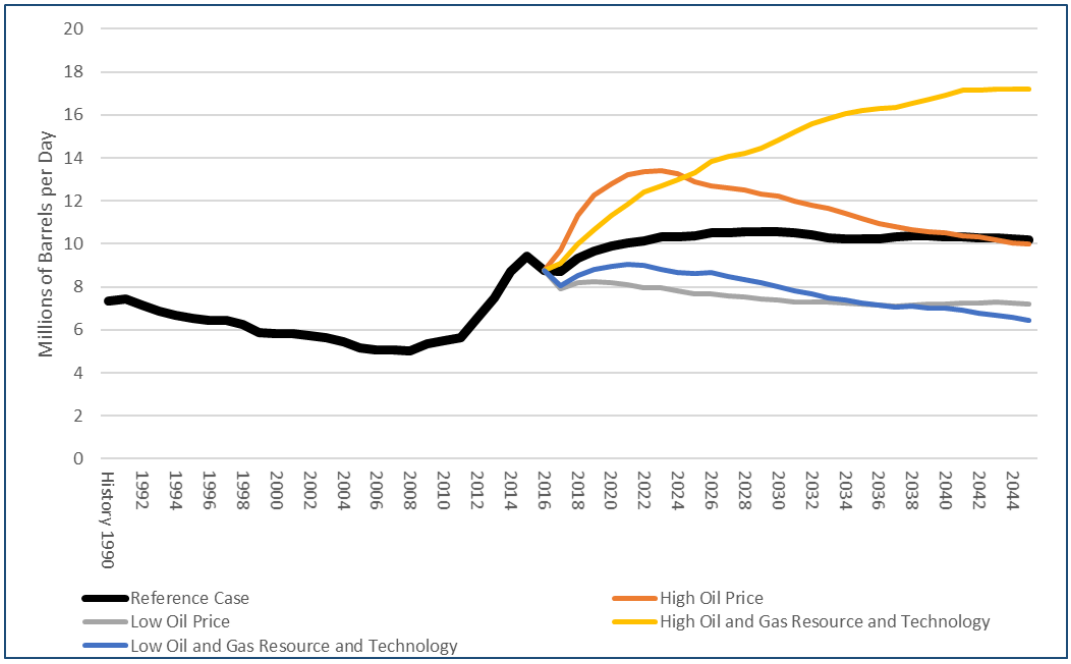
The U.S. Energy Information Administration has produced several forecasts for U.S. crude oil production reflecting varying assumptions on price and technology (**Figure 18).** Unless there is an increase in oil prices, the U.S. Energy Information Administration expects nationwide production to fall in 2017, and then rise slightly and stabilize in the 2020s. Should oil prices trend downward, production is expected to also decrease.

Oil transported in Oklahoma is influenced by production at two sources. One source is oil extracted locally in Oklahoma. Most of the locally produced oil moves by truck to bulk storage facilities or pipeline hubs. The second source of oil—one that materialized within the last five years—is the Bakken Formation (the Bakken) in North Dakota. The Bakken became a major oil production area due to new extraction technologies that became cost effective as oil prices increased, reaching a peak production of 1.2 million barrels per day in December 2015.

In 2013, the production in the Bakken outstripped the existing pipeline capacity. The high price of oil made railroads a cost-effective means of transportation. Oil moving to the Gulf of Mexico was either shipped entirely by rail or moved by rail to Oklahoma for subsequent transport by pipeline. Crude oil coming into Oklahoma by rail was moved by the Stillwater Central (SLWC) short line to Stroud where it was transferred by pipeline to Cushing, where it was in turn shipped by larger pipelines to the Gulf.

Since 2013, pipeline capacity serving the Bakken has increased. Pipeline and refinery projects are planned that would more than double refining and pipeline takeaway capacity in the region. The use of rail transportation will, for the most part, be limited to shipping to markets not accessible by pipeline, particularly the East and West Coasts' refineries and ports. Consequently, crude oil moving by rail into Oklahoma from the Bakken is not expected to reach levels of the past.

Figure 18. U.S. Crude Oil Production under Five Scenarios (million barrels per day)



Source: U.S. Energy Information Administration, Annual Energy Outlook, 2016

Canadian Crude Oil

Although the shipping of North Dakota crude oil into Oklahoma has diminished significantly, it is being replaced by shipments from Canada. Pipelines from Alberta are currently operating at capacity, resulting in significant congestion. Required new capacity is not expected until 2019.

USD Group, a company involved in oil logistics management and infrastructure acquired, acquired the crude oil destination terminal in Stroud in June 2017.[13] Canadian crude oil is being shipped by rail from USD Group's Hardisty oil origination terminal in Alberta to Stroud. The route, over BNSF and SLWC railroads, is similar to the rail corridor previously used for transporting North Dakota oil. From Stroud, the oil is moved by pipeline to Cushing. Producers are again turning to rail transportation—at least until additional pipeline capacity is in place.[14]

Anadarko Basin: Oil and Gas

The Anadarko Basin located in the western part of the state is a major source of natural gas, and to a lesser extent, crude oil. While oil production is significantly diminished, natural gas production has increased and is expected to continue to grow. Although natural gas is shipped by pipeline, the sand, water, gravel and heavy equipment that is required in the extraction process is moved primarily by rail and truck.

Environmental Issues and Clean Fuels

While Oklahoma maintains a favorable federal air quality standard, there remains a sharp focus on upholding this status. The increasing number of vehicles on the transportation system presents opportunities to find innovative ways of sustaining environmental integrity in Oklahoma.

Oklahoma is poised to support industries producing clean energy and using clean energy technology as a means of meeting federally mandated air quality standards. Oklahoma continues to improve alternative fuel corridors, providing clean energy options to motorists—including charging stations and compressed natural gas stations on federally designated alternate fuel corridors.[15] Other beneficial environmental opportunities lie with increasing

utilization of low-emission rail and waterway services to transport goods due to their large carrying capacity and lower shipping costs.

Wind Turbines and Trucks

WIND ENERGY

According to the U.S, Energy Information Administration, in 2015 Oklahoma ranked third in the nation in net electricity generation from wind, which provided about one-fourth of the state's total. The state's share of power generation fueled by coal has decreased in recent years as wind-powered generation and natural gas have increased.

IMPLICATIONS OF ENERGY AND ENVIRONMENTAL TRENDS

Oklahoma has long been a leader in the energy sector, and will continue to maintain that status. In addition to raw materials extraction, core components of Oklahoma's energy system include machinery and manufacturing natural gas products and distribution systems. The state is also proud of its ability to meet air quality standards, leveraged in part by proactive efforts in promoting and using natural gas.

Energy freight movements are sensitive to national and global market forces and thus Oklahoma's freight transportation will need to position itself to be responsive to changes in the international scene. Oklahoma's use of rail, truck, and waterway systems provide a variety of ways to respond to the changing demand for this commodity. The volatile energy market poses a unique challenge to the transportation system due to the high volume of heavy loaded vehicles traveling through rural communities that are not equipped to handle the size and scale of these shipments.

4.1.2 Demographic Trends

POPULATION

Oklahoma is the 19th most populated state. Since the last census in 2010, population in Oklahoma is estimated to have grown to 3.9 million people in 2016. This represents a 4.6 percent increase in population over the period. Population growth in Oklahoma tracked closely with national growth of 4.7 percent.

While the state's population is anticipated to exceed 4.2 million people in 2025, a 15 percent increase over 2010, this reflects a tapering of growth.[16] Growth is expected to be centered in the existing metropolitan areas.

EMPLOYMENT

Oklahoma employment growth began to lag that of the nation in 2013 as Oklahoma's mining employment flattened out, before the decline in energy prices. Looking ahead, unemployment rates in the state are expected to be around 4 percent in 2017 and 2018, comparable to U.S. forecasted rates of 4.5 percent.[17]

Industry employment projections are developed by the Oklahoma Employment Security Commission. **Table 6** illustrates the importance of freight-related industry employment to Oklahoma. Thirty-six percent of the state's employment depends on freight transportation.

Table 6. Oklahoma Economic Sector Employment (Third Quarter, 2016)

Sector	Average Employment
Goods Producing	282,846
Agriculture, Forestry, Fishing, and Hunting	10,688
Mining	42,860
Utilities	16,335
Construction	83,518
Manufacture	129,444
Trade and Transportation	302,731
Wholesale Trade	58,534
Retail Trade	186,095
Transportation and Warehousing	58,102
Other Services	734,639
Government	235,611
Total	**1,555,827**

Source: Oklahoma Employment Security Commission and the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW), 2016.
https://www.ok.gov/oesc_web/Services/Find_Labor_Market_Statistics/QCEW/qcewdata2.html

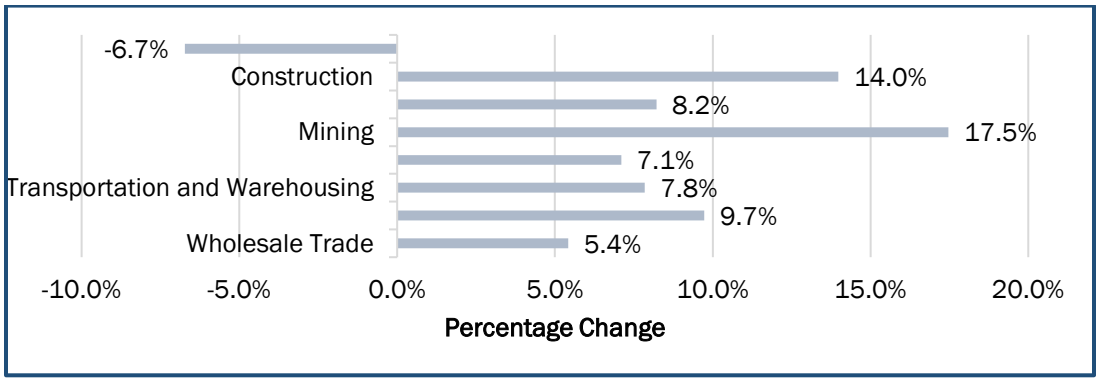
Implications of Demographic Trends

Oklahoma, like many other Midwestern and South Central states, is expecting modest growth in population and employment over the next decade. With growth concentrated in urban areas, freight flows, congestion, and conflicts are likely to increase. The expected future increase in population concentration in Oklahoma City and Tulsa will have a twofold impact on freight transportation in the state. First, the two major population centers will experience an increase in demand for goods, intensifying truck movements in the metropolitan areas. Second, increased inbound truck activity combined with a growth in personal auto travel associated with the increase in population will contribute to additional congestion on the Oklahoma City and Tulsa road networks. Adding further to the congestion will be increased traffic passing through the two metropolitan areas.

As rural populations are more dispersed, other issues related to efficient freight transport will need to be addressed. In rural areas, increased home delivery and consolidation of commercial rail and intermodal services present challenges as further described later in this chapter.

Figure 19 shows the projected change in employment for Oklahoma freight-related industries between 2014 and 2024.

Figure 19. Projected Employment Growth (2014 through 2024)



Source: Oklahoma Employment Security Commission, 2017
https://www.ok.gov/oesc_web/Services/Find_Labor_Market_Statistics/Projections/

- During this time period, mining, which includes oil and gas extraction, and construction are expected to demonstrate the greatest employment growth.
- Agriculture is the one industry sector expected to have a decrease in employment. The decrease, however, will likely not affect agriculture transportation demand as productivity will continue to improve. Additionally, agriculture is a land intensive sector of the economy, so shipment distances and freight transportation demand could increase, despite employment decline.
- Employment in the transportation and warehousing sector is expected to increase by 7.8 percent. Within that sector, however, warehousing and distribution center employment is projected to grow by 41.8 percent.

4.1.3 Economy and Trade

Economic Growth

Measured by annual real GDP, U.S. economic growth slowed in 2016. In 2016, annual GDP grew 1.6 percent compared with annual growth of 2.6 percent in 2015. Although the economy grew over the two-year period, freight traffic did not always parallel that growth. Using rail carloads as a measure, non-containerized rail traffic decreased 13.8 percent over the period. If coal is excluded, the two-year decrease was 3.8 percent. Intermodal loads were flat over the two years. Truck vehicle-miles traveled (VMT) over the two years—measured in combination truck mileage in Oklahoma—increased 0.8 percent.

By comparison, the Oklahoma economy enjoyed a period of prolonged growth from the middle of 2010 through 2014 before oil prices peaked and the recent 2015 through 2016 downturn ensued. As measured by gross state product, the state suffered a recession similar to the experience of 2008. In 2016, oil and gas production was down after climbing for the previous six years. Growth occurred in the areas of education, health, construction, hospitality, and agriculture; and annual GDP grew 1.3 percent in 2016. In 2017, oil and gas employment is steady, but has yet to show signs of significant gains. Industry professionals expect the growth to continue with growth to average 2.0 percent in 2017 and 2018.[18] Looking to the national future, GDP is expected to average 2 percent annual growth over the next 10 years.[19]

Agriculture Products – Transmodal Transport

Agriculture produces about 1 percent of Oklahoma's GDP and has been identified as a critical user of the transportation system. Intermodal transportation can benefit a wide range of shippers including agriculture producers. According to the U.S. Department of Agriculture, about 28 percent of U.S. agricultural shipments are shipped in containers, and about 10 percent of U.S. grains are shipped in containers.[20]

Flatbed Truck on I-40

Containerized (intermodal) transport allows shippers to maintain the identity of bulk agricultural products and allows customers to buy in small lot sizes. Providing intermodal service to rural areas is difficult. At present, Oklahoma markets do not generate sufficient quantities to meet the required threshold for financially viable intermodal services.

Similar to the intermodal transportation, there is a growing demand for transload facilities so that non-containerized freight can be transferred from one mode to another. In particular, there is an increasing demand for shipments that travel on Oklahoma rail or water systems and use truck for "last mile" transport. In Oklahoma, wheat production is a primary agriculture product using transload facilities. Grown largely in low-density western areas of the state, farmers rely on trucks and short-line railroads to get their products to barges and/or Class I rail terminals.

Retail Home Delivery

A major reason for the emphasis on time to market is the growth in consumer home delivery. All of Tompkins International Supply Chain Consortium[21] members—retailers and manufacturers alike—expect direct to consumer sales to increase in the next three years.

E-Commerce

From 2004 to 2014 (the latest data fully available) the U.S. Census Bureau's Retail Trade Survey reports that electronic commerce rose from 2.1 percent of total retail trade to 6.4 percent, climbing at a compound annual growth rate of 17 percent compared to 2.7 percent for traditional retail. This trend underlies fierce competition between electronic and storefront retailers, and has given rise to so-called omni-channel retail, which denotes the attempt to merge in-store with online shopping. A department store customer can view merchandise from their smartphone, know which stores have it in stock, examine it in the store, buy it, bring it home or have it delivered, order a different style from another store or Distribution Center (DC), pick it up or send it home—or handle the entire transaction from home on their smartphone.

> We appreciate being involved in the freight discussion and building relationships with others to improve freight transportation. Relationships are important to share information in order to improve infrastructure, increase efficiency for our fleet, and reduce costs for our customers
> *—Large-retail corporation executive*

Underlying these marketing strategies are logistics strategies. The more volume an online retailer like Amazon commands in the light-density lanes into residential areas, the lower its cost and the less room there is for competitors. The same logic applies to rapid delivery: only a few competitors can attract the volume to afford it, and the speed is designed to approximate the convenience and immediacy of in-store purchases. Moreover, consumer research demonstrates that the demand for next-day and same-day delivery service rises along with the frequency of online purchases, suggesting that growth in one facilitates growth in the other.[22] Storefront retailers in turn are obliged to match the fast delivery service for customers who prefer it.

For both electronic and storefront merchants, the goods have to be positioned to fulfill the time commitment, requiring facilities—distribution centers, stores and other staging points—close enough to accomplish this. While consolidation of next-day and same-day deliveries can be achieved through the networks of such major package carriers as UPS, FedEx, and U.S. Postal Service, smaller time windows reduce the opportunity for it. In addition, traffic, access, and parking conditions affect the ability to meet time commitments.

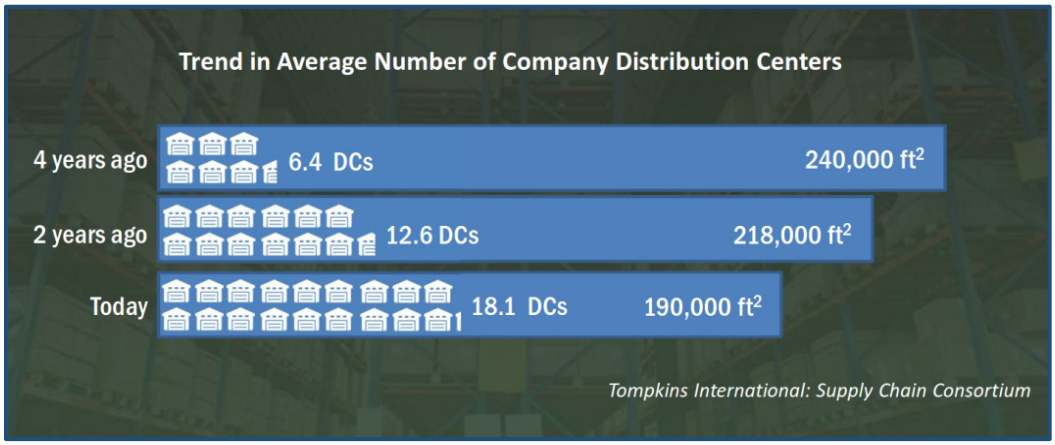
Warehouse Location and Automation

The number of DCs used by U.S. supply chains has tripled in the past four years, from an average of 6 to an average of 18 per supply-chain, according to data collected by Tompkins.[23] Tompkins reports pronounced growth in DCs in both sectors, although it is strongest among retailers. The reason for this dramatic increase in facilities is the rising importance of faster time to market, which requires that the staging points for goods be placed closer to the points of consumption.

Distribution Centers

The average size of DCs (**Figure 20**) has decreased in parallel, partly because inventory is divided up and some of the added facilities are simple cross-docks or branch DCs, but also because warehouse automation has made it possible to reduce the physical footprint of DCs by two-thirds with no sacrifice in throughput.[24]

Figure 20. Proliferation of Distribution Centers



Source: Tompkins International, 2015.

DCs in Oklahoma are likely to increase in number. Oklahoma traditionally has not attracted large regional retail DCs because much of its population is within overnight or same-day trucking range of Dallas and Kansas City, both of which have larger urban markets for anchors and serve as regional distribution hubs. The proliferation of warehousing does not change this, but it can mean that the need for, and the viability of, satellite facilities in Oklahoma will grow, especially near its cities. Smaller facilities could have a competitive edge since facilities designed for more labor-intensive warehouse operations could gradually become obsolete.

Implications of Economic and Trade Trends

Innovations in transportation and e-commerce will affect the future for agriculture, retail, and warehouse operations.

As agriculture productivity and global demand for Oklahoma products such as wheat and soybeans increase, transportation efficiency will be of heightened importance. Oklahoma exports are likely to be transported by truck to rail or barge terminals. These transmodal (non-containerized) operations present an opportunity to leverage the strengths of each mode to reduce agriculture transportation costs.

Multiple factors related to retail trade have implications for Oklahoma:

- Delivery vehicles in urban residential and rural areas are likely to increase. As volumes grow across the variety of product types noted above, the carrying capacity as well as the number of delivery vehicles required becomes an issue. A case in point is that of drones, whose capacity generally is a shipment of about five pounds.[25] Drones can be productive for rural and suburban deliveries with infrequent and dispersed demand but, as traffic builds up and shipment types proliferate, they become less well suited.
- Competition between storefront retail and online sales will be stiff. Oklahoma has recently broadened sales tax requirements, and this will provide a balance point for retail sales.
- Delivery delays and their causes will be more visible to Oklahoma residents. This could lead to a higher incidence of complaints, but could also make the challenges of freight delivery more tangible and meaningful

to citizens. The belief that "freight doesn't vote" could begin to recede as residents experience their household supplies failing to arrive when needed and learn the reasons firsthand.

- Concern for the safety and environmental qualities of delivery trucks is likely to continue. Adoption of different and new technology is apt to accelerate, including use of natural gas and hybrid electric trucks, and safety advances associated with connected and automated/autonomous vehicles (C/AV). The ability for drivers to see—and vehicles to sense—activity and obstacles all around them, promises substantial reductions in incidents and accidents, and makes trucks far more neighborhood-friendly.

Trucks on I-40

Warehouse and DCs in Oklahoma are likely to increase in number. Oklahomans can expect distribution from smaller local facilities; higher shipping volume per acre because of greater storage density; and continued emphasis on speed and reliability of the freight network.

4.1.4 Transportation Technology and Innovation

Connected and Automated/Autonomous Vehicles

In October 2016 in Colorado Springs, CO, the first automated freight delivery was completed by the self-driving truck company, OTTO, carrying a 120-mile shipment of Budweiser beer for Anheuser-Busch InBev.[26] This is remarkable not only as a transportation milestone, but for the degree of automation: the beverages rolled off the production line onto the truck and continued from the plant to the delivery point with little or no direct involvement of labor. Effectively, this made the delivery process an extension of the manufacturing—and OTTO in fact is marketing itself as a "self-driving solution for lean factories."[27]

OTTO Budweiser Driverless Delivery

Truck Platoons

Truck platoons are an aspect of connected and automated/autonomous truck technology that is apt to be especially meaningful in Oklahoma because of its high proportion of through freight and its long travel distances over relatively open and flat territory. Platoons consist of two or more trucks traveling closely behind one another,

using automated sensors and controls to maintain short headway distances between vehicles, which in turn allow the vehicles behind the lead truck to reduce fuel consumption by air drafting. Fuel savings vary by position in the line. The Texas A&M Transportation Institute quotes estimates of 5 to 20 percent fuel savings,[28] and a European manufacturer claims an average savings of 10 percent.[29]

Coupled with the potential for drivers to switch to autonomous "autopilot" mode (especially in the trailing vehicles, although the lead vehicle could do the same), significant cost savings become available in fuel and labor, which are the two largest cost components in trucking. Live demonstrations of truck platoons have been conducted in the United States and Europe,[30] including a successful 2016 European Union "challenge" that saw half a dozen truck manufacturers run platoons over separate public roadways through five countries—thus testing the regulatory as well as the operational concept.[31]

Commercial Vehicles Equipment and Other Technology

For some time, truckers have been employing technology in their operations and supporting public initiatives to add technologies on the highways. The products that have developed are important to safety, cost monitoring, and efficient operations.

Truck and Trailer Information Systems

Trucking equipment is continually evolving to include technologies to monitor the performance and operation of the vehicle, to improve communication with company personnel and for the safety and convenience of the operator. These technologies cover a wide range of capabilities from speed control, engine monitoring, communication and driver comfort and convenience.

Highway Technology

Highway technologies are also evolving and being deployed with greater frequency. Current applications of electronic signage help drivers avoid problem areas and improve their trips by having access to current travel time and alternate route notification. Commercial-vehicle monitoring allows enforcement officials to monitor regulatory compliance of passing vehicles.

Load Access

Online load boards have been around for a considerable length of time. New technological capabilities have allowed the concept of real-time load access to balloon. Brokers, logistics services, and trucking companies with excess freight are all developing some form of a cellphone application that gives drivers access to potential loads, to capture detailed load information and report status.

Railroad Technology

As an example of next generation technology, drones are being used to inspect difficult locations like tunnels and bridges. The Positive Train Control systems that railroads are implementing nationwide promise improvement in safety performance. Additionally, regulators at the Federal Railroad Administration and the Pipeline and Hazardous Materials Safety Administration called for a new electronically controlled pneumatic braking system that would prevent—or lessen the severity of—hazardous materials crashes.

Waterways Innovation and Technology

The USACE Tulsa District has used real-time technology to monitor loads applied to a center-post. A center-post is used to set a temporary de-water closure on one end of a lock chamber, which allows the gates to be operated for repair and inspection purposes while the chamber is empty. A real-time system detects loads and provides information to the USACE personnel to better understand the forces that are applied to this structure during the temporary lock closure.

The USACE is working with its Engineering Research and Development Center[32] to evaluate ways to address corrosion for gates at Webbers Falls lock and dam. Corrosion protection is a major maintenance need for miter gates, and an innovative primer is being tested to determine its effectiveness.

IMPLICATIONS OF TRANSPORTATION TECHNOLOGY TRENDS

The implications of automated vehicle technology for Oklahoma are many and uncertain. The safety benefits when a driver is present in an automated vehicle could be substantial, and would accrue from the interaction with technology-enabled automobiles as well as from enabled trucks. Advancements in safety could reduce community concerns about truck traffic, and would be especially helpful in the context of home deliveries. However, without a driver actively behind the wheel, the public perception is apt to be different and risk-averse, even if the safety profile is equally strong. There are other legal, technological, and market issues that could slow or speed implementation. As a result, truck and automobile technologies are likely to evolve by degrees, and automated operations are likely to coexist with traditional ones for years.

ODOT will have a role in implementing new vehicle technology as it interacts with the transportation network. Information technology and ITS applications will need to continue to evolve and expand to address various levels of communication and automation.

The rail and waterways industries are using new and sustainable methods for their systems as well. Drone technology, new braking systems, and improved replacement or repair components for locks and dams will improve efficiency and safety for rail and waterways, respectively.

4.1.5 Transportation Industry Trends

SUPPLY CHAINS

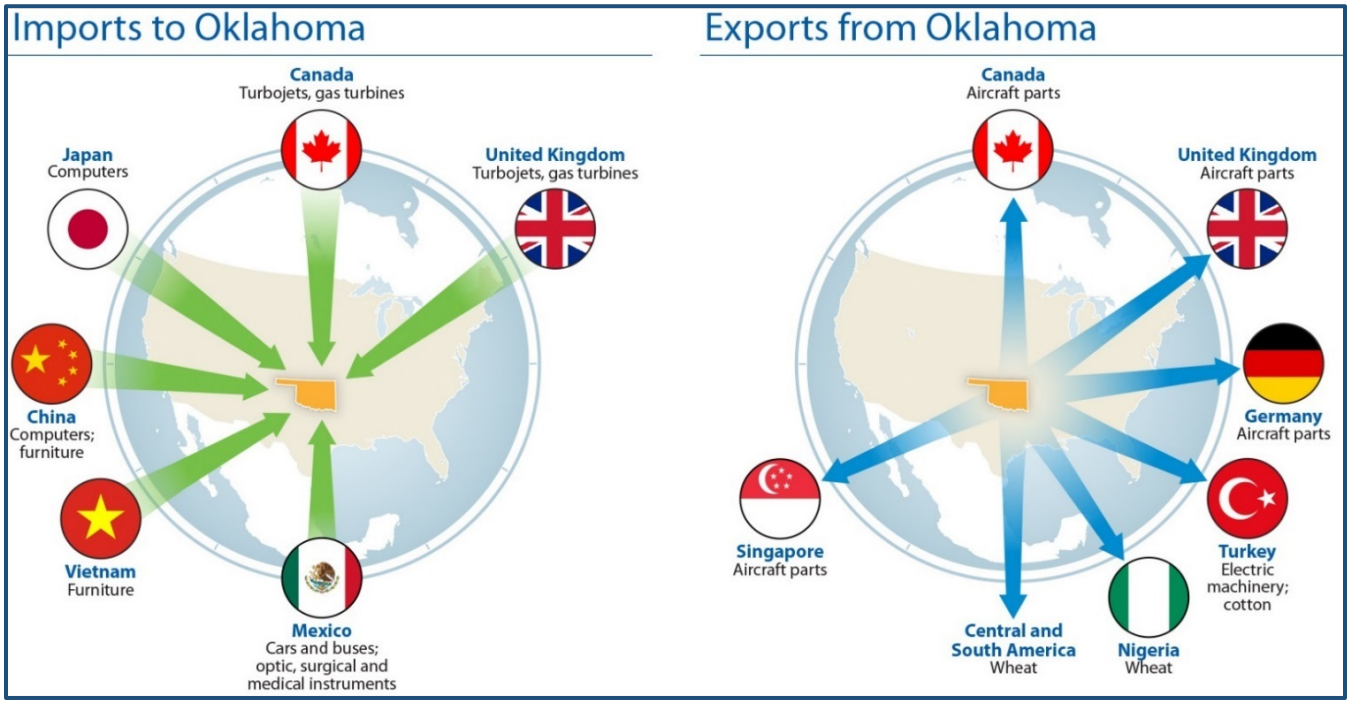
Supply-chain sourcing relates to where retailers obtain products for sale, where manufacturers obtain materials and components, and relatedly, where manufacturers locate the production that supplies retailers. The concept of supply-chain management or logistics is about efficient management of business operations from initial input (sourcing) to final product delivery. Clearly, an optimized transportation system plays an essential role. Oklahoma is involved in complex supply chains that require goods movement across the globe, as shown in **Figure 21**.

The long advancing off-shoring trend shuttered 40 percent of large U.S. factories in the 2000s,[33] even though U.S. manufacturing output was almost 40 percent higher in 2011 than in 2001, and has grown since.[34] The growth in manufacturing output could be explained by higher productivity enabled by automation and information technology, as well as lower labor components for some of the production that stayed in the United States.

As wages overseas began to rise along with fuel prices, the expectation that production could return to the United States arose in the mid-2000s. This is known as the near-shoring or re-shoring phenomenon. Supporting it was the increasing importance of time to market. Nevertheless, more recent research from A.T. Kearney indicates that re-shoring mainly has not materialized, apart from a blip in 2011.[35] While the report cites scores of instances where re-shoring occurred in the same industries cited above, there has not been a sea change. Even so, other survey research found 31 percent of North American manufacturers considered near-shoring a possible opportunity for their company, with the United States and Mexico about equally attractive.[36]

In light of the findings, the key question is not whether near-shoring was a possibility, but to what degree. U.S. production clearly does have advantages in time to market and benefits from automation (e.g., robotics, optics, artificial intelligence, 3D printing). Availability of lower cost domestic raw materials, regionalization, and investment in local jobs are also factors in the equation.

Figure 21. Examples of International Imports and Exports To and From Oklahoma



Three-Dimensional (3D) Printing

Three-dimensional (3D) printing (or additive manufacturing) is not new, but its appearance in new applications with advanced materials is bringing it more deeply into manufacturing processes and supply chains. The technology replaces traditional fabrication in factories with production from specialized printing devices operating in three dimensions, using a variety of materials, and able to be located almost anywhere. Its principal transportation effect is to substitute local production for longer distance transportation from plants and DCs. Thus, local traffic related to such locations could increase as well.

CHANGING INTERNATIONAL SHIPPING LOGISTICS

East Coast ports have gained market share at the expense of West Coast ports in recent years, with the West Coast ports' import market share decreasing from 56.8 percent in 2000 to 49.5 percent in 2015. The modernization of the Panama Canal, which was completed in June 2016, could cause this trend to continue. The project increased the capacity of the canal since it now allows the passage of much larger ships. Economies of scale from the increase in vessel size reduce the cost of all-water service via the canal between Asia and the East Coast. With lowered costs, some cargoes could shift from entering the United States through West Coast ports to East Coast ports, eliminating the rail trip to the east.

However, several factors will moderate the transfer. The all-water transpacific service via the Panama Canal is much slower than shipments using West Coast ports and intermodal rail service to the East Coast or Gulf Coast states. Products that are cost-sensitive could shift to the all-water service, but products that are more time sensitive will continue to be transported by existing West Coast/inland rail routes. Finally, a study for the Texas Department of Transportation (Panama Canal Study)[37] demonstrates that rising charges and high volumes at the Southern California ports have stimulated interest in other trade corridors. Growth of freight in and out of Texas ports means growth in transport of products to and from Texas and neighboring states like Oklahoma.

IMPLICATIONS OF TRANSPORTATION INDUSTRY TRENDS

Changes surrounding supply-chain management, international shipping logistics, trucking and rail infrastructure affect where goods will be shipped, in what quantities, and how they will be transported.

The opening of the expanded Panama Canal is expected to result in an increase in cargo handled at Gulf Coast ports, although the magnitude is unclear and will depend on a number of factors, including the tolls levied by the Panama Canal Authority and how railroad and port pricing structures change.[38] If cargo handled at Gulf Coast ports does increase, there will be a ripple effect of freight transportation growth in Oklahoma.

Truck Parking

Supply-chain matters for freight planning, first, because it affects Oklahoma's locations of goods movement. Secondly, freight-based investments could be motivated by economic development and could be influenced by the market prospects for the businesses involved. Some of the investments, like 3D printing, could substitute local traffic for regional traffic; others could result in modal shifts. Understanding Oklahoma's industrial profile is important, so that opportunities and threats can be recognized, new developments can be observed closely, and forecasts are viewed as guides to (not proclamations of) the future.

The trucking industry in Oklahoma is strong and plays a significant role in the economy. Trucking in Oklahoma includes every type of carrier from individual haulers and small companies with a few trucks to the largest national carriers. The types of vehicles in operation and the commodities that they carry are equally diverse. Oklahoma's mean wage for heavy truck driving jobs ($42,000) is among the highest in the nation. This is reflective of both the demand and the skill level of certain driving jobs in the state, including the transport of hazardous materials in the energy market. Conditions such as driver shortages and hours of service—combined with an economy that continues to prefer faster and more customized service—reinforce the need for the continued growth and development of this industry.

Demand for freight rail service is expected to continue in Oklahoma, enhanced by the state's geographic location. Twenty-one freight railroads, including three Class I carriers, operate in the state. Attracting and training talented workers, and implementing new technology for safety and efficiency will continue to be important to the rail industry.

The lack of investment in infrastructure has resulted in highways, bridges and waterways that are obsolete and in disrepair. The U.S. freight railroads are private organizations that are responsible for their own maintenance and improvement projects. It is anticipated that railroad companies will need to continue adding to their systems to address the growth in rail traffic over the next decades. Once a source of pride and a great asset for U.S. businesses, many parts of the nation's transportation infrastructure network urgently require investment in renovation and restoration.

4.2 FUTURE GROWTH

Table 7 shows the growth in freight by tonnage between 2015 and 2045. Freight in Oklahoma is expected to grow by nearly 50 percent over the next 30 years. Most of this growth is projected to be in longer trips that have either an

origin or destination point, or both, outside of the state. Through traffic is expected to see the greatest growth, at 63 percent.

Table 7. Long-Term Oklahoma Freight Growth (2015 through 2045)

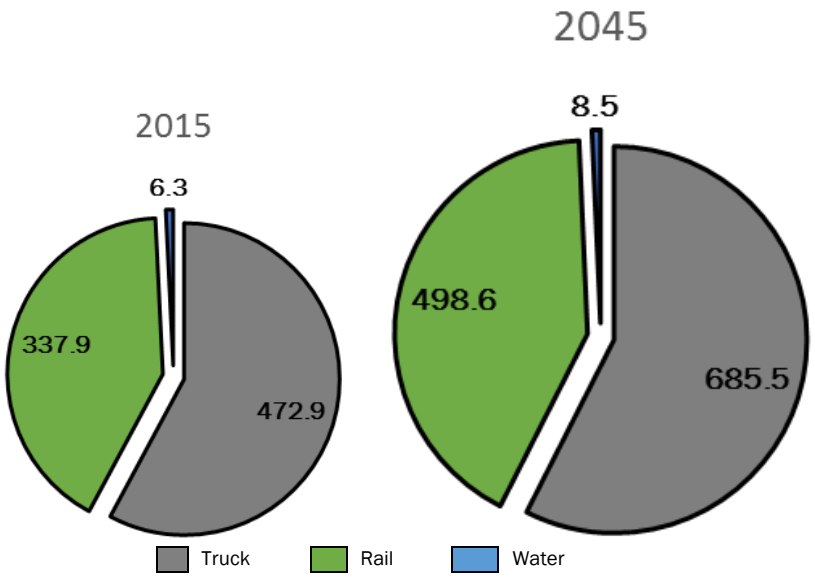
Flow	Mode	Tons (Millions)		Percentage Growth
		2015	2045	2015 through 2045
Inbound	Truck	46.5	65.1	40.04%
	Rail	29.5	29.7	0.60%
	Water	3.1	3.9	25.38%
	Total	*79.1*	*98.7*	*24.76%*
Outbound	Truck	78.5	103.6	32.02%
	Rail	18.0	24.0	32.83%
	Water	3.2	4.6	45.01%
	Total	*99.7*	*132.2*	*32.57%*
Within	Truck	123.6	123.8	0.17%
	Rail	2.5	3.2	30.99%
	Total	*126.1*	*127.0*	*0.78%*
Through	Truck	224.3	393.0	75.19%
	Rail	287.9	441.7	53.42%
	Total	*512.2*	*834.7*	*62.95%*
Total	**Truck**	**472.9**	**685.5**	**44.97%**
	Rail	**337.9**	**498.6**	**47.54%**
	Water	**6.3**	**8.5**	**35.14%**
	Total	**817.1**	**1,192.6**	**45.96%**

Source: IHS Markit Transearch, Freight Analysis Framework 4.3, WSP analysis

In terms of modes, trucking will represent the largest mode share in 2045; however, rail freight is expected to grow at a slightly faster rate (nearly 48 percent compared to 45 percent) over the 30-year period. Water is expected to grow more slowly (35 percent).

Figure 22 shows the tonnage by truck, rail, and water in 2015 and 2045. As shown, all modes are expected to grow substantially over the 30-year period.

Figure 22. Oklahoma Freight by Mode, 2015 and 2045 (millions of tons)



Source: IHS Markit Transearch, Freight Analysis Framework 4.3, WSP analysis

4.3 CONCLUSION

Several important trends are likely to affect the demand for and availability of future freight transportation in Oklahoma:

- Energy independence will require increased production of crude oil. While this will be shipped principally by pipeline, sand required in the extraction process will be moved by rail.
- Agriculture will continue to be a growth industry consuming significant amounts of highway, rail, and waterway capacity.
- The changing retail trade environment will increase both urban and deliveries by truck; expanded number of branch distribution centers will also increase truck volumes; both will compete with through traffic for highway capacity.
- Technology advances supporting truck platoons could divert traffic from rail; safety concerns may require the construction of dedicated truck lanes, but also add to future congestion.

Chapter 5 identifies specific bottlenecks and mobility issues that will prevent the smooth flow of freight. Chapter 6 identifies and prioritizes potential projects to eliminate or mitigate them.

5.0 Freight Bottlenecks and Mobility Issues

5.1 HIGHWAY

5.1.1 Truck Bottlenecks

For the purposes of this analysis, a bottleneck is defined as part of the transportation system that imposes disproportionately high costs in the movement of freight. A specific approach was followed to identify truck freight bottlenecks on the Legacy Oklahoma National Highway System (Oklahoma NHS or NHS).[39]

Some of the adopted bottleneck identification concepts were based on guidance recently published by the FHWA.[40] This guidance stresses the importance of thinking about bottlenecks from the perspective of system users, leading to indicators that approximate user impacts and costs.

The FHWA guidance also highlights the importance of delving into additional data sources to investigate potential causes of performance issues. Therefore, in addition to the performance measures, the analysis included consideration of other indicators such as crashes, pavement conditions, curves, grades, and congestion. The results of these analyses were utilized in freight plan efforts to identify potential solutions and investment priorities.

In addition to evaluating performance based on measures estimated from data, it is also important to consider experience of, and comments from, stakeholders who use the roadway network. System users can identify issues not captured by the data.

MOBILITY/SYSTEM PERFORMANCE

Two performance measures were used to identify mobility and system performance issues: average delay of trucks and the travel time reliability of trucks. The definitions and results for each indicator are described below.[41]

Delay Measure and Results

Delay is a planning measure for talking about recurring congestion. Delay is calculated as the difference between travel time in average conditions and travel time under free-flow conditions. This indicator measures the additional hours that a truck spends traversing a roadway segment. This delay directly translates into additional costs such as additional driver wages, vehicle operations, and fuel consumption.

Average delay was calculated for the NHS from the National Performance Management Research Data Set (NPMRDS)[42]—presented in Technical Report 5, Goals and Performance Measures, Policies and Strategies—and average annual daily truck traffic (AADT) data from traffic counts in Oklahoma's federal Highway Performance Monitoring System (HPMS).[43] The NPMRDS provides actual truck travel times across individual segments of the network continuously throughout the year.

Reliability Index and Results

The reliability measure demonstrates how bad travel conditions can be on a given highway segment. Reliability is a measure of unpredictable or non-recurring congestion. It is calculated by the ratio of the worst-case travel time to the median travel time. The miles-weighted average truck travel time reliability (TTTR) index for interstate highways in Oklahoma is 1.27. This means that a trucker should plan 38 minutes for a trip that takes 30 minutes in free-flow conditions (30 minutes multiplied by 1.27 equals 38 minutes).

It is calculated from the same data sources as the average delay measure. Like the delay measure, the TTTR index incorporates truck volume in order to provide greater weight to locations that have higher truck volumes.

As the index gets higher, it indicates greater reliability problems on that segment. Thus, a larger number of trucks need to plan more time into their schedules to guarantee on-time delivery. The analysis found the worst delay and reliability problems for trucks in and around the major metropolitan areas of Oklahoma City and Tulsa.

Preliminary Identification of Bottlenecks

Thresholds were set for the average delay and reliability measures to identify areas with the worst performance in the state for trucks. If a segment was in the worst 5 percent for the state in terms of average delay or in terms of reliability, it was identified as a truck bottleneck location that merited further analysis and proposed solutions in the freight plan.

STAKEHOLDER INPUT

Stakeholder perspective on system problems and needs was solicited early in this planning effort. This input provided insight as to the location and severity of problems from the perspective of system users. Stakeholder perceptions are useful in identifying and prioritizing system needs. At the first FAC meeting in the fall 2016, committee members flagged locations with freight issues, bottlenecks, or concerns. In addition, ODOT staff solicited comments from MPOs and rural area planners, and interviewed individual stakeholders to obtain their perspectives.

Like the data-driven performance measures, stakeholders identified clusters of bottlenecks in urban areas, particularly Oklahoma City and Tulsa. There was a great deal of overlap in the identified needs in these areas. Like the data-driven analysis, stakeholders also identified interchanges throughout the state as having congestion and delay. Stakeholders noted many more problems in rural areas, including slowing speeds along two-lane stretches of highway and through small towns, poor pavement conditions and intersection delay issues.

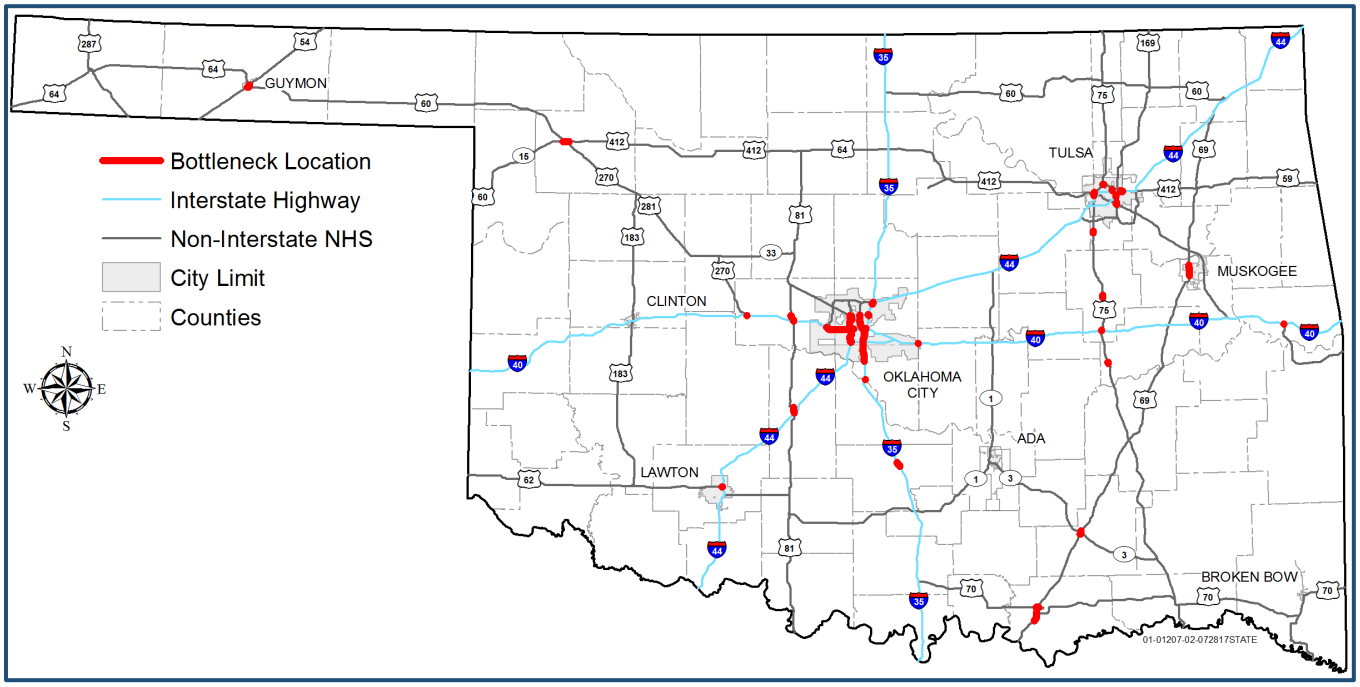
In addition to the suggestions provided by the FAC, three public meetings were held in June 2017 to elicit input from the broader public. Overall, most comments validated the bottlenecks identified through the data. Frequently, comments provided perceptions about observed problems and explained the causes behind slowdowns.

There were several instances where construction was mentioned as the main cause behind slowdowns. Since construction is a temporary condition, construction-related delays were removed from the list of bottlenecks.

FINAL BOTTLENECK IDENTIFICATION

Approximately 150 individual segments were identified as bottlenecks for trucks. **Figure 23** shows the results statewide. As can be seen, the bottlenecks tend to cluster in and around the urban areas of Oklahoma City and Tulsa, although there are some bottleneck locations in the western part of the state, along U.S. 81, and U.S. 75 and U.S. 69.

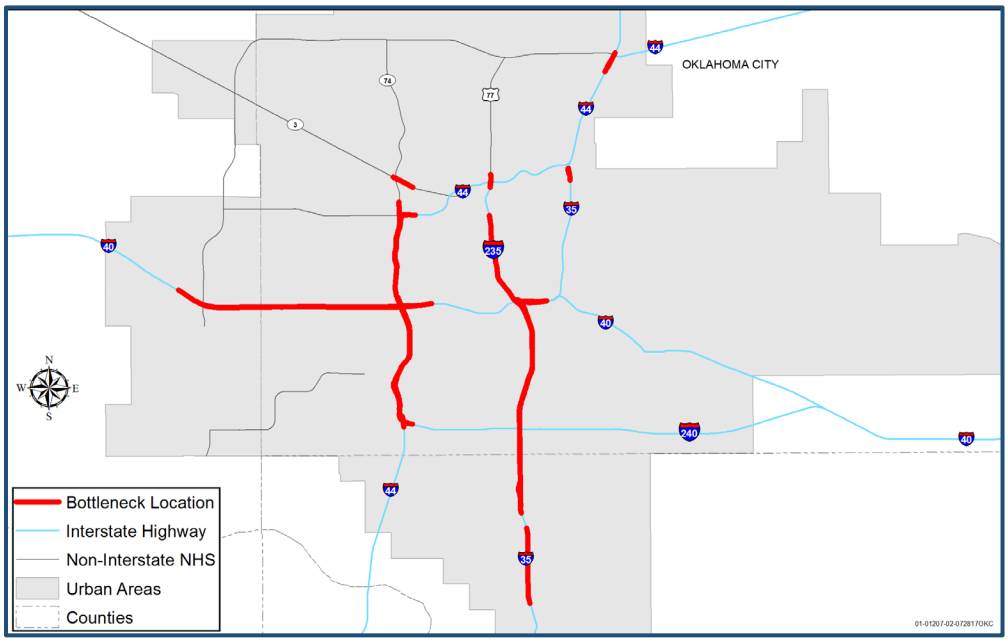
Figure 23. Final Bottleneck Locations – Top 5 Percent



Source: WSP analysis of Highway Performance Monitoring System and National Performance Management Research Data Set data

Figure 24 and **Figure 25** show these results in more detail for Oklahoma City and Tulsa, respectively. As can be seen on **Figure 24**, in Oklahoma City much of the highway system has bottlenecks including long stretches of I-35, I-44, I-40, and U.S. 77 as well as several interchanges.

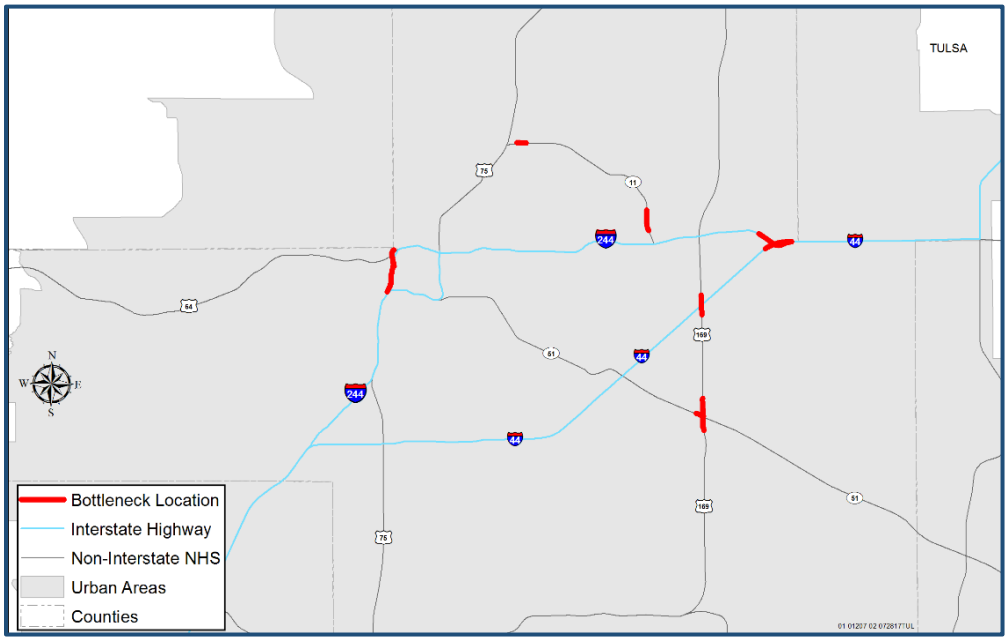
Figure 24. Final Bottleneck Locations, Top 5 Percent – Oklahoma City Area



Source: WSP analysis of Highway Performance Monitoring System and National Performance Management Research Data Set data

In the Tulsa area (**Figure 25**), there are several bottlenecks, and they tend to be located near interchanges.

Figure 25. Final Bottleneck Locations, Top 5 Percent – Tulsa Area



Source: WSP analysis of Highway Performance Monitoring System and National Performance Management Research Data Set data

5.1.2 Safety

In addition to presenting a safety risk, crashes on a facility can cause slowing and backups that affect all traffic. Locations of frequent crashes affect reliability—a key issue for trucks. To identify areas of safety issues, crashes were evaluated for the entire NHS network. Locations that were in the top 10 percent for the state (**Table 8**)—in terms of crash density (crashes per mile) and crash rate per million VMT—were identified.

Table 8. Mileage in the Worst 10 Percent of Crash Locations Statewide

	Crashes Per Mile	Crashes Per 1M VMT
Threshold (top 10 percent)	27	2.6
Miles over threshold	139	232
Percentage of total miles	1.9	3.2

Source: ODOT Traffic Engineering Division, 2017

Crashes per mile are a good indication of the potential for delays that could occur on a particular stretch of roadway. Crashes per mile tend to cluster in metropolitan areas and near the interchanges where freeways and highways intersect. For safety analysis, crashes are typically normalized by VMT. Crashes per million VMT points to locations where safety conditions exist that might result from roadway configuration or other physical conditions. The top 10 percent of crashes per million VMT identified problematic stretches of highways in rural areas including segments of U.S. 69, U.S. 412, U.S. 75, and U.S. 81.

5.1.3 State of Good Repair

Locations with deteriorated pavement conditions can present hazards and slow travel. The International Index ratings for 2014 through 2015 were calculated according to the federal standards in the HPMS. A small fraction of Oklahoma's NHS mileage is categorized as having "poor" pavement conditions under this federal specification. The pavement quality on these segments affects freight movement and should be considered along with other needs as part of the state's freight investment strategy.

Other factors on the transportation system, including but not limited to roadway geometry or outdated design features, may contribute to freight bottlenecks as well.

5.1.4 Freight-Related Bottlenecks on Highways

Heavy-freight traffic can also create bottlenecks that affect other highway users. To identify potential locations where delay is exacerbated by freight transportation, the study team examined locations on or near the network that are within 0.25 mile of an area with significant truck delay. The areas that have both freight generation and significant freight delay are locations where freight could be affecting other users.

The following locations are areas where high freight delay intersects with close proximity to identified freight generators:

- U.S. 54/U.S. 412 (U.S. 64) intersection – Texas County
- U.S. 81 between S.H. 33 and S.H. 3 – Kingfisher County
- U.S. 81 and I-40 Intersection – Canadian County
- U.S. 81 just south of the I-40 intersection – Canadian County
- S.H. 7 and I-35 interchange – Murray County

General traffic congestion or delay issues in these areas could be caused by freight. Solutions to these issues should consider resolution of freight conflicts as well.

5.1.5 Heavy-Load Route Issues

HEAVY-HAUL IN OKLAHOMA

This OFTP is intended to develop an improved understanding of the impact of heavy-haul vehicles on the highway system and to identify strategies to reduce deterioration. Most heavy-haul traffic moves within established weight limits, but with payloads and gross vehicle weights at the upper limits. In Oklahoma, a vehicle that exceeds the legal statutory dimensions usually requires an OSOW permit, and must pay associated additional fees to legally travel on designated highways.[44] An OSOW permit typically includes the conditions related to route specifics, dates of load travel, times of load travel, and escort vehicles. Channeling the heavy loads to fewer routes is one mechanism states use to minimize the impact of heavy loads on the highway system. Another strategy is to direct as much heavy cargo as possible to the rail and water modes. Even in the case of primary transport by rail of water however, trucks often complete the first and last moves for water and rail shipments.

ROUTE DEFINITION FOR HEAVY-HAUL VEHICLES

Heavy-haul routes, for the purposes of this plan, are highway locations where travel by heavy commercial motor vehicles (including agriculture, energy, mining, or timber cargo) is projected to substantially deteriorate the condition of the roadways. These routes may be traversed by regulation-size vehicles at or near the gross-vehicle-weight limits carrying heavy cargo, or by OSOW vehicles, or superloads.

S.H. 18 at the Arkansas Red River in Pawnee/Osage Counties

As part of the freight plan process, pavement conditions on the heavy-haul designated routes, and areas of freight flows of heavy commodities, were analyzed. Highways that connect to the NHS, which carry bulk products from farm fields, oilfields and wind installations, were also reviewed as part of this analysis. Clearly, heavy loads increase the rate and magnitude of pavement deterioration.

Structurally deficient bridges are problematic across the country, and Oklahoma is no exception. In rural areas, the challenge of travel on inadequate bridges goes beyond truck travel and extends to agricultural equipment transport, where the axle ratios are different from trucks and therefore create special needs. Fields on large farms and ranches can be separated by restricted bridges, creating additional miles to move from field to field. Slurry wagons associated with confinement livestock can be extremely heavy and present a similar challenge in rural areas.

At present, ODOT does not have a method for tracking vehicle volumes by route for trucks with oversize overweight permits or with special superload permits. Tallies of OSOW permits have been 215,000 or more annually for the past four years. Developing a source for permitted volumes will aid ODOT in better defining the required network for OSOW traffic. This data will help prioritize repair, maintenance and improvements in order to provide better conditions for Oklahoma business requiring OSOW transport. More detailed permit information will

also aid ODOT's participation with neighboring states in developing commercial corridors for OSOW traffic and for harmonizing regulations.

HEAVY-HAUL CONCERNS

OSOW shipments present difficulties in managing physical infrastructure, operational processes, and policy. For shipments crossing state lines, the problems are compounded by the need to interact with neighboring states, and/or several states along an extended route.

Physical Infrastructure

OSOW shipments have an impact on physical infrastructure, increasing the need for maintenance and repair to maintain good condition. Bridge conditions are particularly problematic given the need for out-of-route miles to work around restricted bridge locations, although ODOT has steadily expanded the system of unrestricted facilities. Superloads by their nature add clearance considerations to physical design for vertical clearance, turning radius, and other dimensional characteristics.

A related physical aspect has to do with the choice of suitable routes and interaction with other traffic. OSOW freight can impede traffic flow on high-volume corridors and create disruptions in cities and towns. This is particularly true for superloads, which move slowly and require special considerations for clearance such as navigating under power lines and traffic signals.

Policy and Operations Practice

Oklahoma carriers report concerns with the permit system as one particular barrier to efficient operations. Although much of this pertains to regular OSOW shipments, the superload operations are especially affected. While concerns include issues such as the need for individual permits for repetitive loads and for empty returns from the same two locations, the OKiePROS system cited earlier in fact has substantially simplified and expedited the permitting process for carriers.

5.2 RAIL MOBILITY ISSUES/CONCERNS IDENTIFIED

Railroad-related concerns and mobility issues can be attributed to several factors. Inadequate track and a rail yard's physical capacity can produce railroad bottlenecks, as can the crossing of two tracks. Rail bottlenecks in turn, impact rail velocity. Deficient structures such as bridges can introduce speed restrictions that affect freight mobility

These factors not only affect the mobility of rail freight, but can also have an impact on highway traffic. Slow or stopped trains can interfere with motor vehicle traffic at grade crossings. Even fast moving trains in high frequency railroad corridors can create motor vehicle bottlenecks.

Table 9 is an initial summary of locations where stakeholders expressed concern about freight railroad mobility issues in relation to the overall transportation system. A planning level evaluation to assess rail constraints and possible conflicts may be warranted.

Table 9. Possible Railroad Mobility Issues

Concern/Issue	Railroad	Location	Comment
Missing leg of wye* connecting Avard and Red Rock subdivisions	BNSF	Perry	Increased number of trains/day affect local traffic
Red Rock subdivision single track	BNSF	North of Edmond to Flynn Yard (Flynn)	Increased rail traffic
Red Rock subdivision Oklahoma River Bridge	BNSF/SLWC	Oklahoma City	Second river crossing needed to remove SLWC trains from BNSF line
Claremore crossing	BNSF/UP	Claremore	Frequent trains on two tracks in middle of town, local and state freight and other highway traffic at crossings is significant
Cherokee Yard location constraints	BNSF	Tulsa	Recent, and anticipated additional, increased north south rail traffic
Shawnee-McAlester line closed	UP (AOK)	Shawnee/McAlester	Inefficient routing of rail traffic between the two locations
Inability to transport standard 286,000 lbs. freight cars	SKOL	Tulsa	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Inadequate rail truck transfer capacity	SKOL	Tulsa	Increased roadway traffic
Inability to transport standard 286,000 lbs. freight cars	SLWC	Lawton subdivision	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Lack of capacity/rail sidings	Farmrail	Elk City	Increased capacity needed to support energy industry
Inability to transport standard 286,000 lbs. freight cars	Farmrail/ Grainbelt	Western Oklahoma	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Inability to transport standard 286,000 lbs. freight cars	AT&L	Watonga-Geary-El Reno	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Inability to transport standard 286,000 lbs. freight cars	AOK	OKC-Shawnee/McAlester-Howe	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Inability to transport standard 286,000 lbs. freight cars	Kiamichi	Valiant-Arkansas border	Extra freight cars required to handle traffic; increased cost to railroad and shippers
Inability to transport standard 286,000 lbs. freight cars	TSU	Tulsa-Sapulpa	Extra additional freight cars required to handle traffic; increased cost to railroad and shippers
Inability to transport standard 286,000 lbs. freight cars	WTJ	Altus-Texas border	Extra freight cars required to handle traffic; increased cost to railroad and shippers

Source: Oklahoma DOT, Rail Programs Division

* A wye is an arrangement of railroad tracks in the form of a "Y", used for turning engines, cars, and trains

5.3 WATER CONCERNS

Issues and concerns regarding waterway freight transport have been identified. Interviews with port directors and staff at Oklahoma's three largest ports—Tulsa Port of Catoosa, Port of Muskogee, and Port 33—confirmed that reliability and state of good repair for the MKARNS is the shared highest priority for all three ports.

ODOT's Waterways Program concurs in this view, and has noted the following:[45]

> …. The MKARNS has never had a catastrophic failure of the locks and dams causing the system to be shut down for an extended period of time since being dedicated in 1971. There are scheduled maintenance projects that the stakeholders work around when notified by the USACE of the shutdowns, usually months ahead of time for periods up to 2 weeks … lock availability on the 5 locks in Oklahoma over a 10 year period of time (is) 98.7%.

In 2015, the MKARNS was inoperable for 90 days, but this was caused by heavy rains and associated water flows and shoaling, not infrastructure failures.

According to the U.S. Army Corps of Engineers (USACE) Tulsa District, there is a backlog of maintenance projects on the MKARNS. "Critical backlog" projects are those that address infrastructure with an estimated 50 percent chance of failure within a 5-year period. In most cases, any single infrastructure failure would not result in total loss of system operability, but the cumulative effects of multiple failures could be very significant.

ODOT's Waterways Program staff coordinated with USACE to develop a list of the critical backlog projects considered most significant for the continued reliability and operability of the MKARNS, and provided the list for use in the OFTP.[46] The recommendations address the following critical needs:

- Tainter gates rusty and worn out at Robert S. Kerr, Mayo, Webbers Fall Locks and Dams
- Tainter valves corroded and leaky at Graham Lock and Dam
- Lock roofs leaking onto equipment at multiple locations
- Miter gate pintle balls worn and poorly functioning
- Faulty and deteriorated lock control wiring at multiple locations
- Inadequate stop logs at Robert S. Kerr Lock and Dam

5.4 AIRPORT ACCESS CONCERNS

As described in Chapter 2 of this Plan, the state has three primary commercial service airports—Lawton-Fort Sill Regional in Lawton, Will Rogers World Airport in Oklahoma City, and Tulsa International in Tulsa.

The truck bottlenecks identified in section 5.1.1 were reviewed to determine whether any of them affected the airports. Will Rogers World Airport is near the interchange of I-44 and I-240, which is a bottleneck (see **Figure 24** earlier in this report). In addition, on I-44 just north of the interchange is a series of bottlenecks. Trucks accessing Tulsa International Airport could be affected by bottlenecks at the interchange of I-44 and I-244 and on the Gilcrease Expressway just north of the interchange with I-244 (see **Figure 25** earlier in this report). There is a bottleneck at the intersection of U.S. 62 and I-44 that affects trucks accessing the Lawton-Fort Sill Regional Airport (see **Figure 23** earlier in this report).

6.0 Moving Freight

6.1 FREIGHT FLOWS FOR 2018 THROUGH 2022

Oklahoma's total freight tonnage across directions and modes is projected to grow 4.5 percent for Plan years 2018 through 2022, from 844 million tons to 883 million tons (**Table 10**). Growth is led by rail at 5.3 percent, followed by water at 4.1 percent, and trucking at 4.0 percent.

Table 10. Oklahoma Freight Growth (2018 through 2022)

Tonnage 2018 by Mode and Direction (Millions)					
Mode	Inbound	Outbound	Within	Through	Total
Truck	48.1	80.7	123.6	234.3	**486.7**
Rail	29.5	18.6	2.6	300.5	**351.1**
Water	3.2	3.3	0.0	0.0	**6.5**
Total	**80.8**	**102.5**	**126.1**	**534.8**	**844.3**
Tonnage 2022 by Mode and Direction (Millions)					
Mode	Inbound	Outbound	Within	Through	Total
Truck	50.3	83.8	123.6	248.6	**506.3**
Rail	29.5	19.3	2.7	318.1	**369.6**
Water	3.3	3.4	0.0	0.0	**6.8**
Total	**83.2**	**106.5**	**126.3**	**566.8**	**882.6**
Percent Change in Tonnage by Mode and Direction between 2018 and 2022					
Mode	Inbound	Outbound	Within	Through	Total
Truck	4.6%	3.8%	0.0%	6.1%	**4.0%**
Rail	0.1%	3.9%	3.7%	5.9%	**5.3%**
Water	3.1%	5.1%	—	—	**4.1%**
Total	**2.9%**	**3.8%**	**0.1%**	**6.0%**	**4.5%**

Source: IHS Markit Transearch, Freight Analysis Framework 4.3, WSP

Projected growth varies by type of flow. Oklahoma-based traffic increases are led by outbound freight growth of 3.8 percent. Inbound freight is expected to grow at a slower 2.9 percent, due to flat rail volumes. Within-state freight volumes are projected to grow just 0.1 percent between 2018 and 2022. In contrast, through freight is projected to grow a relatively high 6.0 percent from 2018 to 2022.

During this time period, the commodity mix is expected to stay relatively stable. The top inbound commodity—coal—is expected to decline in volume because of the national trend toward replacement of coal-fired electrical generation capacity with natural gas. Coal is the only top-ranked commodity that is carried almost exclusively by rail. During the five-year period, shipments of nonmetallic minerals are expected to increase and become the top inbound commodity group. Refined petroleum products, which are carried mostly by truck, will remain the top outbound commodity. Agriculture, the third largest outbound commodity, is expected to grow the fastest. Coal, agriculture, food and chemical products are anticipated to remain the top through products.

6.2 FREIGHT POLICIES AND STRATEGIES

6.2.1 Policies and Strategies Address Plan Goals

This OFTP establishes freight policies and strategies, which incorporate and draw upon many sources. Oklahoma's LRTP 2015 through 2040 includes an extensive list of policies and strategies. The Oklahoma State Rail Plan: 2018–2021 also identifies strategies for ODOT as it moves forward with its rail programs.

A review of the LRTP showed that its policies include sufficient coverage to address freight issues. Thus, the appropriate policies, along with related strategies, were selected for use in the freight plan.

Additionally, some new freight-focused strategies were developed to supplement those already adopted as a part of the LRTP. **Table 11** summarizes each of the LRTP goal areas and new freight strategies to achieve the LRTP goals.

Table 11. Multimodal Freight Strategies by Goal Areas

Goal Area: SAFE and SECURE TRAVEL
▪ Plan for the impact and promote the appropriate use of connected and automated vehicle technologies.
▪ Utilize data to track the volume and safety of truck, passenger vehicle and train growth and support necessary infrastructure improvements.
▪ Assure sufficient truck parking and rest areas for major freight routes and activity centers.
▪ Improve the safety of rail-highway at-grade crossings.
Goal Area: INFRASTRUCTURE PRESERVATION
▪ Incorporate freight considerations into all appropriate project evaluations.
▪ Monitor and maintain condition of state-owned freight routes.
▪ Track utilization of oversize/overweight truck routes.
▪ Proactively disseminate advance information about highway construction activities to freight stakeholders.
Goal Area: ECONOMIC VITALITY
▪ Assure investment in freight facilities relied upon by industries critical to the state economy.
▪ Encourage viable economic development across the state through availability of effective freight services.
▪ Continue to seek ways to expedite project approvals to speed reaction to market shifts and attract private capital.
▪ Support public transportation options for workforce in freight-dependent industries.
Goal Area: MOBILITY (Choice, Connectivity and Accessibility)
▪ Monitor and seek to improve the reliability, speed and productivity of freight movement in Oklahoma.
▪ Encourage development of multimodal networks and intermodal facilities, and assure efficient highway access to air, rail, and waterway facilities.
▪ Prepare for continued strong growth of home delivery by managing performance of highway access routes between distribution centers and delivery recipients.
Goal Area: EFFICIENT INTERMODAL SYSTEM MANAGEMENT and OPERATION
▪ Identify competitive opportunities and pursue federal grants for strategic freight projects.
▪ Provide information to the Oklahoma congressional delegation to support expansion of federal freight funding, and utilization of existing funds.
▪ Cooperate with neighboring states to develop improvement and funding concepts for multimodal corridors of strategic economic and security importance to the state, region and nation.
▪ Pilot and implement new technologies and intelligent transportation system tools.
▪ Inventory and monitor Oklahoma's critical supply chains, and evaluate their resiliency and reliability.
Goal Area: ENVIRONMENTAL RESPONSIBILITY
▪ Encourage expansion of natural gas fueling facilities.
▪ Support the availability of freight modal options that reduce environmental impacts.

In addition to these multimodal freight strategies, the LRTP includes policies and strategies related to freight movement by modal system: Highway and Bridge; Freight Rail; Multimodal; Waterways and Ports; and Airport Access and Aviation.[47]

This OFTP is intended to draw upon, and integrate, a broad range of perspectives and opportunities. In addition to the LRTP, the draft Oklahoma State Rail Plan: 2018–2021 currently in development identifies strategic initiatives for ODOT as it moves forward with its rail programs. ODOT recognizes that other important goals, policies, and strategies may be contained in state economic development plans, metropolitan area plans, regional/county/local documents, development plans for ports and airports, and private development plans.

These types of plans are continuously in development, and as they produce important recommendations for freight policies and strategies, ODOT will consider them as part of its larger ongoing program of freight planning.

6.3 FREIGHT PERFORMANCE MEASURES

The FAST Act—like its predecessor legislation, Moving Ahead for Progress in the 21st Century Act (MAP-21)—emphasizes the establishment of performance measures. The value of freight performance measurement is to improve Oklahoma's ability to quantify key performance dimensions in a consistent and systematic way, to identify emerging bottlenecks or deficiencies at the early stages so they can be appropriately addressed, to make project investment decisions in a data-driven manner, and—perhaps most importantly—to track its progress toward meeting its freight goals.[48] Freight performance measures must therefore be closely aligned with freight goals.

6.3.1 Performance Measurement

U.S. DOT requires the collection and reporting of only one freight performance measure, which addresses TTTR on the interstate system. U.S. DOT also requires states to report other performance measures that are not freight-specific, but are relevant to achieving state freight goals.

Table 12 illustrates the correspondence between Oklahoma freight goals and the recommended freight performance measures.[49]

Table 12. Oklahoma's Freight Goals and Correspondence to Oklahoma Freight Transportation Plan Freight Performance Measures

OFTP Freight Goal Areas	Source of Measure	OFTP Freight Transportation Performance Measures
Safe and Secure Travel	OK Measure	Mileage with Paved Shoulders
	U.S. DOT Measure	Rail Grade Crossing Crashes Truck Crashes
Infrastructure Preservation	U.S. DOT General Requirement	Bridge Deck Condition Ratings Pavement Condition Ratings
Mobility: Choice, Connectivity and Accessibility	U.S. DOT Freight Requirement	Truck Travel Time Reliability (TTTR) Index *A measure indicating how well the* over OK interstate highway *system performs in periods of congestion; the higher the index, the greater the impact of congestion.*
Economic Vitality	OK Measure	Highly Used Truck Mileage
Efficient Intermodal System Management and Operation	OK Measure	Median Truck Travel Speed Truck Travel Time Index *A measure indicating how well the system performs in periods of congestion; similar to the TTTR above, but covering all of Oklahoma's NHS.* Truck Delay *A measure of how congestion impacts truck travel times, which in turn impacts freight transportation costs and prices.*
Environmental Responsibility	OK Measure	Clean Fuel Access

6.4 IMPROVEMENT PRIORITIES

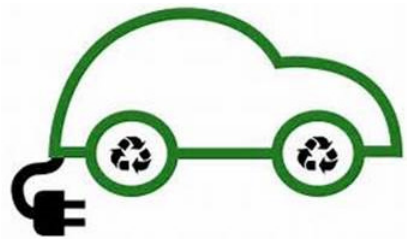
6.4.1 Evaluating Potential Freight Projects

One of the purposes of this OFTP is to identify projects that will improve the efficiency of freight transportation. In addition to using the state apportionment of federal highway funds (e.g., National Highway Performance Program, and Surface Transportation Block Grants), a special category of freight formula funds (NHFP) is made available to the states to support freight projects.

A multi-criteria analysis was used to rank projects listed in the first five years of the ODOT 8 Year Construction Work Plan according to how well they scored on the freight goal areas. As a result of this analysis, projects will be ranked for their usefulness to improving freight transportation—identified as freight mobility projects—and listed with planned funding programs. The criteria (**Table 13**) are organized according to this OFTP's goals and performance measures. Specific measures were selected to fit with the framework that is being used by ODOT to rank 8 Year Construction Work Plan projects.[50]

Table 13. Evaluation Criteria

Goal Areas	Measures	Calculation
Safety and Security	Unpaved Shoulder	Number of shoulder miles unpaved (10 feet for interstates and 4 feet for other), along the project segment
	Expected Change in Truck Crash Injuries	Crash Reduction Factor for Injuries times base injury rate (over 5 years)
	Expected Change in Truck Crash Fatalities	Crash Reduction Factor for Fatalities times base fatality rate (over 5 years)
Infrastructure Preservation	Bridges in Poor Condition	Federal measure
	Pavement Condition – IRI	Average IRI throughout project segment
	Heavy-Loaded Truck Routes	Average volume of heavy-loaded trucks
Mobility	Identified Bottleneck	Does project segment coincide with identified bottleneck
	Truck Proportion	Average truck proportion throughout project segment
	Percent Truck Volume Increase - 2025	Average percentage increase in truck traffic in project segment (5 million tons or more)
Economic Vitality	Identified Bottleneck	Does project segment coincide with identified bottleneck?
	Proximity to Key Industry	Number of jobs in key industries within 3 miles
	Proximity to Multimodal and Military Facilities	Number of multimodal and military facilities within 75 miles
Environmental Responsibility	Proximity to Compressed Natural Gas (CNG) Stations	Number of CNG stations within 5 miles
	Proximity to Electric Vehicle (EV) fast charging stations	Number of EV fast charging stations within 5 miles
Strategic Value	Strategic Value	Grant a bonus for example to 1) corridors of regional significance; 2) for geographic balance; and 3) for transformative projects, such as preparation of roadways for vehicle-to-infrastructure technology.



In selecting projects for this OFTP, only projects in the 8 Year Construction Work Plan[51] located on the National Highway System[52] were considered. The analysis was performed on projects scheduled during the first five years of the Work Plan, to coincide with the required OFTP years 2018-2022. In total, 190 highway and bridge projects were considered including the following:

- Improvements to grades, drainage, and surface
- Interchange improvements or additions
- Resurfacing and pavement rehabilitation
- Reconstruction within and without lane additions
- Bridge rehabilitation
- Improvement of bridge approaches

The scoring procedure first calculated the percentile rank of each project according to the measures listed above. Then the percentile ranks were summed using the following weights by goal area, which reflect FAC goal priorities and were established by ODOT management:

- Safety and Security: 30%
- Infrastructure Preservation: 25%
- Mobility: 20%
- Economic Vitality: 10%
- Environmental Responsibility: 5%
- Strategic Value: 10%

Table 17 under Section 6.5: Investment Plan lists the resulting top highway freight mobility projects.

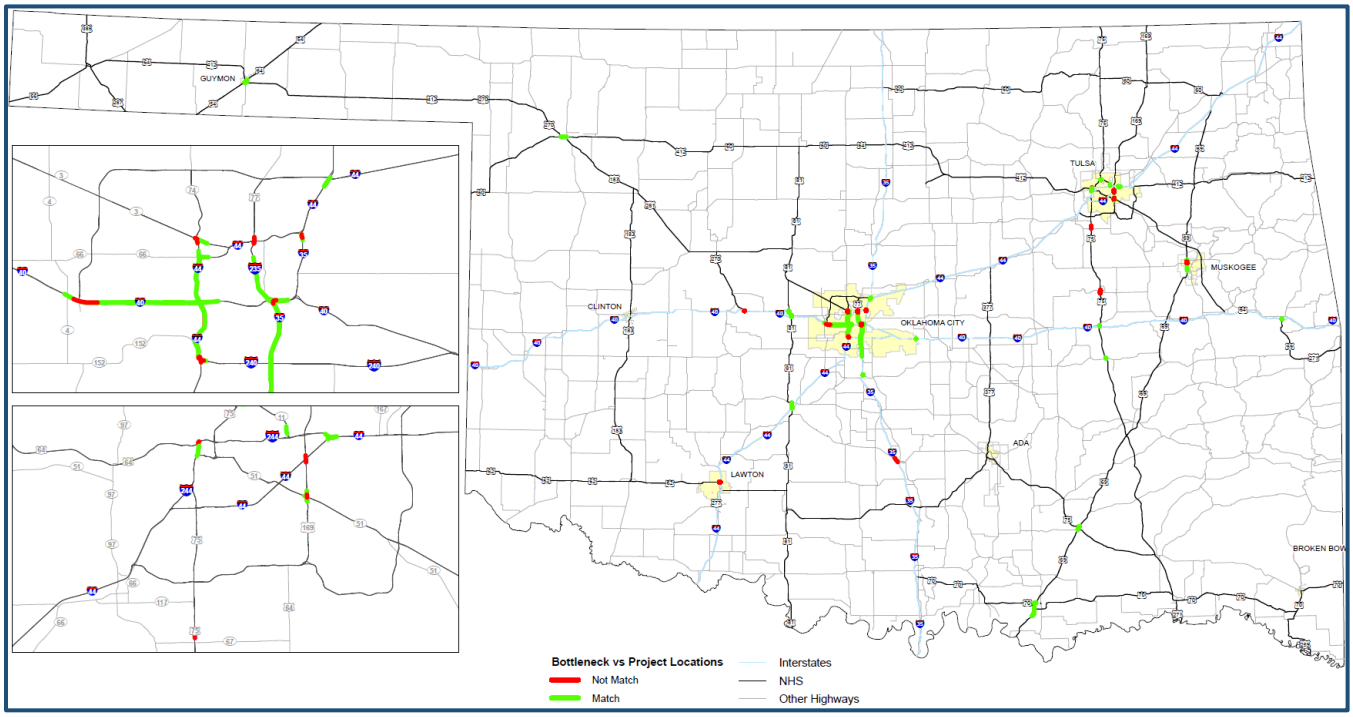
6.4.2 Project Gaps

The bottleneck analysis described in Chapter 5 identified highways with performance issues (**Figure 23**). For a location to be identified as a bottleneck priority that would receive further consideration in the OFTP final analysis, it had to rank in the top 5 percent of way segments in terms of delay or unreliability. Therefore, these are the places on Oklahoma's State Highway System that are considered the major chokepoints for truck movements.

Of the highway bottlenecks identified, 25 did not have a project associated with that location in the first five years of the 8 Year Construction Work Plan. Some of these locations are addressed with projects that are underway, or will be addressed by projects in later years of the 8 Year Construction Work Plan.

Figure 26 shows the bottleneck locations without a project.

Figure 26. Bottleneck Locations Without Project



Source: Oklahoma Department of Transportation; WSP analysis of Highway Performance Monitoring System and National Performance Management Research Data Set data

Table 14 corresponds to the above map and lists the highways affected by bottleneck locations, which do not have projects in the first five years of the 8 Year Construction Work Plan. An engineering analysis is required to assess the situation and develop appropriate responses. As noted above, there are various possible explanations, including that solutions are too expensive or infeasible to address at this time. The determination can be made only after looking into each location individually.

Table 14. Bottleneck Locations without Project

Type of Highway	County	Affected Highway
Interstate	Canadian	I-40
	Garvin	I-35
	Oklahoma	I-35, I-44, I-235, I-35, I-35/I-40, I-240, I-235, I-235/1-40/I-35
	Tulsa	I-244
Other Highway	Atoka	U.S. 69
	Canadian	U.S. 281
	Comanche	U.S. 62
	Muskogee	U.S. 62
	Oklahoma	U.S. 77, S.H. 3
	Okmulgee	U.S. 75
	Texas	U.S. 412, U.S. 54
	Tulsa	U.S. 64, U.S. 169, U.S. 169, U.S. 75

Source: WSP analysis 2017

6.5 FREIGHT INVESTMENT ELEMENT

6.5.1 Funding for Freight Projects

Addressing the many needs on Oklahoma's transportation system requires extensive collaboration and resources from public and private partners.

Table 15 provides a summary of potential federal, state, and local government funding options.

Table 15. Potential Public Funding Options

Federal (Discretionary Grant Programs)	Federal (Formula Funds)	State and Local
Capital Investment Grants	National Highway Performance Program	Rebuilding Oklahoma Access and Driver Safety Fund
Transportation Investment Generating Economic Recovery (TIGER) Grants	Surface Transportation Block Grants	Dedicated Local Funds
Infrastructure for Rebuilding America (INFRA) Grants	Highway Safety Improvement Program	
Rail Line Relocation and Improvement Capital Grant Program	Railway-Highway Crossings Program	
Federal-State Partnership for State of Good Repair Program	Congestion Mitigation and Air Quality Improvement	
Restoration and Enhancement Grants	Metropolitan Planning Funds	
Railroad Safety Infrastructure Improvement Grant Program	National Freight Program	
Consolidated Rail Infrastructure and Safety Improvements		

Source: WSP 2017

Table 16 provides a summary of potential traditional and alternative financing options.

Table 16. Potential Alternative Financing Options

Traditional Financing	Alternative Financing
State Tax Exempt Bonds	State Infrastructure Bank
	Revenue Anticipation Notes

Source: WSP 2017

> In my opinion, infrastructure is one the most important functions that government can provide.
> *—Member of grain marketing consortium of 28 farmer owned cooperatives in central & western Kansas, Oklahoma and the Texas panhandle.*

6.5.2 Highlighted Freight Projects

As indicated in its mission statement "…to provide a safe, economical and effective transportation network for the people, commerce and communities of Oklahoma", ODOT has long planned constructed and maintained a transportation system that addresses freight and goods movement. With the FAST Act emphasis on freight, Oklahoma like many other states is adopting its first Freight Transportation Plan, which specifically calls out projects that benefit freight.

The following tables describe planned highway, rail and waterway improvements that are expected to have a significant impact on freight mobility. Many other projects not listed here—projects underway, planned, or envisioned for years beyond the scope of this Plan—have merit for improving freight transportation as well.

Table 17 lists 54 highway freight mobility projects for this OFTP years 2018 through 2022, all of which are or could be eligible for application of National Highway Freight Program funds. These are the top eligible projects in the state as measured by the freight evaluation criteria described in this chapter. About 40 percent of them improve freight mobility through capacity improvements and 60 percent through operational improvements. These projects are also in the 8 Year Construction Work Plan: 2018-2025 and will be in the State Transportation Improvement Plan: 2018-2021 accordingly, by year.

Table 17 Top-Ranked Highway Freight Mobility Projects (FFY 2018 through 2022)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	Plan Cost Est. (M$)
Tulsa 8	28881(04)	I-444 OVER 11TH AND 6TH STREET, .3 MILE NORTH OF S.H. 51	2018	C	$4.20
Beckham 5	30998(04)	I-40: S.H. 6 BOTH NB & SB BRIDGES OVER I-40 IN ELK CITY	2018	C	$9.34
Oklahoma 4	27905(04)	I-235: NB OFFRAMP IMPROVEMENTS AT N. 23RD ST.	2018	C	$.50
Oklahoma 4	28855(04)	I-44: EB, WB & ON-RAMP BRIDGES OVER DEEP FORK CREEK 6.7 MIS. N. OF I-40	2018	OI	$4.00
Oklahoma 4	30444(06)	I-35: ADD CAPACITY TO EXISTING BRIDGES AT I-35/I-40 INTERCHANGE - INTERIM IMPROVEMENT	2018	OI	$5.00
Okmulgee 1	29673(04)	U.S. 75: BRIDGES OVER KO & G R.R. (ABANDONED RR), 1.2 MILE NORTH OF I-40	2018	OI	$4.71
Sequoyah 1	28961(04)	I-40: BRIDGE OVER CO. RD. (OLD U.S. 64) & KCS R.R., 1.40 MI. E. OF JCT. U.S. 59	2018	OI	$10.89
Sequoyah 1	10618(07)	I-40 INTERCHANGE @ U.S. 64 IN SALLISAW (BR @ U.S. 64 & LITTLE SALLISAW CR)	2018	C	$25.90
Tulsa 8	28859(04)	129TH E. AVE, I-244 UNDER, 1.54 MI EAST OF JCT U.S. 169	2018	C	$6.29
Tulsa 8	28900(04)	I-444 FROM ARKANSAS RIVER EXTEND EAST APROX. 1.68 MILES (SOUTH LEG OF THE IDL)	2018	OI	$20.50
Washita 5	29003(04)	I-40 NORTH FRONTAGE ROAD: BRIDGE AND APPROACHES OVER SAND CREEKLOCATED 0.11 MILE EAST OF S.H. 44.	2018	OI	$.74
Grady 7	24428(05)	U.S. 81 REALIGNMENT FROM 1 MI. N. OF THE U.S. 81/U.S. 277 JCT. S. OF CHICKASHA EXT. N. 8.63 MI. TO .85 MI. N OF THE U.S. 62/U.S. 81 JCT. (R/W)	2018	C	$11.51
Oklahoma 4	27897(04)	I-35NB & SB OVER DEEP FORK CR SERVICE RD, 4.6 MI N OF I-40 JUNCTION	2018	OI	$33.00
Texas 6	14971(36)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; ROW	2018	OI	$.80
Texas 6	20839(08)	U.S. 54; BEGIN APPROX. 8.5 MI. NORTH OF U.S. 64 & EXTEND N 2.0 MILES THROUGH TYRONE	2018	OI	$9.42
				Subtotal 2018	*$146.81*

Table 17 Top-Ranked Highway Freight Mobility Projects (FFY 2018 through 2022) (continued)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	Plan Cost Est. (M$)
Bryan 2	31855(04)*	U.S. 69. BEGIN AT SOUTH END OF CALERA AND EXTEND NORTH TO U.S. 70 INTERCHANGE (FASTLANE @ $62M).	2019	C	$120.00
Canadian 4	27004(04)	I-40B: OVER THE UP RAILROAD ON THE SOUTH EDGE OF EL RENO	2019	OI	$7.58
Oklahoma 4	31006(04)	I-44: DOWEL BAR RETROFIT AND DIAMOND GRINDING FROM SW 74TH ST, NORTH TO OKLAHOMA RIVER, ADDED LANE ON SB FROM 0.5 SOUTH OF SW74TH ST	2019	OI	$10.10
Oklahoma 4	31019(04)	I-44: NB AND SB BRIDGE REHABILITATION OVER S.59TH ST, 0.75 MILES SOUTH OF S.H. 152 JCT	2019	OI	$1.52
Oklahoma 4	9033(27)	I-235: MAINLINE THRU I-44 INTERCHANGE (SEGMENT 8)	2019	OI	$45.45
Oklahoma 4	9033(11)	I-235: NB TO WB & EB TO NB FLYOVER BRIDGES I-235/ I-44 INTERCHANGE (SEGMENT 2B)	2019	OI	$35.35
Pittsburgh 2	14999(09)	U.S. 69 CONSTRUCTION INTERCHANGE @ KINKEAD ROAD IN MCALESTER	2019	C	$20.00
Texas 6	14971(37)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; UT	2019	OI	$.37
Texas 6	14971(41)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; (SURFACE FOR SB LANES)	2019	OI	$3.00
				Subtotal 2019	*$243.36*
Canadian 4	30715(04)	I-40. INTERCHANGE AT FRISCO ROAD, 4.5 MILES WEST OF THE KILPATRICKTURNPIKE JUNCTION.	2020	C	$17.36
Dewey 5	17671(41)	U.S. 270, BEGIN 0.4 MI SE OF THE S.H. 51 E JCT AND EXTEND SE 4.9 MILES.TURNKEY PROJECT (CONSTRUCT AS 4 LANE DIV & REHAB EXISTING)	2020	C	$20.00
Garvin 3	20970(08)	I-35: FROM S.H. 19, NORTH 3.21 MI	2020	OI	$15.55
Grady 7	24428(06)	U.S. 81 REALIGNMENT FROM 1 MI. N. OF U.S. 81/U.S. 277 JCT. S. OF CHICKASHA EXT. N. 8.63 MI. TO .85 MI. N OF THE U.S. 62/U.S. 81 JCT. (UTILITIES)	2020	C	$6.30
Muskogee 1	27108(04)	U.S. 69: BEGIN 0.1 MI N OF U.S. 64 E (PEAK BLVD) & EXT N 2.5 MILES	2020	C	$4.00
Muskogee 1	31211(04)	U.S. 69: NB - FROM 4.5 MI. N. OF MUSKOGEE C/L N. 8.5 MI., SB - FROM 8.5 MI. N OF MUSKOGEE C/L N. 4.5 MI.	2020	OI	$6.00
Oklahoma 4	9033(28)	I-44: WB TO NB RAMPS AT I-44/I-235 INTERCHANGE (SEGMENT 3A)	2020	OI	$15.81
Oklahoma 4	9032(05)	I-35: OVER THE I-240 JCT. RECONSTR INTERCHANGE (PHASE IB)	2020	OI	$12.24
Rogers 8	27031(04)	S.H. 20: FROM 4 MILES EAST OF TULSA COUNTY LINE EAST TO 1 MILE EAST OF VERDIGRIS RIVER	2020	C	$52.49
Texas 6	20947(04)	U.S. 54 FROM 4.8 MI. N of U.S. 64 EXTEND N 3.7 MI, GRADE & DRAIN,	2020	OI	$3.25
				Subtotal 2020	*$152.99*

Table 17 Top-Ranked Highway Freight Mobility Projects (FFY 2018 through 2022) (continued)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	Plan Cost Est. (M$)
Custer 5	31060(04)	AIRPORT ROAD OVER I-40 LOCATED 4.3 MILES EAST OF S.H. 54 IN WEATHERFORD.	2021	C	$6.32
Dewey 5	17671(13)	U.S. 270 FROM 5.4 MI SOUTH OF S.H. 51 EAST JCT & EXT SE 3.0 MILES.TURNKEY PROJECT (CONSTRUCT AS 4 LANE DIV & REHAB EXISTING)	2021	C	$14.17
Oklahoma 4	26422(05)	I-40: FROM MM 171 EAST TO MM 173 (RECONSTRUCT & ADD LANES & RECONSTRUCT, HARRAH/NEWALLA INTERCHG	2021	C	$20.60
Oklahoma 4	9032(06)	I-35: OVER THE I-240 JCT. (PHASE II) RECONST INTERCHG	2021	OI	$24.72
Oklahoma 4	9032(07)	I-35 @ THE I-240 JCT (PHASE III) RECONST INTERCHG	2021	OI	$16.48
Oklahoma 4	9032(08)	I-35 @ THE I-240 JCT (PHASE IV) RECONST INTERCHG	2021	OI	$31.93
Rogers 8	26242(04)	S.H. 20 / S.H. 66 CONNECTION	2021	C	$32.70
Texas 6	20947(07)	U.S. 54 FROM 4.8 mi. N of U.S. 64, EXTEND N 3.7 MI; SURFACE	2021	OI	$9.31
Texas 6	20947(08)	U.S. 54 FROM 4.8 mi. N of U.S. 64 EXTEND N 3.7 mi, RR	2021	OI	$.14
				Subtotal 2021	*$156.37*
Canadian 4	27959(04)	U.S. 281 SPUR: BRIDGE OVER I-40 4.1 MIS. E. OF THE CADDO C/L	2022	OI	$4.00
McClain 3	19314(04)	I-35/S.H. 9 INTERCHANGE (PHASE III)	2022	C	$7.18
Oklahoma 4	29844(04)	I-35: NB & SB BRIDGES OVER 63RD STREET 5.0 MIS. N. OF I-40 INCLUDING RECONFIGURATION OF I-35/I-44 INTERCHANGE TO ACCOMODATE BRIDGES	2022	C	$33.00
Oklahoma 4	29843(04)	I-35: NB & SB BRIDGES OVER WATERLOO ROAD AT LOGAN C/L	2022	C	$28.00
Oklahoma 4	31013(06)	I-240: DIAMOND GRINDING FROM 0.15 MILES EAST OF I-35, EXTEND WEST 5.75MILES TO THE WEST SIDE OF AIR DEPOT	2022	OI	$1.50
Oklahoma 4	31018(04)	I-44: BRIDGE REHABILITATION OVER I-240, 1.3 MILES NORTH OF OKLA/CLEVELAND CL INCL. RAMP AND NB MAINLINE	2022	OI	$3.03
Pottawatomie 3	21007(07)	I-40: FROM OKLAHOMA C/L, EAST 5.0 MI TO S.H. 102S (MP172.89 TO MP 177.89)	2022	C	$16.00
Rogers 8	31093(04)	U.S. 412 ADD J-TURNS AT 265TH E AVE & 289TH E AVE. APPROX. 2.8 MI & 4.3 MI EAST OF I 44 JCT	2022	C	$.25
Tulsa 8	29694(04)	UNION AVE OVER I-44, 1.6 MILES EAST OF S.H. 66	2022	C	$10.55
Texas 6	14971(35)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; GR, DR, SURF	2022	OI	$2.49
Texas 6	14971(42)	U.S. 54. BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; SURF.	2022	OI	$11.13
				Subtotal 2022	*$117.13*
				Grand Total	*$816.66*

**Project is stated at total cost, including funds from FASTLANE grant*
Project Types: Capacity (C), Operational Improvements (OI)

6.5.3 Freight Investment Plan Projects

National Highway Freight Program Projects

ODOT considered various factors for the allocation of federal freight formula funds for Oklahoma's freight projects including level annual funding, corridor focus, geographic diversification, project ranking, stakeholder priorities, project size, and designation of critical candidate rural freight corridors. The resulting set of 18 projects, selected to be funded in part with National Highway Freight Program (NHFP) funds, constitute Oklahoma's Five Year Financially Constrained Freight Investment Plan. As shown in **Table 18**, these projects require total funding of $250.5 million. NHFP funds will cover $100.2 million, and the remaining $150.3 million will be supplied by state and other federal sources. An additional $62 million (not included in the $250.5 million) already is being funded by a federal FASTLANE grant for U.S. 69 in Bryan County.

U.S. 69 Bryan County

Visualization of U.S. 69 after completion of FASTLANE grant project

Table 18. Five Year Financially Constrained Freight Investment Plan Projects

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	NHFN *	Plan Cost Est. (M$)	Funding Source		
							NHFP	Nat'l Hwy PP	State
Grady 7	24428(05)	U.S. 81 REALIGNMENT FROM 1 MI. N. OF U.S. 81/ U.S. 277 JCT. S. OF CHICKASHA EXT. N. 8.63 MI. TO .85 MI. N OF THE U.S. 62/ U.S. 81 JCT. (R/W)	2018	C	R	$11.51	$4.60	$4.60	$2.30
Oklahoma 4	27897(04)	I-35NB & SB BRIDGES OVER DEEP FORK CR SERVICE RD, 4.6 MI N OF I-40 JUNCTION	2018	C	Y	$33.00	$13.20	$13.20	$6.60
Sequoyah 1	10618(07)	I-40 INTERCHANGE @ U.S. 64 IN SALLISAW (BR @ U.S. 64 & LITTLE SALLISAW CR)	2018	C	Y	$25.90	$10.36	$10.36	$5.18
Texas 6	14971(36)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; ROW	2018	C	R	$.80	$.32	$.32	$.16
Texas 6	20839(08)	U.S. 54; BEGIN APPROX. 8.5 MI. NORTH OF U.S. 64 & EXTEND N 2.0 MILES THROUGH TYRONE: GRADE, DRAIN, SURFACE	2018	C	R	$9.42	$3.77	$3.77	$1.88
Tulsa 8	28859(04)	129TH E. AVE I-244 UNDER, 1.54 MI EAST OF JCT U.S. 169; BRIDGE	2018	C	Y	$6.29	$2.52	$2.52	$1.26
			Subtotal 2018			***$86.92***	***$34.77***	***$34.77***	***$17.38***

Table 18. Five Year Financially Constrained Freight Investment Plan Projects (continued)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	NHFN *	Plan Cost Est. (M$)	Funding Source		
							NHFP	Nat'l Hwy PP	State
Bryan 2	31855(04)**	U.S. 69. BEGIN AT SOUTH END OF CALERA AND EXTEND NORTH TO U.S. 70 INTERCHANGE; GRADE, DRAIN, SURFACE, BRIDGE (FASTLANE @ $62M)	2019	C	R	$58.00	$23.20	$10.80	$24.00
Texas 6	14971(37)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; UT	2019	C	R	$.37	$.15	$.15	$.07
Texas 6	14971(41)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; (SURFACE FOR SB LANES)	2019	OI	R	$3.00	$1.20	$1.20	$.60
				Subtotal 2019		***$61.37***	***$24.55***	***$12.15***	***$24.67***
Grady 7	24428(06)	U.S. 81 REALIGNMENT FROM 1 MI. N. OF THE U.S. 81/U.S. 277 JCT. S. OF CHICKASHA EXT. N. 8.63 MI. TO .85 MI. N OF THE U.S. 62/U.S. 81 JCT. (UTILITIES)	2020	C	R	$6.30	$2.52	$2.52	$1.26
Texas 6	20947(04)	U.S. 54 FROM 4.8 mi. N of U.S. 64 EXTEND N. 3.7 MI, GRADE & DRAIN	2020	C	R	$3.25	$1.30	$1.30	$.65
				Subtotal 2020		***$9.55***	***$3.82***	***$3.82***	***$1.91***
Oklahoma 4	26422(05)	I-40: FROM MI MARKER 171 EAST TO MI MARKER 173 (RECONSTRUCT & ADD LANES & RECONSTRUCT, HARRAH/NEWALLA INTERCHANGE	2021	C	Y	$20.60	$8.24	$8.24	$4.12
Texas 6	20947(07)	U.S. 54 FROM 4.8 mi. N of U.S. 64, EXTEND N 3.7 MI; SURFACE	2021	C	R	$9.31	$3.72	$3.72	$1.86
Texas 6	20947(08)	U.S. 54 FROM 4.8 mi. N of U.S. 64 EXTEND N 3.7 mi, RR XING	2021	OI	R	$.14	$.06	$.06	$.03
				Subtotal 2021		***$30.05***	***$12.02***	***$12.02***	***$6.01***

Table 18. Five Year Financially Constrained Freight Investment Plan Projects (continued)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	NHFN *	Plan Cost Est. (M$)	Funding Source		
							NHFP	Nat'l Hwy PP	State
Oklahoma 4	29844(04)	I-35: NB & SB BRIDGES OVER 63RD ST 5.0 MIS. N. OF I-40 INCL RECONFIG OF I-35/ I-44 INTERCHGE TO ACCOMODATE BRIDGES	2022	C	Y	$33.00	$13.20	$13.20	$6.60
Pottawatomie 3	21007(07)	I-40: FROM OKLAHOMA C/L, EAST 5.0 MI TO S.H. 102S; GRADE, DRAIN, SURFACE (MP172.89 TO MP 177.89)	2022	C	Y	$16.00	$6.40	$6.40	$3.20
Texas 6	14971(35)	U.S. 54: BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; GRADE, DRAIN	2022	OI	R	$2.49	$1.00	$1.00	$.50
Texas 6	14971(42)	U.S. 54. BEG APPROX 10.5 MI N of JCT of US54/US64W and EXTEND N 3.6 MI; SURFACE	2022	OI	R	$11.13	$4.45	$4.45	$2.23
			Subtotal 2022			*$62.62*	*$25.05*	*$25.05*	*$12.52*
			Grand Total			*$250.51*	*$100.20*	*$87.80*	*$62.50*

**Y indicates Yes, on National Highway Freight Network (NHFN); R indicates Recommended for NHFN*
***Plan Cost Est. ($58M) + FASTLANE grant ($62M) = Total project cost of $120M*
Project Types: Capacity (C), Operational Improvements (OI)

HIGHWAY FREIGHT MOBILITY PROJECTS

Additional Support by traditional federal and state programs

In addition to projects funded in part by NHFP funds, 36 top highway freight mobility projects appear in the 8 Year Construction Work Plan. These projects are being funded from traditional highway sources, with 80 percent from the federal government and 20 percent from the state. These 36 projects represent an additional $504 million investment in freight over the next five years, as displayed in **Table 19**. Combined with the 18 projects that will receive NHFP funds, the total highway freight investment in Oklahoma over the next five years is $816 million, covering all of the 54 top projects presented in Table 17. The location of these 54 projects appears in the map in **Figure 27**, which also depicts the top highway freight bottlenecks in the state. Twenty-nine of the projects are slated for locations with bottlenecks.

Table 19. Five Year Highway Freight Investment Projects Funded with Traditional Federal and State Funds

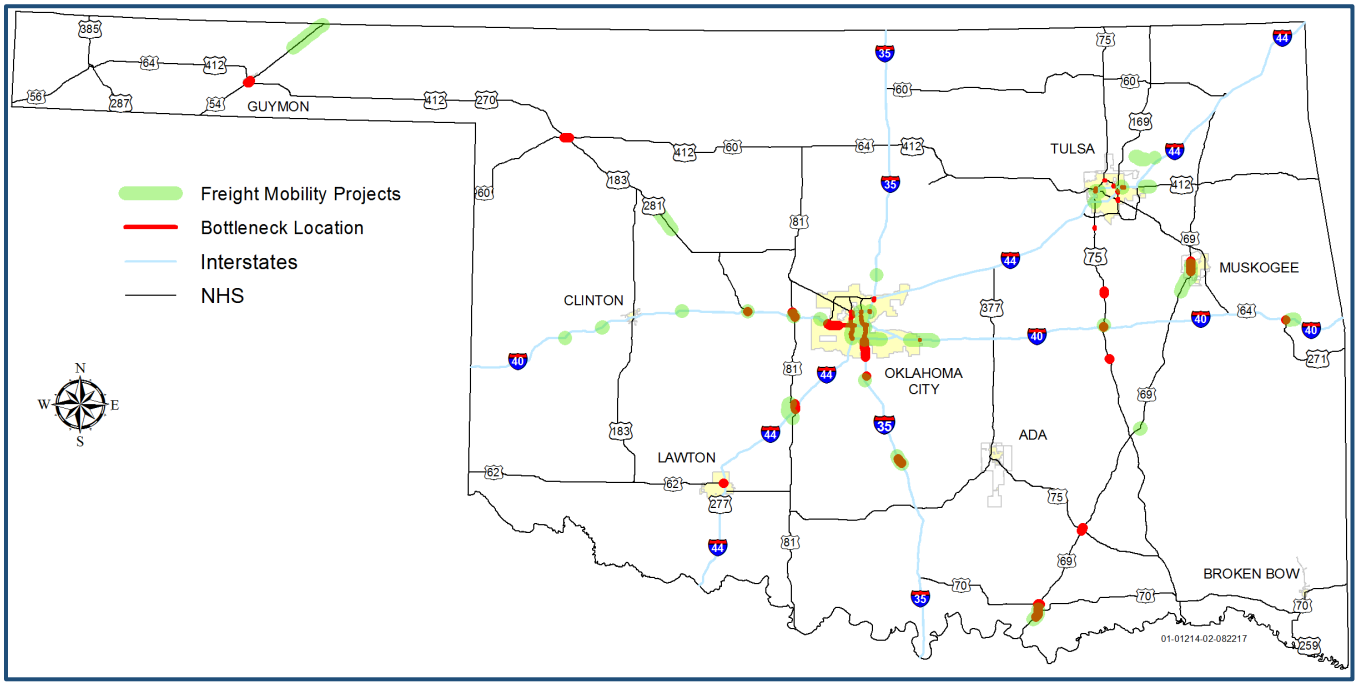
County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	Plan Cost Est. (M$)
Tulsa 8	28881(04)	I-444 OVER 11TH AND 6TH STREET, .3 MILES NORTH OF S.H. 51	2018	C	$4.20
Beckham 5	30998(04)	I-40: S.H. 6 BOTH NB & SB BRIDGES OVER I-40 IN ELK CITY	2018	C	$9.34
Oklahoma 4	27905(04)	I-235: NB OFFRAMP IMPROVEMENTS AT N. 23RD ST.	2018	C	$.50
Oklahoma 4	28855(04)	I-44: EB, WB & ON-RAMP BRIDGES OVER DEEP FORK CREEK 6.7 MIS. N. OF I-40	2018	OI	$4.00
Oklahoma 4	30444(06)	I-35: ADD CAPACITY TO EXISTING BRIDGES AT I-35/I-40 INTERCHANGE - INTERIM IMPROVEMENT	2018	OI	$5.00
Okmulgee 1	29673(04)	U.S. 75: BRIDGES OVER KO & G R.R. (ABANDONED RR), 1.2 MILE NORTH OF I-40	2018	OI	$4.71
Sequoyah 1	28961(04)	I-40: BRIDGE OVER CO. RD. (OLD U.S. 64) & KCS R.R., 1.40 MI. E. OF JCT. U.S. 59	2018	OI	$10.89
Tulsa 8	28900(04)	I-444 FROM ARKANSAS RIVER EXTEND EAST APROX. 1.68 MILES (SOUTH LEG OF THE IDL)	2018	OI	$20.50
Washita 5	29003(04)	I-40 N. FRONTAGE ROAD: BRIDGE & APPROACHES OVER SAND CREEK, 0.11 MILE EAST OF S.H. 44.	2018	OI	$.74
				Subtotal 2018	$59.89
Canadian 4	27004(04)	I-40B: OVER THE UP RAILROAD ON THE SOUTH EDGE OF EL RENO	2019	OI	$7.58
Oklahoma 4	31006(04)	I-44: DOWEL BAR RETROFIT AND DIAMOND GRINDING FROM SW 74TH ST, NORTH TO OKLAHOMA RIVER, ADDED LANE ON SB FROM 0.5 SOUTH OF SW74TH ST	2019	OI	$10.10
Oklahoma 4	31019(04)	I-44: NB AND SB BRIDGE REHABILITATION OVER S.59TH ST, 0.75 MILES SOUTH OF THES.H. 152 JCT	2019	OI	$1.52
Oklahoma 4	9033(27)	I-235: MAINLINE THRU I-44 INTERCHANGE (SEGMENT 8)	2019	OI	$45.45
Oklahoma 4	9033(11)	I-235: NB TO WB & EB TO NB FLYOVER BRIDGES I-235/ I-44 INTERCHANGE (SEGMENT 2B)	2019	OI	$35.35
Pittsburg 2	14999(09)	U.S. 69 CONSTRUCTION INTERCHANGE @ KINKEAD ROAD IN MCALESTER	2019	C	$20.00
				Subtotal 2019	$119.99

Table 19. Five Year Highway Freight Investment Projects Funded with Traditional Federal and State Funds (continued)

County / ODOT Division	Job Piece No.	Project Description	Plan Year	Type of Project	Plan Cost Est. (M$)
Canadian 4	30715(04)	I-40: INTERCHGE AT FRISCO ROAD, 4.5 MILES WEST OF THE KILPATRICKTURNPIKE JUNCTION.	2020	C	$17.36
Dewey 5	17671(41)	U.S. 270, BEGIN 0.4 MI SE OF THE S.H. 51 E JCT AND EXTEND SE 4.9 MILES.TURNKEY PROJECT (CONSTRUCT AS 4 LANE DIV & REHAB EXISTING)	2020	C	$20.00
Garvin 3	20970(08)	I-35: FROM S.H. 19, NORTH 3.21 MI	2020	OI	$15.55
Muskogee 1	27108(04)	U.S. 69: BEGIN 0.1 MI N OF U.S. 64 E (PEAK BLVD) & EXT N 2.5 MILES	2020	C	$4.00
Muskogee 1	31211(04)	U.S. 69: NORTHBOUND - FROM 4.5 MI. N. OF MUSKOGEE C/L N. 8.5 MI., SOUTHBOUND - FROM 8.5 MI. N OF MUSKOGEE C/L N. 4.5 MI.	2020	OI	$6.00
Oklahoma 4	9033(28)	I-44: WB TO NB RAMPS AT I-44E/I-235 INTERCHGE (SEGMENT 3A)	2020	OI	$15.81
Oklahoma 4	9032(05)	I-35: OVER THE I-240 JCT. RECONSTR INTERCHGE (PHASE IB)	2020	OI	$12.24
Rogers 8	27031(04)	S.H. 20: FROM 4 MILES EAST OF TULSA COUNTY LINE EAST TO 1 MILE EAST OF VERDIGRIS RIVER	2020	C	$52.49
				Subtotal 2020	$143.44
Custer 5	31060(04)	AIRPORT ROAD OVER I-40 LOCATED 4.3 MILES EAST OF S.H. 54 IN WEATHERFORD.	2021	C	$6.32
Dewey 5	17671(13)	U.S. 270 FROM 5.4 MI SOUTH OF S.H. 51 EAST JCT & EXT SE 3.0 MILES.TURNKEY PROJECT (CONSTRUCT AS 4 LANE DIV & REHAB EXISTING)	2021	C	$14.17
Oklahoma 4	9032(06)	I-35: OVER THE I-240 JCT. (PHASE II) RECONST INTERCHG.	2021	OI	$24.72
Oklahoma 4	9032(07)	I-35 @ THE I-240 JCT (PHASE III) RECONST INTERCHG.	2021	OI	$16.48
Oklahoma 4	9032(08)	I-35 @ THE I-240 JCT (PHASE IV) RECONST INTERCHG	2021	OI	$31.93
Rogers 8	26242(04)	S.H. 20 / S.H. 66 CONNECTION	2021	C	$32.70
				Subtotal 2021	$126.32
Canadian 4	27959(04)	U.S. 281 SPUR: BRIDGE OVER I-40 4.1 MIS. E. OF THE CADDO C/L	2022	OI	$4.00
McClain 3	19314(04)	I-35/S.H. 9 INTERCHGE (PHASE III)	2022	C	$7.18
Oklahoma 4	31013(06)	I-240: DIAMOND GRINDING FROM 0.15 MILES EAST OF I-35, EXTEND WEST 5.75MILES TO THE WEST SIDE OF AIR DEPOT	2022	OI	$1.50
Oklahoma 4	29843(04)	I-35: NB & SB BRIDGES OVER WATERLOO ROAD AT LOGAN C/L	2022	C	$28.00
Oklahoma 4	31018(04)	I-44: BRIDGE REHABILITATION OVER I-240, 1.3 MILES NORTH OF THECLEVELAND COUNTY LINE INCL. RAMP AND NB MAINLINE	2022	OI	$3.03
Rogers 8	31093(04)	U.S. 412 ADD J-TURNS AT 265TH E AVE & 289TH E AVE. APPROX. 2.8 MI & 4.3 MI EAST OF I 44 JCT	2022	C	$.25
Tulsa 8	29694(04)	UNION AVE OVER I-44, 1.6 MILES EAST OF S.H. 66	2022	C	$10.55
				Subtotal 2022	$54.51
				Grand Total	$504.15

Note: Project Types: Capacity (C), Operational Improvements (OI)

Figure 27. Top Highway Freight Mobility Projects



Source: Oklahoma Department of Transportation; WSP analysis of Highway Performance Monitoring System and National Performance Management Research Data Set data

WATERWAY FREIGHT MOBILITY PROJECTS

Turning to investments in other parts of the Oklahoma multimodal freight system, **Table 20** lists freight mobility projects scheduled on the MKARNS system at the time of this Plan's development.

Table 20. Waterway Freight Mobility Projects, FFY 2018 through 2022

County ODOT Division	Ref. No.	Owner/ Operator	Project Description	Yr. of Planned Expenditure	NHFN	Est. Cost. Mill $	Funding Sources
Wagoner, Sequoyah & LeFlore, Muskogee 1 and 2	WW 1	USACE	Replace lock roof at multiple locations to eliminate leaking onto control panels	2018	NA	0.30	USACE
Muskogee 1	WW 2	USACE	Acquire new miter gate pintle ball for Webbers Falls	2018	NA	0.40	USACE
Wagoner, Leflore & Sequoyah 1 and 2	WW 3	USACE	Replace lock control wiring at multiple locations upstream & downstream	2018	NA	2.50	USACE
LeFlore & Sequoyah 1 and 2	WW 4	USACE	Purchase stop Logs (50 foot) at Robert S Kerr lock	2018	NA	5.50	USACE
					Total	**$8.7**	

RAILROAD FREIGHT MOBILITY PROJECTS

Table 21 lists freight mobility projects planned for railroads in Oklahoma at the time of Plan development. Further information is available in the Oklahoma State Rail Plan: 2018–2021.

Table 21. Rail Freight Mobility Projects, FFY 2018 through 2022

County ODOT Division	Ref. No.	Owner/ Operator	Project Description	Yr. of Planned Expenditure	NHFN	Est. Cost. Mill $	Funding Sources
Oklahoma Pottawatomie 3 and 4	RR1	AOK	AOK Shawnee Subdivision Upgrade	2020 through 2022	NA	$1.5	State and Local gov't, Railroad and/or other private sector sources
Oklahoma 4	RR2	BNSF	BNSF rail bridges over Interstate240, north of Flynn Yard (Oklahoma City)	2020	NA	$20.0	Federal, State, and Local gov't, Railroad and/or other private sector sources
Blaine 5	RR3	GNBC	Replace GNBC bridge over North Canadian River between Southard and Eagle City	2018/19	NA	$5.4	
Blaine 5	RR4	GNBC	GNBC Okeene Passing Siding and Mainline Rail Upgrade	2018/19	NA	$7.6	
Choctaw 2	RR5	KRR	Track rehab on KRR Paris Subdivision (Hugo, Oklahoma to Paris, Texas)	2020 through 2022	NA	$1.5	Railroad and/or other private sector sources, local gov't
Choctaw 2	RR6	KRR	Track rehab on KRR Lake Subdivision - Hugo to Lake	2020 through 2022	NA	$3.6	
Tulsa 8	RR7	SKOL	SKOL Bridge Upgrades at Milepost 60.6	2018/19	NA	$1.5	
Tulsa 8	RR7	SKOL	SKOL Owasso Yard Switch Upgrade	2018/19	NA	$0.2	
Comanche 7	RR8	SLWC	Tie improvement / Surfacing on SLWC Lawton Subdivision (Milepost 563-Milepost 580)	2020 through 2022	NA	$0.5	
Caddo, Comanche, Grady 7	RR9	SLWC	Various SLWC Bridge Repairs (Milepost 438.9 – Milepost 668.7)	2020 through 2022	NA	$0.6	
Tulsa 8	RR10	SS	Rail repair and crossing renewals on Sand Springs Railway in Tulsa area	2020 through 2022	NA	$0.4	
Tulsa 8	RR11	TSU	Perform bridge and track maintenance on TSU system wide	2020 through 2022	NA	$2.0	
Tulsa 8	RR12	TSU	Add Storage Track Capacity on TSU Systemwide	2020 through 2022	NA	$5.0	
					Total	**$49.8**	

FREIGHT TRANSPORTATION PROVIDED BY MULTIPLE MODES

The freight investment captured by the projects listed in the four previous tables represents a total of $875 million to be spent over the five years of the OFTP. This includes rail at $49.8 million, waterways at $8.7 million, and highways at $816.7 million, including the full value of the FASTLANE grant. In subsets, the highway program represents $100.2 million NFHP, $62.0 million FASTLANE grant, $491.2 million federal formula funds, and $163.3 million state funds.

6.6 NETWORK DESIGNATIONS

6.6.1 National Highway Freight Network

The Oklahoma freight network consists of the state's transportation corridors and assets designated as parts of the National Highway Freight Network (NHFN) and NMFN. The FAST Act directs the FHWA to establish the NHFN, which replaced the Primary Freight Network and the Freight Network; both were created by MAP-21. The NHFN has the following components:[53]

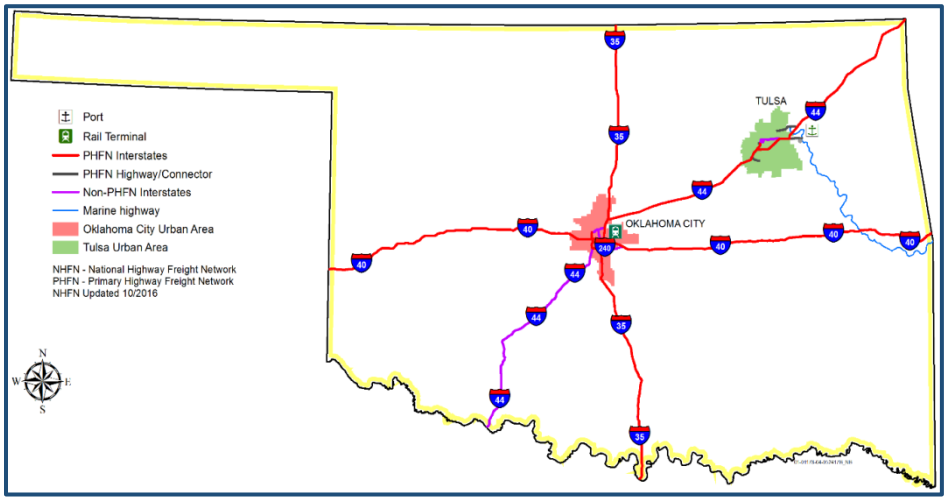
- **Primary Highway Freight System (PHFS[54]):** This is a network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerlines miles, including 37,436 centerline miles of interstate and 4,082 centerline miles of non-interstate roads. In Oklahoma, this includes I-40, I-35, I-44 (partial), I-240 (partial), I-244 (partial), U.S. 412, and S.H. 364 (Creek Turnpike).
- **Other interstate portions not on the PHFS:** These highways consist of the remaining portion of interstate highways not included in the PHFS. These routes provide important continuity and access to freight transportation facilities. These portions amount to an estimated 9,511 centerline miles of interstate nationwide, and will fluctuate with additions and deletions to the interstate highway system. In Oklahoma, this includes I-44 (partial), I-235, I-240 (partial), I-244 (partial), and I-444.
- **Critical Rural Freight Corridors (CRFCs):** These are public roads not in an urbanized area which provide access and connection for the PHFS and the interstates with other important ports, public transportation facilities, or other intermodal freight facilities.
- **Critical Urban Freight Corridors (CUFCs):** These are public roads in urbanized areas which provide access and connection for the PHFS and the interstates with other ports, public transportation facilities, or other intermodal transportation facilities.

The NHFN also includes 14 miles of intermodal connectors in Oklahoma. Prior to designation of CRFCs and CUFCs, the NHFN consists of the PHFS and other interstate portions not on the PHFS.

The FAST Act initially designated the PHFS as the network identified by MAP-21 for the highway primary freight network. In October 2015, after a solicitation of comments, the FHWA confirmed the initial PHFS. The PHFS can be re-designated by the FHWA every five years to reflect changes in freight patterns, including emerging and critical commerce corridors. In addition to the PHFS, the FAST Act included all segments of the interstate system (that were not part of PHFS) in the NHFN.

Thus, the starting point for the NHFN in Oklahoma (**Figure 28**) is the interstate system, approximately 11 additional highway miles in the Tulsa area; the BNSF terminal line and the Williams Pipeline station in Tulsa; and road connectors to Port 33 and the Tulsa Port of Catoosa. The assumption is that these NHFN elements are the most critical components of a continuous and accessible state freight transportation system.

Figure 28. Oklahoma National Highway Freight Network



Source: Federal Highway Administration; Oklahoma DOT

Table 22. Oklahoma National Highway Freight Network Mileage Distribution

Primary Highway Freight System (PHFS)			
Route	**Start Point**	**End Point**	**Miles**
Creek Turnpike/ S.H. 364	I-44	U.S. 75	4.90
I-240	I-44	I-35	4.61
I-244	OK3R (BNSF RR in Tulsa)	I-44	3.52
I-35	TX/OK Line	OK/KS Line	236.13
I-40	TX/OK Line	I-35	151.76
I-40	I-35	OK/AR Line	177.96
I-44	I-240	4.68 miles north of I-40	7.92
I-44	I-35	OK/MO Line	194.00
U.S. 412	SH6P/near Oakley's Port 33	I-44	6.40
		Subtotal	**787.20**
PHFS Intermodal Connectors			
Facility ID	**Facility Name**	**Facility Description**	**Miles**
OK2L, Tulsa Co. pipeline	Williams Pipeline Station	21st St (33rd W Avenue east to BNSF Terminal at 23 Street)	1.27
OK2R, Tulsa Co. railroad	BNSF Railroad	From SW Blvd. and I-244 north to BNSF Terminal; (parallel to SW Boulevard)	0.56
OK5P/ S.H. 266, Rogers Co. port connector road	Port of Catoosa	S.H. 266 (from U.S. 169 to I-44/W. Rogers Turnpike)	11.42
OK6P/ S.H. 412P, Wagoner Co. port connector road	Oakley's Port 33	From location 0.25 mile south of U.S. 412 on N/S 415, and approximately 5 miles east of W. Rogers Turnpike, then east 1.1 miles on S.H. 412P to port and river	1.14
		Subtotal	**14.39**
		PHFS Total	**801.59**
Interstate Not On PHFS			
Route	**Start Point**	**End Point**	**Miles**
I-235	I-40	I-44	5.14
I-240	I-35	I-40	11.68
I-244	S 21st St	I-44	12.24
I-44	TX/OK Line	I-240	114.91
I-44	0.35 Miles South of S.H. 66	I-35	7.70
I-444	I-244 (South)	I-244 (North)	2.50
		Non-PHFS Total	**154.17**
		All	**955.76**

Source: Federal Highway Administration, Oklahoma Department of Transportation

As shown in **Table 22** the NHFN amounts to 955 miles in Oklahoma prior to the designation of CRFCs and CUFCs. PHFS routes or connectors comprise 802 miles; the remaining 154 miles are Oklahoma interstate miles that are not part of the PHFS. I-40 represents the longest part of the network followed by I-35.

The principal significance of the NHFN is that it determines eligibility for use of apportioned funds under the NHFP (also referred to as "freight formula funds"), which total $101.6 million in Oklahoma over the five years of the FAST Act. It also determines eligibility for highway projects under the FAST Act's Infrastructure for Rebuilding America (INFRA) competitive grant program.[55]

As a part of this OFTP's development, there was a recognition that several highways or rail lines in Oklahoma that are important to freight movement will not be included the National Highway/Multimodal Freight Network due to the limited mileage allocated to the state. Thus, it should be noted that a number of freight facilities at the state level could be viewed as essential to the goods movement process, even if they are not officially designated as a critical freight corridor or of the national networks.

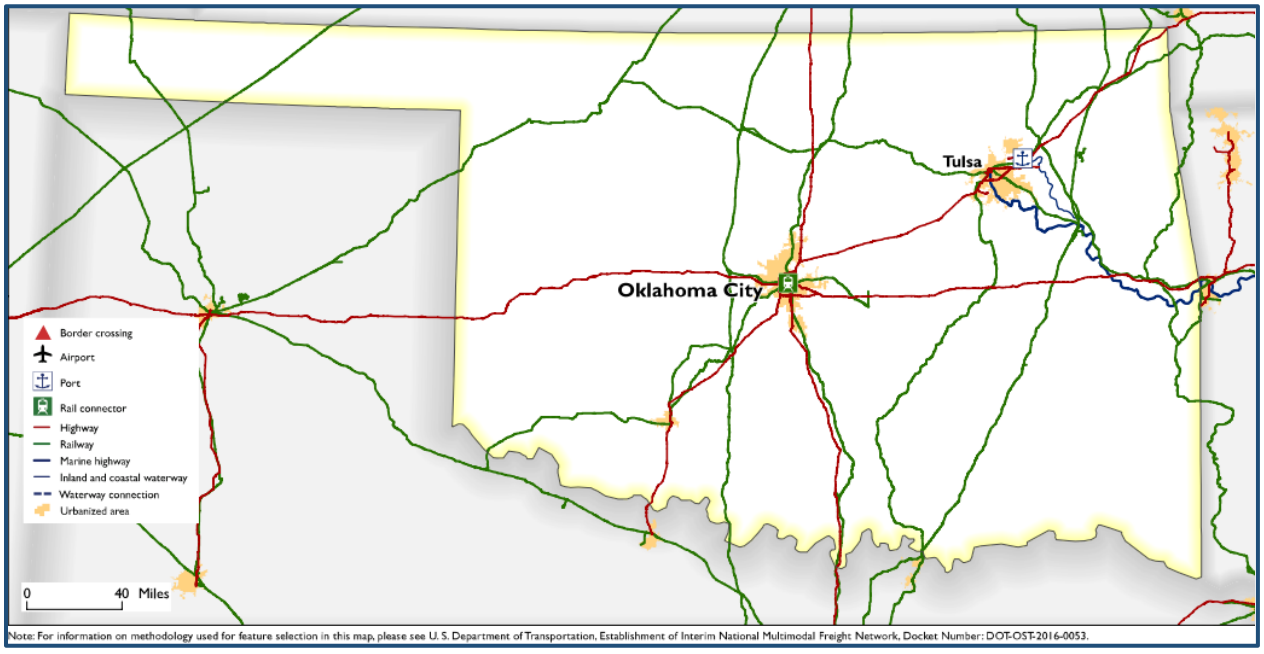
National Multimodal Freight Network

The FAST Act also directed ODOT to establish an NMFN to:

- Assist states in directing resources toward improved system performance for efficient movement of freight.
- Inform freight transportation planning.
- Assist in prioritizing federal investment.
- Assess and support federal investment to achieve national multimodal freight policy goals.

The statute directed U.S. DOT to designate an interim NMFN, with a final network to be identified by December 2017. This corresponds to the FAST Act's emphasis the multimodal nature of freight transportation. **Figure 29** shows the interim NMFN in Oklahoma.

Figure 29. Oklahoma Interim National Multimodal Freight Network



Source: U.S. Department of Transportation

In addition to the highways and intermodal connectors included in NHFN, the interim NMFN also includes over 2,000 miles of railroad, 205 navigable river miles on the MKARNS (Marine Highway M-40), and the Port of Catoosa. The railroad component of the network includes the routes of all the Class I operators in the state: BNSF, KCS, and UP.

6.6.2 Rural Freight Corridors

The final elements of the NHFN have been left to the discretion of the states: the CRFCs and the CUFCs. These are limited as to centerline miles; the limits in Oklahoma are 160 rural miles and 80 urban miles. Candidate highways are identified in this document.

Rural freight corridors are called out for specific attention in the FAST Act. The concept "critical rural freight corridor" is reserved for specific designation of a limited number of rural miles in each state that are important to freight mobility. Following the adoption of this OFTP, the recommended CRFCs that are approved will join the rural interstates, urban interstates, the PHFN, and the CUFCs in being Oklahoma's portion of the NHFN.

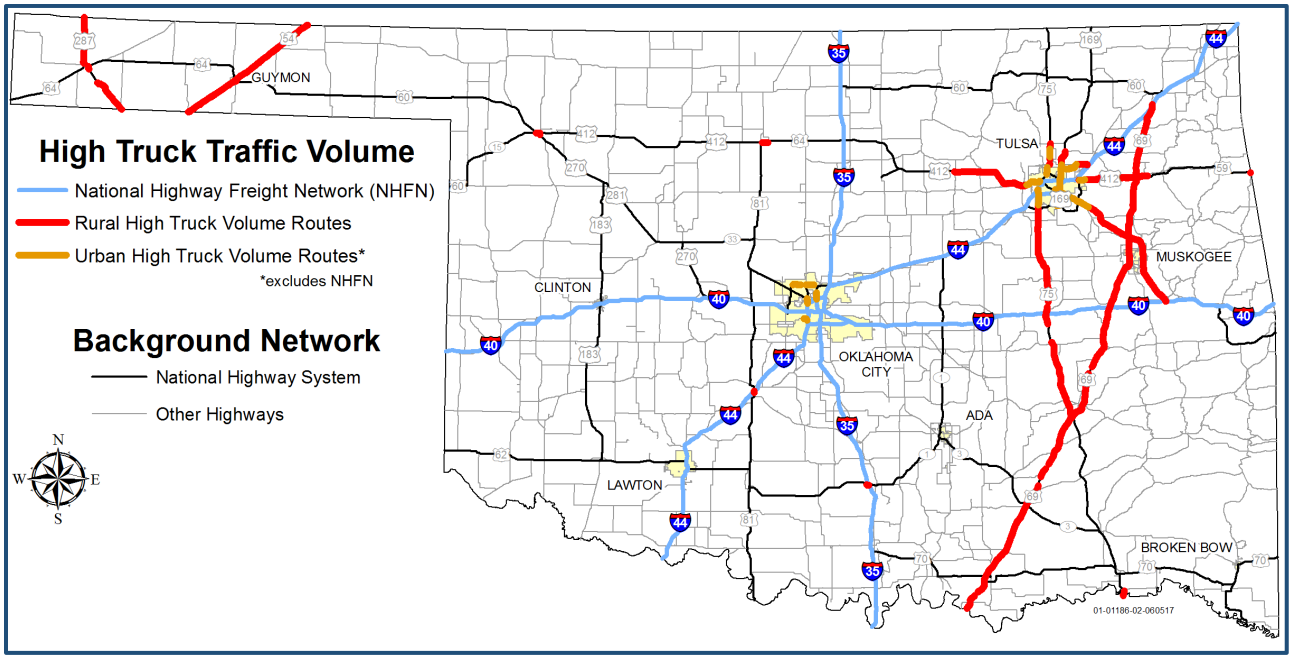
DEFINITION OF CRITICAL RURAL FREIGHT CORRIDORS

The FAST Act makes provisions for expanding the NHFN beyond the interstate highway system by designating two other components: the CRFC and the CUFC subsystems. CRFCs are principal arterials located outside of the U.S. Census Bureau-designated urbanized areas.[56] To qualify as a CRFC, the roadway must meet one or more criteria such as high volume or high percentage truck traffic, access to energy, agriculture or other production areas, or connection to interstates and ports.

FHWA also encouraged states, to consider connector routes from high-volume freight corridors to key rural freight facilities, including manufacturing centers, agricultural processing centers, farms, intermodal, and military facilities.

Figure 30 shows Oklahoma corridors that carry a high volume of truck traffic.[57]

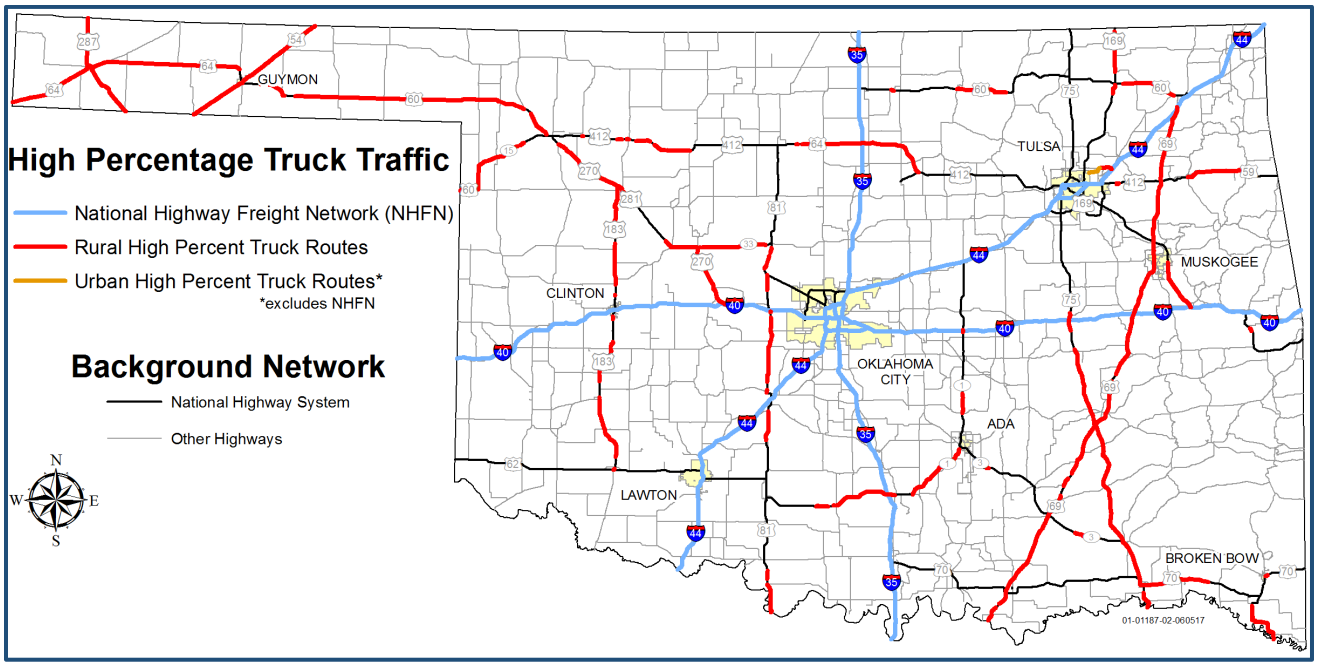
Figure 30. High Truck Traffic Volume



Source: Oklahoma Department of Transportation, WSP analysis

Figure 31 shows the rural highway routes with average daily combination vehicle truck counts equal to or exceeding the 25 percent minimum, described in FHWA guidance.

Figure 31. High Percentage Truck Traffic



Source: Oklahoma Department of Transportation, WSP analysis

Like many states, Oklahoma employed a process of identifying "candidate" rural corridors; the final determination as to requesting designation as CRFCs was made following an identification of projects most suitable for freight formula funds. The locations of those projects directed the final recommendation for naming CRFCs.

Identification of Oklahoma Rural Freight Corridor Candidates

To identify eligible highway segments that would be candidates for inclusion in the Oklahoma CRFC, as a part of this Plan's process, ODOT employed a methodology that considered the FAST Act criteria as described above for CRFCs. The methodology also recognized projects slated for FFY 2018 through FFY 2022 from the 8 Year Construction Work Plan, identifying rural highway sites where improvement projects have been defined or are needed.

The initial review of possible CRFCs by ODOT found that the 8 Year Construction Work Plan has more projects than can currently be accommodated by the CRFC designated highways. However, the FAST Act allows initially identified CRFCs can be modified as conditions warrant.[58]

Looking at locations where proposed freight mobility projects coincided with high percentage truck traffic provided a mechanism to narrow the list to projects where funding was most needed. In doing so, candidate CRFCs were those eligible highways where freight mobility improvements requiring funding (Table 17) were identified. Additionally, highways experiencing high truck volumes or high truck percentages were considered.

Following selection of projects for NHFP funding, recommendations for CRFCs (**Table 23**) were made accordingly. Each of these facilities is a principal arterial carrying a high volume and/or high percentage of truck traffic. The highways also provide connectivity to highway, rail, and /or waterway freight facilities; and each highway is vital to improving the efficient movement of freight in the State. This OFTP recommends that the CRFC designation change as funds are used and needs are met.

Table 23. Recommended Critical Rural Freight Corridors

County	Route No.	Start Point	End Point	Length/ miles
Bryan County	U.S. 69	2.2 miles North of S.H. 91	Main St., Durant, Old U.S. 70	10.29
Atoka County	U.S. 69	Bryan/Atoka C/L	Pittsburgh/Atoka C/L	41.48
Pittsburgh County	U.S. 69	Pittsburgh/Atoka C/L	U.S. 69/U.S. 69B Jct. N of McAlester	26.43
Muskogee County	U.S. 69	10.2 mi N of Muskogee/McIntosh C/L	Arkansas River	9.01
Wagoner County	U.S. 69	Muskogee/Wagoner C/L	Mayes/Wagoner C/L	19.22
Mayes County	U.S. 69	Mayes/Wagoner C/L	U.S. 69/S.H. 20 Junction (Pryor)	16.54
Grady County	U.S. 81	1.5 mi S of U.S. 81/S.H. 19 Jct.	.85 mile N of U.S. 62/U.S. 81 Jct.	8.65
Texas County	U.S. 54	U.S. 54 from 4.8 mi N of Jct. U.S. 54/ U.S. 64E	Jct. of U.S. 54 and Okla/Kansas SL	14.82
			Total	**146.44**

Source: Oklahoma Department of Transportation

6.6.3 Critical Urban Freight Corridors

Urban freight corridors are also identified in the FAST Act as locations that merit specific attention. The term "critical urban freight corridor" is reserved for designation for a limited number of miles in urban areas that are important to freight mobility. Following the adoption of this OFTP, the recommended CUFCs that are approved will join the rural interstates, the CRFCs, urban interstates, and the PHFN in being Oklahoma's portion of the NHFN. Projects on these corridors will be eligible for freight formula funds or for FAST Act competitive freight grant proposals.

Definition of Urban Freight Corridors

The FAST Act provides guidance for selecting CUFCs in urbanized area. To identify the corridors in an urbanized area with a population of 500,000 or more individuals, the MPO, in consultation with the state, may designate a CUFC. In an urbanized area with a population between 50,000 and 500,000 individuals, the state, in consultation with the MPO, may designate a CUFC.

A public road designated as a CUFC must be in an urbanized area. It must meet one or more of several criteria related to providing a key role in movement of freight, including connections to key freight facilities. FHWA encourages consideration be given to first- or last-mile connector routes from high-volume freight corridors to freight-intensive land and key urban freight facilities, including ports, rail terminals, and other industrial-zoned land.

Each state can designate as CUFCs a maximum of 75 miles of highway or 10 percent of the PHFS mileage in the state, whichever is greater. The maximum mileage for Oklahoma is 80.

Oklahoma Urban Freight Corridor Candidates

The proposed streets and highways to include as CUFCs were identified by the MPOs, in consultation with ODOT, for the Oklahoma City and Tulsa metropolitan areas. The recommended CUFCs will be submitted to FHWA for approval.

Oklahoma City Area

In consultation with local communities and ODOT, the Association of Central Oklahoma Governments (ACOG), the MPO for the Oklahoma City metropolitan area, developed a list of proposed CUFCs (**Table 24**) for the Oklahoma City urbanized area.

Table 24. Association of Central Oklahoma Governments/Oklahoma City Area Recommended Critical Urban Freight Corridors

Entity	Location	From	To	Length in Miles
OKC	MacArthur Boulevard	N. 16th Street	S. 44th Street	4.50
	N. 122nd Street	Santa Fe Avenue	I-235/S.H. 77	0.45
	Santa Fe Avenue	N. 150th Street	N. 114th Street	2.60
	Reno Avenue	Morgan Road	Western Avenue	9.00
Norman	Flood Avenue	I-35	S. 239th Street (Robinson Street)	3.87
	Eastern Avenue (24th Avenue SW)	S. 209th Street (Tecumseh Road)	S.H. 9	4.86
OKC	Memorial Road	Santa Fe Avenue	Kelley Avenue	1.01
MWC	Douglas Boulevard	U.S. 62 (N. 23rd Street)	I-40	4.22
OKC	Council Road	I-40	S.H. 152	3.24
	N. 36th Street	Santa Fe Avenue	Lincoln Boulevard	0.49
	Reno Avenue	I-235	Eastern Ave	1.24
Del City	Sunnylane Road	N. 4th Street	I-40	1.13
Moore	S. 149th Street (S. 19th Street)	Telephone Road	Eastern Avenue	0.76
Yukon	N. 10th Street	Cemetery Road (Garth Brooks Boulevard)	Mustang Road	2.02
			Total	**39.37**

Source: Association of Central Oklahoma Governments

Several criteria were used to score and rank each corridor. These included items such as inclusion in a master transportation plan, functional classification, average annual daily traffic, connectivity with highways and other modes, and proximity to freight reliant industries. While scores were used to narrow the corridor list initially, consideration was also given to local government priorities. Local entities were advised to rank corridors based on interstate and multimodal connections, high freight traffic, pavement condition, and overall project priorities.

Tulsa Area

The Indian Nations Council of Governments (INCOG)—the MPO for the Tulsa metropolitan area—formed a technical working group comprising representatives of member governments. The working group identified CUFC segments based on high-growth freight corridors, travel times, target miles for the MPO, and projects in the ODOT 8 year Construction Work Plan. **Table 25** shows the proposed CUFCs for the Tulsa area.

Table 25. Indian Nations Council of Governments/Tulsa Area Critical Recommended Urban Freight Corridors

Entity	Location	From	To	Length in Miles
Tulsa	S.H. 51/U.S. 64	IDL/U.S. 75	U.S. 169	7.7
Tulsa	U.S. 169	U.S. 64/ Memorial Drive	Pine St.	11.7
Rogers	S.H. 167	I-44	S.H. 266	4.8
Tulsa	U.S. 75	S.H. 364/Creek Turnpike	I-244	7.0
			Total	**31.2**

Source: Indian Nations Council of Governments

6.7 FREIGHT FUNDING PARTNERSHIPS

In addition to the freight formula funding available through the FAST Act, ODOT should continue to pursue other revenue sources. INFRA Grants[53] are a key component of this. ODOT was awarded a $62 million grant in the first (2016) round of FASTLANE competition for improvements on U.S. 69 in Bryan County. The project will improve approximately four miles of existing arterial highway with numerous access point and three signalized intersections. The new facility will be fully access controlled, with grade separation and functional frontage roads.

ODOT will submit three projects for Infrastructure for Rebuilding America (INFRA) in 2017:

- Tulsa County - Reconstruction of I-44/U.S. 75 interchange bridges and related reconstruction and improvements on I-44, City of Tulsa (approximately 2.5 miles)
- Grady County - Construction of controlled-access 4-lane divided realignment of U.S. 81 west of city of Chickasha (approximately 8.6 miles)
- Oklahoma County I-40/Douglas interchange reconstruction and related interstate widening in Oklahoma City (approximately 5.5 miles)

ODOT has a number of freight projects included in the Five Year Freight Investment Plan and/or Construction Work Plan that should compete well for future INFRA funding. Private and or public funding partnerships will be critical to the success of these applications.

7.0 Conclusion and Next Steps

7.1 CONCLUSION

The Oklahoma freight transportation system serves the people of the state by delivering the necessities of everyday life: food, fuel, clothing, medicine, building materials and the equipment for communication, transportation, sporting and a multitude of other purposes. The system serves the businesses of Oklahoma by ensuring their supply lines, and giving them access to markets near and far, thus contributing to employment for people and prosperity for the state. To residents, these fundamental functions are largely invisible because they perform well, and their vital importance could attract attention only because of disruptive events. Even so, the quality of performance must be sustained at a favorable cost, so that Oklahoma is an affordable place to live and a competitive place for businesses to locate.

Good performance is reliable, productive, safe and secure; it is generated daily through freight operations and longer term through capital investments and policies in the public and private sectors. A high-quality transportation system benefits from multiple modes of transportation, because modal options keep competition sharp, thus influencing lower costs. A variety of modes accommodates a range of shipments whose volume, time commitments, and physical characteristics are quite diverse. The Oklahoma multimodal freight system does all these things. Moreover, it performs these functions for constituents well beyond its borders by means of the great quantities of goods that pass through Oklahoma on the highways, railroads, and waterways of the state.

This is the first comprehensive freight plan ODOT has issued, although ODOT has considered the needs of freight in its transportation plans for many years. This Plan sets forth a vision and goals, strategies, and policies to achieve the goals measures to track achievement, and investments selected because they support the goals. Importantly, ODOT has gone beyond the allocation of $100 million in NHFP funds toward freight projects as required by the FAST Act. It has identified a further series of investments for priority multimodal freight projects to be funded by traditional means, and all told has created an $875 million statewide freight investment program for the next five years. Looking farther ahead, ODOT also has defined a set of significant freight bottlenecks for potential investment in future editions of its 8 Year Construction Work Plan.

These steps represent a commitment to freight transportation that ODOT has institutionalized in several key ways:

- Through performance measures, progress toward freight goals and challenges in meeting them will be tracked regularly.
- Through incorporation of freight elements in the tools for project prioritization, using the process adopted and documented through this Plan, ODOT will ensure that the influence of investments on freight transportation is accounted for, and the 8 Year Construction Work Plan is a vehicle for promoting that investment. This has the effect of *mainstreaming* freight, meaning that freight is treated as an everyday focus in transportation management instead of something unusual or ancillary;
- Through continuing meetings of the Oklahoma FAC, ODOT will a) remain abreast of developments in industry and retain direct input on multimodal concerns; b) report on performance to stakeholders and receive their guidance on how to respond; and c) solicit stakeholder views on freight projects in the annual process of updating the 8 Year Construction Work Plan;

- Through pursuit of federal competitive grants that emphasize freight and are typically opened for annual bids, ODOT may augment its resources for freight investment and cultivate a platform for public-private partnerships.
- Through ongoing coordination with MPOs in their freight planning - particularly in respect to bottlenecks because they tend to concentrate in metropolitan areas.
- Through ongoing coordination with adjoining states, all of whom will have completed multimodal freight plans at the same time, ODOT can align selected investments with neighbors to improve performance contiguously along freight corridors.

In keeping with the FAST Act, ODOT will update its freight plan on a five-year cycle. The methods outlined above enable the next update to be the culmination of continuing efforts instead of a periodic revisiting of freight requirements. In other words, the aforementioned steps represent the institutionalization of the management of freight in the ordinary way that ODOT does business. The stakeholders in freight transportation are the residents and industries it supplies and supports. These people and entities are the ones who will benefit from ODOT's commitment and its steady dedication to the vision and goals articulated in this Plan.

7.2 NEXT STEPS

This Plan was developed in concert with the Freight Advisory Committee (FAC). Upon completion, the Oklahoma Transportation Commission reviewed the Plan; and the FAC endorsed it in a public meeting on October 23, 2017, and recommended FHWA approval, in accordance with the FAST Act.

- The Freight Investment Plan will be executed and funds expended according to the indicated schedule.
- The CUFCs and CRFCs defined in this Plan will become part of the NHFN following FHWA approval, and projects on these facilities will be eligible for grant application under the INFRA program.
- Freight bottlenecks not yet addressed by projects will be evaluated for future editions of the 8 Year Construction Work Plan.
- An implementation plan for freight policies and strategies will be developed and put into effect by ODOT in calendar year 2018, including program designs, responsibilities, inter-departmental coordination, and timelines.
- The institutionalization of freight management at ODOT will proceed as described above.
- This Plan will be posted on the ODOT website and made available to stakeholders around the state and to interested parties elsewhere.

8.0 Glossary

8 Year Construction Work Plan (CWP)	the eight-year construction work plan administered by ODOT that guides the scheduling and conducting of the complex engineering, environmental, and right-of-way activities necessary to complete construction projects in a timely fashion. The first four years of the Eight Year Construction Work Plan are represented in the Statewide Transportation Improvement Program (STIP).
Automated/autonomous vehicle technology	robotic vehicle that is designed to travel between destinations without a human operator. To qualify as fully autonomous, a vehicle must be able to navigate without human intervention to a predetermined destination over roads that have not been adapted for its use.
Average Annual Daily Truck Traffic (AADTT)	the total volume of truck traffic on a highway segment for one year, divided by the number of days in the year.
Barge	the cargo-carrying vehicle that inland water carriers primarily use. Basic barges have open tops, but there are covered barges for both dry and liquid cargoes.
Bottleneck	a section of a highway or rail network that experiences operational congestion
Bulk Cargo	cargo that is transported unpackaged in large quantities in either liquid or granular, particulate form, as a mass of relatively small solids, such as petroleum/crude oil, grain, coal, or gravel
Capacity	physical facilities, personnel and process available to meet the product of service needs of the customers. Capacity generally refers to maximum output of transportation network or facility.
Carload	unit of rail freight equivalent to one freight car
Carrier	a firm that transports goods or people via land, sea or air
Class I Rail Carrier	classification of rail carriers having annual operating revenues of $447,621,226 (current dollars) or more
Class II Rail Carrier	classification of rail carriers having annual operating revenues less than $447,621,226 but in excess of $35,809,698 (current dollars)
Class III Rail Carrier	classification of rail carriers having annual operating revenues of $35,809,698 (current dollars) or less
Combination Vehicles	standard 5-axle semi trailer-trucks with a trailer on tractor (see Long Combination Vehicles)
Commodity	synonym for type of good (e.g., coal, grain, iron, metallic minerals)
Container	a large metal box of a standard design and size used for the transportation of goods by road, rail, sea, or air
Containerized Cargo	cargo transported in containers that can be transferred easily from one transportation mode to another
Critical Rural Freight Corridors	public roads not in an urbanized area that provide access and connection to the Primary Highway Freight System and the Interstate system providing access to freight generators

Critical Urban Freight Corridors	public roads in urbanized areas that provide access and connection to the Primary Highway Freight System and the Interstate with other ports, public transportation facilities, or other intermodal transportation facilities
Distribution Center (DC)	facility that holds inventory from manufacturing for distribution to stores or smaller local warehouses; can perform consolidation, warehousing, packaging, decomposition and other functions linked with handling freight
Dynamic Message Signs (also called Variable Message Signs)	large, electronic signs that overhang or appear along major highways. The signs are typically used to display information about traffic conditions, travel times, construction, and road incidents.
Economies of Scale	factors that cause the average cost of producing goods or services to fall as the volume of its output increases. Hence it might cost $3,000 to produce 100 copies of a magazine but only $4,000 to produce 1,000 copies. The average cost in this case falls from $30 to $4 a copy because the main elements of cost in producing a magazine (editorial and design) are unrelated to the number of magazines produced. Similarly, it is less expensive to run one freight train with 150 cars than two trains of 75 cars each.
Fixing America's Surface Transportation Act (FAST ACT)	authorized $305 billion over fiscal years 2016 through 2020 for highway, highway and motor vehicle safety, public transportation, motor carrier safety, hazardous materials safety, rail, and research, technology, and statistics programs
Freight Analysis Framework 4 (FAF 4)	database produced through a partnership between Bureau of Transportation Statistics and Federal Highway Administration, integrating 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
Gross Domestic Product	sum of all goods and services produced within a nation's borders. In the U.S., it is calculated quarterly by the Commerce Department.
Gross Vehicle Weight	combined weight of a vehicle and its freight
Hazardous Material	a substance or material that the U.S. Department of Transportation has determined to be capable of posing a risk to health, safety, and property when stored or transported in commerce
Highway Performance Monitoring System	a national level highway information system that includes data on the extent, condition, performance, use and operating characteristics of the nation's highways
Hours of Service	amount of time a driver is allowed to work without rest
Hub/Freight Hub	a facility where cargo is exchanged between vehicles or between transport modes
IHS Markit Transearch Database	exclusive source for U.S. county-level freight-movement data by commodity group and mode of transportation
Indian Nations Council of Governments (INCOG)	a voluntary association of local and tribal governments in the Tulsa metropolitan area in northeast Oklahoma comprising Creek, Osage, Rogers, Tulsa, and Wagoner Counties
Infrastructure for Rebuilding America (INFRA) Program	a program that provides dedicated, discretionary funding for projects that address critical issues facing our nation's highways and bridges. INFRA grants creates opportunities for all levels of government and the private sector to fund infrastructure, using innovative approaches to improve the necessary processes for building significant projects, and increasing accountability for the projects that are built.

Intelligent Transportation System	a system that collects, stores, processes and distributes information relating to the movement of people and goods
International Roughness Index (IRI)	a scale for roughness based on the simulated response of a generic motor vehicle to road surface irregularities
Intermodal	the transportation of freight in an intermodal container or vehicle, using multiple modes of transportation (rail, barge, and truck), without any handling of the freight itself when transferring modes
Intermodal Connectors	highways that provide access between major intermodal facilities and the other four subsystems making up the National Highway System
Intermodal terminal	a facility for the transfer of containers between railroad and truck
Inventory	number of units and/or value of the stock of good a company holds
Land Mobile Radio	terrestrially based wireless commonly used for critical communications by public safety organizations such as police, firefighters, and other emergency response organizations
Last Mile	figure of speech describing movement of goods from a transportation hub to the final delivery destination
Level of Service	qualitative measure of a road's operating conditions
Liquid Bulk Cargo	type of bulk cargo that consists of liquid items, such as crude oil or liquid natural gas
Lock	device used for raising and lowering boats, ships and other watercraft between stretches of water of different levels on river and canal
Logistics	all activities involved in the transport of goods to customers
Long Combination Vehicles	commonly defined as tractor-trailer with two or more trailers that can carry more than 80,000 pounds of gross vehicle weight
Long Range Transportation Plan	document produced by regional or statewide agency serving as the vision for the region's or state's transportation systems and services. In metropolitan areas, the plan typically indicates all of the transportation improvements scheduled for funding over the next 20 years, and is sometimes known as the metropolitan transportation plan.
Moving Ahead for Progress in the 21st Century Act (Map-21)	in 2012, MAP-21 authorized over $105 billion in federal funding for surface transportation programs for fiscal years 2013 and 2014. It was extended until the signing of the FAST Act in December 2015.
McClellan-Kerr Arkansas River Navigation System	the 445-mile navigation channel that begins at the confluence of the White and Mississippi Rivers and proceeds one-half mile upstream on the White River to the Montgomery Point Lock and Dam. From there, the channel proceeds 9 miles upstream on the White River to the manmade Arkansas Post Canal, and then 9 miles through the canal to the Arkansas River. The McClellan-Kerr Arkansas River Navigation System crosses the state of Arkansas into Oklahoma, traversing the state until it reaches the confluence of the Arkansas and Verdigris Rivers where the navigation channel follows the Verdigris River terminating 51 miles upstream at the Port of Catoosa, near Tulsa.

Metropolitan Planning Organization	regional policy-setting body, required in urbanized areas with populations over 50,000, and designated by local officials and the governor of the state; responsible in cooperation with the state and other transportation providers for carrying out the metropolitan transportation planning requirements of federal highway and transit legislation
Mobility	the ease with which people or goods move from place to place
Multimodal	transportation of freight using several modes
National Highway Freight Network	mandated by the Fixing America's Surface Transportation Act (FAST Act) to strategically direct federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system and includes the Primary Highway Freight System (PHFS) plus remaining Interstates not on the PHFS
National Highway System (NHS)	roadway system established by Congress consisting of roads important to the national economy, defense, and mobility. The NHS includes the following subsystems of roadways, Interstates, some Principal Arterials, the Strategic Highway Network, and Intermodal Connectors. The MAP-21 legislation made some significant changes to the NHS.
National Multimodal Freight Network	proposed national freight network inclusive of all modes
National Performance Management Research Data Set (NPMRDS)	Federal Highway Administration database that contains location information collected in five-minute intervals for road segments on the National Highway System. The data can be used to estimate speed for roadway segments. (Sometimes referred to as National Travel Time Data.)
National Travel Time Data	see National Performance Management Research Data Set
Near-shoring	relocation of businesses from overseas locations to bordering or nearby countries
Oversize/Overweight Loads	load that exceeds the standard or ordinary legal size and/or weight limits for a specified portion of road, highway or other transport infrastructure, such as air freight or water freight
Owner/Operator	trucking operation in which the owner of the truck is also the driver
Performance Measures	metrics that can be used to track results serve and can serve as a basis for comparing progress against a target or other objective
Port of Entry	in Oklahoma, Ports of Entry are locations at the state border where commercial vehicles undergo electronic processing for a number of items, including but not limited to driver credentials, weight, tax and fee status, and safety inspection. At the national level, Ports of Entry usually means a place where foreign goods may be cleared through customs
Primary Highway Freight System	network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerlines miles, including 37,436 centerline miles of Interstate and 4,082 centerline miles of non-Interstate roads.
Radio Frequency Identification (RFID)	uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves.
Regional Railroad	see Class II railroad

Reliability	refers to the degree of travel time certainty and predictability on the transportation system
Re-shoring	the practice of bringing manufacturing and services back to the United States from overseas.
Shipper	party that tenders goods for transportation
Short Line Railroad	see Class III railroad
Strategic Highway Network (STRAHNET)	critical to the Department of Defense's domestic operations. STRAHNET is a 62,000-mile system of roads deemed necessary for emergency mobilization and peacetime movement of heavy armor, fuel, ammunition, repair parts, other commodities to support U.S. military operations. STRAHNET facilities are also on the National Highway System. Strategic highway network connectors are highways that provide access between major military installations and highways that are part of the Strategic Highway Network.
Street	public thoroughfare especially in a city, town, or village including all areas within the right-of-way (such as sidewalks and tree belts) and sometimes further distinguished as being wider than an alley or lane but narrower than an avenue or boulevard
Supply Chain	system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer
Team Track	track designated for multiple customer use to load or unload shipments when direct rail service is unavailable
Ton-mile	measure of output for freight transportation to capture weight of shipment and the distance traveled
Train Speed	measures the line-haul movement between terminals. The average speed is calculated by dividing train-miles by total hours operated, excluding yard and local trains, passenger trains, maintenance of way trains, and terminal time.
Transit time	elapsed time between a shipment's pickup and delivery
Transloading	transferring bulk shipments from one mode to another
Travel Time Reliability	measured by the percentage of trips that succeed in achieving a predetermined standard for time or speed.
Truck Travel Time Reliability	the consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day
Unit Train	train handling a single commodity type that remains as a unit between origin and destination
Vehicle-Miles Traveled (VMT)	unit for measuring vehicle travel distances; number of miles traveled nationally by vehicles for a period of one year
Warehouse	storage facility for products prior to shipment (at origin) or prior to delivery (at destination)

ENDNOTES

[1] Woods and Poole data from Oklahoma Long Range Transportation Plan: 2015-2040 (LRTP).

[2] National numbers from *https://www.rita.dot.gov/bts/press_releases/bts013_16*, Oklahoma from IHS *Markit Transearch, Freight Analysis Framework 4.3, WSP.* Both national and Oklahoma long term forecasts come to just over 1.2 percent per year.

[3] Source: IHS 2014 Transearch, WSP analysis, 2017

[4] The two largest airports in Oklahoma, Tulsa International Airport in Tulsa and Will Rogers World Airport in Oklahoma City, rank 65th and 84th respectively in landed weight according to the Federal Aviation Administration's 2012 report on landed weight by airport. *https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy12cargoairports.pdf*

[5] Commodity groups used in the analysis are based on Standard Transportation Commodity Codes (STCCs), which are the system employed by the TRANSEARCH database. STCCs can be expressed at different levels of detail. For example, the 2-digit code 20 covers all processed food products, while the 4-digit code 2086 isolates soft drink beverages and mineral water.

[6] Currently available at OKroads.org *http://ok.maps.arcgis.com/apps/Viewer/index.html?appid=023e821ebf7b4acd999ccfd58d92c3da*

[7] ODOT is considering reducing the number sites initially and contracting for weather prediction service in order to compare the two sources and determine the most efficient method.

[8] ODOT and the Oklahoma Department of Public Safety jointly developed a system, OKiePROS, which provides motor carriers the ability to submit a standard OS/OW permit request over the internet at any time of day, generate a safe route, and pay and receive their permit electronically. The system was opened for operation in 2011.

[9] In the United States, according to the Surface Transportation Board, a Class I railroad has annual operating revenues of $447.6 million or more (current dollars).

[10] Oklahoma's Five Military Installations: An Economic Impact Report. Oklahoma Department of Commerce website *http://okcommerce.gov/wp-content/uploads/2015/06/Military_Impact_Study.pdf*

[11] Freight and Congestion Federal Highways Administration, Freight Management and Operations *https://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/congestion.htm*

[12] The National Performance Management Research Data set (NPMRDS) is a dataset provided by FHWA that includes detailed information about travel time and delay for commercial motor vehicles. More information is available in the Technical Report 5: Goals and Performance Measures, Policies and Strategies available here (*http://www.okstatefreightplan.com*).

[13] http://usdpartners.com/terminal/stroud

[14] *https://rbnenergy.com/get-back-on-my-stroud-canadian-congestion-revives-cushing-rail-op*

[15] See *http://www.fhwa.dot.gov/environment/alternative fuel corridors/*. For purposes of the Oklahoma Freight Transportation Plan, access to compress natural gas and fast-charge electric vehicle stations is used as a performance measure related to the achievement of Oklahoma environmental goals

[16] Woods and Poole data from LRTP

[17] *https://economy.okstate.edu/forecasts/files/Economic_Outlook_2017-Feb.pdf*

[18] *http://www.greateroklahomacity.com/clientuploads/pdf/OKC_Economic_Forecast_2016_web.pdf*

[19] *https://www.conference-board.org/data/globaloutlook/*

[20] Bruce Blanton, *USDA's Perspective on Agricultural Transportation Priorities*, Ag Transportation Summit, August 4, 2015, Rosemont, IL.

[21] The Tompkins Consortium is a benchmarking organization of Fortune 500-type companies, approximately half of them retailer manufacturers. Tompkins International citations are taken from the public presentations of the Triangle Regional Freight Plan, Capitol Area MPO, Durham-Chapel Hill-Cary, and North Carolina DOT, December 2015.

[22] Walker Sands Future of Retail Study, quoted in "Will the Sharing Economy Disrupt Transportation and Logistics", presentation by Richard Metzler of uShip, Stifel, Nicolaus & Co., June 29, 2016

[23] The Tompkins Consortium is a benchmarking organization of Fortune 500-type companies, approximately half of them retailers and half manufacturers. Tompkins International citations here and below are taken from public presentations of the Triangle Regional Freight Plan, Capitol Area MPO,-Durham-Chapel Hill-Cary MPO, and North Carolina DOT, December 2015.

[24] Direct experience of a major retailer, reported in "Logistics and Supply Chain Asset Study", Michigan Economic Development Corporation, March 2015

[25] Dr. Michael Lierow, Oliver Wyman, "Digital Turmoil: Digitalization of the Logistics Value Chain", Stifel, Nicolaus & Co., October 12, 2016

[26] "Self-Driving Truck's First Mission: A 120-Mile Beer Run", *New York Times*, October 25, 2016.

[27] *www.ottomotors.com*, accessed February 24, 2017

[28] "Autonomous Truck Platooning a Game Changer for Fuel Efficiency, Safety", *Texas A&M Today*, February 26, 2016.

[29] "New NXP Technology Allows Tighter Truck Platooning", *Forbes*, November 7, 2016.

[30] "Truck Platooning, Past, Present and Future", *TruckingInfo.com*, April 2016

[31] "European Truck Platooning Challenge 2016", Dutch Ministry of Infrastructure and the Environment, available at *https://www.eutruckplatooning.com/home/default.aspx*

[32] *https://operations.erdc.dren.mil/pdfs/TechExtLife1.pdf*

[33] "The Future of Chicago Manufacturing? Fewer People Doing More", *Chicago Tribune*, 9/19/15, quoting from a White House press release of July 2015.

[34] U.S. GDP by Industry, issued by Bureau of Economic Analysis, U.S. Department of Census, extracted February 2017.

[35] "U.S. Re-Shoring: Over Before It Began? A.T. Kearney, December 2015

[36] "Nearshoring Gaining Popularity in Western Europe While N. American Activity Slows", AlixPartners, reported by Stifel Nicolaus & Company, September 9, 2015

[37] Cambridge Systematics, Inc. 2011. *Potential Effects of the Panama Canal Expansion on the Texas Transportation System*. Texas Department of Transportation

[38] *https://static.tti.tamu.edu/tti.tamu.edu/documents/tti-testimony-05042016-1.pdf*

[39] Legacy network refers to highways on the National Highway System prior to Moving Ahead for Progress in the 21st Century Act (MAP 21). The State of Oklahoma has not completed some revisions that it began in 2013.

[40] Federal Highway Administration. August 2015. *Freight Performance Measure Approaches for Bottlenecks, Arterial, and Linking Volumes to Congestion*. U.S. Department of Transportation, Washington, D.C.

[41] Technical Report 7, Bottlenecks and Mobility Issues, presents a more detailed discussion of assessing delay and reliability and how these factors are related to bottlenecks and other mobility issues available at *http://www.okstatefreightplan.com*.

[42] The National Performance Management Research Data set (NPMRDS) is a dataset provided by Federal Highway Administration that includes detailed information about travel time and delay for commercial motor vehicles. More information is available in the Technical Report 5, Goals and Performance Measures, Policies and Strategies, available at *http://www.okstatefreightplan.com*.

[43] The National Performance Management Research Data Set data was from 2016 and AADT data was from the 2015 HPMS.

[44] ODOT has an extensive system of designated Overweight Truck permit "green" routes for approved heavy-haul and long-combination vehicle routes. See ODOT website at *http://www.okstatefreightplan.com*.

[45] Oklahoma DOT Waterways Division, February 1, 2017, email to Oklahoma Freight Transportation Plan project team.

[46] Oklahoma DOT Waterways Division, February 27, 2017, email to Oklahoma Freight Transportation Plan project team.

[47] Freight-related strategies are described in detail in Technical Report 5, Goals and Performance Measures, Policies and Strategies, available at *http://www.okstatefreightplan.com*.

[48] For example, ODOT is investing in a tool called "Decision Lens" to support the development of its 8 Year Construction Work Plan. The Decision Lens tool may include performance criteria addressing criteria such as bridge condition, pavement condition, geometric deficiencies, crash mitigation, system utilization, and system mobility/performance. Freight performance measures may also be incorporated into the tool.

[49] Technical Report 5, Goals and Performance Measures, Policies and Strategies, explains performance measures in greater detail at *http://www.okstatefreightplan.com*.

[50] During the development of these criteria, work on Decision Lens was in progress, so that a final set of Decision Lens criteria was not available. Some measures have also been customized to freight.

[51] The 8 Year Construction Work Plan (CWP) is updated annually. Research and analysis for the OFTP was based on years 2018-2022 from the CWP, 2017–2024. The CWP was being updated concurrently with the development of the OFTP. With very few exceptions, all projects in the first five years of the CWP 2017-2024 were also included in the CWP 2018–2025. Minor inconsistencies were addressed prior to completion of this OFTP.

[52] Most of Oklahoma's truck traffic occurs on the National Highway System (NHS), which includes the interstates and major U.S. and state highways. The federal freight performance measure requirement applies to this system as well. Freight-related performance measure for bridge data and pavement conditions are required for the NHS.

[53] *https://ops.fhwa.dot.gov/freight/infrastructure/nfn/*

[54] The terms network and system are used interchangeably when referring to the primary highway freight network/system or the national highway freight.

[55] The Infrastructure for Rebuilding America (INFRA) program advances the pre-existing FASTLANE grant program established in the FAST Act of 2015 and utilizes updated criteria to evaluate projects to align them with national and regional economic vitality goals and to leverage more non-federal funding. The INFRA program utilizes Nationally Significant Freight and Highway Projects (NSFHP) funds that are offered on a competitive grant application basis by USDOT in the amount of $4.5 billion over a five-year period.

[56] The U.S. Census Bureau defines urbanized areas as having a population of 50,000 or more people in the most recent decennial census. *https://www.census.gov/geo/reference/ua/urban-rural-2010.html*

[57] The high truck volume map shows highway segments with high combination (tractor-trailer) vehicle volumes, where "high" is defined as 1,280 combination vehicle AADTTs per highway segment. The 1,280 combination vehicle AADTT's threshold was selected as the high truck count reference point because highway segments having 1,280 AADTTs represented the highest 25 percent segment AADTTs. Further information on this subject is contained in Technical Report 6, Network Designation, at http://www.okstatefreightplan.com

[58] More details on the evaluation criteria and process for developing the proposed CRFC and CUFC routes are contained in Technical Report 6, Network Designation, at *http://www.okstatefreightplan.com*.