Kansas State Freight Plan

FINAL PLAN

Prepared for:

Kansas Department of Transportation

Prepared by:

cpcs

In association with:

TranSystems Corporation
High Street Consulting Group

February 2023

U.S. Department of Transportation
Federal Highway Administration

Kansas Division

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May 02, 2023

In Reply Refer To:
HDA-KS

Mr. Calvin Reed
Interim Secretary of Transportation
Kansas Department of Transportation
Topeka, KS 66603

ATTN: Mr. Chris Herrick, Director – Division of Planning & Development

Subject: IIJ Act Compliant Kansas Freight Plan

Dear Secretary Reed:

The Federal Highway Administration ("FHWA") Kansas Division Office ("Division Office") has reviewed the Kansas Department of Transportation's (KDOT) Kansas Statewide Freight Plan ("Plan") dated April 2023 and received by the Division Office on February 28th, 2023.

The Division Office finds that the Plan contains all elements required by 49 U.S.C. § 70202. The State has, therefore, met the prerequisite in 23 U.S.C. § 167(h)(4) that it develop a State Freight Plan in accordance with 49 U.S.C. § 70202 before it may obligate funds apportioned to the State under 23 U.S.C. § 104(b)(5). The State may now obligate such funds for projects that meet all National Highway Freight Program ("NHFP") eligibility requirements described in 23 U.S.C. § 167, and all other applicable Federal requirements.

Please be advised that the Division Office's finding that the Plan satisfies the requirements of 49 U.S.C. § 70202 and 23 U.S.C. § 167(h)(4) is not a determination that the projects listed in the freight investment plan component of the Plan required by 49 U.S.C. § 70202(c)(2) meet all other NHFP eligibility requirements set forth in 23 U.S.C. § 167, or any other applicable Federal requirement.

If you have any questions regarding NHFP eligibility requirements, please contact Mr. Matt McDonald, Program Development Team Leader, of my staff (785) 273-2643.

Sincerely yours,

Richard E Backlund

Richard E. Backlund, AICP
Division Administrator

CC: Caitlin Hughes, Director, Office of Freight Management and Operations
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Table of Contents

Table of Figures

Glossary of Terms

286K	286,000 pounds
AAR	Association of American Railroads
ADA	Americans with Disabilities Act
APU	Auxiliary Power Unit
ARRA	American Recovery and Reinvestment Act
ASV	Abilene and Smoky Valley Railroad
ATSF	Atchison, Topeka and Santa Fe Railway
BEA	Bureau of Economic Analysis
BH&W	Boot Hill & Western Railroad
BIA	Blackwell Industrial Authority
BIL	Bipartisan Infrastructure Law
BNGR	Blackwell Northern Gateway Railroad
BNSF	BNSF Railway
BRR	Blue Rapids Railroad
BTS	Bureau of Transportation Statistics
BUILD	Better Utilizing Investments to Leverage Development
CARES Act	Coronavirus Aid, Relief, and Economic Security Act
CBRR	Central Branch/Missouri Pacific Railroad
CHP	Comprehensive Highway Program
CFS	Commodity Flow Survey
CO	Colorado
COFC	Container-on-flatcar
COVID-19	Coronavirus Pandemic
CRIP	Chicago, Rock Island and Pacific Railroad or Rock Island Railroad
CRISI	Consolidated Rail Infrastructure and Safety Improvements
CTP	Comprehensive Transportation Program
CVR	Cimarron Valley Railroad
DERA	Diesel Emissions Reduction Act
DOT	Department of Transportation
eSCI	Customer Service Indicator
ES	Executive Summary
EPA	Environmental Protection Agency
EV	Electric Vehicle
FAF	Freight Analysis Framework
FAF5	Freight Analysis Framework Version 5

FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
GCW	Garden City and Western Railway
GDP	Gross Domestic Product
HAL	Heavy Axle Load
HUTX	Hutchinson Transportation Company
I-ETMS	Interoperable Electric Train Management System
IFG	International Freight Gateway
IKE	Eisenhower Legacy Transportation Program
JCAX	New Century AirCenter Railroad
KAW	Kaw River Railroad
K&O	Kansas & Oklahoma Railroad
KCS	Kansas City Southern Railway
KCT / KCTR	Kansas City Terminal Railway Company
KDA	Kansas Department of Agriculture
KDC	Kansas Department of Commerce
KDOT	Kansas Department of Transportation
KS	Kansas
KYLE	Kyle Railroad
LPKC	Logistics Park Kansas City
LRTP	Long Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MID	Midland Railway
MIRPC	Midwest Interstate Passenger Rail Commission
MKT	Missouri-Kansas-Texas Railway
M&NA	Missouri & Northern Arkansas Railroad
MO	Missouri
MPH	Miles per hour
MPO	Metropolitan Planning Organization
MUTCD	Manual of Uniform Traffic Control Devices
MWRRI	Midwest Regional Rail Initiative
NHFP	National Highway Freight Program
NKCR	Nebraska, Kansas, & Colorado Railway
NE	Nebraska
n.e.c.	Not Elsewhere Classified
NEVI	National Electric Vehicle Infrastructure

NS	Norfolk Southern Railway
NTAD	National Transportation Atlas Database
ODOT	Oklahoma Department of Transportation
OK	Oklahoma
OTM	Other Track Material
OTP	On-Time Performance
PRIIA	Passenger Rail Investment and Improvement Act
PRRF	Passenger Rail Revolving Fund
PSR	Precision Scheduled Railroading
PTC	Positive Train Control
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
ROW	Right-of-way
RPAC	Rail Plan Advisory Committee
RSIA	Rail Safety Improvement Act
RSIF	Rail Service Improvement Fund
SAP	Kansas Highway-Rail Grade Crossing State Action Plan
SDP	Service Development Plan
SF	Square Foot
SFY	State Fiscal Year
SLRIF	Short Line Rail Improvement Fund
SLSF	Saint Louis-San Francisco Railway
SKOL	South Kansas & Oklahoma Railroad
STB	Surface Transportation Board
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TF	Track Foot
TIGER	Transportation Investment Generating Economic Recovery
TOFC	Trailer-on-flatcar
T-WORKS	Transportation Works for Kansas
UP	Union Pacific Railroad
USDA	US Department of Agriculture
US	United States
USDOT	United States Department of Transportation
V&S	V&S Railway

Executive Summary

About the Kansas State Freight Plan

The Kansas Department of Transportation (KDOT) has developed the Kansas State Freight Plan to guide the state's vision for freight transportation and to identify strategies to achieve this vision. This Plan serves as an update to KDOT's 2017 Kansas State Freight Plan and meets federal requirements established under the Bipartisan Infrastructure Law (BIL) of 2021.

The Kansas State Freight Plan provides a clear understanding of the multimodal freight system, how industries and people use the system, and the system needs, issues, and opportunities, so KDOT can make better-informed policy and investment decisions.

Vision and Goals

The framework for developing the Kansas State Freight Plan is based on the vision, goals, and objectives identified in the Kansas 2045 Long-Range Transportation Plan (LRTP). Freight planning guidance from the Federal Highway Administration (FHWA) was also used to align this Plan's freight system investments and recommendations with the aspirations of both Kansas and FHWA's for the multimodal freight system.

Figure ES 1: State Long-Range Transportation Planning Focus Area

- Safety and Security
- Transportation System Management
- Asset Preservation
- Freight and Economic Vitality
- Stewardship
- Workforce

Source: CPCS, 2021.

The Kansas State Freight Plan has been developed with extensive public participation and involvement by the state's freight stakeholders. KDOT conducted outreach with nearly 100 unique stakeholder organizations throughout the plan development process. KDOT engaged with freight stakeholders through the Kansas Freight Advisory Committee (KFAC), Rail Plan Advisory Committee (RPAC), one-on-one consultations, and group roundtables. Through these outreach efforts, stakeholders validated information and provided feedback on the existing freight system's conditions, needs, and issues. They also shared input on potential opportunities to enhance the state's multimodal freight system.

Overview of Kansas' Economy

Demographic and Economic Trends

Kansas' demographic and economic trends provide insight into both the supply and demand of freight. The demand for goods and services within Kansas depends on consumer demand from people living in and moving through Kansas. Meanwhile, the supply of goods and services is driven by Kansas' available workforce. These trends include:

Urbanizing Population

Kansas' population is growing, much of which is concentrated in the state's urban areas of Kansas City, Topeka, Wichita, Manhattan, and Lawrence. More people are moving to these urban areas and away from rural areas. This trend is projected to continue as Kansas' population continues growing through the next few decades.

Steady Labor Force

The labor force in Kansas has remained steady over the past decade, with the population's median age remaining under 37. This labor force supports Kansas' growing employment. Meanwhile, the state's unemployment rate has steadily decreased.

Advancing Incomes and Education

Kansans are becoming more educated, with more people receiving higher education degrees over the last decade. Further, the share of Kansans graduating high school and receiving bachelor's degrees is higher than the national rate. Skilled Kansans support the state's workforce, which is also seeing higher median household incomes.

GDP Contributions

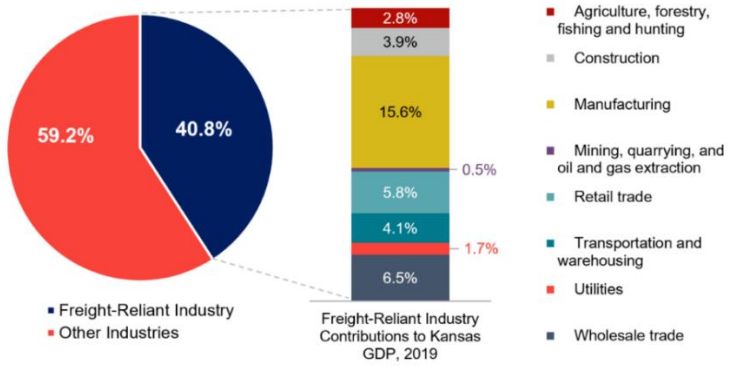
Kansas produced almost $176.5 billion in GDP in 2019, making up 0.8 percent of the national GDP. This represents a GDP per capita of over $60,600 in the state.

Kansas' Freight Reliant Industries

Freight is critical to Kansas' economy, with freight-reliant industries contributing over $72 billion to state GDP in 2019.

Freight-reliant industries drive demand for Kansas' transportation system (Figure ES 2). Freight-reliant industry establishments are located throughout the state with concentrations on the eastern side of the state around Kansas City, Topeka, and Wichita and along the state's transportation network. Kansas' key freight-related industries include manufacturing, agriculture, energy and natural resources, and transportation and warehousing.

Figure ES 2: Freight Contribution to Kansas GDP, 2019



Source: Bureau of Economic Analysis (BEA), GDP by State, 2019. Analysis by CPCS, 2021.

Kansas' Multimodal Freight System

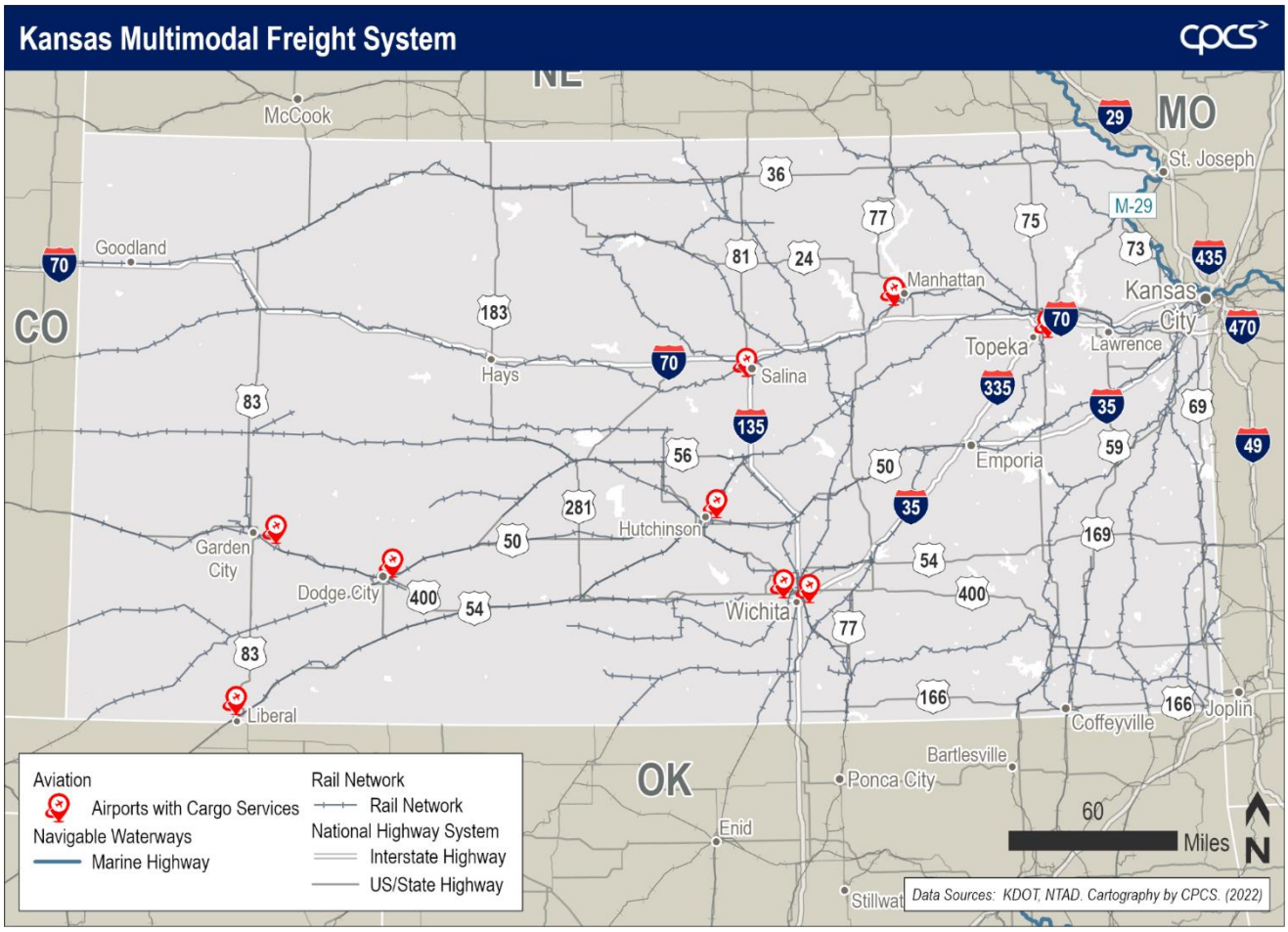
The multimodal freight system supports the goods movements of key industries such as advanced manufacturing, logistics and distribution, food processing and manufacturing, aerospace & defense, agriculture, and energy & natural resources.

Kansas' multimodal freight system (Figure ES 3) provides shippers with a range of modal options to consider when transporting freight and includes:

10,518	4,618	121	9	60,408
Highway Miles	Active Rail Miles	Marine Highway Miles	Air Cargo Airports	Pipeline Miles

Source: HPMS, KDOT, USACE, BTS, T-100, PHMSA, and EIA

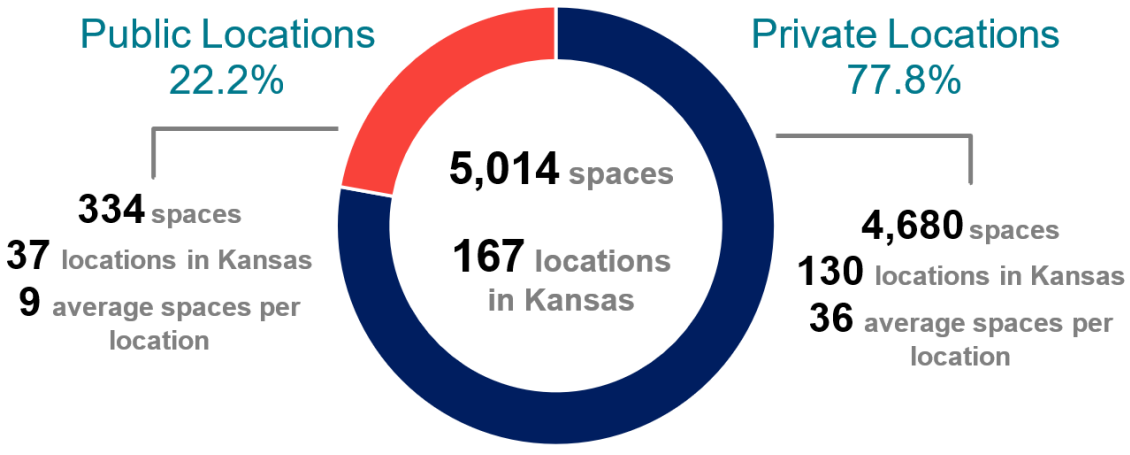
Figure ES 3: Kansas' Multimodal Freight System



Kansas is home to 167 truck parking locations that offer over 5,000 truck parking spaces.

This includes truck stops located along the Kansas Turnpike. Public rest areas provide the remaining 334 spaces, making up 7 percent of Kansas' truck parking spaces.

Figure ES 4: Public and Private Truck Parking Locations in Kansas



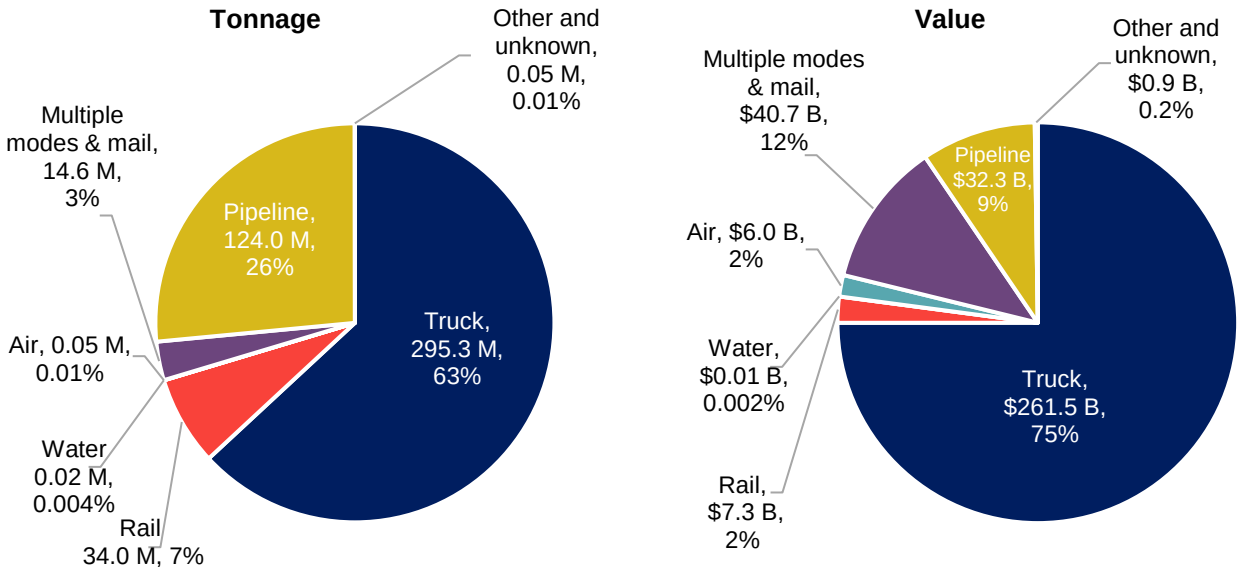
Source: KDOT, Trucker Path, 2021. Analysis by CPCS, 2021.

Kansas' Commodity Flows

The transportation system supports freight-reliant industries by moving goods to, from, and through Kansas. In 2017, this included 468 million tons of goods worth $348.6 billion.[1]

Trucks make up the largest share of the goods movement by both volume and value (Figure ES 5). When removing pipeline, rail carries the next largest share of goods by tonnage but represents a smaller share of goods moved by value, indicating the efficiency of railroads in transporting bulk goods. Meanwhile, multiple modes and mail carry high-value goods, moving a large share of goods by value, but a smaller share by tonnage.

Figure ES 5: Total Tonnage and Value by Mode (2017)

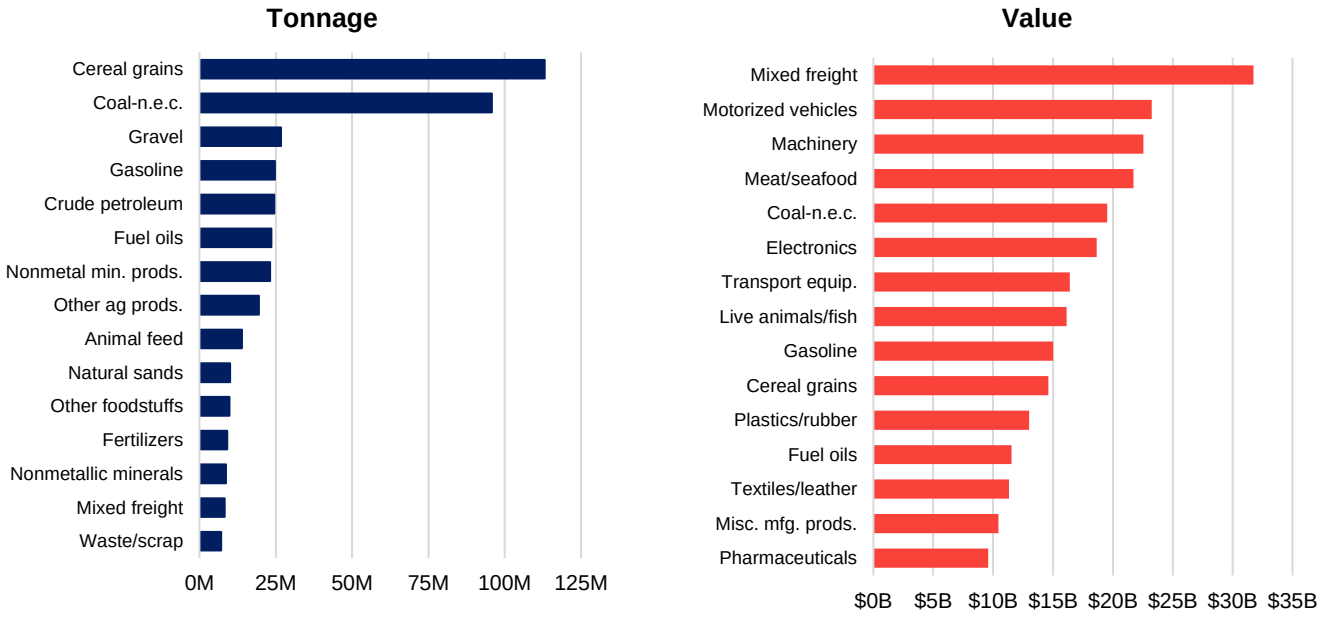


Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

The top fifteen commodities by volume and by value handled on Kansas' freight system include cereal grains and coal-n.e.c. (totaling 113.4 million tons and 95.8 million tons, respectively) and manufactured goods, including mixed freight and motorized vehicles ($31.7 billion and $23.3 billion, respectively) (Figure ES 6).

[1] Note, the tonnage and value do not include goods handled in Kansas City, MO.

Figure ES 6: Total Tonnage and Value by Commodity (2017)



Source: CPCS Analysis of FAF 5. Note: Coal n.e.c. refers to packaged fuel, powdered fuel, and other products of petroleum and coal, not elsewhere classified.

Kansas' top domestic trading partner by value is Missouri (over $34.5 billion, with mixed freight as the top commodity), followed by Texas ($23.3 billion, with meat/seafood as the top commodity), Nebraska ($22.3 billion, with live animals/fish and coal n.e.c. as the top commodities), and Oklahoma ($18.1 billion, with coal n.e.c. as the top commodity).[2]

Canada and Eastern Asia are Kansas' two biggest international trading partners. Top commodities moved between Kansas and Eastern Asia by value include electronics and meat/seafood, while top commodities moved between Kansas and Canada by value include crude petroleum (only imported to Kansas) and transportation equipment.

Freight System Assessment

Existing Statewide Freight System Assessment

Statewide evaluation measures were developed in alignment with KDOT's LTRP vision and goals, to assess the Kansas freight system. This statewide assessment focuses on measures that evaluate the safety and security, transportation system management, and asset preservation of the statewide freight system, with evaluation measures spanning the road, rail, and aviation systems (Figure ES 7).

[2] Includes domestic movements only.

Figure ES 7: Statewide Freight System Evaluation Measures

Goal Area	Statewide Evaluation Measures		
	Road	**Rail**	**Air**
Safety and Security	• Number of truck-involved fatalities • Truck-involved fatality rate • Number of truck-involved serious injuries • Truck-involved serious injury rate	• Total rail incidents • Highway-rail grade crossing incidents • Highway-rail grade crossing incidents by safety device • Rail-related casualty risk • Rail trespassing risk • Blocked crossing trends	N/A
Transportation System Management	• Truck Travel Time Reliability (TTTR) • Oversize/overweight (OS/OW) permit counts • Truck parking utilization • Percent of weigh stations with weigh-in-motion (WIM)	• Percent of miles with double track • Percent of miles with sidings	N/A
Asset Preservation	• Bridges in good condition and poor condition • Pavement in good condition and poor condition • Vertical bridge clearance	• Percent of mileage that is FRA track Class 4 • Percent of mileage that is 286k pound capable • Percent of mileage that is inactive or abandoned	• Runway pavement conditions • Runway lengths

The assessment of the **statewide road network** primarily focused on an evaluation of Kansas' interstate system, unless otherwise noted. Top issues include:

- **Truck-Involved Fatalities and Serious Injuries:** There were 13 truck-involved fatalities and 22 truck-involved serious injuries in 2019 on Kansas' Interstates, at a rate of 3.26 fatalities and 5.51 serious injuries per million truck miles traveled. The five-year rolling average (from 2011-2015 to 2015-2019) of truck-involved fatality counts has increased, while the five-year rolling average of truck-involved fatality counts has decreased.
- **TTTR:** TTTR on Kansas' Interstates has improved from 1.18 in 2019 to 1.13 in 2021, indicating improved truck reliability and exceeding the state's 2021 TTTR target of 1.16.
- **OS/OW Permits:** Kansas issued a total of 414,063 OS/OW permits between 2017 and 2021, with the number of permits issued peaking in 2019 with over 94,000 permits issued and dropping to nearly 78,000 permits issued in 2021.
- **Truck Parking Utilization:** Truck parking utilization is highest in Kansas during the overnight and early morning hours, peaking from 3:00 to 4:00 am.
- **Percent of Weigh Stations with WIM:** In Kansas, five out of the state's eight weigh stations are equipped with WIM technology.
- **Bridge Condition:** Among the states' over 1,400 bridges, 64.6 percent are in good condition (falling short of the state's target of 70 percent), while 2.1 percent are rated poor (exceeding the state's target of 3 percent).

- **Pavement Condition:** In Kansas, 59.9 percent of pavement is rated in good condition (falling short of the state's 65 percent target), while 0.4 percent is rated poor (exceeding the state's target of 0.5 percent).
- **Vertical Bridge Clearance:** Over one-fourth (25.5 percent) of bridges over Kansas' Interstate roads have a vertical clearance under 16 feet, which is the FHWA standard for vertical clearance on interstate roads. Four percent of bridges have a vertical clearance under 15 feet.

The assessment of the **statewide freight rail network** focused on an evaluation of Kansas' active Class I, short line, and switching/terminal railroads. Top issues include:

- **Freight Rail Incidents:** The number of freight rail incidents in Kansas has decreased since 2010. Despite a decrease in freight rail incidents between 2019 and 2020, the number of freight rail incidents in the state was higher than the national average in 2020.
- **Freight Rail Casualties:** The total number of freight rail-related casualties in Kansas has stayed constant over the past decade, remaining below the national average. However, the number of freight-rail-related fatalities in Kansas more than doubled between 2019 and 2020. In Kansas, almost half of rail trespassing casualties that occurred in the last ten years resulted in a fatality. Although the state's trespassing casualties remain below the national average, the number of fatalities more than quadrupled between 2019 and 2020, from 2 to 9 fatalities.
- **Highway-Rail Grade Crossing Incidents:** The number of highway-rail grade crossing incidents in Kansas has decreased overall since 2010. Over the past decade, commercial vehicles have been involved in over a quarter of these highway-rail grade crossings incidents. However, the state experienced a 24 percent increase in highway-rail grade crossing incidents between 2019 and 2020.
- **Blocked Crossings:** In 2020, there were 328 cases of blocked crossings reported in Kansas, with 79 percent of reported crossings blocked for more than 15 minutes.
- **Double track:** Approximately 7.5 percent of the length of the freight rail system in Kansas has two or more tracks, while the rest of the system runs single-track.[3] Almost the entire (99 percent) length of Kansas' double or more rail track system serves Class I railroads.
- **Sidings:** Rail sidings are present along approximately 5 percent of the total length of the freight rail system. When broken down by rail classification, rail sidings are present along 6.8 percent of the Class I rail system and 0.5 percent of the short line rail system in Kansas.
- **FRA Track Class:** Over half (53 percent) of the freight rail system in Kansas is operating on FRA track class 4 or higher, which allows freight rail operations with a speed limit of up to 60 mph and passenger rail operations up to 80 mph. For the Class I rail system in Kansas, 83 percent is FRA track class 4 or higher. While FRA track class 4 is the standard for Class I railroads, FRA track class 2 is the standard for short line railroads. For the short line rail system in Kansas, 73 percent is FRA track class 2 or higher, allowing for freight train speeds of up to 25 mph.[4]
- **286k Compliance:** Almost the entire (98 percent) active Class I system in Kansas is currently 286k capable. However, 32 percent of the active short line system is known to be 286k capable.
- **Inactive or Abandoned Rail:** 3,192 miles (40 percent) of the rail track network in Kansas is abandoned, with an additional 142 miles (2 percent) classified as inactive.

The assessment of the **statewide freight aviation network** focused on an evaluation of Kansas' nine airports that provided cargo service in 2019. Top issues include:

[3] Note: Information pending validation by railroads.
[4] Note: Information pending validation by railroads.

- **Runway Pavement Condition:** Among the runways at Kansas' nine cargo-handling airports, the majority are rated good or excellent, based on FAA criteria. One runway at McConnell Air Force Base (IAB), one runway at Hutchinson Regional Airport (HUT), and two runways at Dodge City Regional Airport (DDC) have pavement rated as fair.
- **Runway Length:** Wichita Dwight D. Eisenhower (ICT), McConnell Air Force Base (IAB), Topeka Regional Airport (FOE), and Salina Regional Airport (SLN) have runway lengths of at least 7,900 feet long, sufficient to serve wide-body, long-distance flights.

Key Freight Corridor Assessment

As part of the Kansas State Freight Plan, KDOT engaged in a process to designate Kansas' highway freight network. This designated freight network is referred to as Kansas' Freight Corridors of Significance (FCS). The final FCS network is shown in Figure ES 8.

Figure ES 8: Final Freight Corridors of Significance

KDOT selected five key freight corridors – US 50, US 83, US 169, US 400, and K-10 – to conduct a deeper assessment of non-interstate system needs in the state.

Planning for the Future in Kansas

Key Freight Factors and Trends

Freight factors and trends in Kansas were evaluated through a "STEEP" framework – a commonly used analytic approach – to assess the various external factors that may impact an organization or agency, accounting for Social, Technological, Environmental, Economic, and Political Considerations.

Figure ES 9 provides an overview of the key STEEP factors impacting the freight system in Kansas. Understanding and preparing for these trends enables KDOT to better understand the state's future freight system needs, issues, and opportunities.

Figure ES 9: STEEP Factors and Trends Impacting Kansas' Freight System

STEEP trends shape freight both directly and indirectly via four pressure points: freight origins, freight destinations, freight routing, and freight volume/value.

- **Freight Origins:** Types of raw materials and other commodities and where they originate.
- **Freight Destinations:** Types of raw materials and other commodities and where they are destined for consumption or other uses.
- **Freight Routing:** How (mode choice, connections) and where (pathway) goods are routed.
- **Freight Volume and Value:** The volume and value of commodities moved on the freight system.

Scenario Planning

Scenario planning is a technique used by planners for developing a shared vision of the future by analyzing how important forces (e.g., STEEP factors and trends) could change transportation networks and investment needs. It allows transportation experts and stakeholders to explore uncertainty in trends and to stress test the transportation system against different potential futures. This helps experts and stakeholders understand possible outcomes and manage potential risks with a range of responses.

As part of Kansas LRTP development, KDOT identified the following scenarios under which to understand and compare the potential impacts of freight trends:

- **Baseline Scenario:** A baseline scenario uses data (when available) and general assumptions (when quantifiable data is unavailable) about historical STEEP trends and anticipated future projections to project 'business as usual.'
- **Regional Hubs in 2045:** Under this scenario, technology helps sustain and invigorate the prosperity of rural areas of Kansas, which are buoyed by growing area hubs. New technology and mobility solutions in these areas are key to supporting economic growth, quality of life, and access to critical services like healthcare.
- **Resiliency Challenged in 2045:** Under this scenario, weather extremes hit infrastructure hard and create unprecedented economic and social disorder, forcing difficult choices about where to invest scarce dollars in resiliency improvements.
- **Cities and Advanced Agriculture Win the Day in 2045:** Under this scenario, people across America embrace city-oriented, tech-driven lifestyles. Population growth is concentrated in places like the Kansas City region or Wichita that absorb most out-of-staters moving to Kansas, job growth, and new housing. This growth is often in areas with more dense housing offering

services and entertainment within easy walking distance. Advanced agriculture, benefitting from a tech revolution, means productivity increases and economic viability strengthens.

The results of the scenario analysis were used to inform freight system strengths, weaknesses, threats, and opportunities.

Freight System Strengths, Weaknesses, and Threats

The strengths, weaknesses, and threats for Kansas' freight system were identified based on an evaluation of KDOT's statewide multimodal freight system, as well as a review of social, technological, economic, environmental, and political trends with the potential to impact the freight system. The results are shown in Figure ES 10, organized by State Freight Plan goal areas.

Figure ES 10: Kansas SWOT

Strengths

Safety and Security

- Five-year rolling average of truck-involved serious injury counts has decreased from 2011-2015 (average of 31.6 serious injuries) to 2015-2019 (average of 23.4 serious injuries).
- The number of freight rail casualties in Kansas remains below the national average.
- The number of freight rail incidents and highway-rail grade crossing incidents in Kansas have decreased since 2010.

Transportation System Management

- TTTR on Kansas' Interstates has improved from 1.18 in 2019 to 1.13 in 2021. This also exceeds the state target of 1.16.
- Kansas provides access to major interstates (I-35, I-70, I-135, I-335), over 4,600 active Class I and short line rail miles, Marine Highway M-29 on the Missouri River, nine airports that provide air cargo services, and over 60,400 miles of pipeline for multimodal freight movements.
- Due to the rural nature of Kansas, the state's surface transportation system encounters fewer roadway obstacles that enable enhanced mobility.
- KDOT is planning for the future of freight and exploring opportunities to leverage new technologies to enhance freight movements statewide. Through the Kansas Statewide Connected and Autonomous Vehicle Vision Plan, the state has identified a framework to maximize CAV deployments and realize benefits for Kansas.
- Statewide utilization at truck parking facilities remains below 90 percent at peak utilization hours.
- Compared to other states nationwide, truck parking issues are less prevalent in Kansas.

Asset Preservation

- Kansas exceeds its targets for the percentage of bridges rated in poor condition (2.1 percent, compared to a target of 3 percent) and for the percentage of pavement rated poor (0.4 percent, compared to a target of 0.5 percent).
- The majority of Kansas' rail system meets FRA track class standards (class 4 or higher for Class I and class 2 or higher for short lines). Additional Class 4 track upgrades are expected to further improve efficiency and operations.
- Almost the entire (98 percent) active Class I system in Kansas is currently 286k capable.
- Among the runways at Kansas' nine cargo-handling airports, the majority are rated good or excellent. Additionally, all Kansas cargo airports have good or fair runway marking conditions.

Freight and Economic Vitality

- Kansas' central location makes the state critical to goods movement nationwide.
- KDOT has designated Freight Corridors of Significance that can inform optimal investment decisions for the state's freight system and economy.
- Several new major freight facilities have recently been completed or are ongoing construction. Additionally, the recently announced $4 billion Panasonic EV Battery Plant is expected to be the largest economic development project in the state's history.
- Kansas issued nearly 78,000 oversize/overweight permits in 2021.
- Kansas' short line rail system makes up 39 percent of the state's active rail infrastructure and transported 2.7 percent of total carloads in Kansas. Short lines provide competitive shipping costs and lower emissions compared to trucks.
- Kansas is advancing efforts to expand access to broadband and upgrade broadband networks, through the Statewide Broadband Expansion Task Force and the Broadband Acceleration Grant program.

Stewardship

- In 2020, renewable energy sources generated 44% of Kansas' in-state electricity. Kansas is also a top 5 state for total wind energy generation.
- KDOT is planning for the integration of electric vehicles.

- KDOT coordinates and partners with railroads on large capital projects for rail improvements and accommodations, and administers Section 130 funds for highway-rail grade crossing projects.
- KDOT supports and on occasion has provided matching funds for federal grant applications.
- KDOT administers several state-funded rail programs that allocate funding to assist short lines and shippers with rail system maintenance and upgrade projects and siding improvements.

Workforce

- Kansas higher education institutions are investing in specialized training and research to support manufacturing sector needs.
- Transportation and warehousing job numbers are projected to grow by 9.8 percent by 2028, compared to 2018, according to Kansas Department of Labor projections.
- Kansas rail stakeholders emphasize positive feedback for KDOT's existing rail-dedicated workforce and the rail programs administered by KDOT.

Weaknesses

Safety and Security

- Five-year rolling average of truck-involved fatalities has increased from 2011-2015 (average of 5 fatalities) to 2015-2019 (average of 14 fatalities).
- The number of freight rail incidents in Kansas was higher than the national average in 2020.
- The number of freight rail-related fatalities more than doubled and the number of highway rail-grade crossings increased by 24 percent in Kansas between 2019 and 2020.
- 328 cases of blocked crossings were reported in Kansas in 2020, with 79 percent blocked for more than 15 minutes.

Transportation System Management

- Enforcement facilities are outdated and require infrastructure upgrades to meet current and future technology needs. Three out of the state's eight weigh stations lack weigh-in-motion capabilities.
- Over one-fourth of bridges over Kansas' interstate roads have a vertical clearance under 16 feet (FHWA standard), with four percent of bridges having a vertical clearance under 15 feet. As a result, OS/OW vehicles may be forced to take alternate routes.
- The majority of Kansas' rail system remains single track, with a need for more double track to account for maintenance needs and network disruptions. The insufficient number and length of sidings on Kansas' rail system also leads to blocked crossings and rail stoppage.
- At many locations statewide, rail maintenance issues cannot be serviced during night hours when it is dark.
- About half of truck parking locations in Kansas individually experience utilization of 90 percent or higher at the state's peak utilization hour, with several smaller public rest areas – all on I-70 – fully utilized.
- Kansas enforcement identified roadway shoulders in Finney County as locations of frequent illegal truck parking.
- Truck drivers cite shortages of truck parking in Kansas.
- Industry stakeholders identify a high demand for truck parking, with a presence of undesignated parking, on key freight corridors (e.g., I-35, I-70, US 169) and last-mile roads (e.g., near Garden City, Edgerton).

Asset Preservation

- Kansas falls short of its targets for the percentage of bridges rated in good condition (64.6 percent, compared to a target of 70 percent) and for the percentage of pavement rated good (59.9 percent, compared to a target of 70 percent).
- Due to annual carload volumes and revenues, short lines have difficulty making investments for needed rail infrastructure maintenance and upgrades. Currently, less than one-third of the active short line system is known to be at the industry-standard 286K capable, and 25 percent of the state's short line system remains below FRA track class 2.
- Five of Kansas' nine cargo-handling airports do not have runway lengths sufficient (at least 7,900 feet) to serve wide-body, long-distance flights.

Freight and Economic Vitality

- Kansas' freight system heavily relies on the road network, with trucks carrying 63 percent in tonnage and 75 percent in value of goods moving to, from, and within the state.
- A high share of freight movements in Kansas includes through movements with origins and destinations outside the state. This represents a significant amount of freight volume and value that is utilizing Kansas' freight system but is not contributing significant economic benefit to the state.

Stewardship

- Many roadway project needs remain unfunded. Freight projects must compete against other non-freight projects to secure state funding, and there currently does not exist a framework that integrates freight as a criterion for prioritization.
- Many short line rail project needs remain unfunded. Due to lower volumes, short line projects require outside funding support to invest in rail system infrastructure improvements.

Workforce

- Difficulty recruiting and maintaining Kansas' private sector rail workforce, due to factors including rural job locations, undesirable and/or unreliable work hours, a limited pool of workers with rail experience, and a post-COVID-19 workforce shortage.
- Limited/diminishing public sector rail-dedicated workforce limits the ability to focus staff time on freight efforts.

Threats

Safety and Security

- Trains are getting longer, increasing the likelihood of blocked grade crossings when trains are stopped.
- Potential for cyber-attacks that compromise freight infrastructure and vehicles.

Transportation System Management

- New large freight facilities in Kansas put increasing strain on the state's existing infrastructure.
- Trains are getting longer, and many existing sidings are not built to accommodate train lengths of the future.
- OS/OW vehicles are getting larger, and many existing roads are not built to handle or do not allow for the maneuvering of longer, wider, and taller vehicles.
- Expected growth in freight traffic on Kansas' highways will drive an increased demand for truck parking.
- Port and container volume growth (e-commerce boom), combined with system disruptions (COVID-19 and others), impact the availability of equipment and capacity. A shortage of containers, boxcars, chassis, and other equipment limits capacity and threatens efficient and reliable freight movements.
- The uncertain CAV market, especially for freight movements, in combination with patchwork CAV policies nationwide, poses challenges to planning and regulation for widespread CAV integration.

Asset Preservation

- Increasing customer demand and growing traffic put increasing stress on aging freight infrastructure, especially on first/last-mile roads and the short line rail system. Meanwhile, the limited capacity of select freight routes (e.g., limited speed and weight capacity, size/weight restrictions) and freight facilities/equipment limit the ability to capture growing customer needs and demands.
- The increasing frequency of catastrophic events and long-term environmental changes threaten freight infrastructure and operations.

Freight and Economic Vitality

- Growth in e-commerce has led to higher demand from and increasing strain on the existing freight system, notably on local first/last-mile roads near warehousing and distribution centers and residential areas.
- Low vacancy and high rates for warehousing and distribution space.
- Limited and aging grain handling facilities and grain storage capacity, while crop volumes increase.
- Rail rates are highly controlled by Class I's, exacerbated by potential mergers.
- International trade policies.

Stewardship

- Need to mitigate the impact of freight on surrounding communities, local air pollution, and wildlife habitats.
- Need for continued authorization and appropriation of funding for federal and state transportation programs.

Workforce

- Kansas' labor force is expected to erode due to the aging population and out-migration of 20- to 24-year-olds. Additionally, increasing traditional educational attainment could lead to a shortfall in skilled technical workers.
- Private sector workforce challenges are exacerbated by unique, industry-specific work conditions (e.g., a lack of reliability of train schedules, stress finding truck parking).
- Turnover or retirement of public and private sector workforce threatens the loss of institutional knowledge and efficiency of future rail efforts and programs administered by KDOT.

Freight System Investment Plan

Freight Policy and Program Opportunities

KDOT has identified freight policy and program opportunities based on data analysis and performance evaluation of the state's multimodal freight transportation system, Kansas Freight Advisory Committee (KFAC) meetings and consultations with other freight stakeholders, and a strengths, weaknesses, and threats assessment. As shown in Figure ES 11, the identified policy and program opportunities have been developed in line with KDOT's goals for the multimodal freight system.

Figure ES 11: Freight System Policy and Program Opportunities and Corresponding Plan Goals

Policy and Program Opportunities	Safety & Security	Transportation System Management	Asset Preservation	Freight & Economic Vitality	Stewardship	Workforce
Address congestion, delay, and improve freight system resiliency		✓		✓	✓	
Improve safety and efficiency of freight system operations	✓	✓	✓	✓		
Preserve and improve roadways used by heavy vehicles		✓	✓	✓		
Address extreme weather, air pollution, flooding, and wildlife and habitat loss		✓	✓	✓	✓	
Strengthen coordination and partnerships	✓	✓	✓	✓	✓	✓
Guide freight-related transportation investment in Kansas	✓	✓	✓	✓	✓	
Address freight-related workforce needs in Kansas						✓

National Highway Freight Program Project Opportunities

To meet federal freight planning requirements KDOT must identify a list of priority projects for National Highway Freight Program (NHFP) funding and describe how NHFP funds will be invested in matched. The following projects have been identified by KDOT for NHFP funding. This project list is provided in Figure ES 12.

Figure ES 12: National Highway Freight Program (NHFP) Funded Projects

Project Name	FY22[5] ($M)	FY23 ($M)	FY24 ($M)	FY25 ($M)	FY26 ($M)	FY27 ($M)	Matching Funds ($M)	Project Total ($M)
I-70 Pavement in Geary County	$14.684	$0.355					$1.671	**$16.711**
I-470 Bridge in Shawnee County		$5.114					$0.568	**$5.682**
I-35 Bridge in Johnson County		$7.631	$9.832				$1.940	**$19.404**
US 83 pavement in Haskell County			$3.530	$13.630	$3.052		$5.053	**$25.265**
I-70/K-18 Interchange in Geary County					$10.850	$4.705	$1.728	**$17.284**
US 83 Pavement in Finney County						$9.197	$46.765[6]	**$55.962**
TOTAL	**$14.684**	**$13.100**	**$13.362**	**$13.630**	**$13.902**	**$13.902**	**$57.726**	**$140.308**

Source: KDOT

Other Freight Project Opportunities

Other freight project opportunities have also been identified by KDOT, based on data and analysis, and supplemented by stakeholder input. These opportunities may address freight transportation needs in Kansas but remain in the concept phase, with project details – including location – yet to be determined. These concepts, which are identified in Figure ES 13, must also be further explored in order to identify potential costs, benefits, and other impacts of implementation.

Figure ES 13: Other Freight Project Opportunities

Project	Project Description	Project Need(s)	Goal Area(s)
Intersection Improvements	Construct intersection improvements along key corridors	• Improve intersection operation and enhance safety	• Safety and Security • Asset Preservation • Transportation System Management • Freight and Economic Vitality
Capacity Expansion	Build new lane capacity for increased traffic volume expected with development	• Increase roadway capacity	• Asset Preservation • Transportation System Management • Freight and Economic Vitality
Truck Parking	Build new and/or expand existing truck parking	• Enhance truck parking facility options	• Transportation System Management • Freight and Economic Vitality • Stewardship • Workforce

[5] FY22 carryover $14,684,486.05.
[6] A portion of the $46.765 million would use future NHFP Funds if available after 2027.

Project	Project Description	Project Need(s)	Goal Area(s)
Grade Crossing Upgrade	Improve highway-rail grade crossing infrastructure – upgrade crossing surface.	• Improve aging infrastructure	• Safety and Security • Asset Preservation
Grade Crossing Upgrade	Improve safety at highway-rail grade crossing locations by upgrading safety devices and adding overhead lighting at crossings.	• Reduce highway-rail grade crossing incidents	• Safety and Security • Asset Preservation
Inspection Facility	Construct new or expand existing inspection facility	• Improve freight operation and efficiency	• Freight and Economic Vitality • Stewardship

KDOT Approach to Advancing Freight Opportunities

As part of developing the Kansas State Freight Plan, KDOT sought to assess and articulate how freight – including the designated Freight Corridors of Significance (FCS) – could be incorporated into broad KDOT policies, project planning, decision-making, and investments. The process involved several discussions held among KDOT's Executive Team and policy experts, which included representatives from the Bureau of Transportation Planning, Bureau of Freight and Rail, Division of Multimodal Transportation and Innovation, and Division of Program and Project Management.

This unique approach undertaken by KDOT demonstrates the agency's commitment to embracing freight as part of the agency's future planning, programming, decision-making, and investments. At the culmination of these discussions, the KDOT Team expressed interest in using the FCS designation as an evaluation factor when determining where to invest funds, intending to prioritize projects that are located on the state's FCS network.

1 Kansas Freight System Vision and Goals

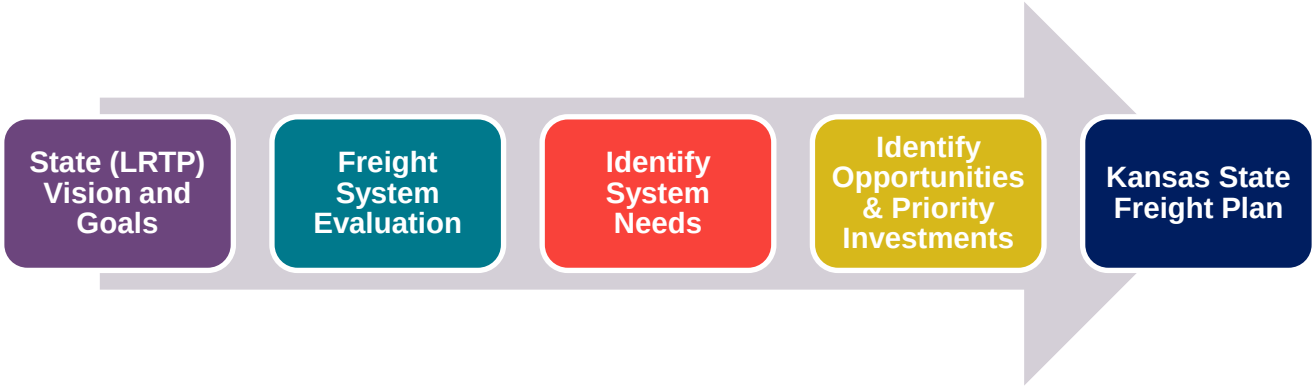
The Kansas Department of Transportation (KDOT) has developed the Kansas State Freight Plan to guide the state's vision for freight transportation and identify strategies to achieve this vision. This Kansas State Freight Plan serves as an update to KDOT's 2017 Kansas Freight System Plan and meets federal requirements established under the Bipartisan Infrastructure Legislation of November 2021. This legislation tasks states seeking to use National Highway Freight Program funds to improve the freight system with developing a state freight plan to set freight transportation policy, guide multimodal planning, and prioritize investments.

1.1 Vision and Goals

The framework for developing the Kansas State Freight Plan (Plan) is based on the relevant vision, goals, and objectives identified in the Kansas 2045 Long Range Transportation Plan (LRTP).

Beginning with the state's vision and goals for the multimodal transportation system, a detailed assessment of the freight system's conditions, needs, and investment opportunities was conducted to inform the Kansas State Freight Plan. The process used to conduct the Kansas State Freight Plan, shown in Figure 1-1, promotes consistency between the Plan's freight investments and recommendations, and Kansas' overarching statewide transportation guidance.

Figure 1-1: Process for Conducting the Kansas State Freight Plan



Source: CPCS, 2021.

The 2045 LRTP reviews the factors impacting the statewide transportation system over the long term to present flexible and responsive strategies that will enable KDOT and the Kansas transportation system to support prosperity and quality of life for all Kansans over the next 25 years. The LRTP reflects the current and future states of the Kansas transportation system, as informed through input from and priorities of diverse Kansas stakeholders. Stakeholder priorities include safety, dialogue, preservation, flexibility, revenue, practical improvements, modal choices, broadband, and economic development.

Based on an analysis of trends and issues in transportation, and in collaboration with stakeholders about transportation needs, the LRTP formulates recommendations for how KDOT and its partners can continue to work together to maintain and enhance the Kansas transportation system through strategies, spread across the six major areas presented in Figure 1-2. The figure describes these areas through a "freight lens" and highlights aspects in each that are most important to this State Freight Plan.

Figure 1-2: State Long-Range Transportation Planning Focus Areas – Through a Freight Lens

Safety and Security: Enhance the safety and security of the transportation system for all users and workers.

Transportation System Management: Maximize the performance of the existing system by investing in transportation choices and technologies that improve the operations and resiliency of the system.

Asset Preservation: Address risks and maintain and harden assets against issues including the impacts of extreme weather, natural disasters, stormwater runoff, and flooding through investments that provide high-value returns and make the best use of limited funds.

Freight and Economic Vitality: Improve reliability and increase flexibility for cost-efficient movement of people, goods, and information to strengthen the Kansas economy.

Stewardship: Continuously improve the quality of the transportation system and reduce its impact on surrounding communities, local air pollution, and wildlife habitats.

Workforce: Get the best from our workforce by attracting and retaining talent, modeling diversity, supporting professional development, and inspiring action.

Source: CPCS, 2021.

1.2 Federal State Freight Plan Compliance

Existing Policies and Governance

Fixing America's Surface Transportation (FAST) Act

The FAST Act, signed into law on December 4, 2015, continues the majority of funding programs and processes established under the Moving Ahead for Progress in the 21st Century Act (MAP-21), which was enacted in 2012 to support the streamlining and reform of statewide and metropolitan transportation processes.

The FAST Act established and funded new programs, notably, the new National Highway Freight Program (NHFP), with states becoming eligible for program funds upon FHWA approval of a State Freight Plan that addresses freight planning processes and decisions.[7] The FAST Act also continued to encourage states to establish a state freight advisory committee. A continuing resolution was passed to extend the FAST Act through September 30, 2021.[8] Congress is currently working to advance a new surface transportation bill.

Bipartisan Infrastructure Law (BIL)

The Bipartisan Infrastructure Law (BIL) was enacted on November 15, 2021. BIL continues the majority of funding processes established and/or continued by the FAST Act and MAP-21. BIL provides $550 billion in additional funding over the next five years to support the continuation, expansion, and establishment of processes and programs that support transportation and infrastructure in the US.

State Freight Plan Requirements

To be eligible to obligate federal funds provided through the National Highway Freight Program (NHFP) KDOT must develop a State Freight Plan that provides a comprehensive plan for the immediate and long-range planning activities and investments of the State with respect to freight. The Kansas State Freight Plan has been developed in acknowledgment of established federal legislation, and a federal compliance crosswalk to illustrate this is in **Appendix A.**

[7] FHWA, FAST Act: A Summary of Highway Provisions, Modified February 8, 2017, https://www.fhwa.dot.gov/fastact/summary.cfm.
[8] Congressional Research Service, Reauthorizing Highway and Transit Funding Programs, Updated March 1, 2021, https://crsreports.congress.gov/product/pdf/IF/IF11125#:~:text=Surface%20transportation%20reauthorization%20acts%20fund,Transportation%20Act%20(FAST%20Act%3B%20P.L

2 Key Stakeholders and Freight Plan Outreach

The Kansas State Freight Plan has been developed with extensive public participation and involvement by the state's freight stakeholders. KDOT conducted outreach with nearly 100 unique stakeholder organizations throughout the plan development process. KDOT engaged with freight stakeholders through the Kansas Freight Advisory Committee (KFAC), Rail Plan Advisory Committee (RPAC), one-on-one consultations, and group roundtables. Through these outreach efforts, stakeholders validated information and provided feedback on the existing freight system's conditions, needs, and issues. They also shared input on potential opportunities to enhance the state's multimodal freight system.

Numerous freight stakeholders participated in outreach efforts (**Appendix B**) conducted throughout the development of the Kansas State Freight Plan. Stakeholders shared data and validated information about Kansas' existing freight operations, as well as perspectives on the performance, needs, and opportunities of the state's multimodal freight system.

KDOT engaged in extensive outreach with freight stakeholders in Kansas to inform the State Freight Plan.

KDOT developed a Communications Plan to guide stakeholder outreach efforts. During the development of the Kansas State Freight Plan, KDOT:

- Regularly communicated plan updates and findings to Kansas stakeholders
- Provided opportunities for Kansas stakeholders to share data and information, insights, and perspectives, and provide feedback on plan content
- Listened and responded to feedback provided by Kansas stakeholders, and incorporated information as appropriate into the plan

Figure 2-1: Kansas State Freight Plan Stakeholder Outreach

3	4	34	97
Kansas Freight Advisory Committee meetings	Rail Plan Advisory Committee meetings	Freight Consultations	Freight Stakeholder Organizations Engaged

Note: Stakeholder Organizations Engaged refers to the number of unique freight stakeholder organizations engaged across all outreach efforts, including KFAC meetings, RPAC meetings, one-on-one consultations, roundtables, and outreach for information validation.

2.1 Freight System Stakeholders

State freight planning requires collaboration and coordination among various public and private stakeholders. KDOT works with other federal, state, regional, and local level public agencies, the private sector, freight system users, and the general public, to advance freight system planning in Kansas.

Among these stakeholders, federal and state agencies shape key policies and provide governance over freight operations in Kansas. Public agencies also oversee funding support for the transportation

network. The following section provides further details on federal, state, and local agencies and governance relevant to the freight transportation systems in Kansas. Grant and other funding provided through these agencies are presented in Chapter 7.

Federal

United States Department of Transportation (USDOT)

The United States Department of Transportation (USDOT) and its operating administrations guide and support the development and improvement of transportation across modes, The USDOT – specifically the Federal Highway Administration (FWHA) and the Federal Railroad Administration (FRA) – are tasked with guiding, reviewing, and approving State Freight Plans and the State Rail Plans, as mandated under federal law.

Federal Highway Administration (FHWA)

Under the USDOT, the FHWA's mission is to enable and empower the strengthening of a word-class highway system that promotes safety, mobility, economic growth, and quality of life. The FHWA provides support for state and local governments to design, construct, and maintain the national highway system and other federally and tribal-owned lands. FHWA offers financial and technical assistance to state and local governments to ensure the safety, reliability, and efficiency of the national highway system. In addition to administering federal-aid highway programs, FHWA also oversees and implements various policies and programs established by existing surface transportation infrastructure legislation.[9]

Federal Motor Carrier Safety Administration (FMCSA)

Under the USDOT, the FMCSA's mission is to prevent commercial motor vehicle (CMV)-related fatalities and injuries. The FMCSA enforces safety regulations, targets high-risk carriers and drivers, improves safety information systems and CMV technologies, develops and strengthens CMV equipment and operating standards, and increases safety awareness. As part of its activities, the FMCSA also provides financial assistance to states to support these efforts.[10]

Federal Railroad Administration (FRA)

Under the USDOT, the FRA's mission is to enable the safe, reliable, and efficient movement of goods and people, as well as to enhance intermodal transportation by engaging stakeholders and developing effective policies, programs, and technology. Among its duties, FRA regulates railroads, plans and administers grant funding, and conducts research. FRA has also provided operating, capital, and debt service assistance to Amtrak since 1970.[11]

Maritime Administration (MARAD)

Under the USDOT, MARAD's mission is to foster, promote, and develop the US maritime industry to meet the nation's economic and security needs. Among its activities, MARAD provides technical support for the US maritime transportation infrastructure, promotes the use of waterborne transportation, and ensures a marine transportation infrastructure integrated with other transportation methods. MARAD also maintains a fleet of reserve cargo ships for war and national emergencies and supports the US Merchant Marine.[12]

Pipeline and Hazardous Materials Safety Administration (PHMSA)

Under the USDOT, PHMSA's mission is to protect people and the environment by advancing the safe transportation of essential energy and other hazardous materials. PHMSA activities include establishing national policy and guidance, setting and enforcing standards, providing education, and

[9] FHWA, About, Modified September 17, 2012, https://www.fhwa.dot.gov/about/. Accessed on June 14, 2021.
[10] FMCSA, About Us, Updated December 12, 2013, https://www.fmcsa.dot.gov/mission/about-us. Accessed on June 14, 2021.
[11] FRA, About FRA, Updated October 21, 2020, https://railroads.dot.gov/about-fra/program-offices/program-offices-overview; FRA, Amtrak, Updated November 1, 2019, https://railroads.dot.gov/passenger-rail/amtrak/amtrak.
[12] MARAD, About Us, Updated June 17, 2020, https://www.maritime.dot.gov/about-us, Accessed June 14, 2021.

conducting research to prevent pipeline and hazardous materials incidents. The administration also prepares the public and first responders to mitigate incident consequences, in the case an incident does occur.[13]

Federal Aviation Administration (FAA)

Under the USDOT, the FAA's mission is to provide the safest, most efficient aerospace system in the world. FAA oversees activities related to regulating civil aviation and US commercial space transportation, encouraging and developing aeronautics and aviation technology, operating a system of air traffic control and nivation, and carrying out programs to control the environmental effects of aviation.[14]

Surface Transportation Board (STB)

The STB is an independent federal agency tasked with the economic regulation of surface transportation modes, primarily freight rail. Created in 1996 under the ICC Termination Act of 1995 and established as an independent agency under the STB Reauthorization Act of 2015, the STB has statutory authority over railroad rate, practice, and service issues, restructuring transitions (e.g., mergers, line sales, line construction, line abandonment), certain passenger rail matters, the intercity bus industry, and household goods carriers' tariffs. Through these activities, the STB supports an efficient, competitive, and economically viable surface transportation network that meets the needs of its users. The STB also has jurisdiction over certain non-energy pipelines and manages rate regulation for non-contiguous domestic waterway transportation.[15]

State

Kansas Department of Transportation (KDOT)

KDOT oversees freight and rail planning in Kansas, including the development of the State Freight Plan. The following divisions and bureaus within Kansas have specific responsibilities related to freight and passenger rail within the state.

Division of Multimodal Transportation Planning and Innovation

During the development of the State Freight Plan, a division was established within KDOT to house the development of KDOT's multimodal transportation plans, as well as merge with the Division of Innovation. The new Division of Multimodal Transportation Planning and Innovation contains the Freight and Rail Unit from the Bureau of Transportation Planning, and is responsible for developing and coordinating state policy, analyzing performance, and administering funding related to freight and rail issues. This division within KDOT produces the Kansas State Freight Plan, the Kansas State Rail Plan and oversees the state's Freight Advisory Committee and Rail Plan Advisory Committee.

Bureau of Transportation Planning

The Bureau of Transportation Planning collects, analyzes, and reports information and coordinates with partners on matters related to Kansas' statewide multimodal transportation system. Among its duties, the Bureau of Transportation Planning administers KDOT's multimodal surface transportation programs. During the development of the State Freight Plan, the Freight and Rail Unit within the Bureau of Transportation Planning was moved to the Division of Multimodal Transportation Planning and Innovation.

Bureau of Road Design: Coordinating Section

The Bureau of Road Design houses the Coordinating Sections for both Road Design and Railroads.[16] Among its duties, these sections lead rail safety and community enhancement projects, supervise rail

[13] PHMSA, About PHMSA, https://www.phmsa.dot.gov/about-phmsa/phmsas-mission, Accessed June 14, 2021.
[14] FAA, About, Modified February 11, 2021, https://www.faa.gov/about/, Accessed June 14, 2021; FAA, Summary of Activities, Modified June 27, 2016, https://www.faa.gov/about/mission/activities/, Accessed June 14, 2021.
[15] STB, About STB, https://prod.stb.gov/about-stb/, Accessed June 14, 2021.
[16] KDOT, Road Design – Coordinating Section, http://www.ksdot.org/burRoadDesign/coorsect/Sectndefault.asp

or highway projects related to highway/rail crossings, and provide information related to highway/rail crossings in the state. The Coordinating Section also administers federal Section 130 funds for safety improvement projects at public railway-highway grade crossings. As required under the FAST Act, the Coordinating Section led the development of the 2022 Kansas Highway-Rail Grade Crossing State Action Plan (SAP), which identifies highway-rail and pathway-rail grade crossings that experienced recent incidents and identifies specific strategies to improve safety at grade crossings (e.g., closures, grade separations).

KDOT Division of Aviation

The Division of Aviation partners with Kansas' 138 public-use airports to support aviation activities in the state, including through research and planning, administering project funding, and providing resources and information.[17]

Other Kansas State Public Agencies

Rail planning requires collaborative efforts between multiple state and local agencies in Kansas. KDOT has continuously coordinated with the following agencies to address concerns and interests related to the state's freight and rail systems, in order to develop a transportation system that corroborates each agency's needs and goals.

Kansas Department of Agriculture (KDA)

The KDA is dedicated to supporting the agriculture sector in Kansas on behalf of farmers, ranchers, food establishments, and agribusinesses. Kansas is a top producer of corn, soybeans, wheat, sorghum, and beef. Agriculture and agriculture-related businesses are crucial to the state's economy. An efficient and reliable transportation system is critical to the transportation of these agricultural commodities and is therefore essential to the growth of the state's economy.

Although KDA does not directly address transportation conditions or provide transportation-specific programs, the agency coordinates with KDOT closely, offering insights into the development and improvement of freight transportation in the state.

Kansas Department of Commerce (KDC)

The KDC is the state's lead economic development agency in charge of business recruitment and expansion and workforce development. The KDC offers a series of programs and incentives that attract investments, create and retain job opportunities, and facilitate economic and community development in Kansas.

The KDC International Division promotes and assists Kansas businesses in their exploration of international markets. The exports, especially cereal and grains, are heavily dependent on rail and intermodal transportation. The International Division's collaboration and coordination with KDOT are essential to ensure a robust intermodal freight system to facilitate the increasing movement of goods.

[17] KDOT, Division of Aviation, http://www.ksdot.org/bureaus/divAviation/default.asp

A Transportation Planning Legacy

In Kansas, long range transportation planning is a well-established tradition. Over the last 30 years, Kansas has benefited from a series of well thought out transportation programs. In each program, KDOT has worked in partnership with the Kansas Legislature and stakeholders across Kansas to guide vital outlays that have helped preserve the transportation system, while generating mobility improvements and strong economic and quality of life returns on investment. Key milestones in the state's transportation planning and programming legacy include:

- The **Comprehensive Highway Program** established an 8-year program of highway construction between 1989 and 1997. The overall funding of $3.8 billion was largely dedicated to building a predefined list of highway projects across the state, selected based on sound engineering criteria embodied in KDOT's data-driven project 'priority formula' system first created in the mid-1980s. This multi-year program structure proved to be a model for collaboration, direction setting, and predictability that has enabled Kansas to make important investments in its transportation infrastructure.
- Beginning in 1999, Kansas embarked on the largest public works program in state history – the 10-year **Comprehensive Transportation Program (CTP)** – with $5.62 billion in funding, which included support not just for highways, but for transit, rail, and aviation. Created under the guidance of the *Transportation 2000* statewide task force, the CTP's success was based on providing certainty about how regions of the state would benefit from the announcement of scheduled completion of specific project needs at the outset of the CTP.
- In 2010, following a report produced by the *Transportation Leveraging Investing in Transportation (T-LINK) Task Force*, the Kansas Legislature passed an innovative and strategic follow-up 10-year program to the CTP called **Transportation Works for Kansas (T-WORKS)**, which provided $4.7 billion for projects designed to preserve the system, make it safer, and promote economic opportunity. Notably, T-WORKS legislation authorized KDOT to move across the state and economic modeling of projected benefits from investments into investment choices.
- In 2018, the Kansas Legislature appointed a **Joint Legislative Transportation Vision Task Force** to evaluate progress on T-WORKS, solicit local input on transportation needs, and examine the health of transportation funding in Kansas among other objectives. Some of the Joint Task Force's key findings included providing "consistent, stable [transportation] funding," and establishing a new multi-year program to support preservation, modernization, and expansion" projects.
- In March 2020, the Kansas Legislature approved, and Governor Kelly signed into law, the **Eisenhower Legacy Transportation Program (IKE)**, which builds on the 2018 Joint Task Force's recommendations and is a 10-year transportation program that preserves, modernizes, and expands the existing system and provides flexibility to address current and future opportunities and challenges. The $9.9 billion IKE program uses existing revenue to invest in safety, highway preservation, broadband, and multimodal transportation with transit, aviation, rail, bicycle, and pedestrian elements.

The legacy of long-range planning in Kansas means back-to-back multi-year comprehensive investment programs have created a network of well-maintained highways, bridges, and transit that enables Kansas workers to get to their jobs safely and allows Kansas businesses to get their goods and services to market efficiently.

Source: KDOT, 2020-2045 Kansas Long Range Transportation Plan, July 2021.

Local

Local public agencies, including cities, counties, and metropolitan planning organizations (MPOs) coordinate with federal and state agencies in an effort to plan for and enhance the freight systems. KDOT frequently coordinates with local jurisdictions and MPOs, who provide regional expertise to inform the state's freight planning efforts. KDOT also works with local economic development agencies to identify and advance opportunities to improve freight service and associated economic development in the state.

Metropolitan Planning Organizations

Metropolitan Planning Organizations (MPOs) are federally funded transportation policy-making organizations established under the Federal-Aid Highway Act of 1962. Any urbanized area with a population of over 50,000 is required to form an MPO. MPOs comprise local government and transportation officials. Core MPO functions include maintaining a regional transportation plan (RTP) and developing a transportation improvement program (TIP). Those two documents cover planning and investments in the mobility and accessibility of people and goods, as well as the preservation and evaluation of the transportation system.[18]

KDOT has a collaborative relationship with the state's MPOs, with at least one KDOT representative on the boards and/or advisory committees of each MPO. The KDOT actively participates in various committees, including Technical Advisory Committees and Good Movements Committees. MPOs also frequently join discussions related to state-level freight and rail planning, providing regional expertise to inform the state's Multimodal Freight Plan, State Rail Plan, and other statewide transportation plans. Figure 2-2 lists the six MPOs in Kansas and their jurisdictions.

Figure 2-2: MPOs in Kansas

MPO	Jurisdictions
Mid-America Regional Council (MARC)	Eight counties and 120 cities in the Greater Kansas City Area, both in Kansas and Missouri.
Lawrence-Douglas County Metropolitan Planning Organization (LDCMPO)	The City of Lawrence and Douglas County are located between the Kansas City and Topeka urbanized areas
Wichita Area Metropolitan Planning Organization (WAMPO)	Sedgwick County and parts of Butler County, including the city of Andover and Sumner County, including the city of Mulvane
Metropolitan Topeka Planning Organization (MTPO)	A part of Topeka, including a portion of Shawnee County as well as a small portion of Jefferson County.
St. Joseph Area Transportation Study Organization (SJATSO)	A portion of Doniphan County, consisting primarily of the cities of Wathena and Elwood.
Flint Hills Metropolitan Planning Organization (FHMPO)	Portions of Geary, Pottawatomie, and Riley Counties, including the cities of Junction City and Manhattan

Source: KDOT, Metropolitan Planning Organizations, https://www.ksdot.org/bureaus/burtransplan/burovr/mpo.asp.

Local Economic Development Agencies

Many local economic development agencies exist across Kansas, including regional-, county-, and city-level economic development agencies, chambers of commerce, development councils, corporations, and associations. These agencies represent businesses by location, industry, and labor force. The US Economic Development Administration identifies seven economic development districts within Kansas: Flint Hills Economic Development District, Great Plains Development Inc., Mid-America Regional Council, North Central Regional Planning Commission, Northwest Kansas Planning and Development Commission, South Central Kansas Economic Development District, and Southeast

[18] 23 U.S. Code 134 – Metropolitan transportation planning. https://www.law.cornell.edu/uscode/text/23/134

Kansas Regional Planning Commission.[19] In addition, the Economic Development Directory in Kansas lists 44 city and county-level economic development entities throughout the state.[20]

Even though those economic development agencies do not work directly with freight providers, the agencies and their business members have significant interests in the freight system and freight-related investments due to freight's crucial role in economic development and vitality. KDOT has been in coordination with those local economic development agencies to gather local feedback on freight and rail service and offer joint funding programs to freight and rail projects.

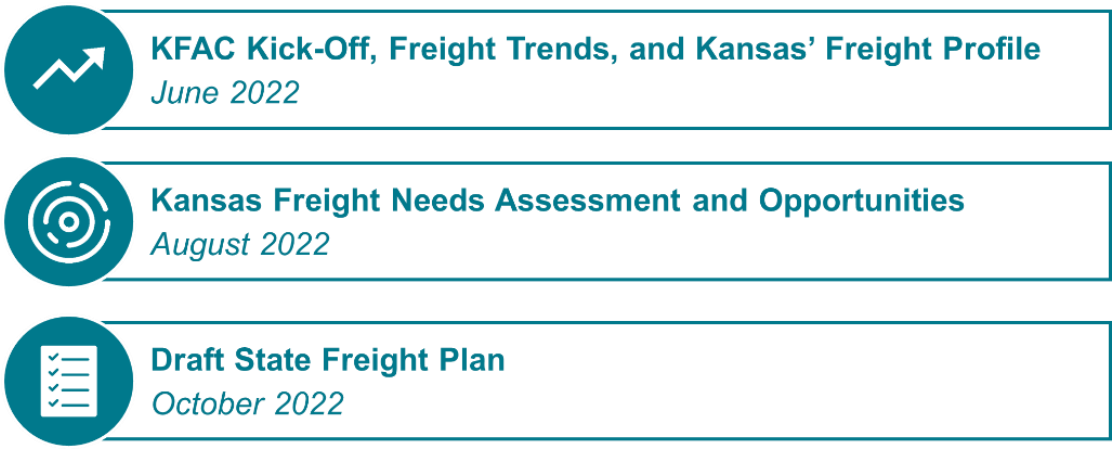
2.2 State Freight Plan Outreach

Advisory Committees

Kansas Freight Advisory Committee (KFAC)

The KFAC convenes a group of multimodal freight stakeholders to guide the development of the Kansas State Freight Plan. A total of three hybrid (in-person and virtual options) KFAC meetings were held throughout Freight Plan development, with stakeholders providing input on multimodal freight system needs, issues, and opportunities. Figure 2-3 provides an overview of the topics presented and discussed during the KFAC meetings.

Figure 2-3: KFAC Meeting Topics



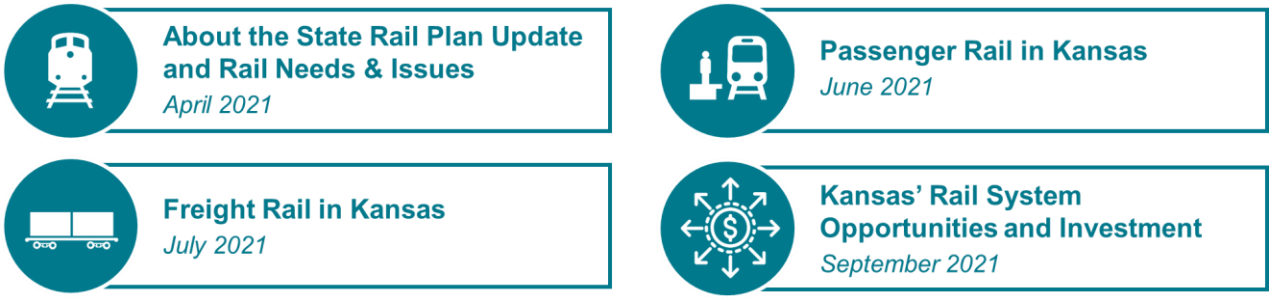
Appendix B provides a list of stakeholder organizations and agencies represented in the KFAC and summaries of KFAC meetings.

Rail Plan Advisory Committee (RPAC)

As part of the development of the Kansas State Rail Plan, the Kansas RPAC convened a small group of freight and passenger rail stakeholders to guide plan development. A total of four virtual RPAC meetings were held throughout Rail Plan development, with stakeholders providing input on freight and passenger rail system needs, issues, and opportunities. Figure 2-4 provides an overview of the topics presented and discussed during the RPAC meetings.

[19] U.S. Economic Development Administration, Economic Development Director, https://eda.gov/resources/directory/states/ks.htm
[20] Economic Development Directory in Kansas. https://ecodevdirectory.com/listings-category/north-america/united-states/kansas/

Figure 2-4: RPAC Meeting Topics



Appendix B provides a list of stakeholder organizations and agencies represented in the RPAC and summaries of RPAC meetings.

Freight Consultations

Throughout the planning process, consultations were held with 30 multimodal freight stakeholders, representing freight carriers, Class I and short line railroads, manufacturers, state agencies, economic development agencies, and other multimodal freight system users and support services. **Appendix B** provides a list of multimodal freight stakeholder organizations and agencies consulted.

Agriculture Stakeholder Roundtable

KDOT, in collaboration with the KDA, held a roundtable on July 12, 2021, with 21 agriculture stakeholders to gather feedback related to agricultural commodity movements in Kansas. The agriculture stakeholder roundtable aimed to obtain a list of freight and rail transportation system strengths, needs, and opportunities from Kansas' diverse agricultural stakeholders to aid in developing the Kansas State Rail Plan and Freight Plan Updates. **Appendix B** provides a list of agriculture stakeholder organizations and agencies represented and offers a summary of findings from the roundtable.

3 Economic Context of Freight on Kansas' Transportation System

Kansas' demographic and economic trends provide insight into both the supply and demand of freight. The demand for goods and services within Kansas depends on consumer demand from people living in and moving through Kansas. Meanwhile, the supply of goods and services is driven by trends that include an urbanizing population, steady labor force, advancing incomes, and education. Freight is critical to Kansas' economy, with freight-reliant industries, including advanced manufacturing, logistics and distribution, food processing and manufacturing, aerospace & defense, agriculture, and energy & natural resources, contributing over $72 billion to state Gross Domestic Product in 2019. In 2017 a total of 468 million tons of goods worth $348.6 billion moved on the multimodal freight system to, from, and within Kansas.

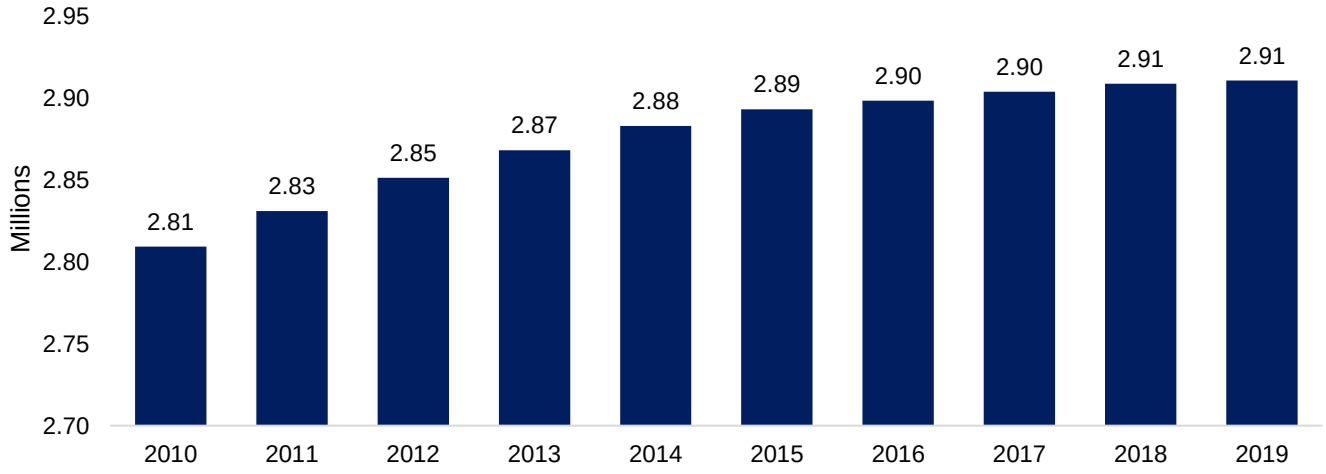
3.1 Economic Profile

Kansas' demographic and economic trends provide insight into both the supply and demand of freight. The demand for goods and services within Kansas depends on consumer demand from people living in and moving through Kansas. Meanwhile, the supply of goods and services is driven by Kansas' available workforce. The following chapter presents the demographic and economic information in Kansas and highlights the importance of the state's freight-reliant industries.

Population

In 2019, Kansas had an estimated population of 2.9 million people (Figure 3-1). Between 2010 and 2019, Kansas' total population increased by over 100,000 people, or 3.6 percent, during this time. This represents an annual growth rate of 0.39 percent, compared to the nation's annual growth rate of 0.66 percent.[21] The state's population is projected to continue growing at an annual growth rate of 0.43 percent between 2020 and 2070.[22]

Figure 3-1: Kansas Statewide Population

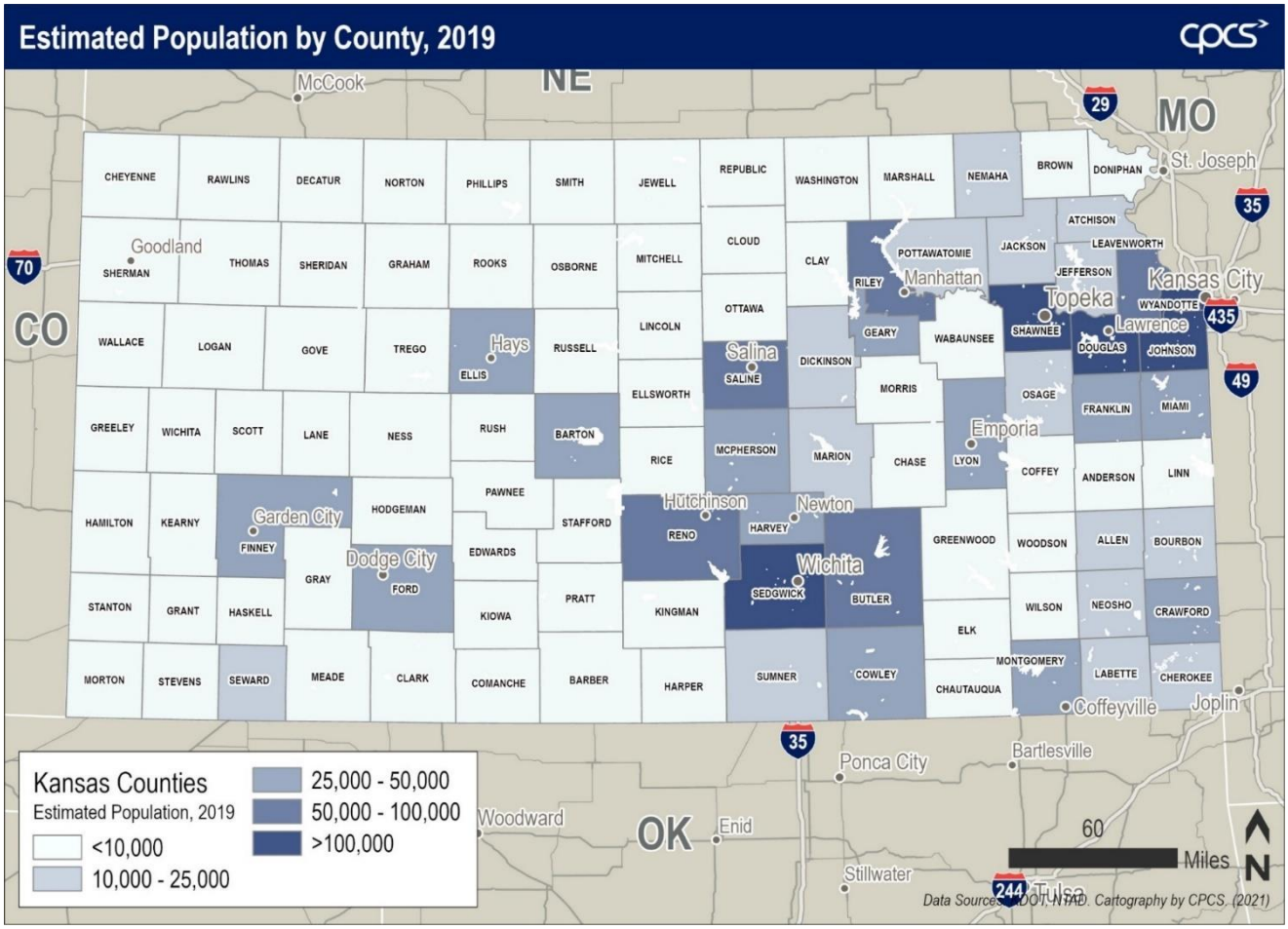


Source: US Census, American Community Survey (ACS), 2010-2019. Analysis by CPCS, 2021.

[21] U.S. Census, American Community Survey, 2010-2019.
[22] Wichita State University, Center for Economic Development and Business Research, Population Forecasts, 2015-2070, https://www.cedbr.org/forecast-blog/kansas-population

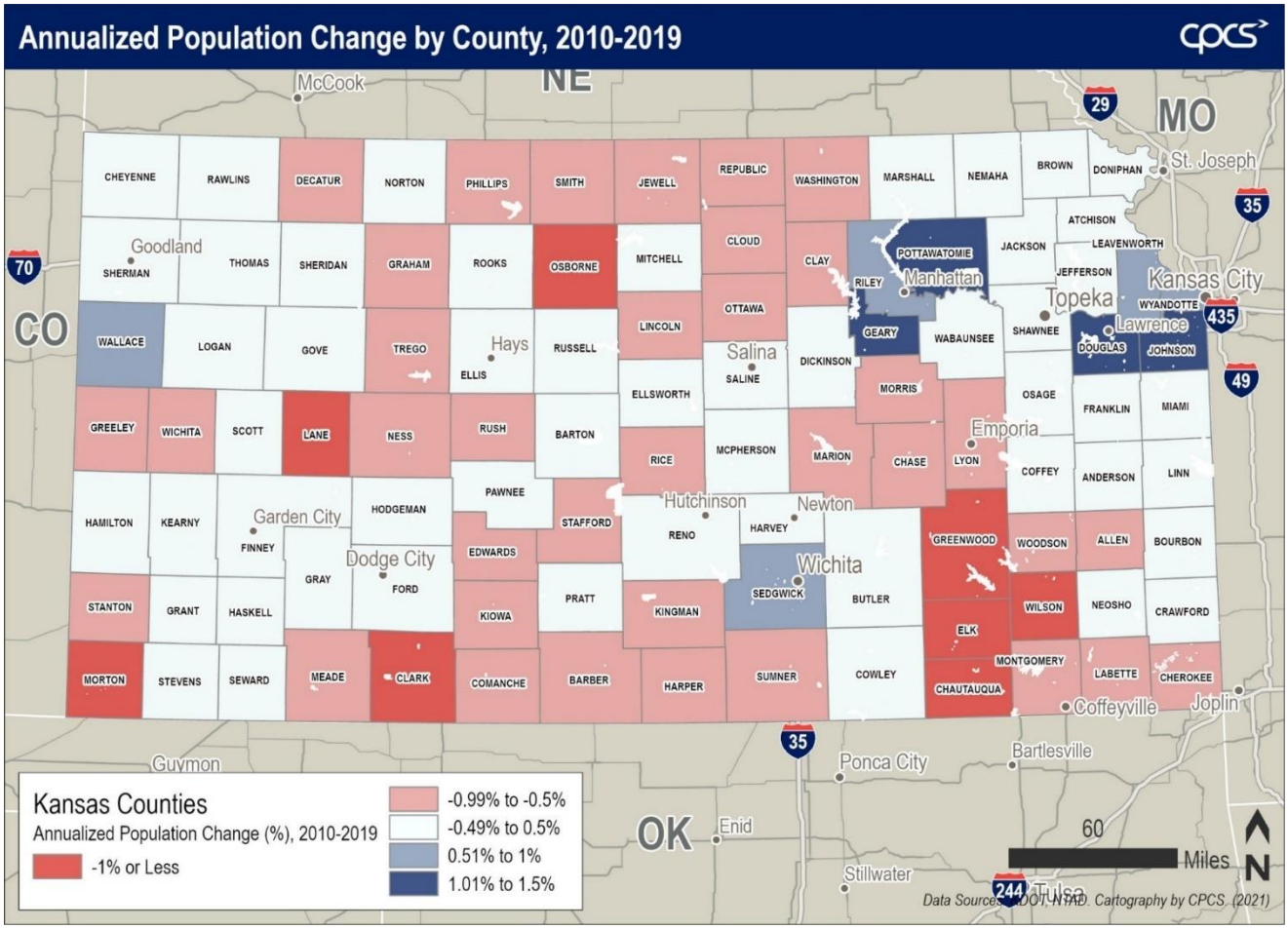
As illustrated in Figure 3-2, Kansas' population is clustered around the metropolitan areas of Kansas City (Johnson County and Wyandotte County), Wichita (Sedgwick County), Topeka (Shawnee County), Manhattan (Riley County), and Lawrence (Douglas County). Each of these counties experienced an increase in population between 2010 and 2019. The following figure shows that those counties that saw the highest population growth are primarily located in the northeast corner of the state. A total of 22 Kansas counties saw an increase in population, clustered around urban centers. Meanwhile, the remaining 83 counties, located in the state's more rural areas, experienced a population decline. Rural areas are experiencing a decline in population due to a combination of natural population decrease (more deaths than births) and out-migration to other Kansas counties and nearby states.[23]

Figure 3-2: Estimated Population by County, 2019



[23] U.S. Census, Estimates of the Components of Resident Population Change for Counties, April 1, 2010 to July 1, 2019; U.S. Census, County-to-County Migration Flows, 2014-2018 ACS.

Figure 3-3: Annualized Population Change by County, 2010-2019



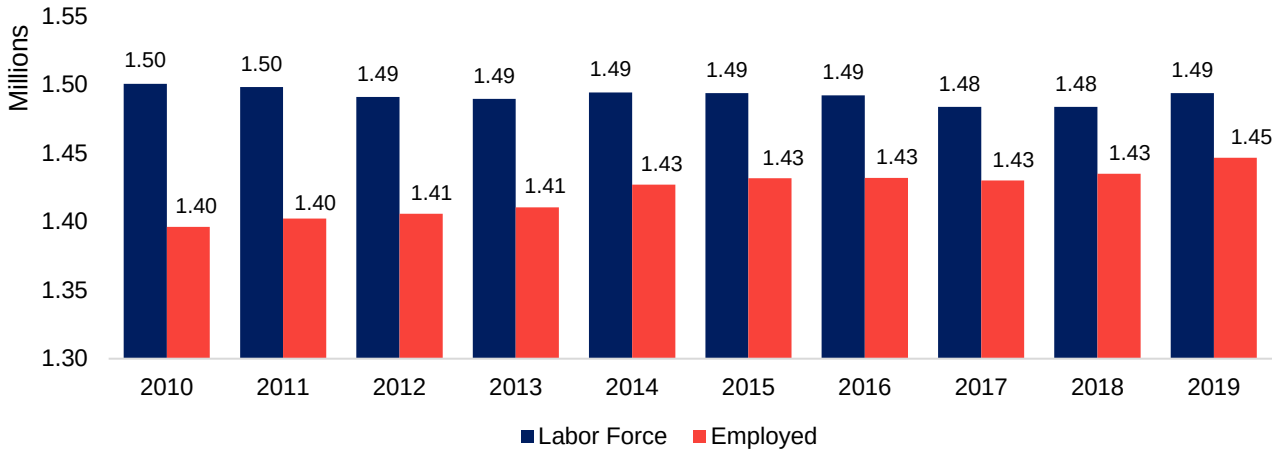
Employment

Kansas' employed population[24] increased between 2010 and 2019, reaching almost 1.45 million employed Kansans in 2019, as illustrated below. The state's labor force[25] has remained steady over the past decade, with 1.49 million people in the labor force statewide as of 2019. The population's median age has also remained relatively steady, increasing slightly from 36.1 in 2010 to 36.7 in 2019. However, the state's population is projected to age, with the share of the over-65 age group growing from about 15 percent in 2019 to over 25 percent of the state's population by 2070.

[24] People are considered employed if they did any work at all for pay or profit during the survey reference week. This includes all part-time and temporary work, as well as regular full-time, year-round employment (as defined by BLS).

[25] Labor force refers to all people age 16 or older who are classified as either employed or unemployed. Conceptually, the labor force level is the number of people who are either working or actively looking for work (as defined by BLS).

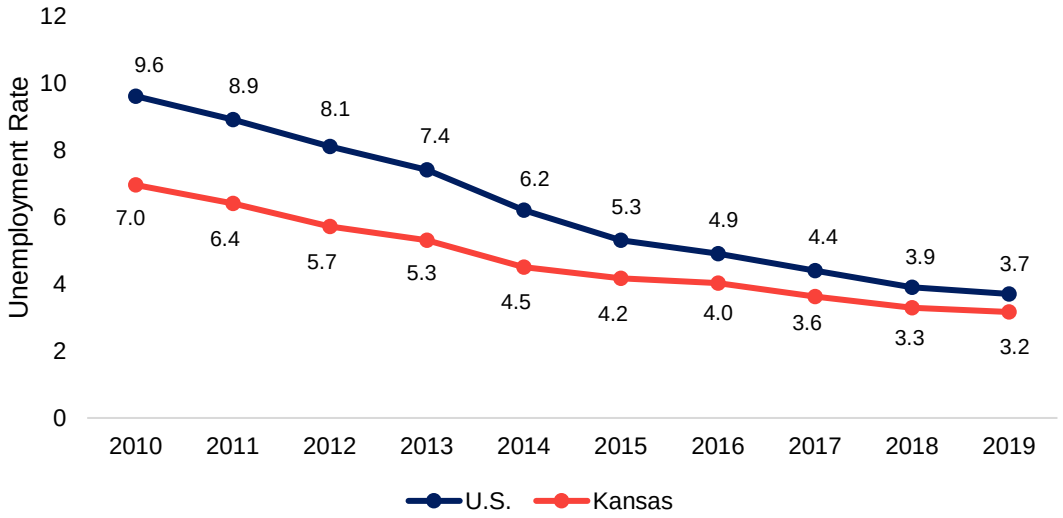
Figure 3-4: Kansas Statewide Labor Force and Employed Population



Source: Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS), Labor force data by county. Analysis by CPCS, 2021.

The unemployment rate in Kansas was 3.2 in 2019, lower than the national average of 3.7. Kansas' unemployment rate ranked 17th (tied) nationwide. As illustrated in Figure 3-5, the state's unemployment rate has steadily decreased between 2010 and 2019, in line with national trends.

Figure 3-5: US and Kansas Unemployment Rates



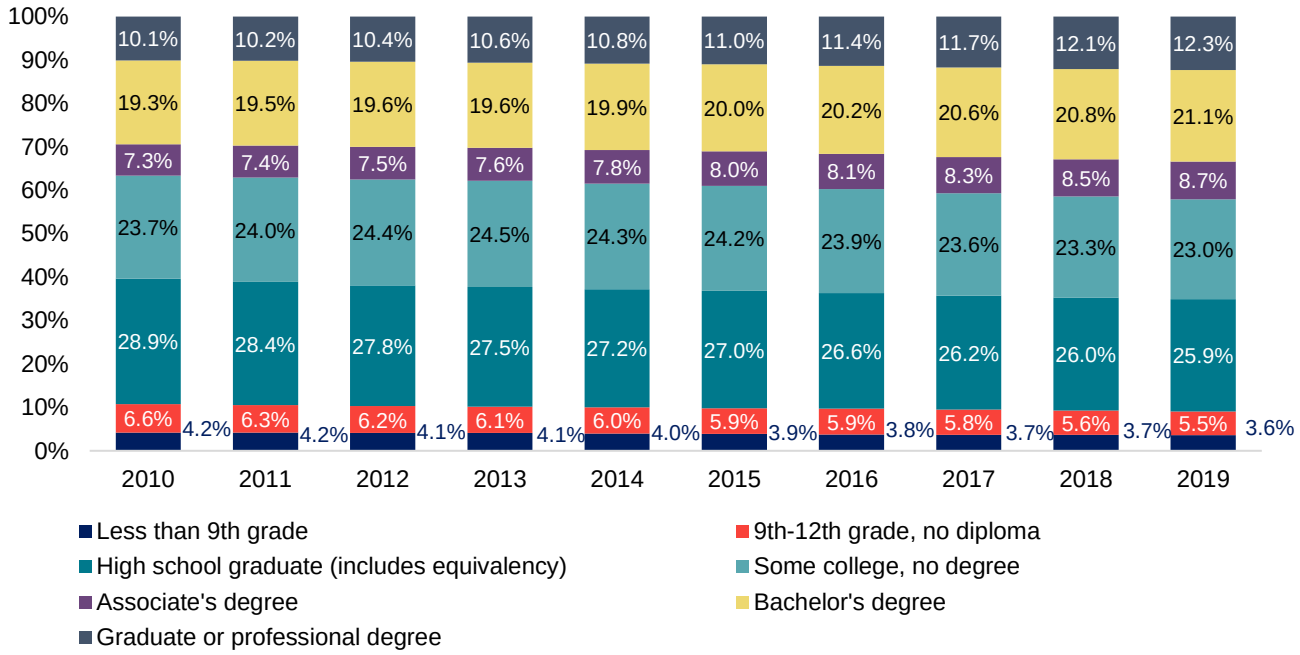
Source: BLS LAUS, Unemployment Rates for States, Annual Averages, 2010-2019. Analysis by CPCS, 2021.

Income and Education

The median household income in Kansas was $59,597 in 2019, representing a growth of $1,650, or 2.8 percent, since 2010. Meanwhile, between 2010 and 2019, the national median household income increased by 3.2 percent, reaching $62,843 in 2019.[26] Educational attainment in Kansas has also increased between 2010 and 2019. The share of the state's population with a higher education degree has steadily increased during this time, as illustrated in Figure 3-6.

[26] Adjusted for inflation using BLS CPI Inflation Calculator, https://www.bls.gov/data/inflation_calculator.htm.

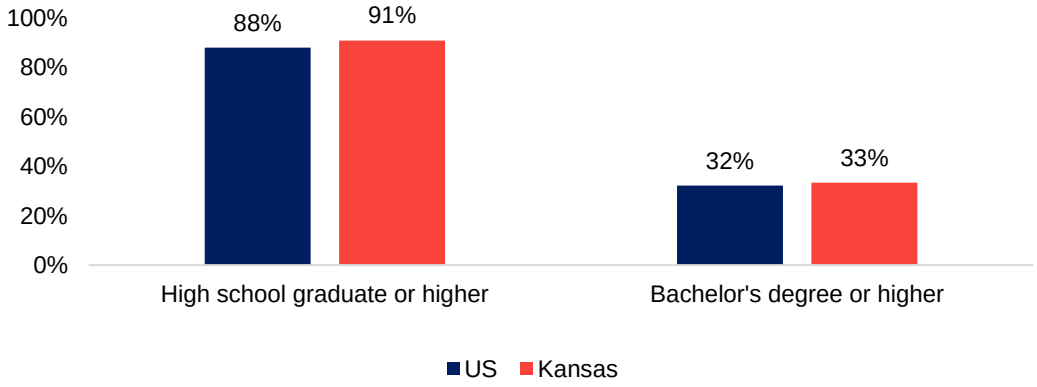
Figure 3-6: Educational Attainment by Level in Kansas, 2010-2019



Source: US Census, ACS 5-Year Estimates, 2010-2019. Note: Includes population 25+ years. Analysis by CPCS, 2021.

In 2019, the share of Kansans completing high school and bachelor's degrees was slightly higher than national rates, as displayed in Figure 3-7.

Figure 3-7: Educational Attainment by Graduation Rates in Kansas and US, 2019



Source: US Census, ACS 5-Year Estimates, 2010-2019. Note: Includes population 25+ years. Analysis by CPCS, 2021.

Gross Domestic Product per Capita

The Gross Domestic Product (GDP) of a state is the sum of 1) compensation of employees, 2) taxes on production and imports less subsidies, and 3) gross operating profits. Kansas' state-produced GDP ranked 33rd nationwide in 2019, reaching almost $176.5 billion and making up 0.8 percent of the national GDP. This represents a GDP per capita of over $60,600.

Across Kansas, Greely, Wichita, and Gray Counties in the southwest and Coffey County in the east had the highest GDPs per capita in 2019. Meanwhile, between 2010 and 2019, GDP increased the most in Phillips, Clark, Butler, and McPherson Counties. These trends are depicted in Figure 3-8 and Figure 3-9.

Figure 3-8: GDP Per Capita by County, 2019

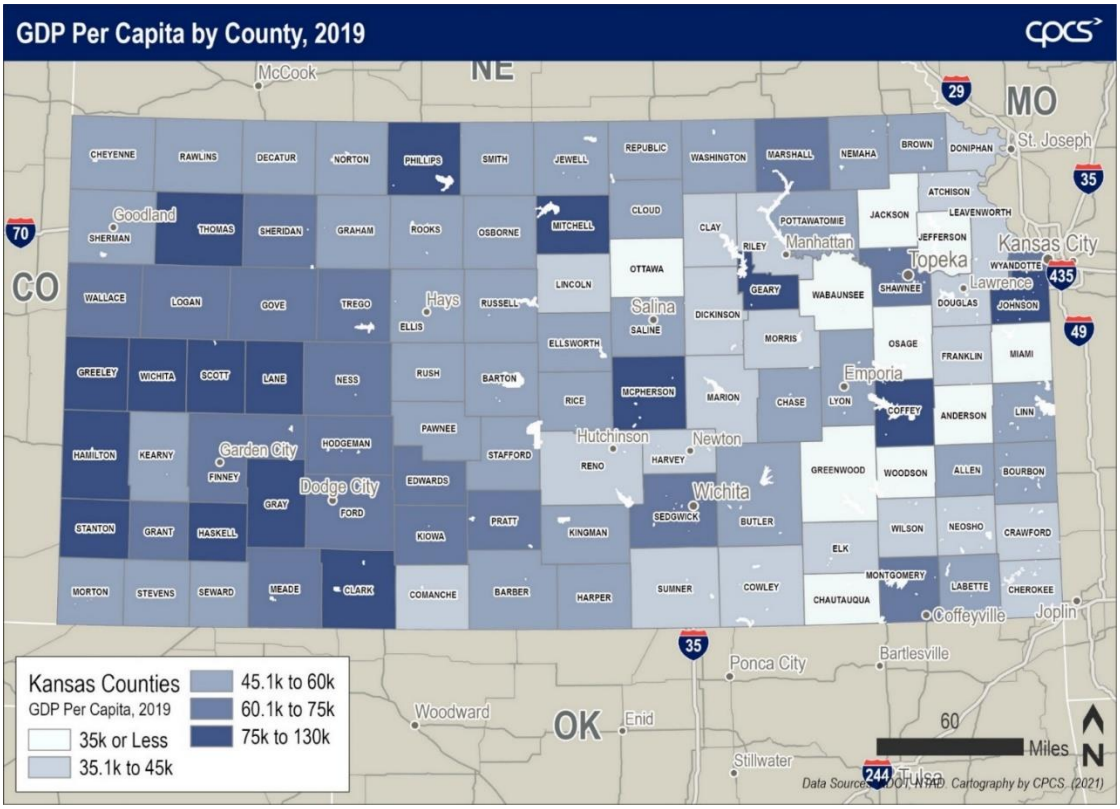
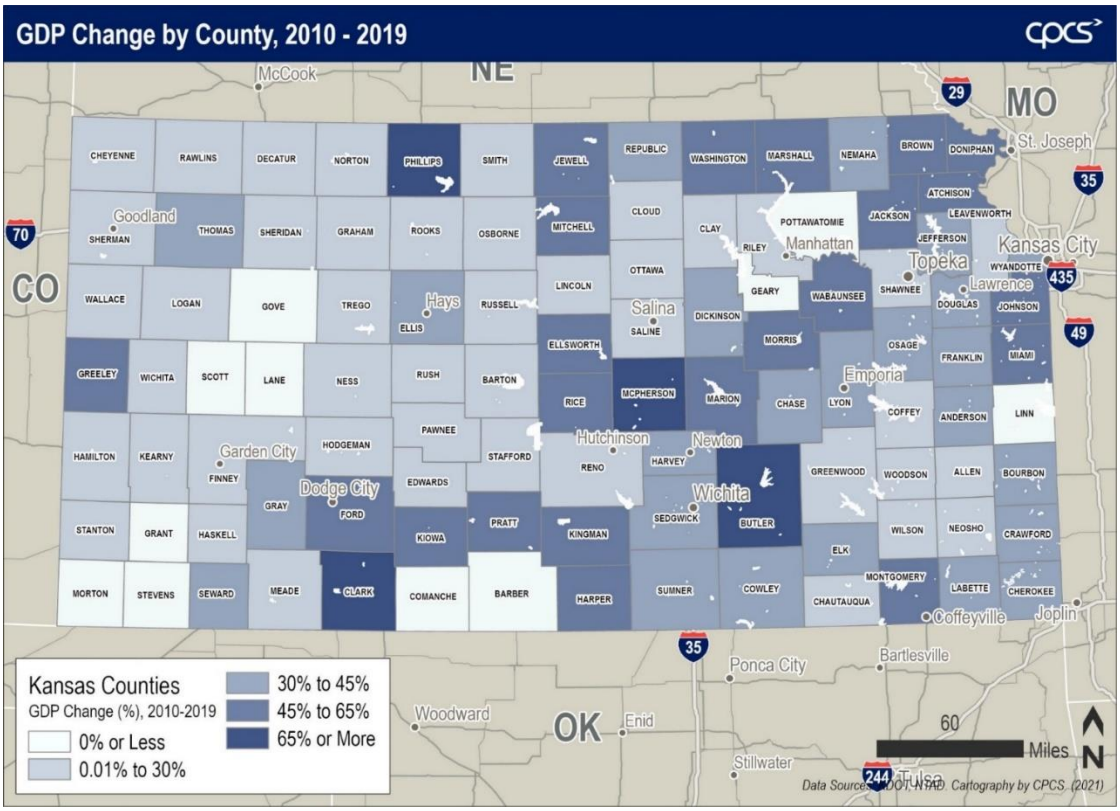


Figure 3-9: GDP Change by County, 2010-2019



3.2 Key Freight Industries

Freight-reliant industries, which refer to industries designated as particularly dependent on the freight system, are critical to Kansas' state economy.

Figure 3-10 presents how freight-reliant industries are defined in this Plan. The North American Industry Classification System (NAICS) is the standard used by federal agencies to classify business establishments by industry. The Kansas Department of Commerce also identifies six key groups.

Figure 3-10: Freight-Reliant Industries

Freight-Reliant Industries (2-Digit NAICS Code)	KDC Key Freight-Reliant Industries
• Agriculture, forestry, fishing and hunting (11) • Mining, quarrying, and oil/gas extraction (21) • Utilities (22) • Construction (23) • Manufacturing (31-33) • Wholesale trade (42) • Retail trade (44-45) • Transportation and warehousing (48-49)	• Advanced Manufacturing • Logistics & Distribution • Food Processing & Manufacturing • Aerospace & Defense • Agriculture • Energy & Natural Resources

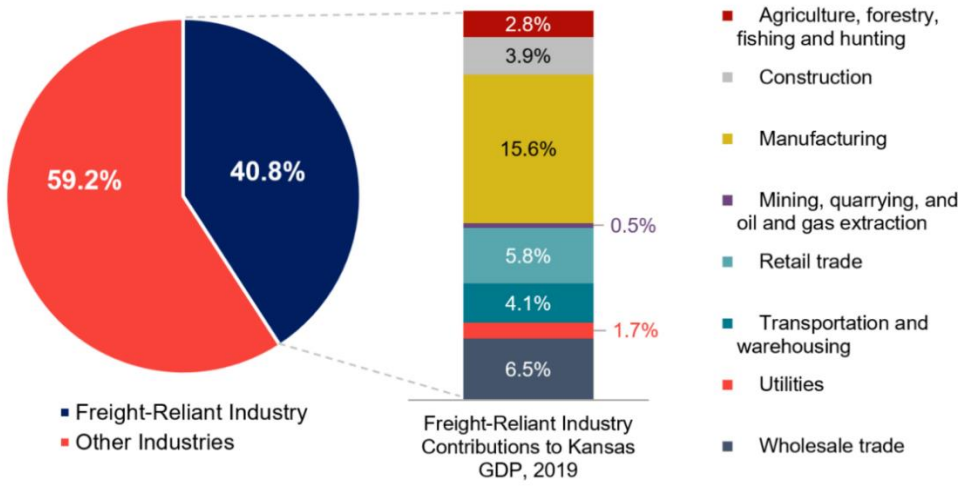
Source: US Census, NAICS Codes, https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html; CPCS Analysis of Kansas Department of Commerce, Key Industries, https://www.kansascommerce.gov/businesses/industries/.

Freight-Reliant Industry GDP

Freight is critical to the Kansas economy, contributing over $72 billion to the state GDP in 2019. Among freight-reliant industries, manufacturing is the largest, reaching over $27.4 billion in GDP and contributing to 15.6 percent of the state's GDP (Figure 3-11). Manufacturing is the state's second-largest industry by GDP, across all industries – freight and non-freight (Figure 3-12).

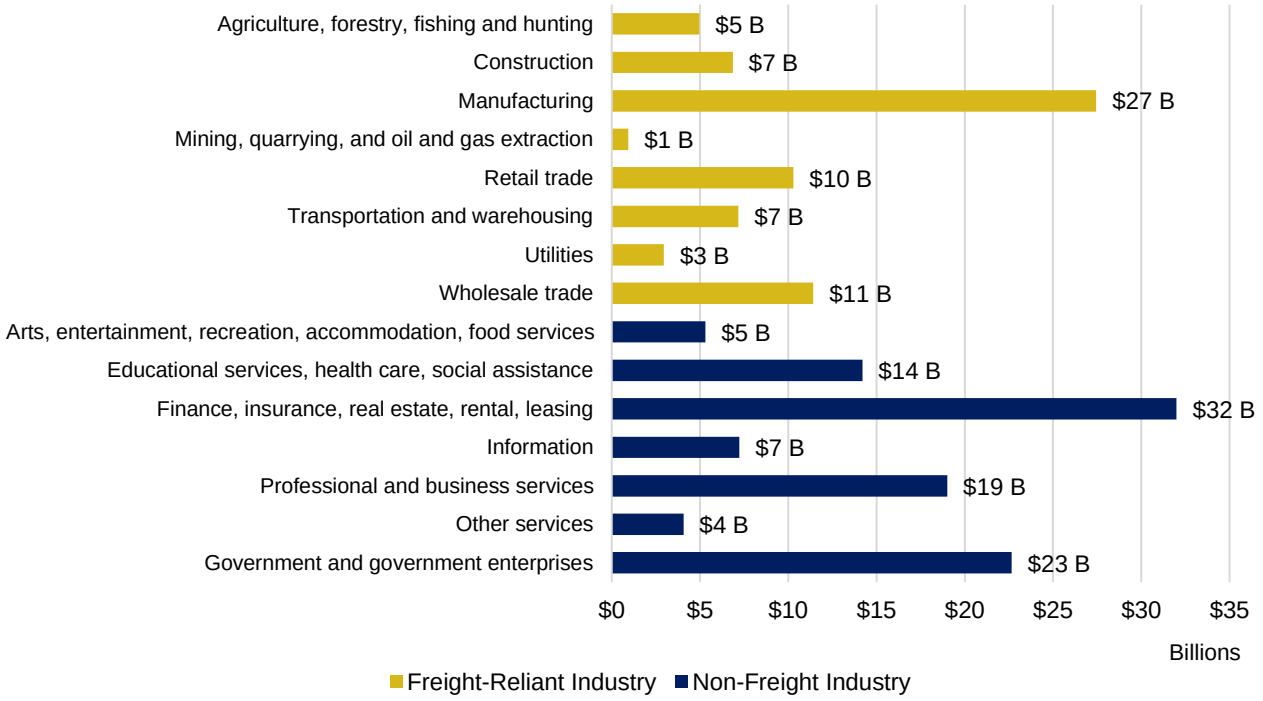
In Kansas, freight-reliant industries contributed to 40.8 percent of the state's $176.5 billion GDP in 2019.

Figure 3-11: Freight Contribution to Kansas GDP, 2019



Source: Bureau of Economic Analysis (BEA), GDP by State, 2019. Analysis by CPCS, 2021.

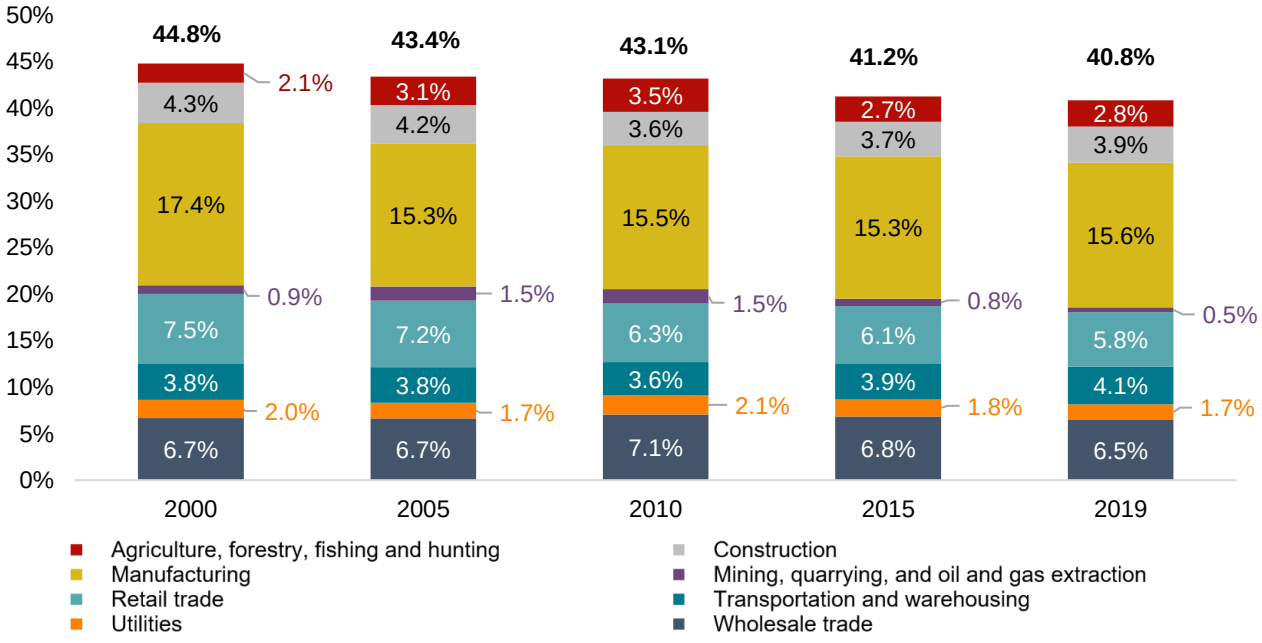
Figure 3-12: Kansas GDP by Industry, 2019



Source: BEA, GDP by State, 2019. Analysis by CPCS, 2021.

Between 2000 and 2019, freight-reliant industries' contributions to Kansas' GDP have declined, indicating that non-freight industries have been growing at a faster pace than freight-reliant industries over the last two decades (Figure 3-13). Notably, the industries of finance, insurance, real estate, rental, and leasing, as well as professional and business services, have seen an increase in their share of Kansas' GDP during this time. However, the transportation and warehousing industry has seen a growth in share, from 3.8 percent in 2000 to 4.1 percent in 2019.

Figure 3-13: Freight Contribution to Kansas GDP, 2000-2019



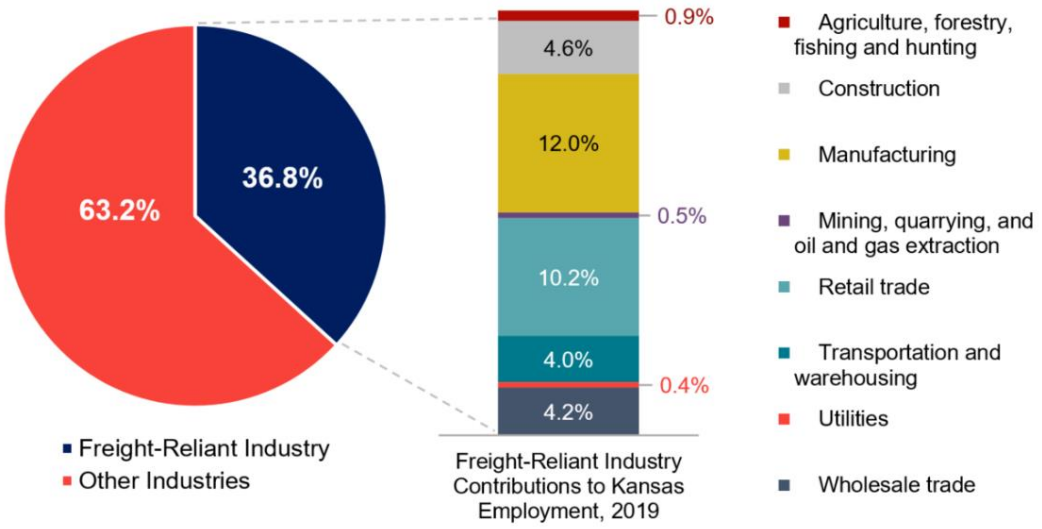
Source: BEA, GDP by State, 2000-2019. Analysis by CPCS, 2021.

Freight-Reliant Industry Workforce

Freight-reliant industries are important for employment in Kansas, employing over half a million people in the state. Among freight-reliant industries in Kansas, manufacturing is the largest employer, with over 167,000 employees and contributing to 12 percent of the state's employment in 2019 (Figure 3-14). This is closely followed by retail trade, employing over 142,000 people, or 10.2 percent of Kansans. These are the state's third- and fourth-largest industries by employment across all industries (Figure 3-15).

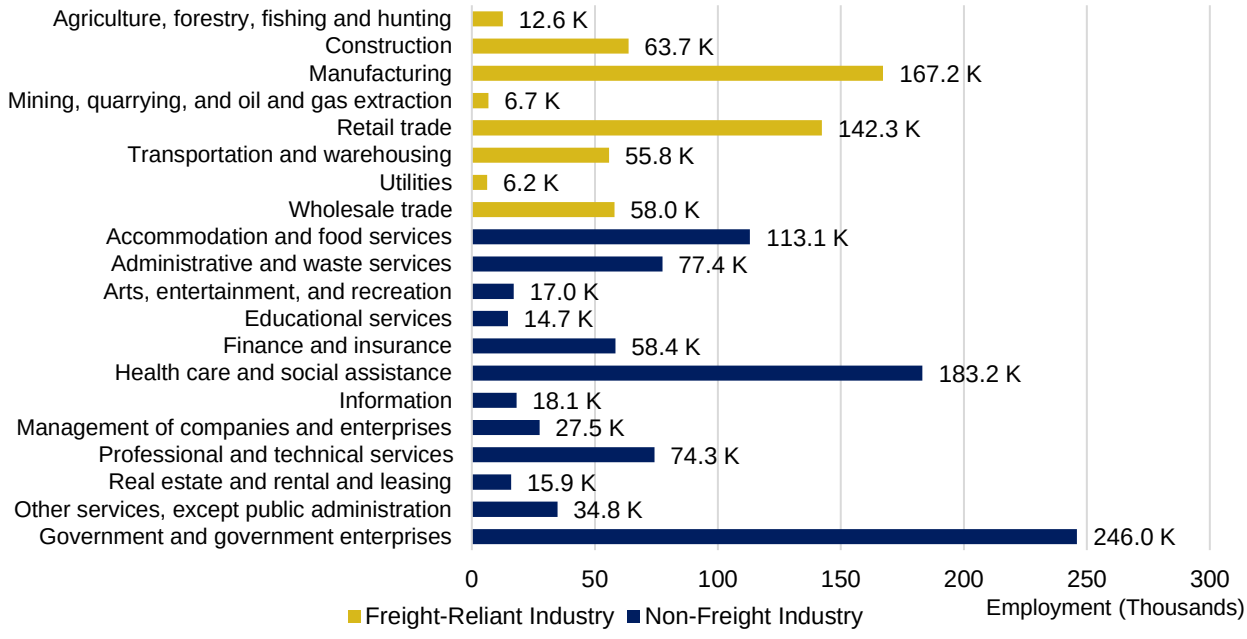
In 2019, freight-reliant industries made up over one-third of employment in Kansas.

Figure 3-14: Freight Contribution to Kansas Employment, 2019



Source: BLS, QCEW (Quarterly Census of Employment and Wages), By Area, Annual Averages for 2019. Analysis by CPCS, 2021.

Figure 3-15: Kansas Employment by Industry, 2019



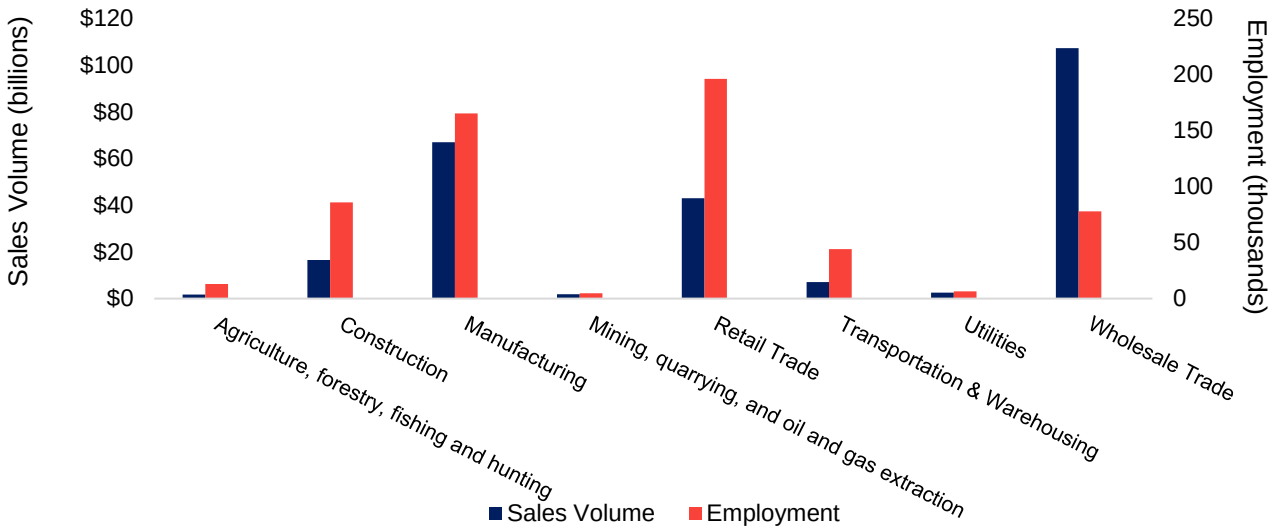
Source: BLS, QCEW, By Area, Annual Averages for 2019. Analysis by CPCS, 2021.

Freight-Reliant Industry Establishments

Kansas has 50,886 freight-reliant industry establishments with 593,711 total employees.

In Kansas, wholesale trade, advanced manufacturing, and retail trade are the top three freight-reliant industries contributing to the state economy. Figure 3-16 details the sales and employment contributions of each freight-reliant industry in Kansas.

Figure 3-16: Sales Volume & Employment by Freight-Reliant Industry



Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Freight-Reliant Industry Profiles

The following section profiles Kansas' freight-reliant industries. **Appendix C** further details business establishment for freight-reliant industries by county.

Agriculture, Forestry, Fishing and Hunting

Agriculture, Forestry, Fishing and Hunting refers to establishments that grow crops, raise or harvest fish and other animals, or harvest fish. This includes farms, ranches, dairies, greenhouses, and orchards, among other establishments.[27] KDC identifies Agriculture as a key industry for Kansas.

Kansas has 58,569 farms and over 45 million acres of farmland.

Agriculture is a crucial contributor to Kansas' economy. Kansas is a top US producer of commodities such as wheat, corn, sorghum, and cattle. Figure 3-17 and Figure 3-18 map the locations of corn, sorghum, soybeans, and wheat crops in the state. Kansas' exports of agricultural products have also grown in recent years, particularly for cereal exports, which increased by 15.47 percent between 2018 and 2020.[28] Figure 3-19 maps the location of cattle and calves in Kansas, with the highest concentrations in the state's southwest counties.

[27] U.S. Census, NAICS, 2017 NAICS Definition, Sector 11--Agriculture, Forestry, Fishing and Hunting, https://www.census.gov/naics/?input=11&year=2017&details=11

[28] Kansas Department of Commerce 2020 Kansas Exports of Commodity. https://www.kansascommerce.gov/wp-content/uploads/2021/02/2020-Kansas-Exports-by-Commodity.pdf.

Figure 3-17: Kansas Crop Location by Type

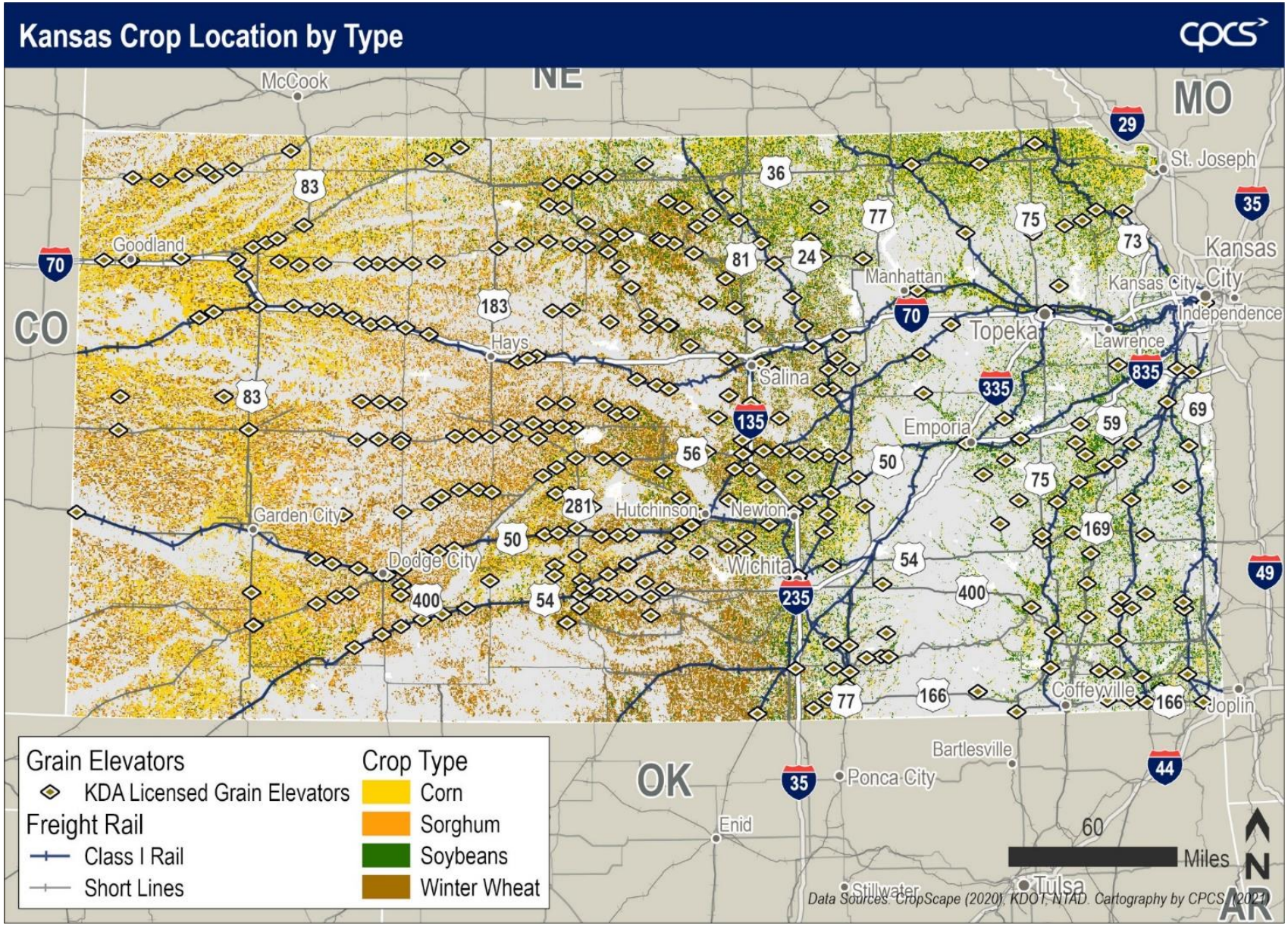


Figure 3-18: Kansas Crop Location by Type: Wheat, Corn, Soybeans, and Sorghum

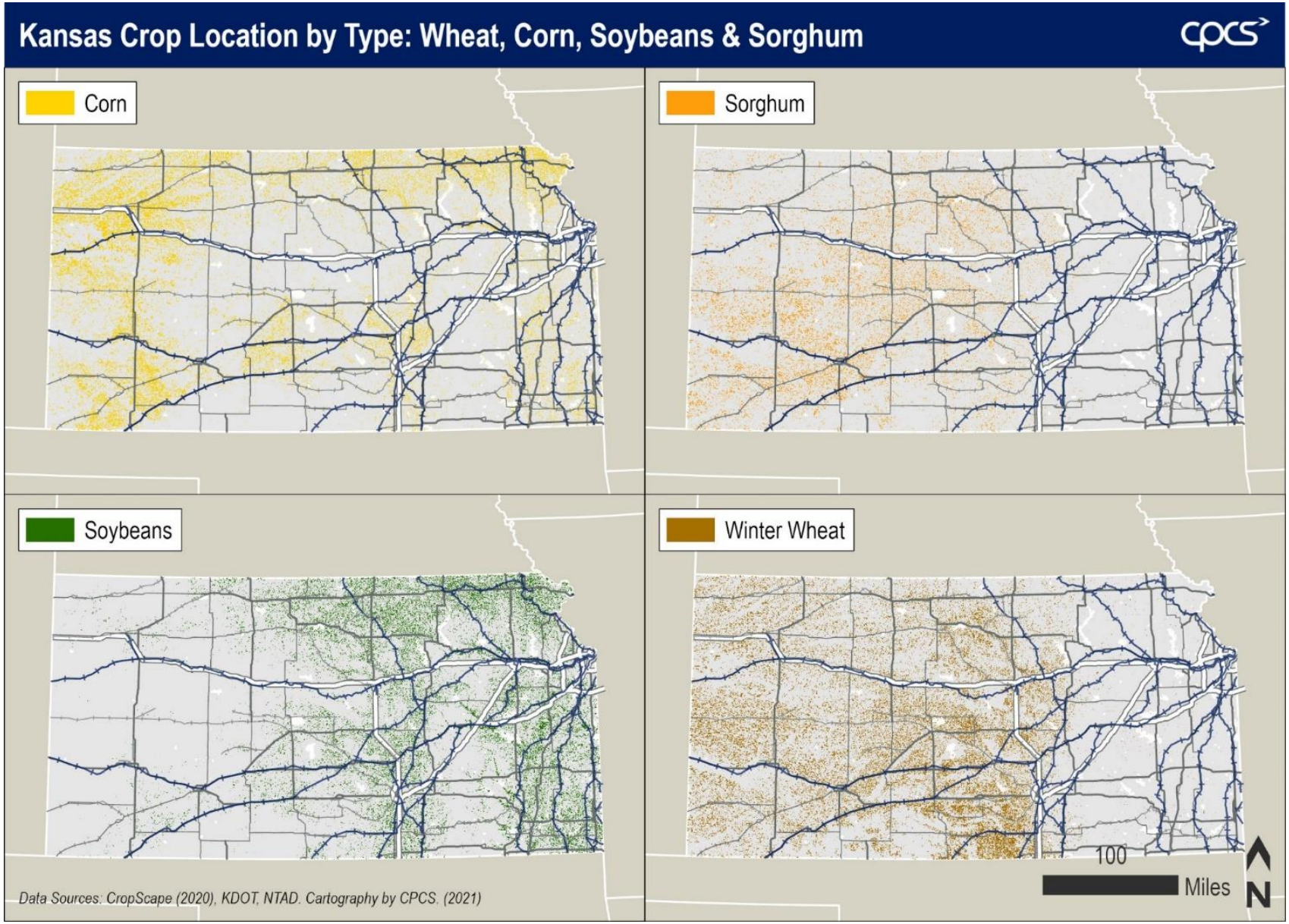


Figure 3-19: Kansas Cattle and Calves Inventory

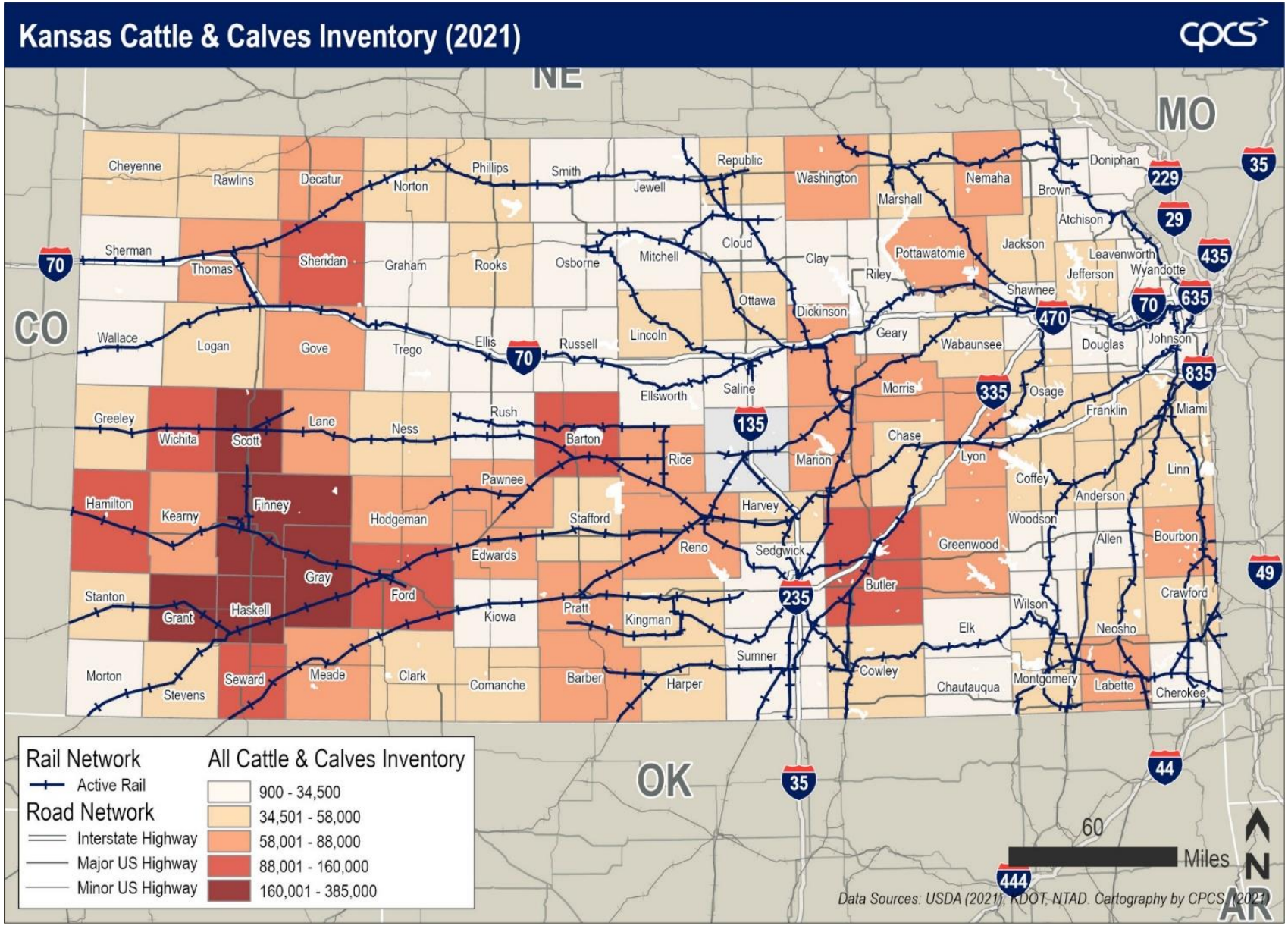


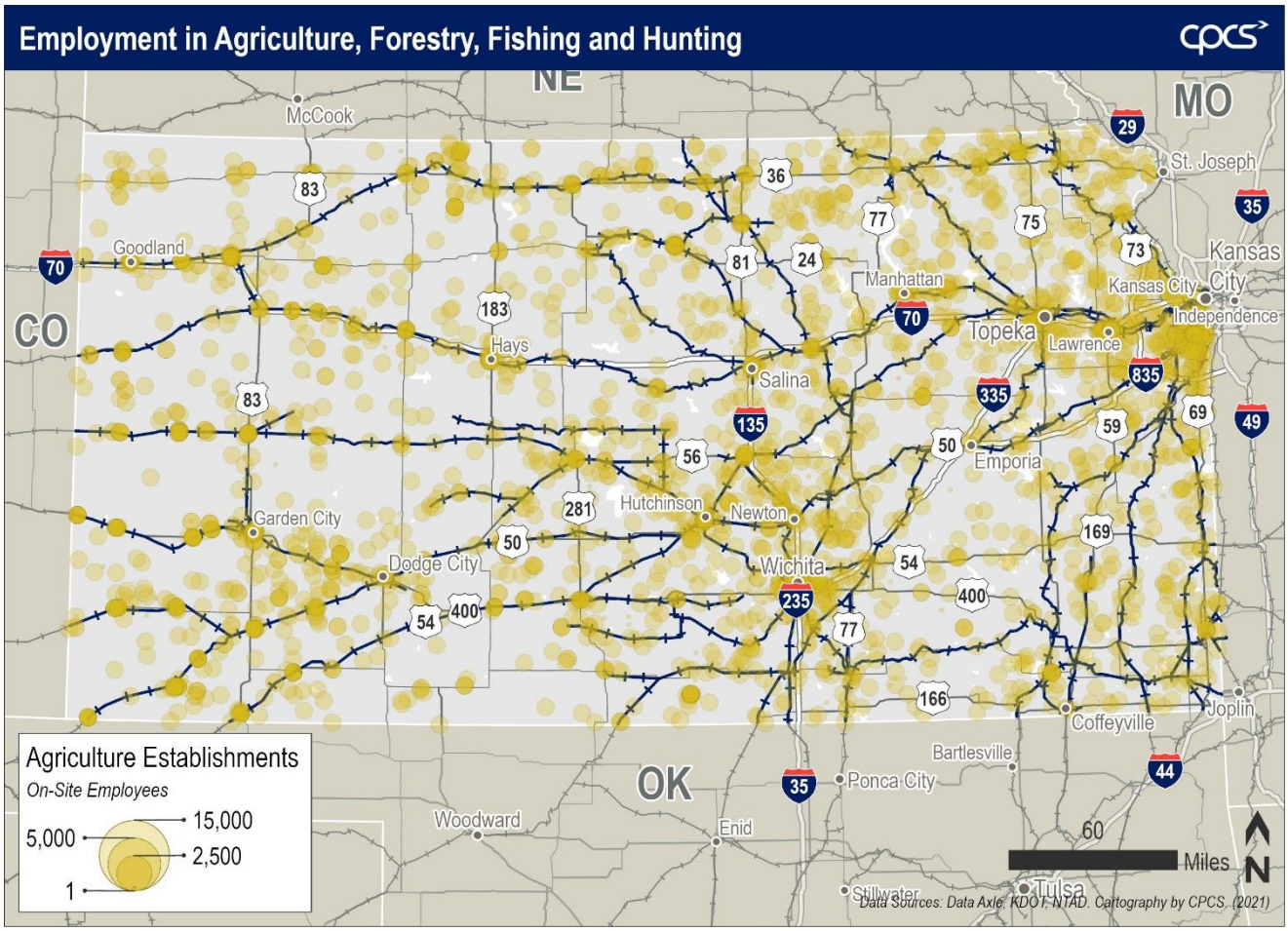
Figure 3-20 lists the top five counties in Kansas by sales volume for the agriculture, forestry, fishing, and hunting industry. All five counties are served by rail. Unlike other freight-reliant industries, agriculture-related business establishments are not concentrated in metropolitan areas or along the highway network; rather, they are spread out across the state, in both rural and urban areas, as mapped in Figure 3-21.

Figure 3-20: Top 5 Counties by Sales Volume for Agriculture, Forestry, Fishing and Hunting ($Billions)

County	Johnson County	Sedgwick County	Reno County	Hamilton County	Gray County
Sales Volume	$0.196	$0.113	$0.081	$0.075	$0.061

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-21: Employment in Agriculture, Forestry, Fishing and Hunting Establishments



Energy & Natural Resources

Energy and Natural Resources is a key industry for Kansas, as identified by KDC, and includes sectors within mining, quarrying, and oil/gas extraction, utilities, and manufacturing that relate to conventional and renewable energy production and operation. This includes activities in wind energy, solar energy, ethanol and biodiesel, natural gas, nuclear energy, coal, and oil.[29]

Wind energy made up 41.4 percent of the total power generated in Kansas in 2019.

In 2019, Kansas' wind power became the state's top source of electricity generation. In addition to wind energy, Kansas has abundant natural resources, such as solar power. The state also provides business incentives to promote the growth of the renewable energy industry. Figure 3-22 provides a list of renewable energy companies with headquarters in Kansas.

Figure 3-22: Select Renewable Energy Companies with Headquarters in Kansas

Company	Location	Description
Conestoga Energy	Garden City/ Liberal	Ethanol producer
Cromwell Solar	Lawrence	Solar Installation
Good Energy Solutions	Lawrence	Solar installation
ICM Inc.	Colwich	Biofuel production design
Kansas Ethanol	Lyons	Ethanol producer
King Solar	Hutchinson	Solar installation
Tradewind Energy	Lenexa	Renewable energy developer

Source: Kansas Department of Commerce

Traditional energy production is also important for Kansas' economy. Figure 3-23 lists the top ten energy and natural resource business establishments in Kansas, in order of estimated sales volumes. Nine out of these ten business establishments produce petroleum-related products. The top business establishments listed drive sales volumes in Kansas, as indicated by the top counties in Figure 3-24. Kansas' energy and natural resources establishments are mapped in Figure 3-25.

Figure 3-23: Top Energy and Natural Resources Business Establishments

Company	Location	Description
Coffeyville Resources Nitrogen	Montgomery	Petroleum refineries
Frontier El Dorado Refining	Butler	Petroleum refineries
Coffeyville Resources	Cowley	Petroleum refineries
Coffeyville Resources Pipeline	Montgomery	Petroleum refineries
Coffeyville Resources Crude	Montgomery	Petroleum refineries
Coffeyville Resources Nitrogen	Montgomery	Petroleum refineries
Coffeyville Resources Crude	Rooks	Petroleum refineries
Frontier Holly	Butler	Petroleum refineries

[29] Kansas Department of Commerce, Energy & Natural Resources Brochure. https://www.kansascommerce.gov/industry/energy-natural-resources/; U.S. Census, NAICS, 2017 NAICS Definition, Sector 21--Mining, Quarrying, and Oil and Gas Extraction, https://www.census.gov/naics/?input=21&year=2017&details=21; U.S. Census, NAICS, 2017 NAICS Definition, Sector 22--Utilities, https://www.census.gov/naics/?input=22&year=2017&details=22; U.S. Census, NAICS, 2017 NAICS Definition, Sector 31-33--Manufacturing, https://www.census.gov/naics/?input=31&year=2017&details=31.

Company	Location	Description
ICM Inc.	Sedgwick	Ethyl alcohol manufacturing
HOC Industries Inc.	Sedgwick	Petroleum refineries

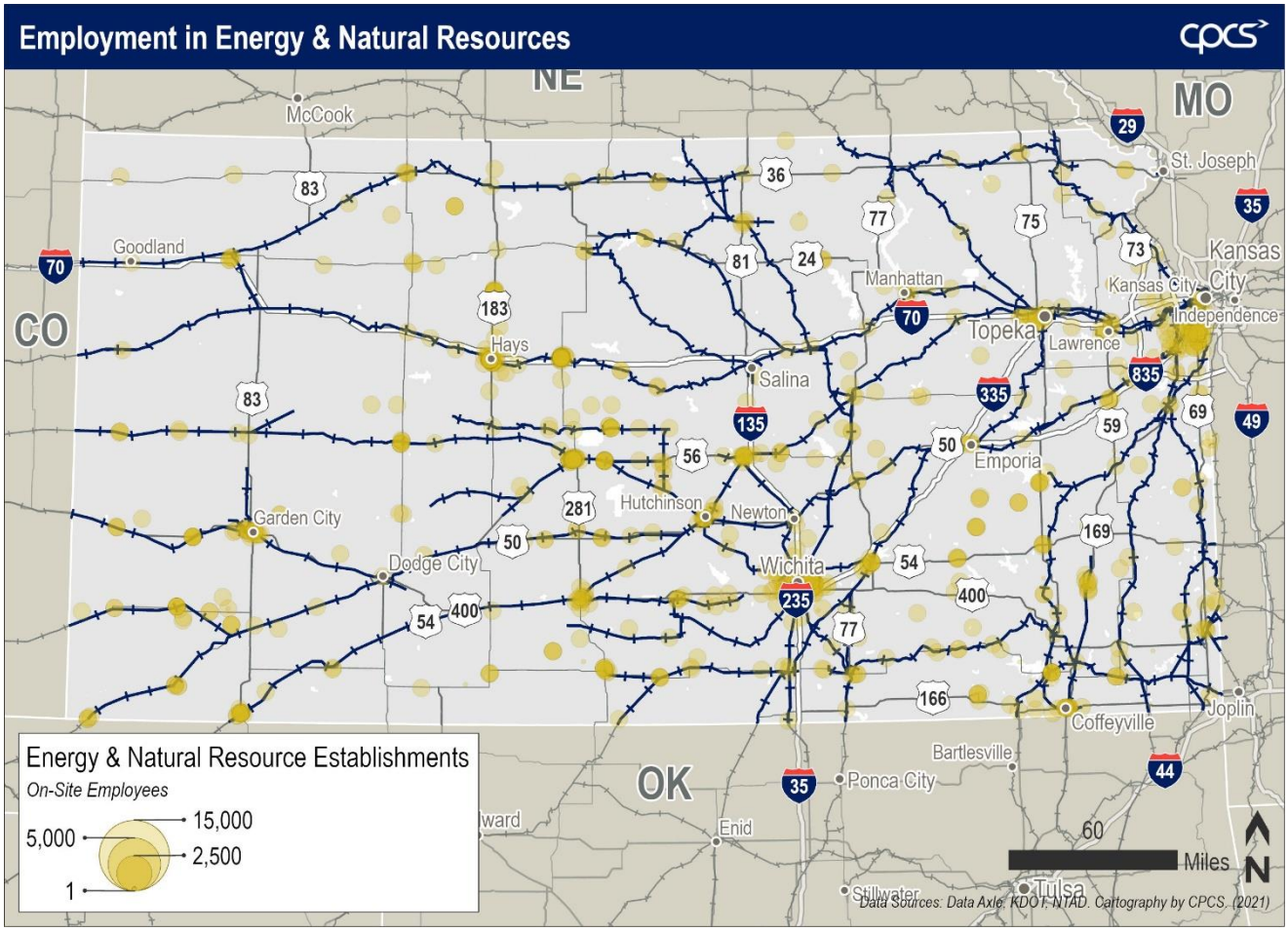
Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-24: Top 5 Counties by Sales Volume for Energy & Natural Resources ($Billions)

County	Montgomery County	Butler County	Sedgwick County	Cowley County	Rooks County
Sales Volume	$10.748	$3.703	$1.562	$1.332	$0.846

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-25: Employment in Energy & Natural Resource Establishments



Manufacturing

Manufacturing encompasses establishments involved in the mechanical, physical, or chemical transformation of materials, substances, or components into new products.[30] Advanced Manufacturing, which refers to the use of advanced techniques and innovative materials in manufacturing activities, is identified by KDC as a key industry for the state. Within manufacturing, KDC also recognizes Food Processing and Manufacturing, as well as Aerospace and Defense, as key industries for Kansas' economy.

Advanced Manufacturing

Advanced manufacturing involves the use of advanced techniques and innovative materials in manufacturing.

For this analysis, Advanced Manufacturing includes all sectors within manufacturing, from the manufacturing of food and chemicals to apparel and machinery. Kansas is home to a diverse range of manufacturing businesses, including Spirit AeroSystems Inc., Textron Aviation, Cargill/Cargill Protein North America, Garmin International, Inc., and Bombardier Learjet.[31] Among freight-reliant industries in Kansas, advanced manufacturing generates the second-highest sales volume.

As mapped in Figure 3-27, manufacturing business establishments are primarily concentrated around major cities, such as Kansas City, Wichita, Topeka, and Dodge City, with smaller clusters of manufacturing establishments located along the state's freight network. Compared to larger urban areas, Montgomery County has fewer manufacturing establishments and employees. However, it produces the highest manufacturing sales volumes in Kansas due to the oil/gas, aerospace, and automotive manufacturing establishments located within the county.

Figure 3-26: Top 5 Counties by Sales Volume for Advanced Manufacturing ($Billions)

County	Montgomery County	Sedgwick County	Wyandotte County	Johnson County	Ford County
Sales Volume	$11.774	$10.635	$7.572	$5.951	$4.622

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

[30] U.S. Census, NAICS, 2017 NAICS Definition, Sector 31-33--Manufacturing, https://www.census.gov/naics/?input=31&year=2017&details=31.

[31] Kansas Department of Commerce, Advanced Manufacturing Brochure. https://www.kansascommerce.gov/industry/manufacturing/

Figure 3-27: Employment in Manufacturing Establishments

Food Processing & Manufacturing

Food processing and manufacturing refers to the production of food, beverages, and pet food.

In Kansas, food manufacturing makes up 21 percent of the total manufacturing industry.

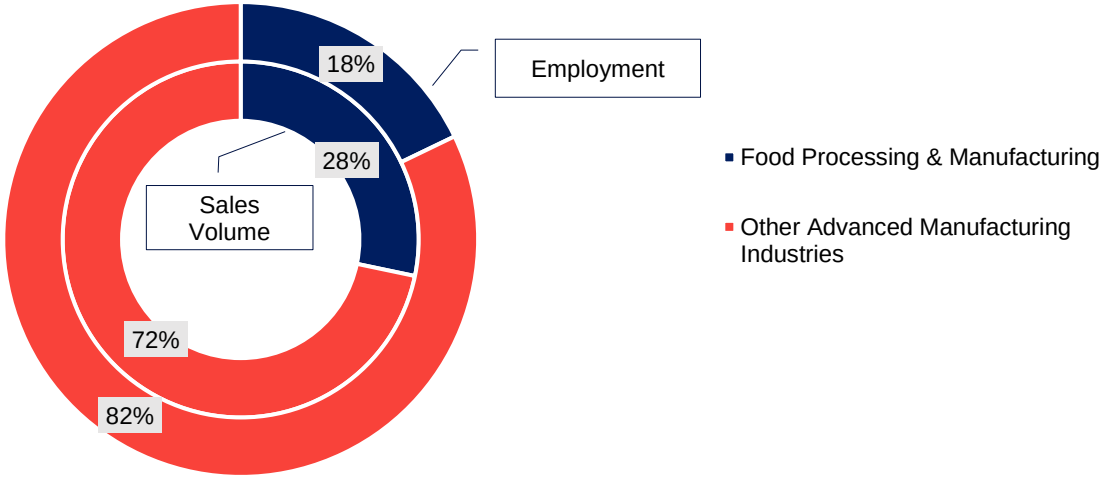
As a leader in agriculture, Kansas has attracted many national food processing and manufacturing companies to the state, including Tyson Fresh Meats, Hostess Brands, National Beef Packing Company, Frito-Lay North America, and Kellogg's, among many others. Figure 3-30 maps the food processing and manufacturing establishments in Kansas. Ford County, which is home to National Beef Packing Company and Cargill, produces the highest sales volume for food processing and manufacturing county in Kansas (Figure 3-28). Compared to other manufacturing sectors, food processing and manufacturing has a higher share of sales volume than employment, indicating a higher sales volume per employee (Figure 3-29).

Figure 3-28: Top 5 Counties by Sales Volume for Food Processing & Manufacturing ($Billions)

County	Ford County	Finney County	Johnson County	Seward County	Sedgwick County
Sales Volume	$4.343	$2.746	$2.573	$1.910	$1.593

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-29: Sales Volume and Employment Comparison between Food Processing & Manufacturing and Advanced Manufacturing Industry



Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-30: Employment in Food Processing & Manufacturing Establishments

Aerospace & Defense

Aerospace and defense refer to design and manufacturing activities for aviation and defense goods, including aircrafts, aviation products and parts, and munitions and military vehicles.[32]

Kansas delivered 35 percent of all general aviation airplanes built in the nation in 2019.

As listed in Figure 3-31, Kansas is home to national and regional headquarters for many of the leading aerospace, aviation, and navigation equipment manufacturers. As shown in Figure 3-32 and mapped in Figure 3-34, four major aviation manufacturers are located in Sedgwick County, driving the county's high sales volumes in aerospace and defense – over $4.6 billion in 2021. Compared to other manufacturing sectors, aerospace and defense manufacturing has a higher share of employment than sales volume, indicating the importance of employees in producing sales volumes in the sector (Figure 3-33).

Figure 3-31: Select Aerospace & Defense Business Establishments with Headquarters in Kansas

Company	Location	Description
Spirit AeroSystems, Inc.	Wichita	Aerostructures manufacturer
Textron Aviation	Wichita	Aircraft manufacturer
Garmin International, Inc.	Olathe/Lawrence/New Century	Communication and navigation equipment manufacturer
Bombardier Learjet	Wichita	Aircraft manufacturer
TECT Aerospace	Wichita	Large-scale structural manufacturer

Source: Kansas Department of Commerce Aerospace & Defense Brochure.

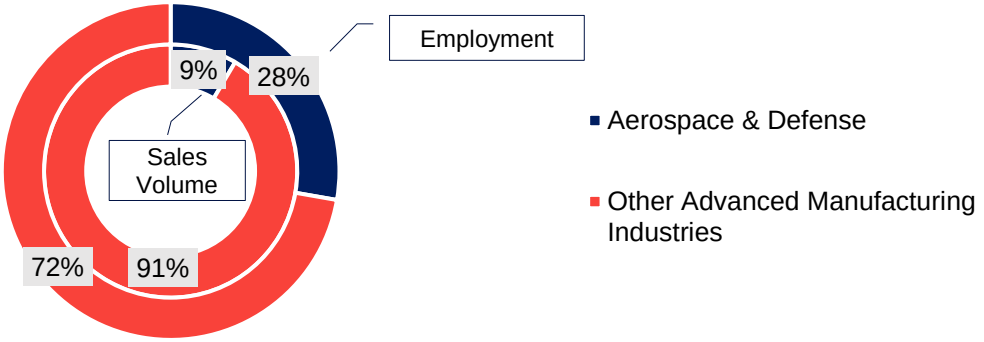
Figure 3-32: Top 5 Counties by Sales Volume for Aerospace & Defense ($Billions)

County	Sedgwick County	Cowley County	Montgomery County	Johnson County	Labette County
Sales Volume	$4.667	$0.257	$0.236	$0.134	$0.131

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

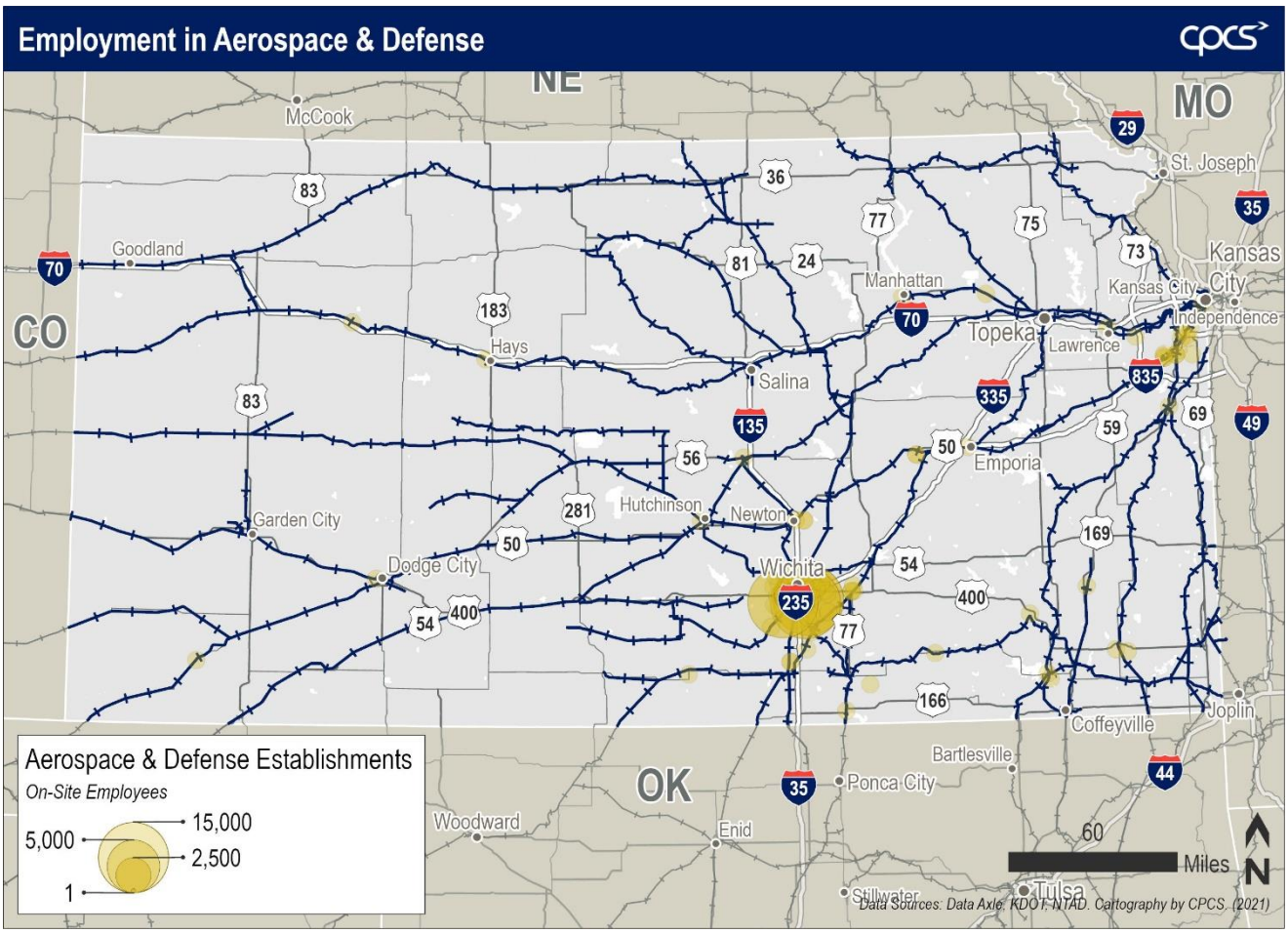
[32] Kansas Department of Commerce, Aerospace & Defense Brochure, https://www.kansascommerce.gov/industry/aerospace/; U.S. Census, NAICS, 2017 NAICS Definition, Sector 31-33--Manufacturing (33), https://www.census.gov/naics/?input=33&year=2007

Figure 3-33: Sales Volume and Employment Comparison between the Aerospace & Defense Industry and the Advanced Manufacturing Industry



Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-34: Employment in Aerospace & Defense Establishments



Transportation and Warehousing

Transportation and warehousing encompass industries that transport goods and people, provide warehousing and storage for goods, or support activities related to transportation.[33] KDC identifies these activities as the key industry of Logistics and Distribution.

[33] U.S. Census, NAICS, 2017 NAICS Definition, Sector 48-49--Transportation and Warehousing, https://www.census.gov/naics/?input=48&year=2017&details=48

Kansas has 4,570 transportation and warehousing business establishments across air, rail, trucking, pipeline, and other supporting sectors.

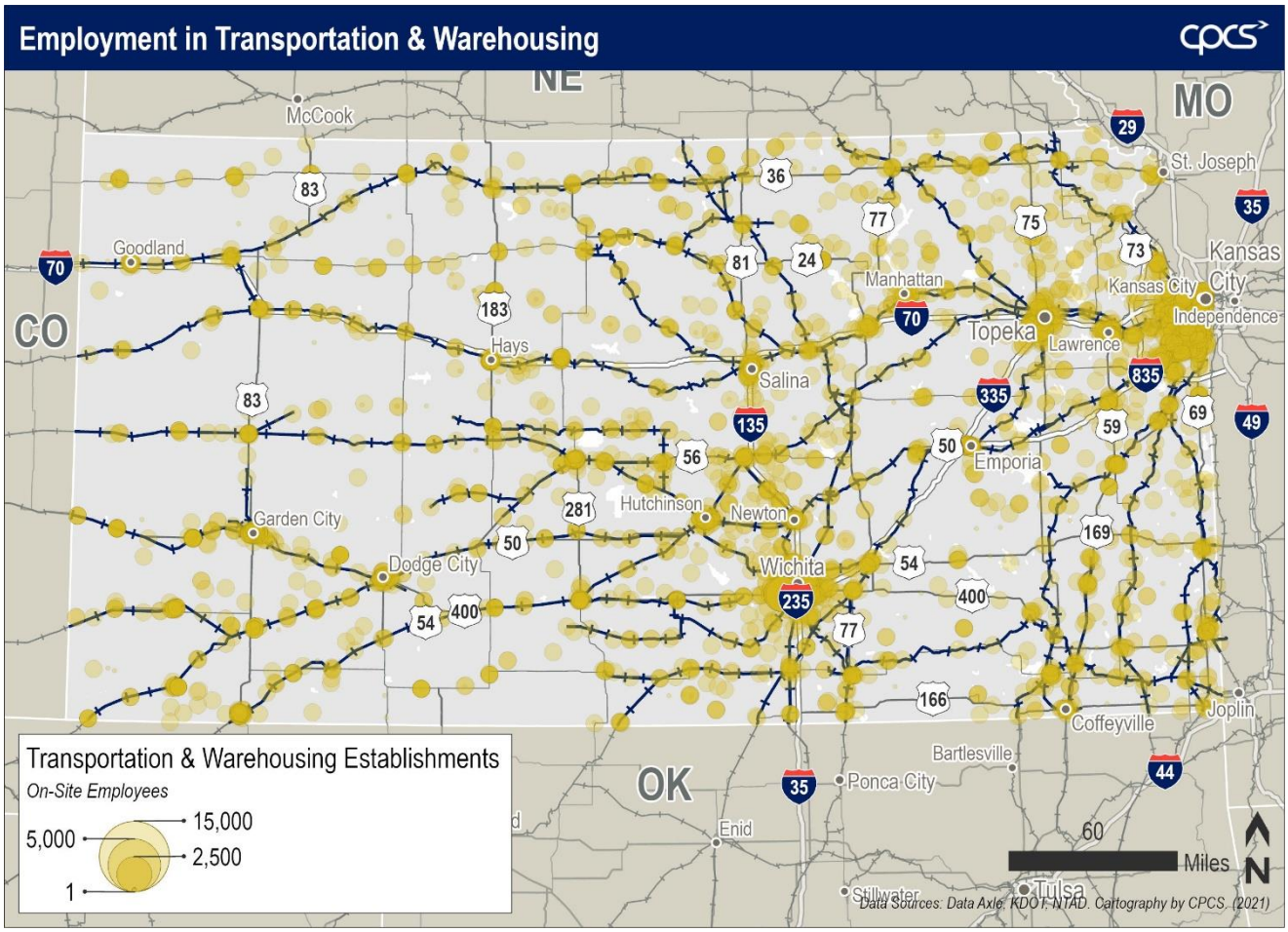
Kansas is strategically located in the heartland of the US, with major interstates I-70 and I-35 running through the state and I-29 connecting to the Kansas City metro area in Missouri. Kansas is also served by over 4,000 rail miles. Transportation and warehousing facilitate goods movement to, from, and through Kansas, thus serving as the backbone of many other sectors that drive Kansas' economy. Figure 3-35 depicts the top five counties for transportation and warehousing sales, all of which are located in or near urban areas. As further mapped in Figure 3-36, transportation and warehousing establishments are not only concentrated around urban areas but also along the state's freight transportation network.

Figure 3-35: Top 5 Counties by Sales Volume for Transportation and Warehousing ($Billions)

County	Sedgwick County	Wyandotte County	Reno County	Johnson County	Shawnee County
Sales Volume	$1.464	$1.135	$0.844	$0.832	$0.252

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-36: Employment in Transportation & Warehousing Establishments



Construction

Construction refers to establishments engaged in the construction of buildings or engineering products, including new construction, additions or alterations, and maintenance or repairs.[34]

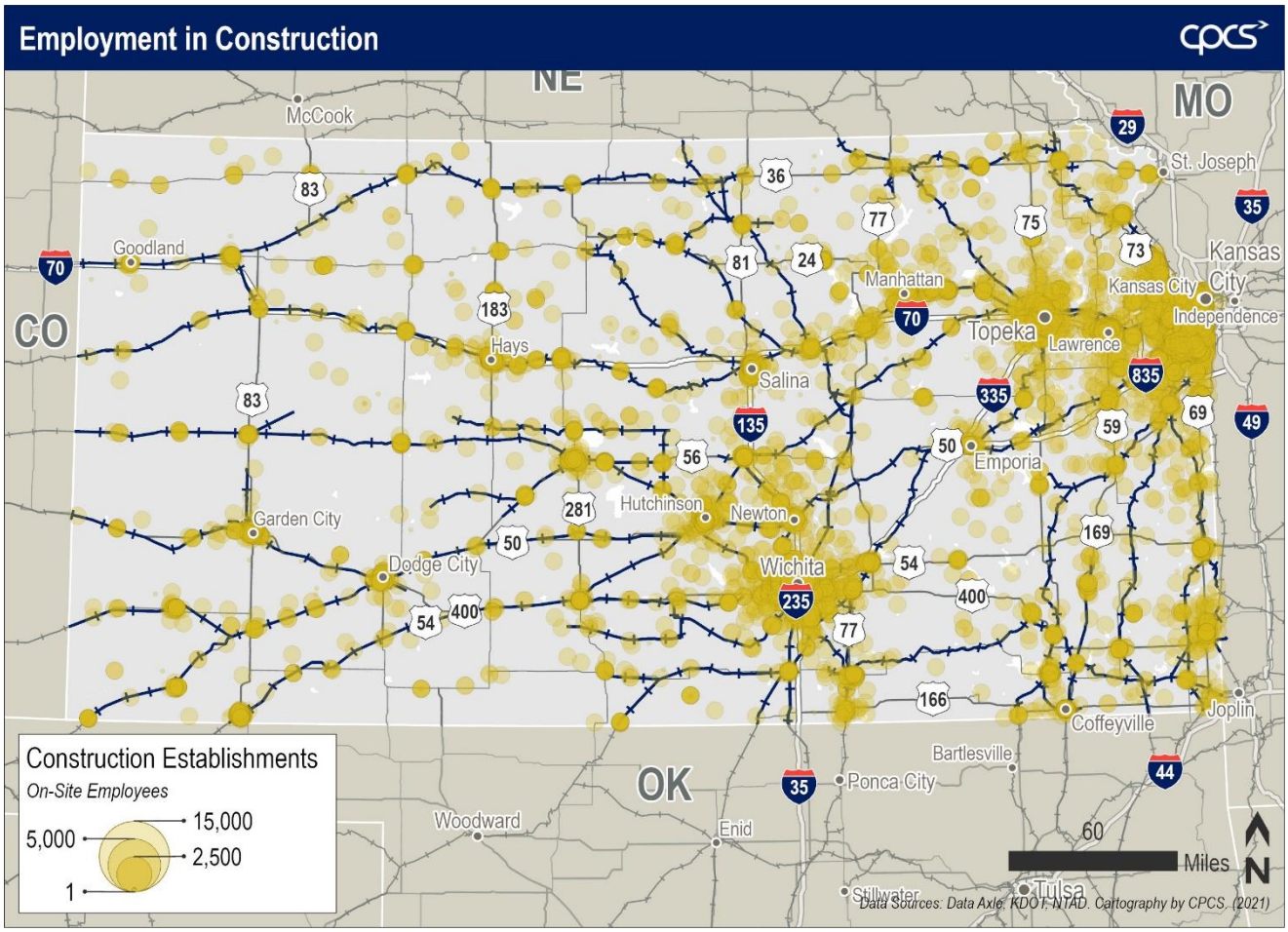
The top counties by sales volume in the construction industry (Figure 3-37) reflect the establishment and employment concentrations mapped in Figure 3-38. As illustrated, construction establishments are primarily clustered in metropolitan regions, such as Kansas City, Wichita, and Topeka.

Figure 3-37: Top 5 Counties by Sales Volume for Construction ($Billions)

County	Johnson County	Sedgwick County	Wyandotte County	Shawnee County	Douglas County
Sales Volume	4.463	3.717	1.865	1.055	0.420

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-38: Employment in Construction Establishments



[34] U.S. Census, NAICS, 2017 NAICS Definition, Sector 23--Construction, https://www.census.gov/naics/?input=23&year=2017&details=23

Wholesale Trade

Wholesale trade encompasses activities related to wholesale merchandise, typically without transformation, including services related to the sale of merchandise to other businesses. Wholesale trade establishments are involved in the intermediate purchase or sale of goods for resale, capital or durable non-consumer goods, and raw and intermediate materials and supplies used in production.[35]

Kansas' top wholesale trade companies provide a diverse range of products – from electrical power equipment and agriculture equipment to food wholesale and propane suppliers. As detailed in Figure 3-39 and Figure 3-40, wholesale trade establishments and employment are scattered throughout the state, particularly along the road network. Clusters with large establishments are additionally located around Kansas City, Wichita, and Salina.

Figure 3-39: Top 5 Counties by Sales Volume for Wholesale Trade ($Billions)

County	Johnson County	Butler County	Sedgwick County	Wyandotte County	Saline County
Sales Volume	2.068	1.942	1.092	1.091	0.695

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-40: Employment in Wholesale Trade Establishments

[35] U.S. Census, NAICS, 2017 NAICS Definition, Sector 42--Wholesale Trade, https://www.census.gov/naics/?input=42&year=2017&details=42

Retail Trade

Retail trade refers to activities related to retailing merchandise, typically without transformation, including services related to the sale of merchandise. Retail trade establishments are involved in the final sale of goods to consumers and include both store and non-store retailers.[36]

As detailed in Figure 3-41 and illustrated in Figure 3-42, large retail trade establishments in Kansas are mainly concentrated around cities on the roadway network, with smaller establishments around the state. Major employers with high sales volume include nationally renowned brands of Walmart, Home Depot, Target, and Lowe's.

Figure 3-41: Top 5 Counties by Sales Volume for Wholesale Trade ($Billions)

County	Johnson County	Sedgwick County	Wyandotte County	Shawnee County	Douglas County
Sales Volume	1.099	0.854	0.351	0.233	0.178

Source: Data Axle, Business Establishment Data, 2021. Analysis by CPCS, 2021.

Figure 3-42: Employment in Retail Trade Establishments

[36] U.S. Census, NAICS, 2017 NAICS Definition, Sector 44--Retail Trade, https://www.census.gov/naics/?input=44&year=2017&details=44

3.3 Freight Movements and Commodities

Statewide Profile

A total of 468 million tons of goods worth $348.6 billion moved to, from, and within Kansas in 2017.

Kansas is located in the heart of the US and is well-connected by multiple modes of transportation. Figure 3-43 provides an overview of the amount of cargo (tons) and value of cargo ($Billions) flowing into, within, and out of Kansas, based on analysis of FHWA's Freight Analysis Framework (FAF) version 5.0. **Appendix D** provides documentation on the FAF5 disaggregation methodology and detailed analysis findings.

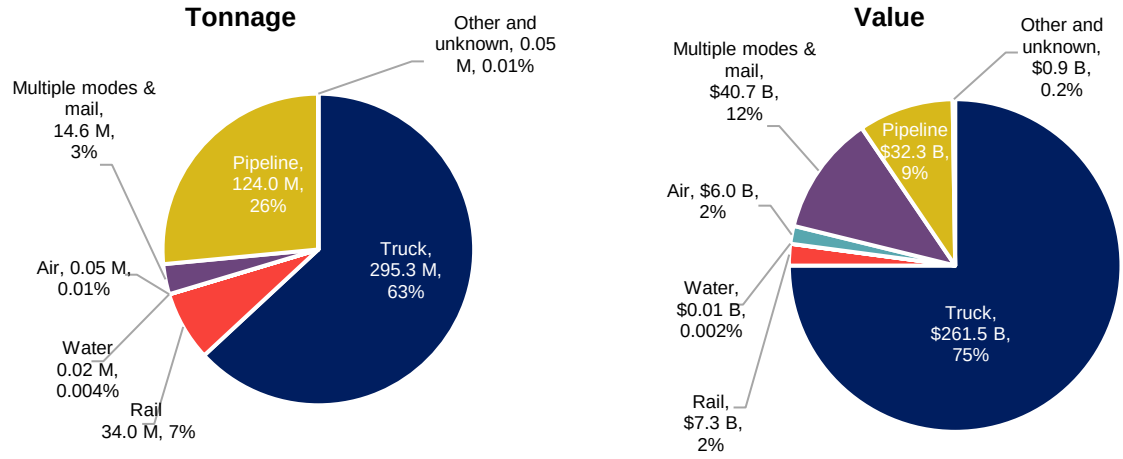
Figure 3-43: Kansas Tonnage and Value of Total Freight Flows by Direction (2017)

Direction	Tons (Millions)	Share of Total	Value (Billions $)	Share of Total
Outbound	120.4	25.7%	136.9	39.3%
Inbound	117.6	25.1%	115.2	33.0%
Within	230.0	49.2%	96.5	27.7%
Total	468.0	100%	348.6	100%

Source: CPCS Analysis of FHWA FAF 5

Truck-based freight flows constitute the majority of Kansas' freight traffic, moving 63.1 percent of freight goods by tonnage and 75.0 percent of freight goods by value to, from, and within the state. Figure 3-44 demonstrates the modal splits of Kansas' goods movements.

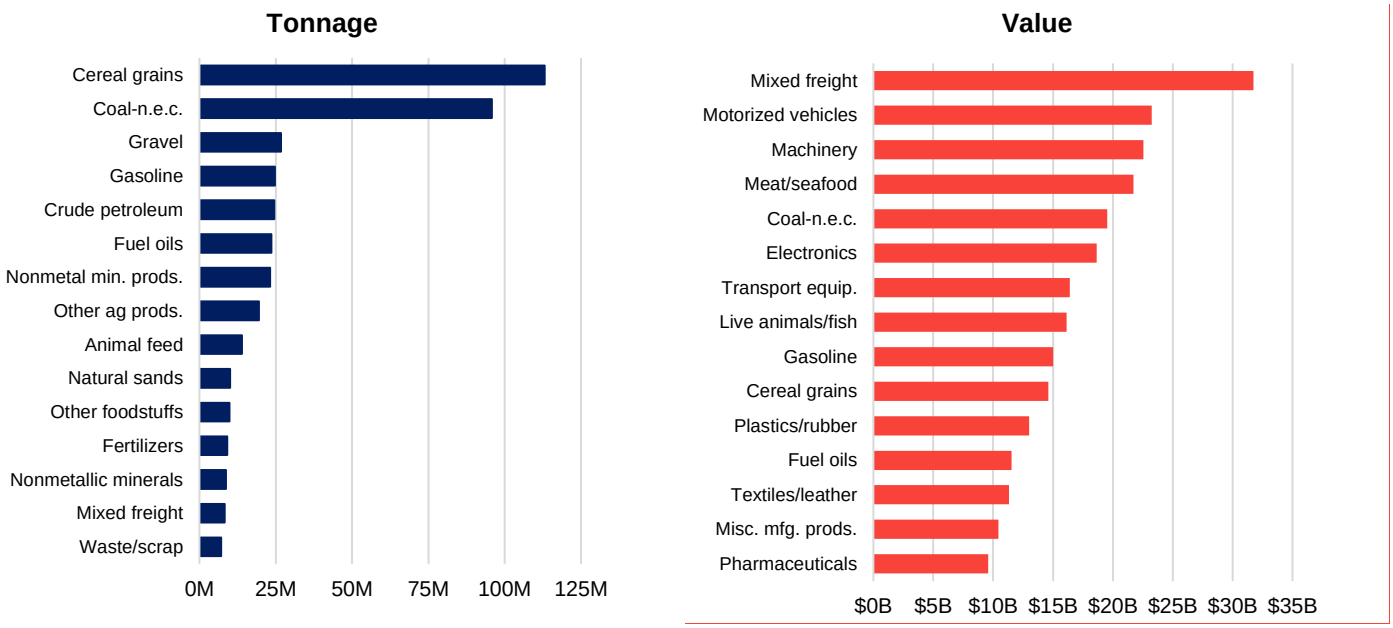
Figure 3-44: Total Tonnage and Value by Mode (2017)



Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

Cereal grains and coal-not elsewhere classified (n.e.c.) were the top commodities by tonnage, totaling 113.4 million tons and 95.8 million tons respectively. Manufacturing goods, including mixed freight ($31.7 billion), motorized vehicles ($23.3 billion), and machinery ($22.6 billion), are the top commodities by value. Figure 3-45 lists the top fifteen commodities by volume and by value handled on Kansas' freight system.

Figure 3-45: Total Tonnage and Value by Commodity (2017)



Source: CPCS Analysis of FAF 5. Note: Coal n.e.c. refers to packaged fuel, powdered fuel, and other products of petroleum and coal, not elsewhere classified.

Other findings from modal commodity flow analysis include:

- Top commodities carried by truck include cereal grains, gravel, and nonmetal mineral products. Truck also transports high-value goods, such as mixed-freight, meat/seafood, and motorized vehicles.
- With over 4,600 active miles of railroad state, rail is a key mode of freight transportation in Kansas, carrying nearly 34 million tons (7.26 percent) of goods worth over $7.3 billion (2.10 percent) goods in 2017. Kansas is a major grain-producing state, with cereal grains making up over 91 percent of all rail movements, by volume. Other top commodities transported by rail by tonnage include coal, and coal n.e.c.
- Kansas' freight transported by water moves through Marine Highway M-29 on the Missouri River. The only commodity moved by water in Kansas in 2017 was crude petroleum, with 18 thousand tons of crude worth nearly $5.7 million transported from Kansas to Illinois.
- Commodities moved by air are often lightweight, time-sensitive, and high-value. Machinery, textile/leather, and electronics are the top three commodities moved by air, when measured by volume, while electronics and machinery are the top commodities carried by air in Kansas when measured by value.
- Multiple modes provide cost-effective solutions to long-distance (water-rail and truck-rail) and high-value (truck-air) freight transportation needs.[37] The top commodity carried by multiple modes is cereal grains by tonnage, but pharmaceuticals by value.
- Kansas' pipeline system primarily carries energy resources and basic chemicals, with coal n.e.c. accounting for 67 percent of total tonnage and 51 percent of total value.

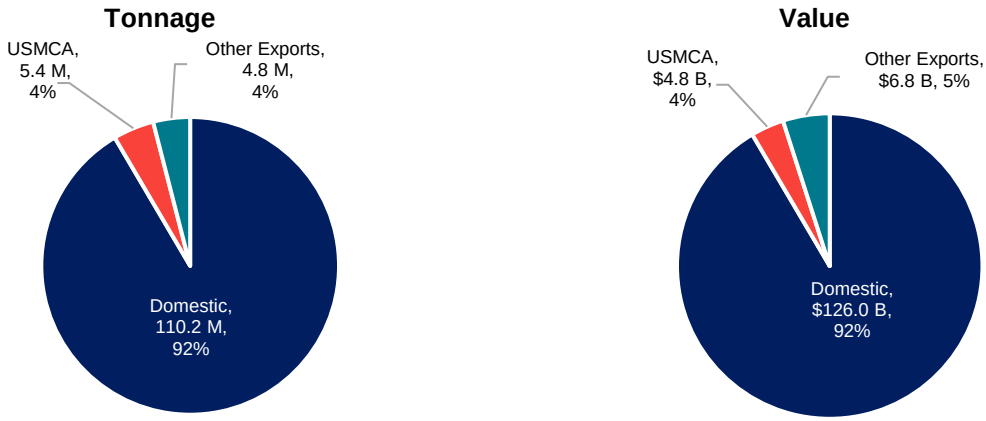
[37] The classification of movements by multiple modes include shipments by water-rail, truck-rail intermodal, and truck-water, as well as by parcel delivery services, U.S. Postal Service, or couriers, such as UPS (less than or equal to 150 pounds). Freight Analysis Framework Version 5. User's Guide for Release 5.0. https://www.bts.gov/sites/bts.dot.gov/files/2021-02/FAF5-User-Guide.pdf

Trading Patterns

Among outbound movements originating from Kansas, 92 percent traveled domestically, by both volume and value (Figure 3-46). The remaining outbound movements are split between United States-Mexico-Canada Agreement (USMCA) exports to Mexico or Canada and exports to other countries.

Domestic movements also make up the majority of inbound commodities destined for Kansas (Figure 3-47), by both volume (91 percent) and value (90 percent). When measured by tonnage, imports from non-USMCA countries make up less than 1 percent of total imports; however, they make up 7 percent of inbound movements by value. This is due to the high-value, but low-volume nature of top imported commodities, such as machinery, textiles/leather, and electronics.

Figure 3-46: Total Outbound Volume and Value by Domestic, USMCA Exports & Other Exports (2017)



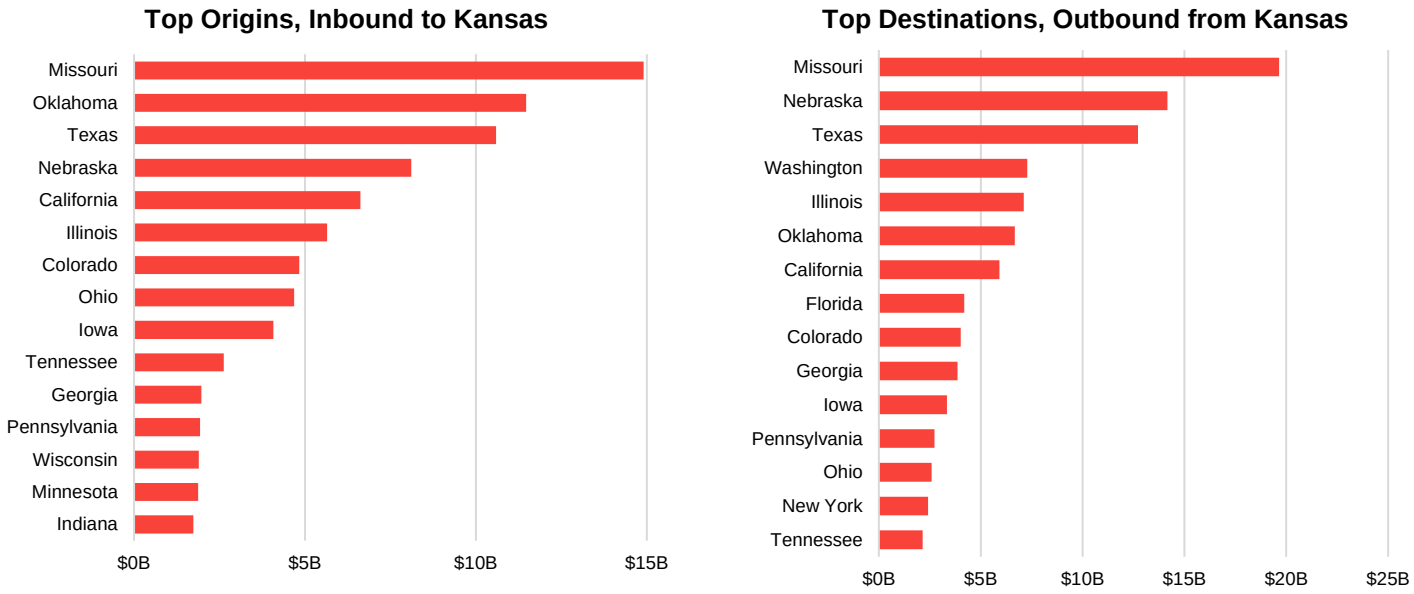
Source: CPCS Analysis of FAF 5.

Figure 3-47: Total Inbound Volume and Value by Domestic, USMCA Exports & Other Exports (2017)

Source: CPCS Analysis of FAF 5.

Kansas' top domestic trading partner is Missouri, with over $34.5 billion in goods moved between the states in 2017. This is followed by Texas ($23.3 billion), Nebraska ($22.3 billion), and Oklahoma ($18.1 billion). Figure 3-48 identifies Kansas' top ten domestic trade partners by value, by both origin and destination.

Figure 3-48: Domestic Trade Partners by Value (2017)



Source: CPCS Analysis of FAF 5.

Top Commodities

Four commodity groups – cereal grains, energy, agriculture and foodstuffs (non-cereal grains), and manufacturing (Figure 3-49) – account for 79 percent in tonnage and 75 percent in value of Kansas' total freight flows (Figure 3-50).

Figure 3-49: Commodity Group and Commodities

Commodity Group	Key Commodities	
Cereal Grains	• Cereal grains	
Energy	• Coal • Crude petroleum • Gasoline	• Fuel oils • Coal – n.e.c. • Basic chemicals*
Agriculture and foodstuffs (non-cereal grains)	• Live animals/fish • Other agricultural products • Animal feed • Meat/seafood	• Milled grain products • Other foodstuffs • Fertilizers •
Manufacturing	• Machinery • Electronics • Motorized vehicles	• Transport equipment • Precision instruments • Mixed freight

*Note: Basic chemicals is considered part of the energy commodity group since basic chemicals include energy sources such as hydrogen and industrial gases according to the Standard Classification of Transported Goods (SCTG).

Cereal Grains

Kansas is a top US producer of agricultural commodities such as wheat, corn, and sorghum. Cereal grains account for 24 percent of tonnage and 4 of commodity value in Kansas. The top counties in the state shipping cereal grains by tonnage include Sedgwick, Finney, and Haskell Counties, and the top counties receiving cereal grains by tonnage include Sedgwick, Shawnee, and Butler Counties.

Truck is the dominant mode of transportation, transporting 81 percent of total cereal grain volumes to and from Kansas, followed by rail (15 percent). Within the US, Texas, Oklahoma, and Nebraska are

Kansas' top three cereal grain trading partners by value. Internationally, Kansas trades the highest value of cereal grains with Mexico and Africa.

Energy

The energy commodity group includes coal, crude petroleum, gasoline, fuel oils, coal n.e.c., and basic chemicals. This commodity group makes up 38 percent of Kansas' total freight tonnage and 17 percent of total freight value. Pipeline moves almost 70 percent of energy products in Kansas. Truck is also crucial, moving 23 percent of total energy commodities by tonnage in the state.

Kansas' top domestic trade partners for energy commodities by value are Oklahoma, Nebraska, and Missouri. Canada is Kansas' top foreign trading partner for energy commodities, by value.

Agriculture and foodstuffs (non-cereal grains)

In addition to cereal grains, Kansas produces many other agricultural and food products, such as live animal and fish, meat and seafood, fertilizers, and animal feed. The agriculture and foodstuffs commodity group includes all agricultural and food products, except for cereal grains. This commodity group makes up 14 percent of freight flows in Kansas by tonnage and 20 percent by value. Truck is the main mode of transportation, accounting for 92 percent of total commodity group movements by tonnage.

Kansas exports $5.1 billion of live animals and fish products to Nebraska, amounting to over half of the total agriculture and foodstuffs value traded between the two states. Exports make up nearly 87 percent of international movements of agriculture and foodstuffs in Kansas, with eastern Asia being Kansas' top trading partner.

Manufacturing

The manufacturing commodity group consists of machinery, electronics, motorized vehicles, transport equipment, precision instruments, and mixed freight. These commodities are often low-volume and high-value. The Kansas freight system carried 14.7 million tons worth nearly $118 billion in manufacturing goods, accounting for 3 percent of the state's total freight tonnage and 34 percent of total freight value in Kansas.

Truck is the dominant mode of transportation for manufacturing products, carrying 96 percent of manufacturing products by volume. Kansas' top domestic trade partners for manufacturing products by value are Missouri, Washington, and Texas. Kansas has a mature aerospace manufacturing industry, with $6.2 billion in transportation equipment making up nearly 84 percent of all goods, by value, moved from Kansas to Washington. Internationally, Kansas' major trading partners include Canada, Eastern Asia, and Europe, trading more than $2 billion with each of these regions.

Figure 3-50: Percentage of Kansas-Based Tonnage and Value by Commodity (2017)

Commodity Group	Tonnage 2017 (Million Tons)	Percentage of Total Tonnage	Value 2017 (Billion $)	Percentage of Total Value
Cereal Grains	113.08	24.2%	14.60	4.2%
Energy	178.08	38.1%	58.53	16.8%
Agriculture and foodstuffs (non-cereal grains)	64.16	13.7%	69.19	19.8%
Manufacturing	14.07	3.0%	117.98	33.8%
Total	369.39	79.0%	260.3	74.6%

Source: CPCS Analysis of FHWA FAF 5.

4 Freight System Profile

Kansas' multimodal freight system provides shippers a range of modal options to consider when transporting freight and includes over 10,000 highway miles, over 4,500 active rail miles, 121 marine highway miles, 9 cargo airports and over 60,000 pipeline miles. Kansas' central location makes the state critical to freight movements nationwide, further connecting its users to international origins and destinations through access to international ports across the country. Additionally, Kansas' strategic defense system of highways and railways provides essential connections for two nationally prominent, Kansas-based military facilities – Fort Riley and Fort Leavenworth.

4.1 Key Roadways, Corridors, and Truck Parking

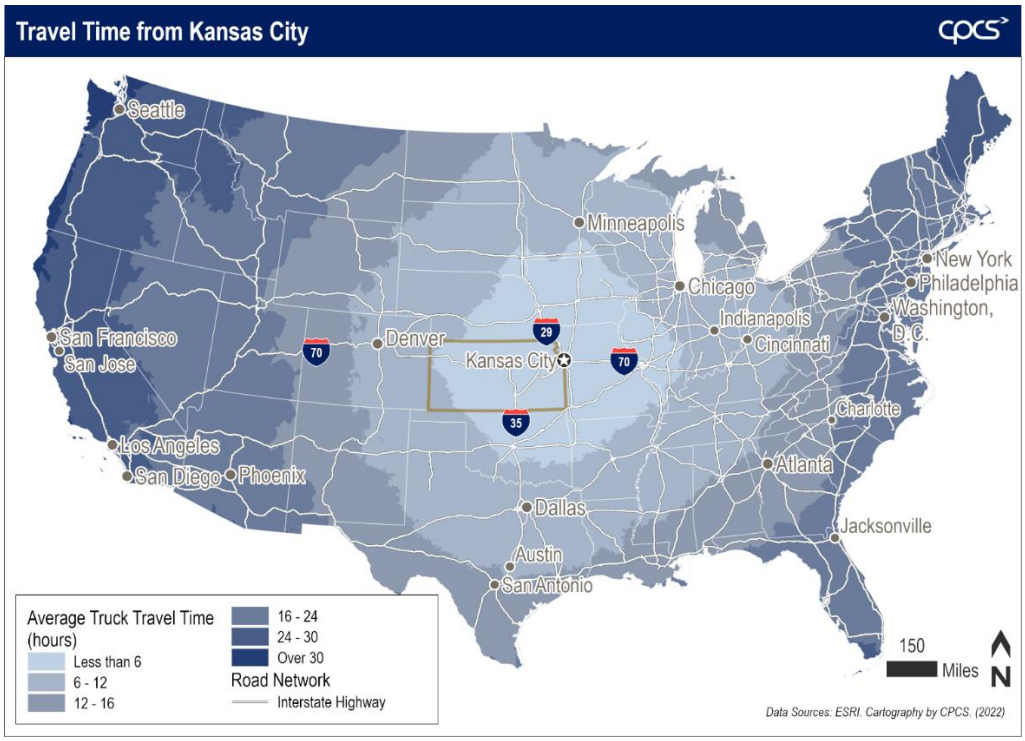
Kansas' central location connects the state to the rest of the country, with the majority of connections within a one-day drive from Kansas.

874	4,831	4,814	730
Interstate Miles	**US Highway Miles**	**State Route Miles**	**Primary Highway Freight System Miles**

Source: FHWA; HPMS

As of 2018, nearly 37,400 miles of roads, streets, and highways run through Kansas. This includes over 10,500 miles of highways, which consists of Interstates, US Highways, and State Routes. Kansas' highway system connects the state to key destinations nationwide, and most of the US is accessible within a one-day drive from Kansas (Figure 4-1).

Figure 4-1: Truck Travel Time from Kansas City



Highway System

National Highway Freight Network

The FHWA designates the National Highway Freight Network (NHFN) to strategically allocate federal resources to maintain and enhance the US highway freight system. The NHFN includes the following four roadway systems:

- **Primary Highway Freight System (PHFS):** Highway network identified as the most crucial highway portions of the US freight transportation system, designated based on quantitative national data. Figure 4-2 and Figure 4-3 detail Kansas PHFS routes, which are further mapped in Figure 4-7.
- **Other Interstate portions not on the PHFS:** Remaining portion of Interstate roads that are not included in the PHFS. These routes provide continuity and critical connections to freight transportation facilities. Figure 4-7 maps these routes in Kansas.
- **Critical Rural Freight Corridors (CRFCs):** Public roads not in an urbanized area (i.e., in a rural area) that provide access and connection to the PHFS and the Interstates, as well as freight transportation facilities, such as ports and intermodal facilities. The CRFCs in Kansas are detailed in Figure 4-4 and mapped in Figure 4-8.
- **Critical Urban Freight Corridors (CUFCs):** Public roads in urbanized areas that provide access and connection to the PHFS and the Interstate, as well as freight transportation facilities, such as ports and intermodal facilities. CUFCs in Kansas are detailed in Figure 4-5 and mapped in Figure 4-8.

Appendix E summarizes the process to update Kansas' CU/CRFCs as part of the State Freight Plan.

Figure 4-2: Primary Highway Freight System (PHFS) Routes

Route No.	Start Point	End Point	Length (Miles)
I-135	I-35	I-70	95.80
I-335	I-35	I-470	50.18
I-35	OK/KS Line	I-335	126.82
I-35	KS/MO Line	0.09 miles south of S150	17.59
I-470	I-335	I-70	4.65
I-635	KS2R (Santa Fe Terminal, Kansas City)	I-70	1.07
I-670	I-70	KS/MO Line	1.57
I-70	KS4L (Williams Pipeline Terminal)	CO/KS Line	423.60
		TOTAL	**721.29**

Source: National Highway Freight Network Map and Tables for Kansas.

Figure 4-3: PHFS Intermodal Connectors

Facility Name	Length (Miles)
Santa Fe Terminal, Kansas City	1.98
Southern Pacific's Kansas City Intermodal Facility	0.71
Williams Pipeline Terminal	5.71
TOTAL	**8.40**

Source: FHWA

Figure 4-4: CRFC Routes

Route No.	Start Point	End Point	Length (Miles)
US 50	Dodge City	Kinsley	40.09
US 50	Hutchinson	Newton/I-135	31.19
I-135	Interchange US 50/ US 135 South	Interchange US 50/ US 135 East	2.11
US 50	Garden City	Dodge City	86.53
US 50	Newton	Emporia	68.52
US 54	Liberal	Bucklin	81.90
US 56	McPherson	US 50 near Elmdale	52.77
US 83	Oakley	KS-OK state line near Liberal	148.41
US 400	Mullinville	Kingman	86.90
		TOTAL	**598.41**

Source: KDOT

Figure 4-5: CUFC Routes

Urban Area	Route	Start and End Points	Length (mi)
FHMPO	US 24 (near Perry, KS)	Manhattan (Fort Riley Rd) to K-99	13.96
WAMPO	K-254	I-135 to 127th St. E	8.38
WAMPO	W Southwest	I-235 to West St.	0.63
WAMPO	K-96	US-54/400 to I-135	10.58
WAMPO	Southeast Blvd.	US-54/400 to I-135	2.95
WAMPO	MacArthur Rd.	I-235 to K-15	2.55
WAMPO	US-54/400	231st St. W to 135th St. W	5.96
WAMPO	US-54/400	I-35 Interchange to Meadowlark Rd.	5.06
WAMPO	West St.	K-42 to I-235	1.40
Lawrence MPO	US 40/KS-10	I-70 to E 23rd St	12.80
MARC	Desoto, Johnson Cty.	83rd St. Bridge over BNSF & US Army RR	0.25
MARC	Olathe, Johnson Cty.	I-35 & 199th St. Interchange	1
MARC	UG, Wyandotte Cty.	Bridge Replacement 311 on Thron Dr	0.1
MARC	UG, Wyandotte Cty.	Bridge Replacement Kansas Ave. Bridge from Berger Ave. to MO state line	0.5
MARC	Johnson Cty.	Kansas River Bridge at De Soto, KS	1
MARC	Lenexa, Johnson Cty.	95th from Renner to Loiret	1
MARC	Shawnee, Johnson Cty.	Shawnee Mission Pkwy I-435 to K-7	3.75
MARC	Shawnee, Johnson Cty.	Shawnee Mission Pkwy Pflumm Rd to I-435	2.5
MARC	UG, Wyandotte Cty.	Turner Digital K-32 to Leavenworth Rd	4
MARC	I-435 to Eudora (Church St. Exit)		12.27
		TOTAL	90.64

Source: KDOT

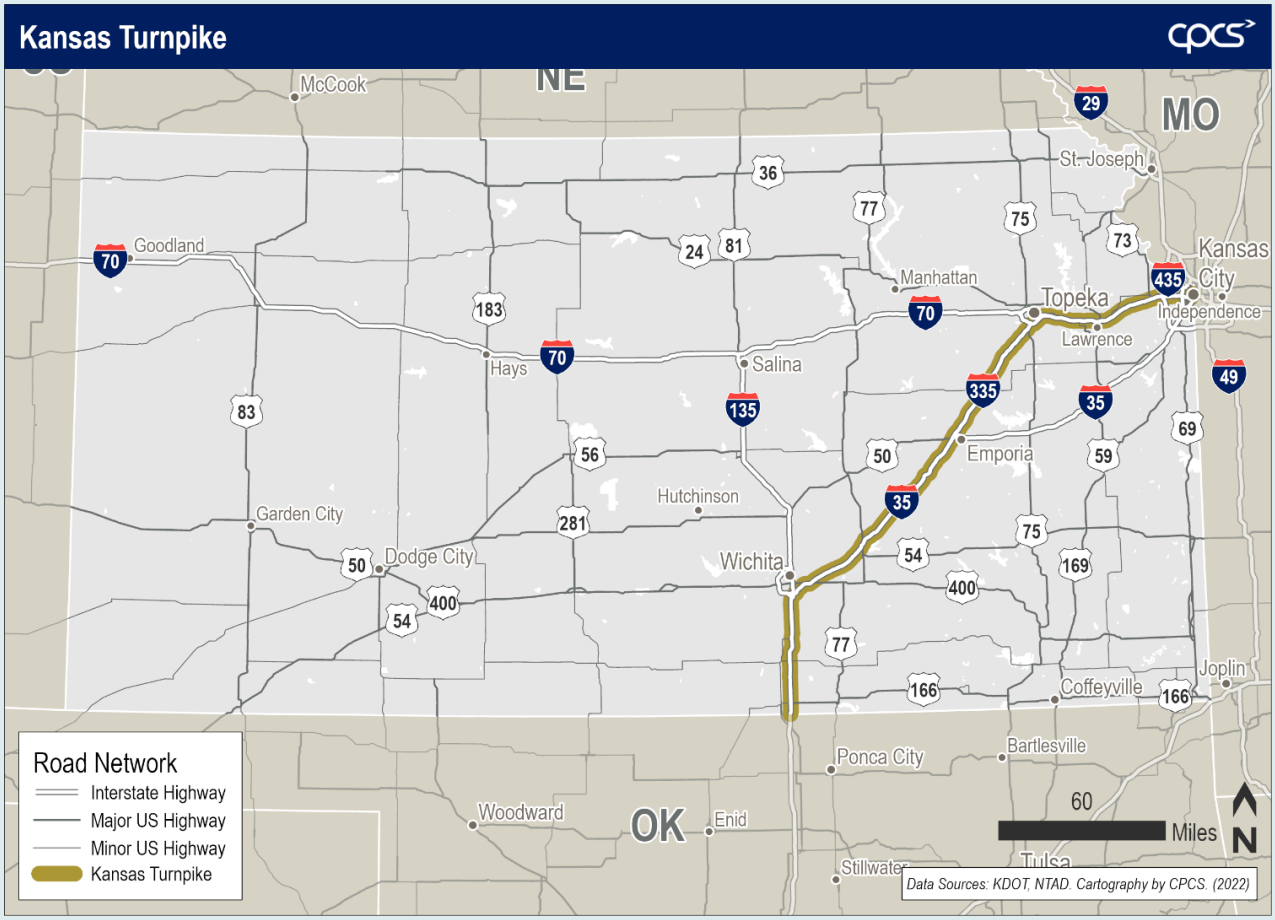
Kansas Turnpike

The Kansas Turnpike is a 236-mile toll road that runs from the Kansas-Oklahoma border to Kansas City, Kansas. The Turnpike spans the following Interstates:

- I-35 from the Kansas-Oklahoma border to Wichita
- I-35 from Wichita to Emporia
- I-335 from Emporia to Topeka
- I-70 from Topeka to Kansas City, KS

The Kansas Turnpike Association (KTA), a private entity that does not receive funds from the state or federal government, operates the Kansas Turnpike. In 2021, the toll revenue funded about 93 percent of the Turnpike's total funding.[38] Legislation in 2013 formalized the partnership between KTA and KDOT, with the Secretary of Transportation directing both organizations.[39]

Figure 4-6: Kansas Turnpike



[38] Kansas Turnpike Authority, Financial Statements 2021. https://www.ksturnpike.com/assets/uploads/content-files/FS21_Final_Updated.pdf

[39] Kansas Turnpike Authority, About Us. https://www.ksturnpike.com/about

Figure 4-7: Primary Highway Freight Network (PHFS) and Non-PHFS Interstates in Kansas

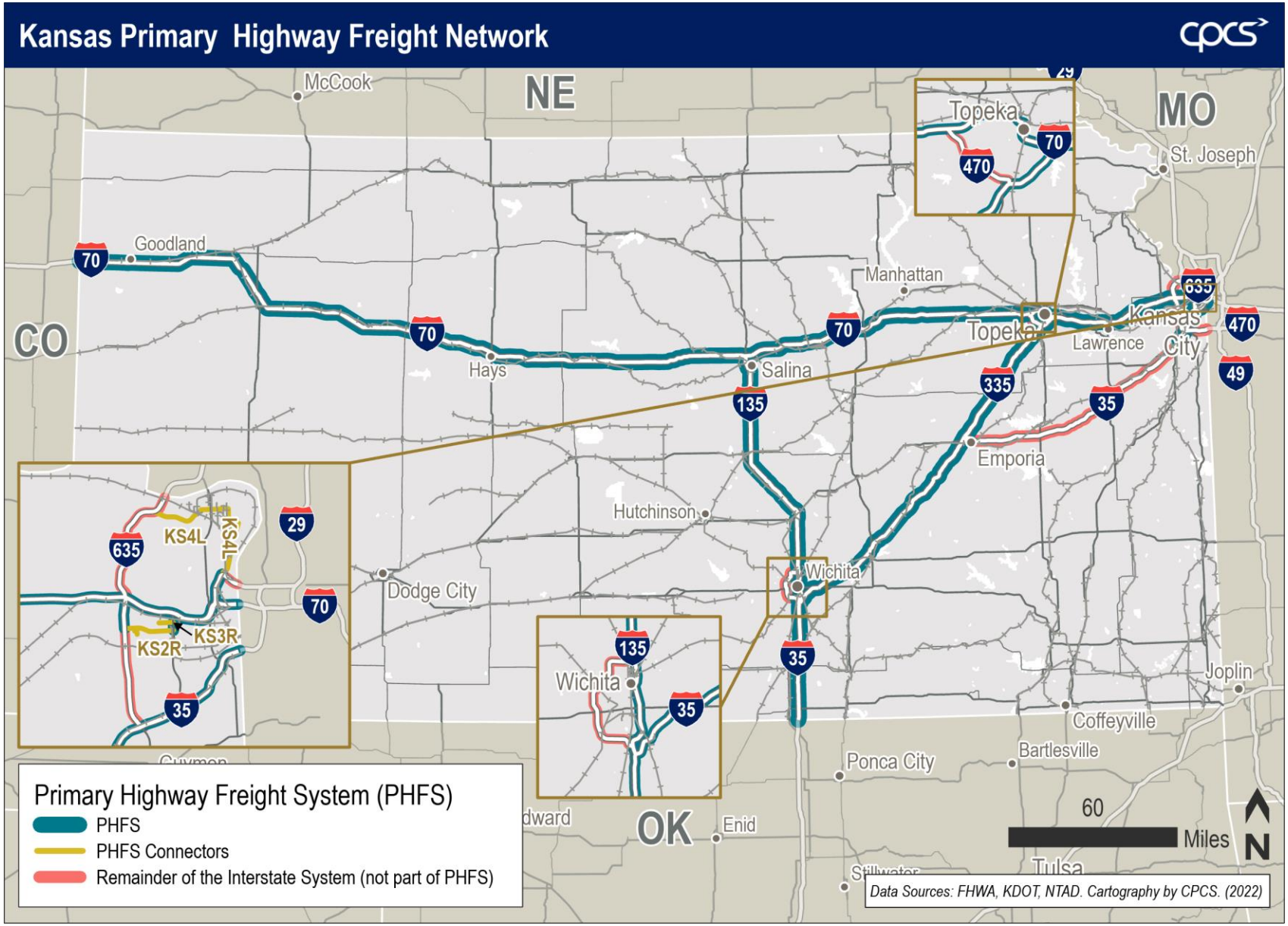
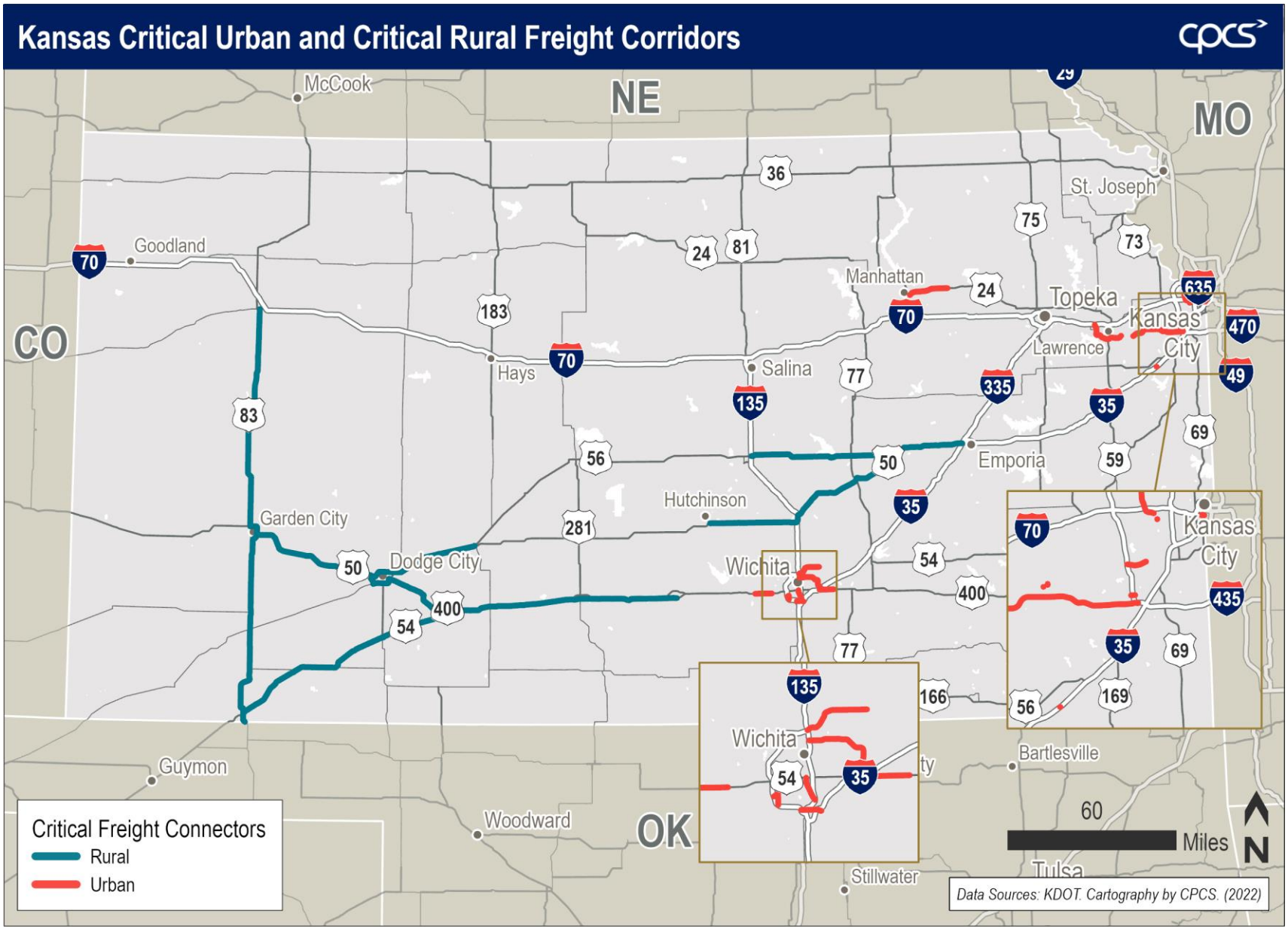


Figure 4-8: Critical Rural and Urban Freight Corridors in Kansas



Kansas Freight Corridors of Significance

Designating a critical freight network can help states allocate and prioritize resources on corridors that are significant to freight movements. In 2014, KDOT developed the Kansas Freight Corridors of Significance (FCS), informed by KDOT highway data and input from KFAC, and documented in Kansas' previous State Freight Plan (2017).

As part of the 2022 Kansas State Freight Plan, KDOT has examined and updated the Kansas Freight Corridors of Significance network, driven by freight data and stakeholder input. As shown in Figure 4-9, KDOT has updated the FCS to serve as a single freight system designation that includes the NHFN (shown on the map in dark and light red), in addition to other key freight corridors in the state (shown on the map in teal). Within the FCS, NHFN corridors, which have allocative purposes through ties to federal funding, are designated as the FCS Primary (Funded) Network. The remaining corridors on the FCS, which are not tied to funding, have been designated as the Secondary (Non-Funded) Network.

Figure 4-9: Kansas Freight Corridors of Significance

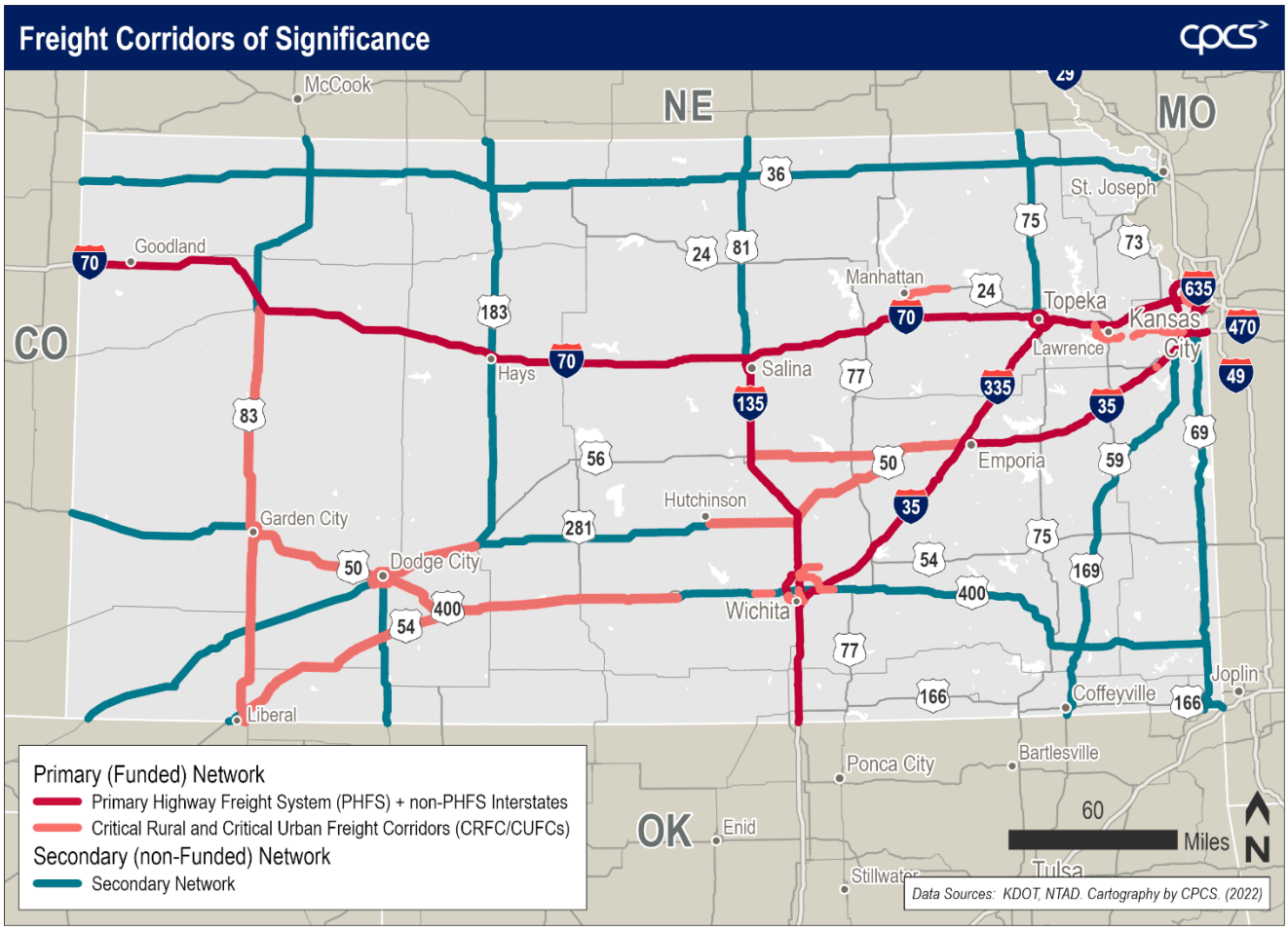


Figure 4-11 classifies the Kansas Freight Corridors of Significance by the number of through lanes. As shown, key freight roadways around Kansas City, Wichita, and Topeka span five to eight through lanes. The remaining key freight corridors in the state have four or fewer lanes.

Figure 4-12 maps the annual average daily traffic (AADT) in Kansas for 2019. As shown, segments of I-435, I-35, and I-70 in Kansas City – which have eight through lanes – experience high concentrations of truck traffic. AADT is also relatively high in Wichita. Across the state, all Interstates (except for I-335) handle over 10,000 daily trucks.

Military Freight

Kansas' Freight Corridors of Significance designation aligns with the Strategic Highway Network (STRAHNET) corridors of I-70, I-470, I-35, I-135, I-235, I-435, and I-635. Continuous investments and effective management of these routes, as well as other designated FCS routes, will further help to support the movement of critical military freight throughout the state.[40] See Chapter 4.6 for more information about the STRAHNET.

Intermodal Connectors

Intermodal connectors are National Highway System (NHS) roadways that provide first- and last-mile connections to intermodal facilities. Although intermodal connectors only account for 0.1 percent of Kansas' highway system mileage, they are critical to the efficient and reliable movements of freight. FHWA identifies a total of 11.06 miles of intermodal connectors in Kansas (Figure 4-10). The NHS intermodal connectors are designated separately from PHFS intermodal connectors, though some segments overlap.

Figure 4-10: Kansas' Freight-Related Intermodal Connectors

Facility	Type	Connector Description	Length (mi)
Mid-Continent Airport, Wichita	Airport	From US 54 south on Mid-Continental Drive 1.180 miles to terminal & terminal loop for 0.68 miles. From Mid-Continent south on Air Cargo Rd for 0.5 miles	2.36
Santa Fe Terminal, Kansas City	Truck/Rail Facility	From I-635 E on K-32 for 0.462 mi, S 0.1 mi on 39th, E 0.1 mi on Fairbanks, S 0.1 mi on 38th	0.8
Santa Fe Terminal, Kansas City	Truck/Rail Facility	From US 69 W on K32 for 1.248 mi, S 0.1 mi on 39th, E 0.1 mi on Fairbanks, S 0.1 mi on 38th	1.3
Southern Pacific's KS City Intermodal Facility	Truck/Rail Facility	From I-635 E on K-32 for 1.710 mi, N 0.2 mi under 18th, 0.3 mi W on Baynard	0.5
Southern Pacific's KS City Intermodal Facility	Truck/Rail Facility	From US 69 under 18th St heading N, W on Baynard (no additional miles)	0
Williams Pipeline Terminal	Truck/ Pipeline Terminal	From I-635 E on K5 for ~2.242 mi, E 1.150 mi on Sunshine Rd, S 1.0 mi on Fairfax, EN 0.490 mi on Donovan	4.6
Williams Pipeline Terminal	Truck/ Pipeline Terminal	From I-70 on Fairfax for 1.510 mi, EN 0.49 on Donovan	1.5

Source: FHWA

[40] Office of the Special Assistant for Transportation Engineering, US Army. https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/STRAHNET/Forms/AllItems.aspx

Figure 4-11: Number of Lanes on FCS (not including CUFCs)

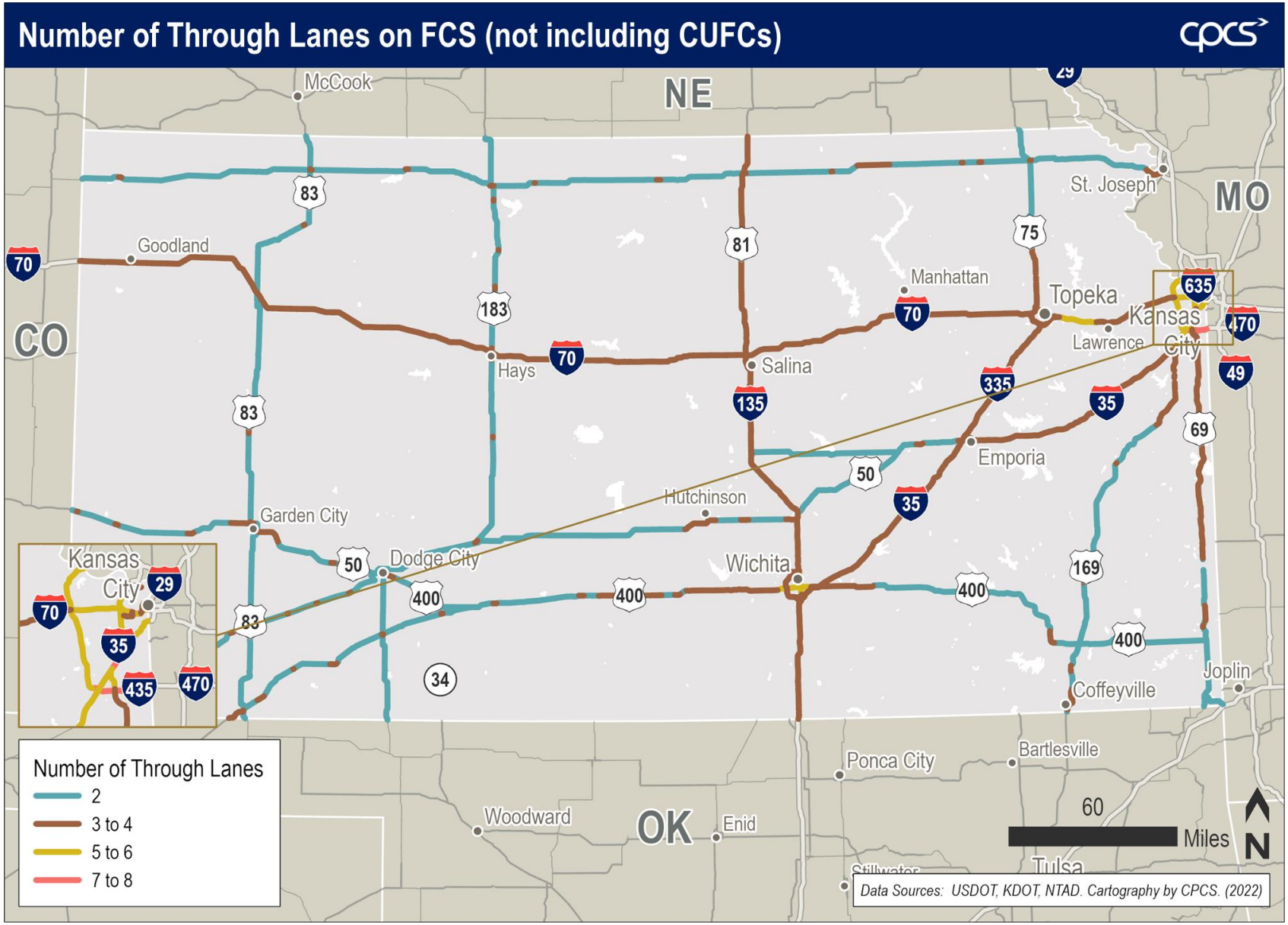


Figure 4-12: AADT Volume (2019) on FCS (not including CUFCs)

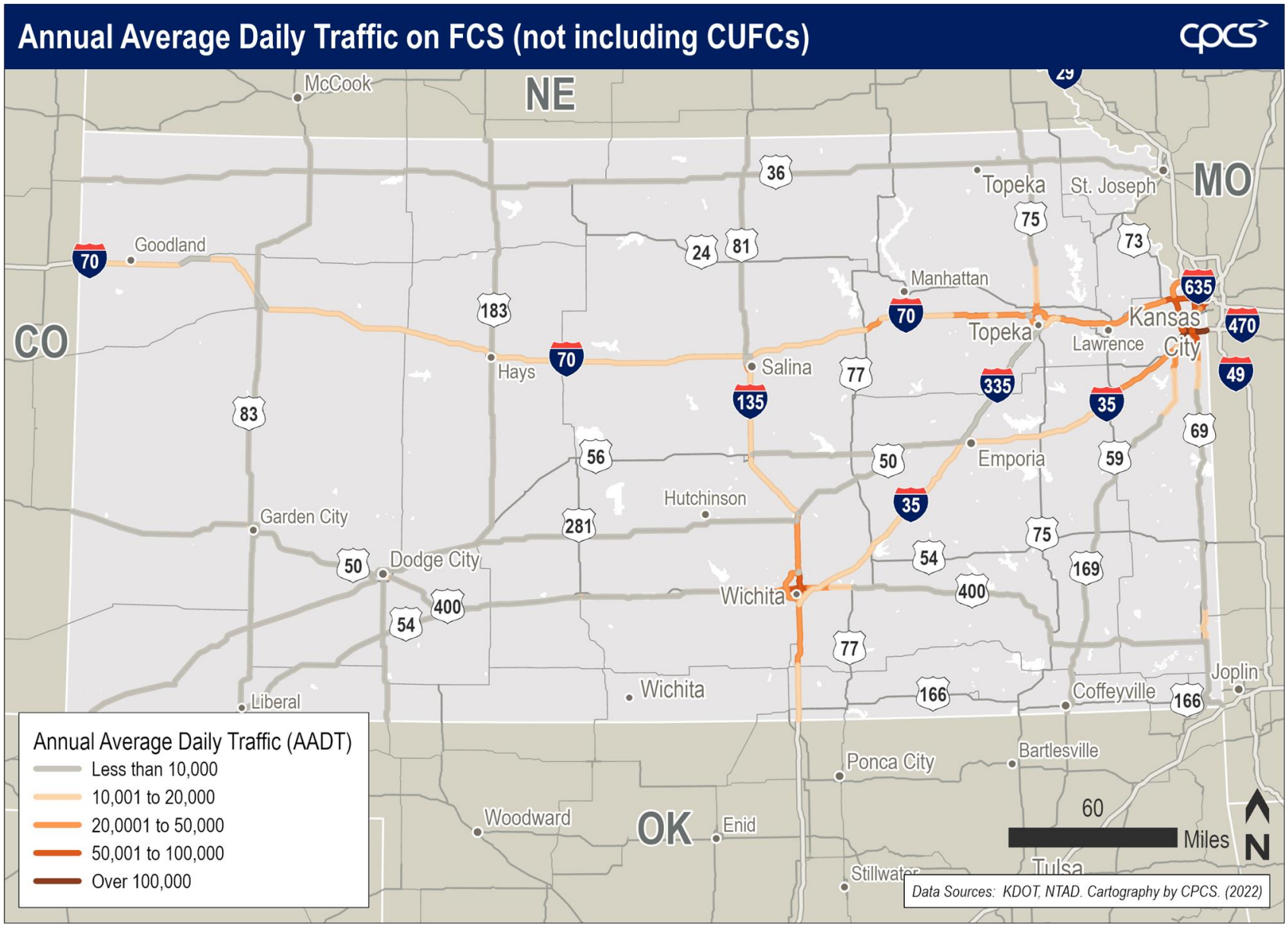
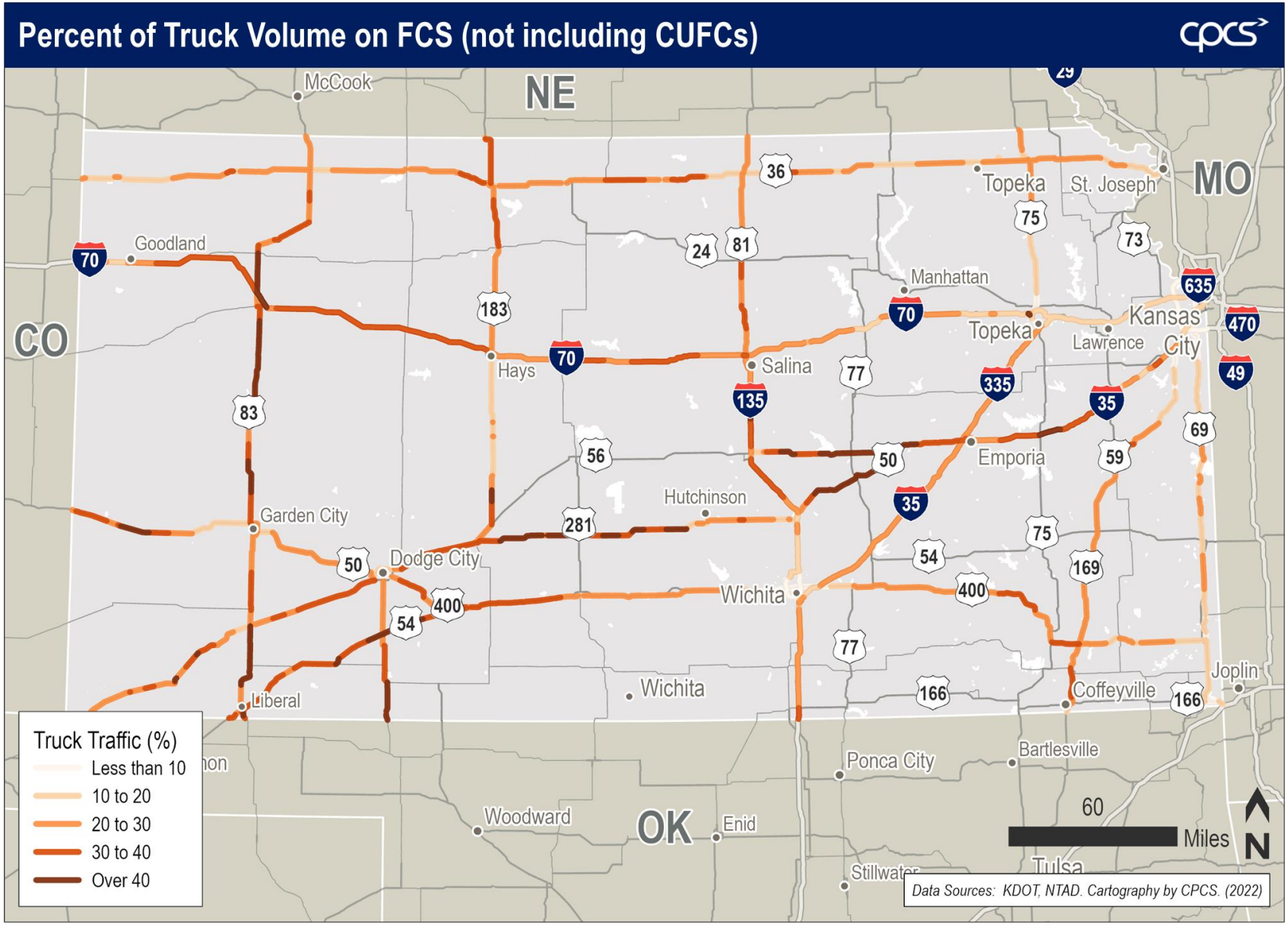


Figure 4-13: Percent of Truck Volume on the FCS (not including CUFCs)



Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Truck Parking

Truck parking must be available for freight operations to run smoothly, as truck drivers require access to safe and secure truck parking to meet federal hours-of-service requirements,[41] access basic amenities, and stage as they wait for pick-up/drop-off appointments.

*See **Appendix F** for Kansas' Truck Parking Inventory, Assessment, and Opportunities.*

Kansas is home to 167 truck parking locations that offer over 5,000 truck parking spaces.

Among the 167 truck parking locations in Kansas, 22 percent are public rest areas and 78 percent are private truck stops.[42] Private truck stops provide 4,680 spaces, making up over 93 percent of all truck parking spaces in the state. This includes truck stops located along the Kansas Turnpike. Public rest areas provide the remaining 334 spaces, making up 7 percent of Kansas' truck parking spaces. This information is further detailed in Figure 4-14 below.

Crowd-sourced Truck Parking Data

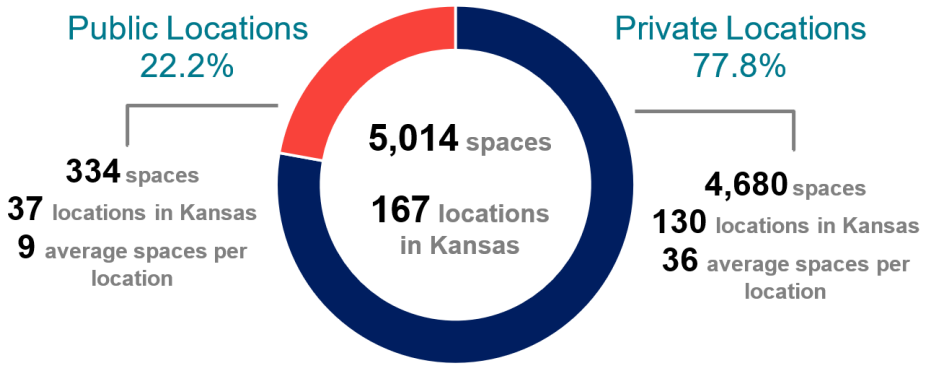
The Kansas truck parking inventory was developed using data from KDOT and Trucker Path.

Trucker Path is a smartphone application that relies on crowdsourced data from almost one million drivers to visually identify and communicate truck parking availability to other drivers. Trucker Path collects and provides information including truck parking location, parking space availability, amenities, and directions, among other information.

An additional 88 locations, providing nearly 3,400 truck parking spaces, are located outside of Kansas, but within 20 miles of the state's border.

Figure 4-15 maps truck parking locations in Kansas, as well as locations within 20 miles of the Kansas border. Truck parking locations are further classified as either public or private locations. Figure 4-16 further illustrates the concentration of spaces at truck parking locations in and surrounding Kansas. As shown, truck parking spaces are typically concentrated around major urban areas and along key freight corridors.

Figure 4-14: Public and Private Truck Parking Locations in Kansas



Source: KDOT, Trucker Path, 2021. Analysis by CPCS, 2021.

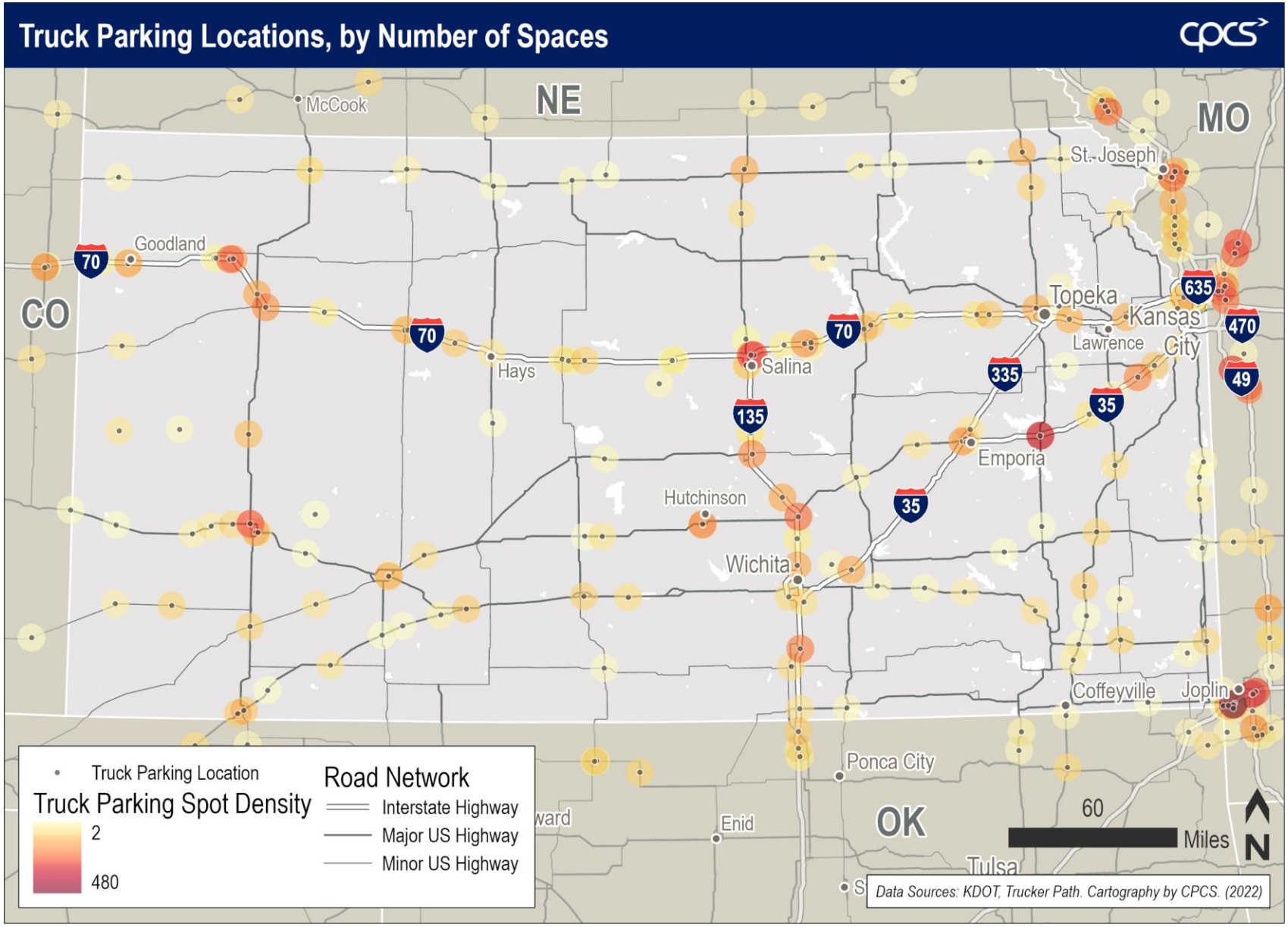
Kansas' truck parking needs and issues, as well as potential opportunities to advance truck parking in the state, are further detailed in this study. This information is also compiled into **Appendix F**, with a comprehensive overview of Kansas' truck parking inventory and assessment.

[41] FMCSA, Summary of Hours of Service Regulations, March 28, 2022, https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations#:~:text=14%2DHour%20Limit,extend%20the%2014%2Dhour%20period.

[42] This does not include informal truck parking locations where truck parking is not the primary business purpose, such as restaurants or retail parking lots and vacant lots, as truck parking at these locations is subject to change.

Figure 4-15: Public and Private Truck Parking Locations (Map)

Figure 4-16: Truck Parking Locations, by Number of Spaces (Map)



4.2 Freight Rail

Kansas' rail system plays a crucial role in the state's economy, supporting goods movement throughout the nation and to key international ports, as well as providing passengers with a long-distance travel alternative to driving or flying.

4,600+	4	13	2	7,269
Active Rail Miles	**Class I Railroads**	**Short Line Railroads**	**Switching/Terminal Railroads**	**Grade Crossings**

Source: KDOT; FRA crossing Inventory Database, 2021; Kansas Railroads, 2021. Analysis by CPCS, 2021.

Kansas is served by over 4,600 miles of active rail in the state, with four Class I railroads, 13 short lines, and 2 switching and terminal railroads, as mapped in Figure 4-17. The state's rail system includes 3,827 miles of Class I railroads, 1,909 miles of short lines, and 10.3 miles of switching and terminal railroads. There are also nearly 7,300 grade crossings present along the rail system (Figure 4-18).

Figure 4-17: Kansas Freight Rail System

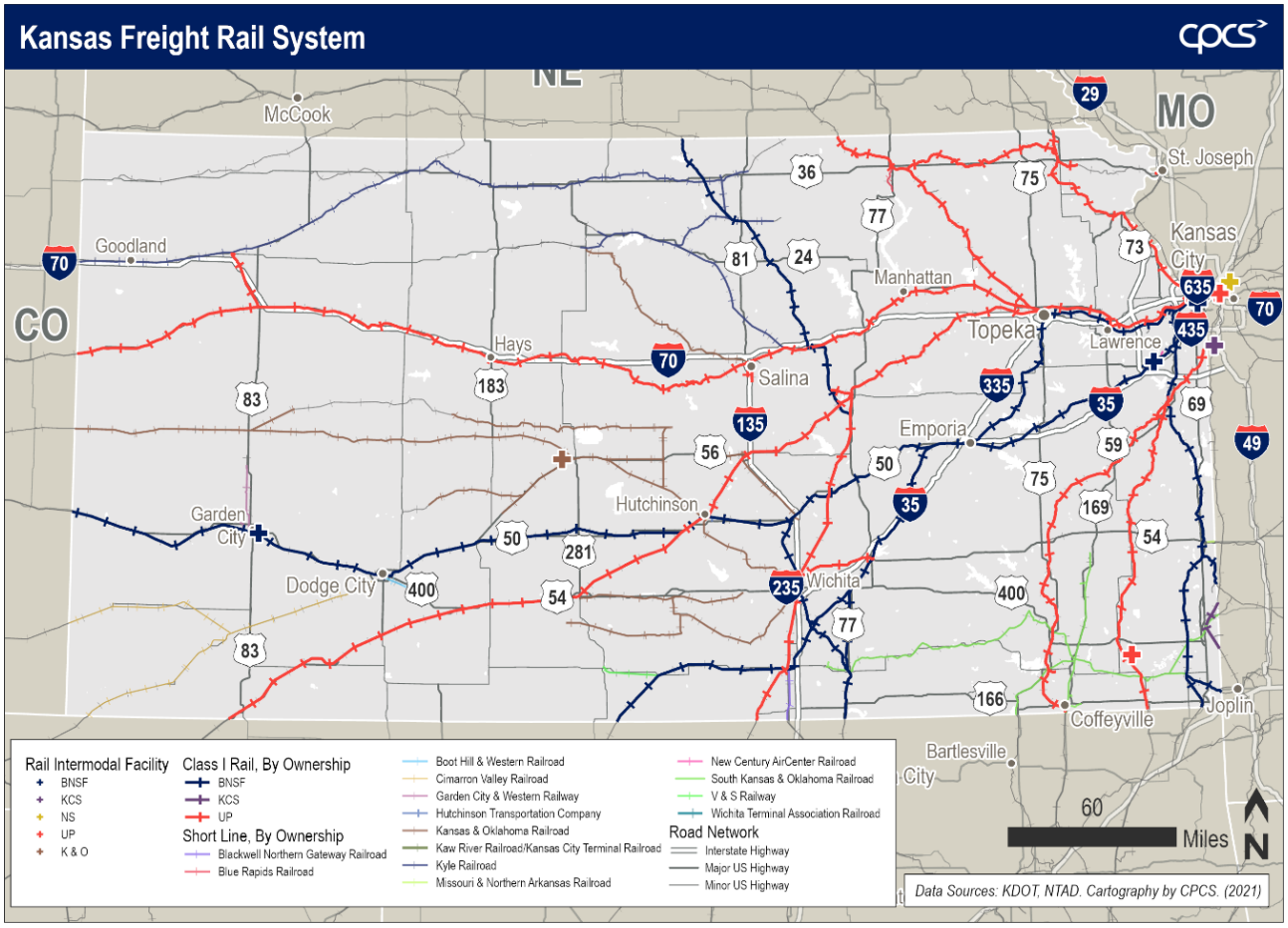


Figure 4-18: Kansas Freight Rail System (Summary Table)

	Class I	Short Line	Switching/Terminal
Operating Miles	3,827	1,909	10.3
No. of Subdivisions	61	53	5
No. of Open Grade Crossings	3,801	3,434	34

Source: KDOT; FRA crossing Inventory Database, 2021; Kansas Railroads, 2021. Analysis by CPCS, 2021.

Freight Rail Carriers

Class I

Four Class I railroads operate on 3,827 miles of rail, which includes the sum of active track owned and trackage rights.[43] It does not include miles leased *to* other railroads. Figure 4-19 summarizes Class I rail operations in Kansas.

Figure 4-19: Class I Railroads in Kansas (Summary Table)

Operator Name	Operating Miles[44]	Miles Owned (Active)	Trackage Right Miles	Miles Leased (Operational Rights, Lessor)	Miles Leased (Operational Rights, Lessee)	No. of Sub-divisions	No. of Open Grade Crossings
BNSF	1,632	1,198	434	--	--	19	1,669
KCS	20.7	20.7		--	--	1	28
NS*	3	--	3	--	--	--	--
UP	2,172	1,604	568	298.5	--	41	2,104
Total	3,827	2,823	1,005	298.5	--	61	3,801

Source: KDOT; FRA Crossing Inventory Database, 2021; Kansas Railroads, 2021. Analysis by CPCS, 2021. * Note: Information pending validation by railroads.

- **Burlington Northern Santa Fe Railway:** The BNSF Railway (BNSF) is a Class I railroad operating 32,500 miles of track in 28 US states and three Canadian provinces. In Kansas, BNSF operates on 1,632 miles of active track. This serves the entire state of Kansas, including the major urban centers of Kansas City, Topeka, and Wichita. BNSF rail lines in Kansas serve key regional networks, including the Southern Transcon corridor, which connects Chicago and Los Angeles. BNSF rail lines also support passenger rail service, with Amtrak trains running on 473 miles of active BNSF track through Kansas City, Topeka, Emporia, Newton, Dodge City, and Garden City along the Southwest Chief connecting Chicago to Los Angeles.
- **Kansas City Southern Railway**: The Kansas City Southern (KCS') Railway is a Class I railroad operating 7,100 route miles that span the Midwest and southeast regions of the US into Mexico.[45] In Kansas, KCS operates on 20.7 miles of track, with a rail yard in Pittsburg. KCS also interchanges with the South Kansas & Oklahoma Railroad (SKOL) in Pittsburg, KS.[46] KCS has significant operations in Kansas City, MO, across the Kansas state border. While KCS in

[43] A trackage rights agreement enables a railroad (tenant) to operate its trains over the tracks of another railroad (owner). Through trackage rights, railroads can expand their operations beyond their owned tracks and serve a wider range of customers. The tenant typically compensates the owner railroad through per car-mile or per ton-mile annual payments. Trackage rights agreements are regulated by the Surface Transportation Board. In a trackage right agreement, the owner railroad can restrict the number of trains per day and the types of cargoes the tenant railroad can carry.

[44] Operating miles (total) represents the sum of miles owned (active) and trackage right miles.

[45] Kansas City Southern, Annual Report, 2020, https://investors.kcsouthern.com/~/media/Files/K/KC-Southern-IR-V2/annual-reports/annual-report-2020.pdf

[46] KCS, Network Map, https://www.kcsouthern.com/en-us/why-choose-kcs/our-network/network-map.

Kansas carries some local traffic, the majority of commodities handled are for long-haul trips to and from markets throughout the country, and both north and south of the US/Mexico border.[47]

- **Norfolk Southern**: Norfolk Southern (NS) Railway is a Class I railroad that operates on 3 miles of trackage rights in Kansas, near the Kansas City area.[48]
- **Union Pacific**: Union Pacific (UP) Railroad is a Class I railroad operating in 23 states across the western US[49] In Kansas, UP operates on 2,172 miles of active track. This serves the entire state of Kansas, including the major urban centers of Kansas City, Topeka, and Wichita.

Short Line

Figure 4-20 notes short line and switching/terminal rail operations in Kansas. These railroads operate on 1,919 miles of rail, which includes active track owned, trackage rights, and miles exclusively leased from other railroads.[50]

Figure 4-20: Short Line and Switching/Terminal Railroads in Kansas (Summary Table)

Operator Name	Operating Miles	Miles Owned (Active)	Trackage Right Miles	Miles Leased (Operational Rights, Lessor)	Miles Leased (Operational Rights, Lessee)	No. of Sub-divisions	No. of Open Grade Crossings
Short Line Railroads							
BNGR	18.3	18.3	--	--	--	1	22
BRR	9.7	9.7	--	--	--	1	26
BH&W	9.6	9.6	--	--	--	1	13
CVR	182.5	178.8	3.7	--	--	3	219
GCW	35.5	35.5	--	--	--	2	65
HUTX	4.8	4.8	--	--	--	1	2
K&O	833.4	647.4	23	--	163	17	1,489
KYLE	431.5	285	11	--	135.5	6	667
M&NA	2.8	2.8	--	--	--	1	2
JCAX	6.06	6.06	--	--	--	1	13
NKCR[51]	--	--	--	--	--	--	110
SKOL	349.8	287.2	62.6	--	--	17	770
V&S	24.5	24.5	--	--	--	2	36
Switching/Terminal							
KAW/ KCTR	3.6	3.6	--	--	--	3	20
Wichita Terminal Association	6.7	6.7	--	--	--	2	14
Total	**1,919**	**1,520**	**100**	**--**	**298.5**	**58**	**3,468**

Source: KDOT; FRA Crossing Inventory Database, 2021; Kansas Railroads, 2021. Analysis by CPCS, 2021.

[47] Consultation, Kansas City Southern, June 2, 2021
[48] Note: Information pending validation by railroads.
[49] Union Pacific Website, Company Overview, https://www.up.com/aboutup/corporate_info/uprrover/index.htm.
[50] A railroad may enter into a lease agreement with another railroad to have full control of the latter railroad's lines. The lessee railroad pays the lessor railroad a certain annual rate, based on maintenance, profit, or overhead. Railroad lease agreements often include full control of operations by the lessee railroad, however, terms of lease can vary based on mutual agreement between the parties.
[51] NKCR owns 74 miles of inactive rail line in Kansas.

Operational Status

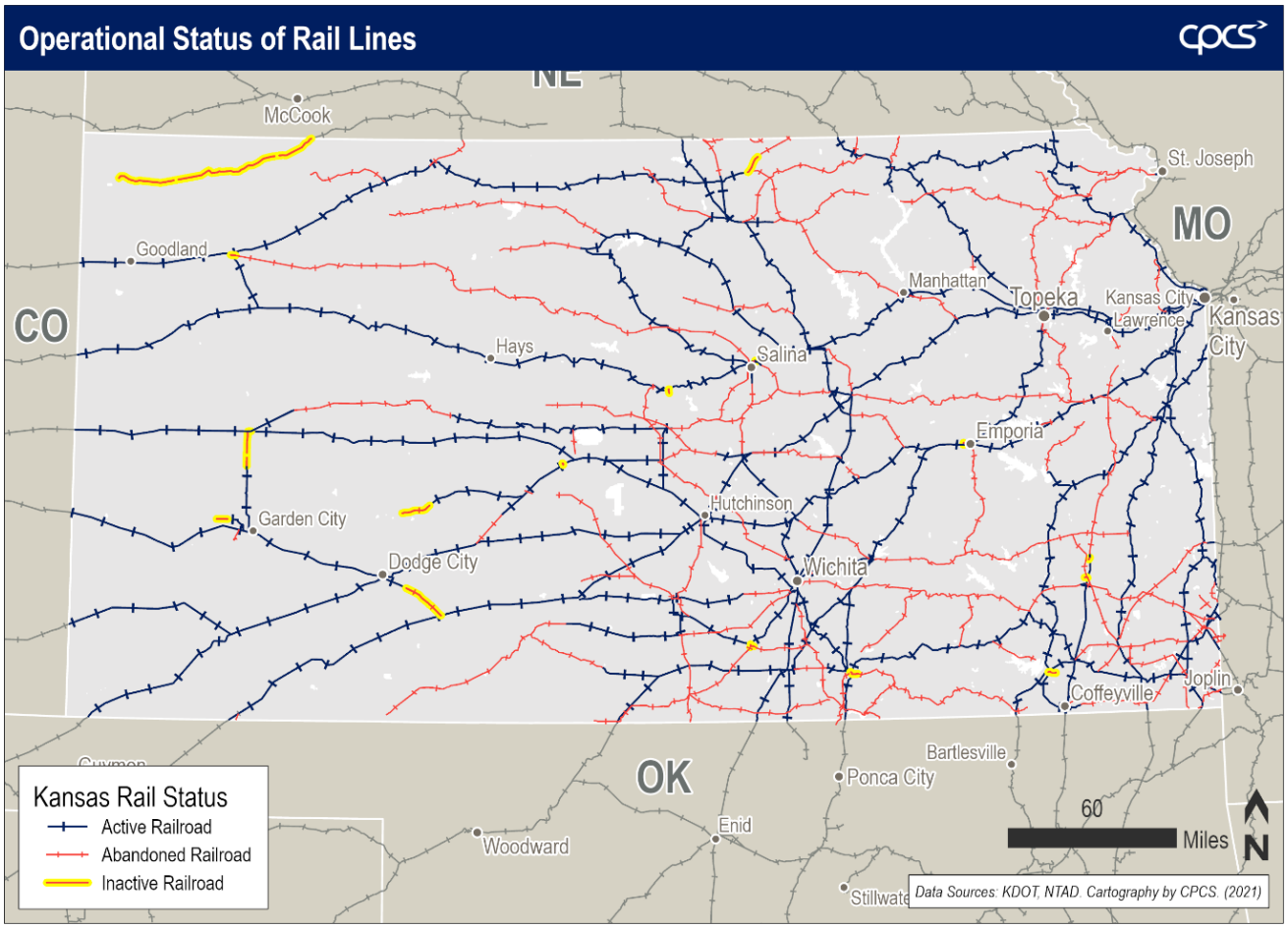
In Kansas, 3,192 miles (40 percent) of the rail track network is abandoned. Abandoned tracks are closed segments of the rail system that are no longer used for rail transportation purposes. Since an abandoned rail segment can affect all the rail users located along a line, the order for authorization of abandonment can only be issued by STB after a comprehensive review of the causes and potential impacts. About two percent of Kansas' freight rail system is inactive. This means that while trains are not operating over these segments, they are still owned by the railroads and can restart operations to serve the shippers. Figure 4-22 maps the operational status of rail lines across the state.

Figure 4-21: Freight Rail Operational Status

Status	Active	Inactive	Abandoned	Total
System Miles	4,618	142	3,192	7,953
% of Total	58%	2%	40%	100%

Source: CPCS analysis of KDOT Rail System Data, 2021.

Figure 4-22: Operational Status of Rail Lines



Source: CPCS analysis of KDOT Rail System Data, 2021.

Rail Abandonment and Alternatives

Rail owners may abandon route segments if the route does not sufficiently contribute to profits. This has impacts for shippers that use the line, as they must change their freight origins, destinations, shipping routes, or shipping modes. When a rail line is considered or designated for abandonment, it may be desirable to preserve the line for potential future use – for instance, short lines may provide service on former unprofitable or underutilized Class I rail lines. Rail lines with little prospect for short-term commercial use may be railbanked – this keeps the alignment intact by converting the rail segment to trail use. Also known as "Rails to Trails," this maintains the potential for renewed rail service, as the line is not technically classified as "abandoned." Permanently abandoned rail lines may also be converted to green spaces, particularly in urban areas.[52]

Grade Crossings

Nearly 7,160 active at-grade crossings exist across Kansas, over 70 percent of which are public crossings, and about 30 percent are private crossings. Public crossings are where rail lines intersect roadways that are under the jurisdiction of public transportation authorities and are open to the public, while private crossings are located on privately-owned roads, such as on a farm or industrial land, and can only be used by the property owner or those permitted by the owner.[53] Approximately one-quarter of both the public and private at-grade crossings in Kansas are located along the rail lines in Sedgwick, Reno, Montgomery, Cowley, Cloud, Barton, Dickinson, Sumner, and Saline Counties, with the highest number of crossings located in Sedgwick County (4.4 percent).

Additionally, 510 railroad crossings in Kansas cross over or under roadway lanes. The majority (96 percent) of these crossings are public. Figure 4-23 summarizes the number of rail crossings in Kansas by position and type. Four of the public at-grade crossings and one of the grade-separated crossings in Kansas are located along tourist train lines in Franklin, Douglas, and Dickinson Counties.

Figure 4-23: Kansas Railroad Crossings by Position and Type

Crossing Position	Private	Public	Unknown	Total
At-grade	2,125	5,032	2	7,159
Railroad under roadway bridge	-	333	-	333
Railroad over roadway bridge	21	156	-	177
Total	2,146	5,521	2	7,669

Source: CPCS analysis of FRA Crossing Inventory Database, 2021.

Rail Facilities

Rail-served multimodal facilities connect rail to other modes. In Kansas, these facilities primarily connect the rail system to the road network. The following five types of rail facilities support rail operations in Kansas:

- **Intermodal terminals** transfer containers between rail and other modes, with goods staying in the same container.
- **Transload facilities** transfer products between rail and other modes by loading and unloading goods, with the transfer depending on the type of goods. Transload facilities encompass a

[52] Caltrans Division of Research and Innovation, Rail Preservation Programs: A Survey of National Guidance and State Practice," Revised June 21, 2011, https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/preliminary-investigations/rail-preservation-pi-6-21-11-a11y.pdf; Abandoned rail tracks are being transformed into park space across the US, November 20, 2022, https://www.kcci.com/article/green-space-abandoned-rail-tracks-are-being-transformed-into-park-space-across-the-us/42007983

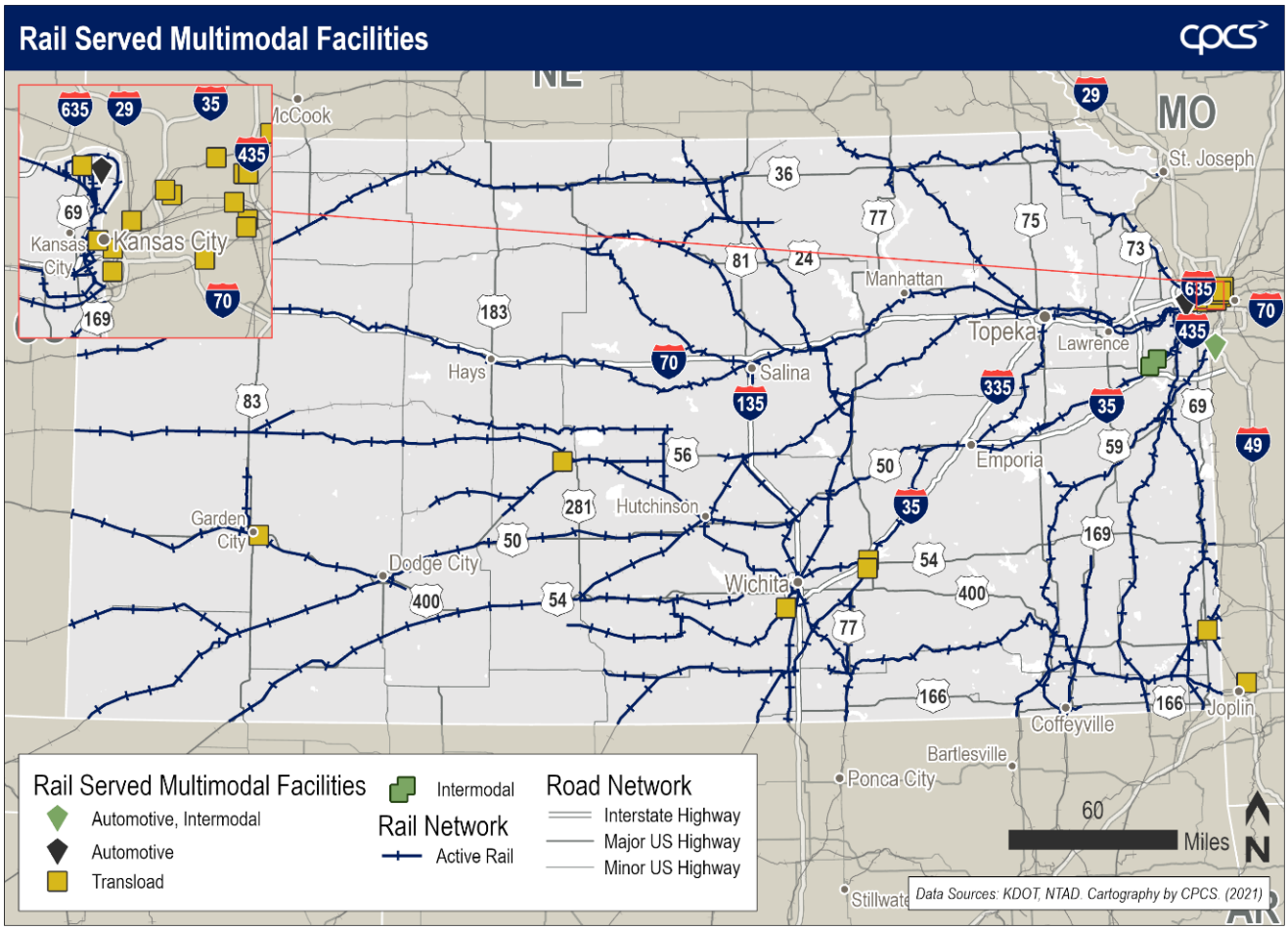
[53] 49 CFR § 234.401 – Definitions.

range of facilities, including but not limited to bulk transload terminals, warehousing and storage facilities, and rail sidings that allow for the direct transfer of cargo.

- **Automotive facilities** connect vehicle assembly or distribution facilities to the rail system.
- **Maritime facilities** provide connections between road, rail, and waterway systems.
- **Grain elevators** store grains, such as wheat, corn, and sorghum, supporting the handling and movement of those agricultural commodities.

Figure 4-24 illustrates the rail-served multimodal facilities in Kansas serving Class I railroads. **Appendix G** details the counts and locations of the rail facilities in Kansas, including those that connect to ports.

Figure 4-24: Rail-Served Multimodal Facilities in Kansas



4.3 Airports

Among the 347 airports in Kansas, 11 of them provide air cargo services.

347	120	11	3
Airports	**Public Airports**	**Commercial Airports**	**Airports Owned by US Army or Navy**

Source: FAA Airport Data and Information Portal

The Kansas Aviation System includes 347 airports, of which 120 airports are publicly owned. Figure 4-25 illustrates the locations of Kansas airports that offer cargo service.

Figure 4-25: Airports with Cargo Services in Kansas (2019)

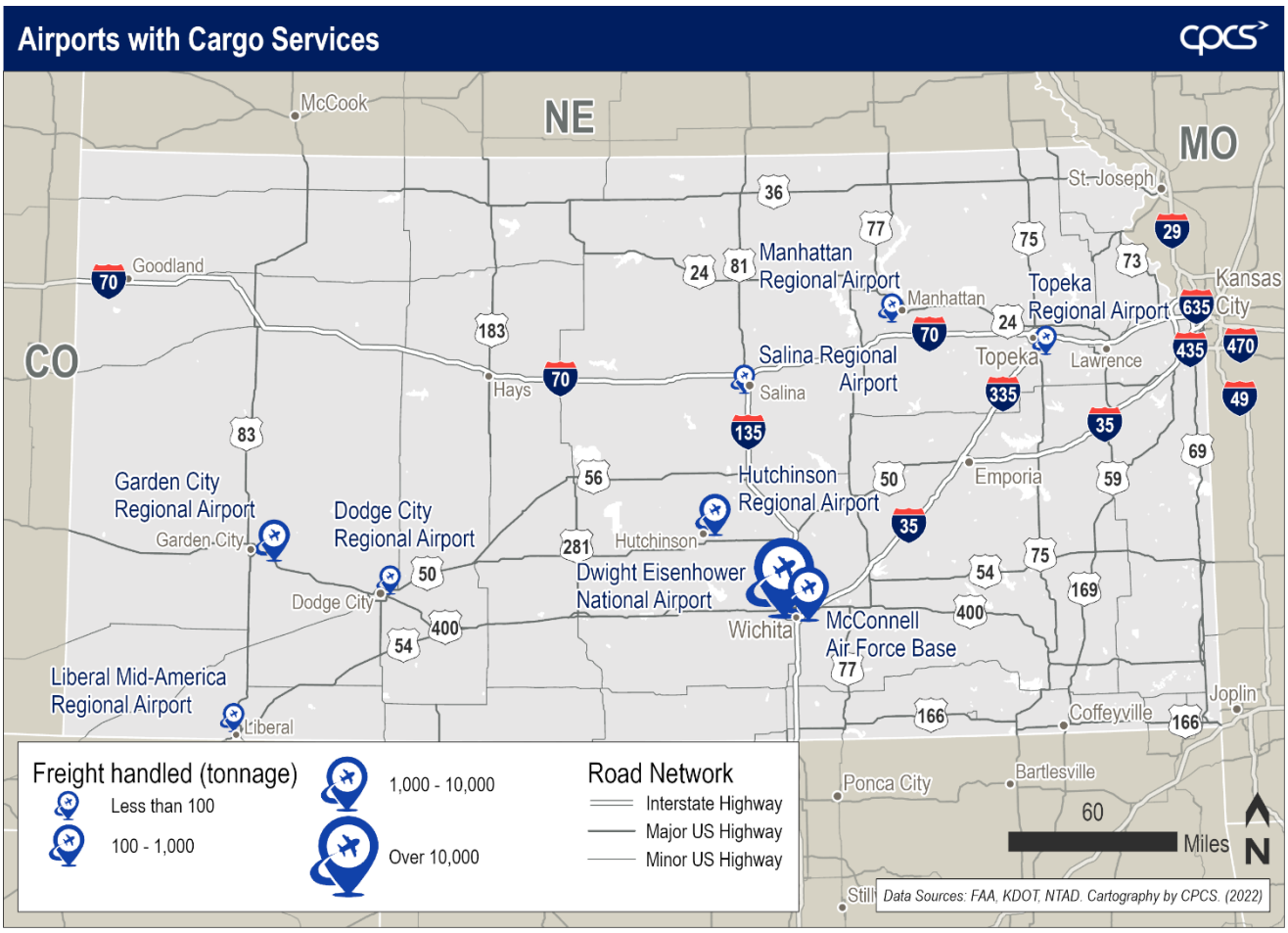


Figure 4-26 lists the 11 public airports that offer commercial services. Commercial flights allow belly cargo, which is a type of air freight service that transports goods using the lower deck of a passenger aircraft. Private airports account for almost 65 percent of the total number of airports in Kansas. Besides privately-owned and publicly-owned airports, two airports are owned by the navy, and one airport is owned by the army.[54]

[54] FAA Airport Data and Information Portal. https://adip.faa.gov/agis/public/#/public.

Figure 4-26: Commercial Airports in Kansas

Airport	County	City
Allen County Airport (K88)	Allen	Iola
Dwight D. Eisenhower National Airport (ICT)	Sedgwick	Wichita
Dodge City Regional Airport (DDC)	Ford	Dodge City
Garden City Regional (GCK)	Finney	Garden City
Hays Regional Airport (HYS)	Ellis	Hays
Liberal Mid-America Regional Airport (LBL)	Seward	Liberal
Manhattan Regional Airport (MHK)	Riley	Manhattan
New Century Aircenter (IXD)	Johnson	Olathe
Salina Regional Airport (SLN)	Saline	Salina
Topeka Regional Airport (FOE)	Topeka	Shawnee
Wellington Municipal Airport (EGT)	Sumner	Wellington

Source: FAA Airport Data and Information Portal

Cargo Air System

Kansas Cargo Airports

In 2019, nine airports in Kansas provided air cargo service. Figure 4-27 and Figure 4-28 demonstrate the outbound and inbound cargo tonnage of those airports in 2014 and 2019. The top three outbound cargo airports by tonnage are Dwight D. Eisenhower National Airport (ICT), McConnell Air Force Base, and Garden City Regional Airport. Among the top five cargo airports, ICT and Manhattan Regional Airport (MHK) experienced growth in air cargo outbound tonnage between 2014 and 2019. The amount of outbound air cargo increased significantly, changing by 326.93 percent during the five years. Similar to the change in outbound volume, ICT and MHK also saw growth in inbound air cargo between 2014 and 2019, increasing by 23.54 percent and 17.23 percent.

Figure 4-27: Outbound Cargo Tonnage by Airport

Airport	Tonnage (2019)	Tonnage (2014)	Percent of Change
Wichita Dwight D. Eisenhower National (ICT)	11,174.08	10,806.36	3.40%
McConnell Air Force Base (IAB)	4,924.97	7,026.47	-29.91%
Garden City Regional Airport (GCK)	160.26	199.82	-19.80%
Manhattan Regional Airport (MHK)	13.79	3.23	326.93%
Topeka Regional Airport (FOE)	6.32	30.58	-79.33%
Liberal Mid-America Regional Airport (LBL)	1.90	0	-
Hutchinson Regional Airport (HUT)	1.33	0	-
Dodge City Regional Airport (DDC)	0.42	0	-

Source: Bureau of Transportation Statistics, T-100 Data

Figure 4-28: Inbound Cargo Tonnage by Airport

Airport	Tonnage (2019)	Tonnage (2014)	Percent of Change
Wichita Dwight D. Eisenhower National Airport (ICT)	19,442.37	15,737.60	23.54%
McConnell Air Force Base (IAB)	2,464.62	3,797.88	-35.11%
Hutchinson Regional Airport (HUT)	640.57	0	-
Garden City Regional Airport (GCK)	252.41	257.59	-2.01%
Manhattan Regional Airport (MHK)	9.72	8.29	17.23%
Salina Regional Airport (SLN)	7.95	0	-
Topeka Regional Airport (FOE)	3.81	27.06	-85.91%
Liberal Mid-America Regional Airport (LBL)	1.34	1.36	-1.48%
Dodge City Regional Airport (DDC)	0.21	0	-

Source: Bureau of Transportation Statistics, T-100 Data

Wichita Dwight D. Eisenhower National Airport (ICT)

The Wichita Dwight D. Eisenhower National Airport (ICT) is located seven miles west of downtown Wichita, Kansas. ICT has an over 47,400 square feet cargo building and a 65,000-square-yard air cargo apron. The airport is also equipped with a 204,000-gallon underground fuel storage.[55] ICT also has three runways that can accommodate wide-body aircraft, as demonstrated in Figure 4-29.

Air cargo providers at ICT include DHL, FedEx, UPS, UPS Supply Chain Solutions, Southwest Airlines Cargo, Empire Airlines, and Integrated Airline Services.[56] In January 2022, Amazon Air started services at ICT. The daily cargo service is between Wichita and Amazon Air's regional hub at Fort Worth Alliance Airport. This new air cargo connection brings express delivery to Prime customers in the Wichita region.[57]

Figure 4-30 and Figure 4-31 demonstrate the outbound and inbound airports that connect to ICT. In general, ICT received more freight by tonnage than exportation. 10,690.61 tons of cargo originated from Memphis International Airport (MEM) in 2019, making MEM the top origin. Similarly, MEM is also the top destination for cargo from ICT, totaling nearly 6,000 tons in 2019. Other major trading airports include Louisville Muhammad Ali International Airport and Fort Worth Alliance Airport.

Figure 4-29: ICT Runway Profile

Runway	Dimension (Feet)	Marking Condition
01L/19R	10,301 * 150	Good
01R/19L	7,301 * 150	Good
14/32	6,301 * 150	Good

Source: FAA Airport Data and Information Portal

[55] Wichita Dwight D. Eisenhower National Airport Brochure. https://www.flywichita.com/wp-content/uploads/2015/01/NBAA-Brochure.pdf
[56] Wichita Dwight D. Eisenhower National Airport Cargo Operations. https://www.flywichita.com/cargo-operations/
[57] Amazon Air Takes off in Wichita with Express Delivery. January 24, 2022. https://www.pymnts.com/amazon/2022/amazon-air-takes-off-in-wichita-with-express-delivery/

Figure 4-30: ICT Top Origins by Tonnage (2019)

	Origin	Tonnage
1	Memphis International Airport (MEM)	10,690.61
2	Louisville Muhammad Ali International Airport (SDF)	3,665.73
3	Fort Worth Alliance Airport (AFW)	1,871.03
4	Indianapolis International Airport (IND)	897.01
5	Piedmont Triad International Airport (GSO)	398.12
6	St. Louis Lambert International Airport (STL)	309.71
7	Dayton International Airport (DAY)	284.25
8	Springfield-Branson National Airport (SGF)	252.51
9	Mitchell Airport (MKE)	214.85
10	Luis Muñoz Marín International Airport (SJU)	169.85

Source: Bureau of Transportation Statistics, T-100 Data

Figure 4-31: ICT Top Destinations by Tonnage (2019)

	Destination	Tonnage
1	Memphis International Airport (MEM)	5,922.49
2	Louisville Muhammad Ali International Airport (SDF)	2,050.55
3	Fort Worth Alliance Airport (AFW)	1,106.66
4	Springfield-Branson National Airport (SGF)	480.68
5	Tijuana International Airport (TIJ)	374.57
6	Mobile Downtown Airport (BFM)	347.38
7	Dallas Fort Worth International Airport (DFW)	234.12
8	Garden City Regional Airport (GCK)	152.85
9	Sioux Falls Regional Airport (FSD)	54.56
10	Omaha Eppley Airfield (OMA)	52.61

Source: Bureau of Transportation Statistics, T-100 Data

McConnell Air Force Base (IAB)

McConnell Air Force Base (IAB) is about four miles southeast of the Central Business District of Wichita, Kansas, and is owned by US Army. It has been playing a crucial role in the development of the aviation industry and the national defense since 1924. The primary tenants include the 22nd Air Refueling Wing, the 184th Wing, and 931st Air Refueling Wing. The Base employed a total of 17,169 personnel. The estimated overall economic impact was more than $600 million per year in 2019.[58][59] The Airport has two runways that can accommodate heavy wide-body aircraft (Figure 4-32).

[58] The History & Impact of McConnell. Published on April 15, 2019. https://thechungreport.com/the-history-and-impact-of-mcconnell/#:~:text=With%20a%20total%20of%2017%2C169,by%20the%20U.S.%20Air%20Force.&text=Of%20the%20families%20and%20individuals,1%2C100%20actually%20reside%20on%20base.

[59] History and Legacy: A Brief History of the 22nd Air Refueling Wing and McConnell Air Force Base. Published in December 2017. https://www.mcconnell.af.mil/Portals/27/22%20ARW%20Heritage%20Pamphlet%20%28Jul%202019%29.pdf

Boeing supplies various air force equipment to IAB. Hence the air freight movements between IAB and Paine Field Airport (PAE) and Charleston International Airport (CHS), which are both locations of Boeing factories (Figure 4-33 and Figure 4-34). In May 2020, the Air Force and Boeing continued their collaboration and reached an agreement to bring a new Remote Vision System to the base.[60] In addition, Spirit Aerosystems uses IAB to deliver finished aircraft and parts to Boeing and other clients across the nation.[61]

Figure 4-32: IAB Runway Profile

Runway	Dimension (Feet)	Marking Condition
01L/19R	12,000 * 150	NA
01R/19L	12,007 * 150	Fair

Source: FAA Airport Data and Information Portal

Figure 4-33: IAB Top Origins by Tonnage (2019)

	Origin	Tonnage
1	Paine Field Airport (PAE)	4,802.56
2	Charleston International Airport (CHS)	122.41

Source: CPCS Analysis of Bureau of Transportation Statistics, T-100 Data

Figure 4-34: IAB Top Destinations by Tonnage (2019)

	Destination	Tonnage
1	Charleston International Airport (CHS)	99.26
2	Paine Field Airport (PAE)	2,365.36

Source: CPCS Analysis of Bureau of Transportation Statistics, T-100 Data

Garden City Regional Airport (GCK)

Garden City Regional Airport (GCK) is located nine miles southeast of Garden City, Kansas. GCK has two runways (Figure 4-35) that are capable of accommodating narrow-body aircraft. Figure 4-36 and Figure 4-37 show that GCK offered freight services to various domestic and international airports, including Dwight D. Eisenhower National Airport, Orcas Island Airport, Spokane International Airport, Winnipeg James Armstrong Richardson International Airport, and Leonardo da Vinci International Airport. The Airport also has one scheduled commercial flight to and from Dallas/Fort Worth International Airport (DFW), which provides GCK with some belly cargo capacity.[62]

Figure 4-35: GCK Runway Profile

Runway	Dimension (Feet)	Marking Condition
12/30	5,700 * 100	Good
17/35	72,99 * 100	Good

Source: FAA Airport Data and Information Portal

[60] 344th ARS: Fueling the development of RVS 2.0. Published in May 11, 2020. https://www.mcconnell.af.mil/News/Article/2182776/344th-ars-fueling-the-development-of-rvs-20/

[61] 2017 Kansas State Freight Plan. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/KDOTPublicCommentFreightPlanWithAppendices.pdf

[62] CPCS Analysis of Bureau of Transportation Statistics, T-100 Data.

Figure 4-36: GCK Top Origins by Tonnage (2019)

	Origin	Tonnage
1	Dwight D. Eisenhower National Airport (ICT)	152.85
2	Winnipeg James Armstrong Richardson International Airport (YWG)	16.25
3	Spokane International Airport (GEG)	15.75
4	Austin-Bergstrom International Airport (AUS)	14.89
5	Fort Worth Alliance Airport (AFW)	14.02
6	Oakland International Airport (OAK)	12.88
7	Memphis International Airport (MEM)	11.92
8	Sawyer International Airport (MQT)	10.33
9	Meadows Field Airport (BFL)	1.92
10	Liberal Mid-America Regional Airport (LBL)	1.34
11	Dallas/Fort Worth International Airport (DFW)	0.28

Source: CPCS Analysis of Bureau of Transportation Statistics, T-100 Data

Figure 4-37: GCK Top Destinations by Tonnage (2019)

	Destination	Tonnage
1	Dwight D. Eisenhower National Airport (ICT)	121.92
2	Orcas Island Airport (ESD)	13.81
3	Portland International Airport (PDX)	10.85
4	Aberdeen Regional Airport (ABR)	10.40
5	Will Rogers World Airport (OKC)	1.58
6	Hutchinson Regional Airport (HUT)	1.333
7	Leonardo da Vinci International Airport (FCO)	0.36
8	Dallas/Fort Worth International Airport (DFW)	0.0025

Source: CPCS Analysis of Bureau of Transportation Statistics, T-100 Data

Cessna Aircraft Field (CEA)

The Cessna Aircraft Field (CEA) is located four nautical miles southeast of Wichita, Kansas and is privately owned by the Cessna Aircraft Company. Even though CEA doesn't have any freight operations, it is the home to the main plant and headquarters of Textron Aviation, the manufacturer of Cessna and Beechcraft.

Nearby Cargo Airports

The accessibility and proximity to neighboring states allow Kansas freight shippers to choose the nearby airports for air freight transportation. Illustrated in Figure 4-38 and Figure 4-39, those airports include Denver International Airport (DEN), Kansas City International Airport (MCI), Eppley Airfield (OMA), Tulsa International Airport (TUL), and Will Rogers World Airport (OKC).

Figure 4-38: Nearby Cargo Airports

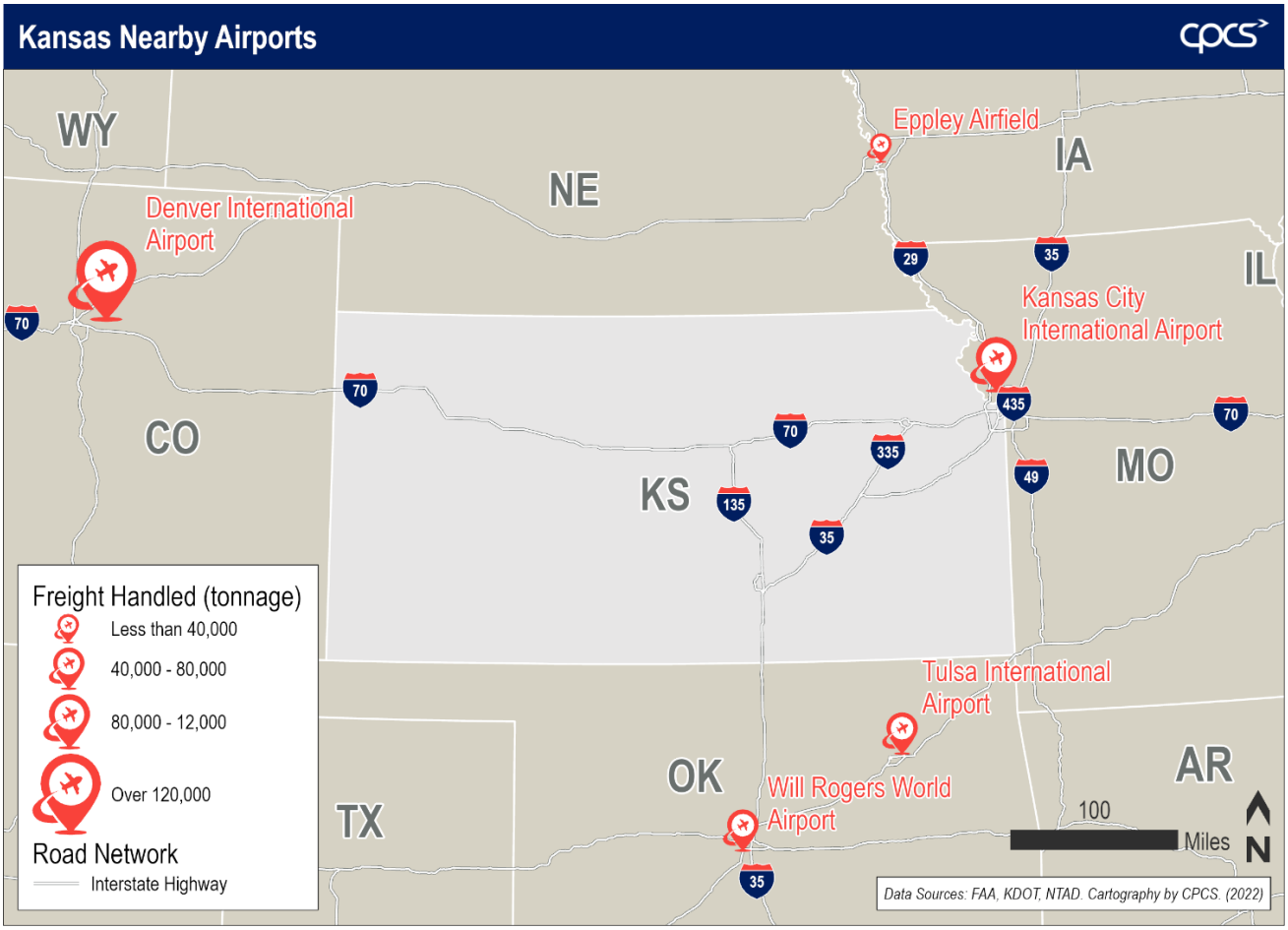


Figure 4-39: Nearby Freight Airports

Airport	Location	Tonnage (2014)	Tonnage (2019)	Percent of Change
Denver International Airport (DEN)	Denver, CO	251,234.30	296,976.70	18.2%
Kansas City International Airport (MCI)	Kansas City, MO	100,795.00	100,292,00	-0.5%
Eppley Airfield (OMA)	Omaha, OK	36,653.39	38,797.23	5.8%
Tulsa International Airport (TUL)	Tulsa, OK	61,730.96	75,459.45	22.2%
Will Rogers World Airport (OKC)	Oklahoma City, OK	57,653.22	71,150.69	23.4%

Source: CPCS Analysis of Bureau of Transportation Statistics, T-100 Data

4.4 Maritime

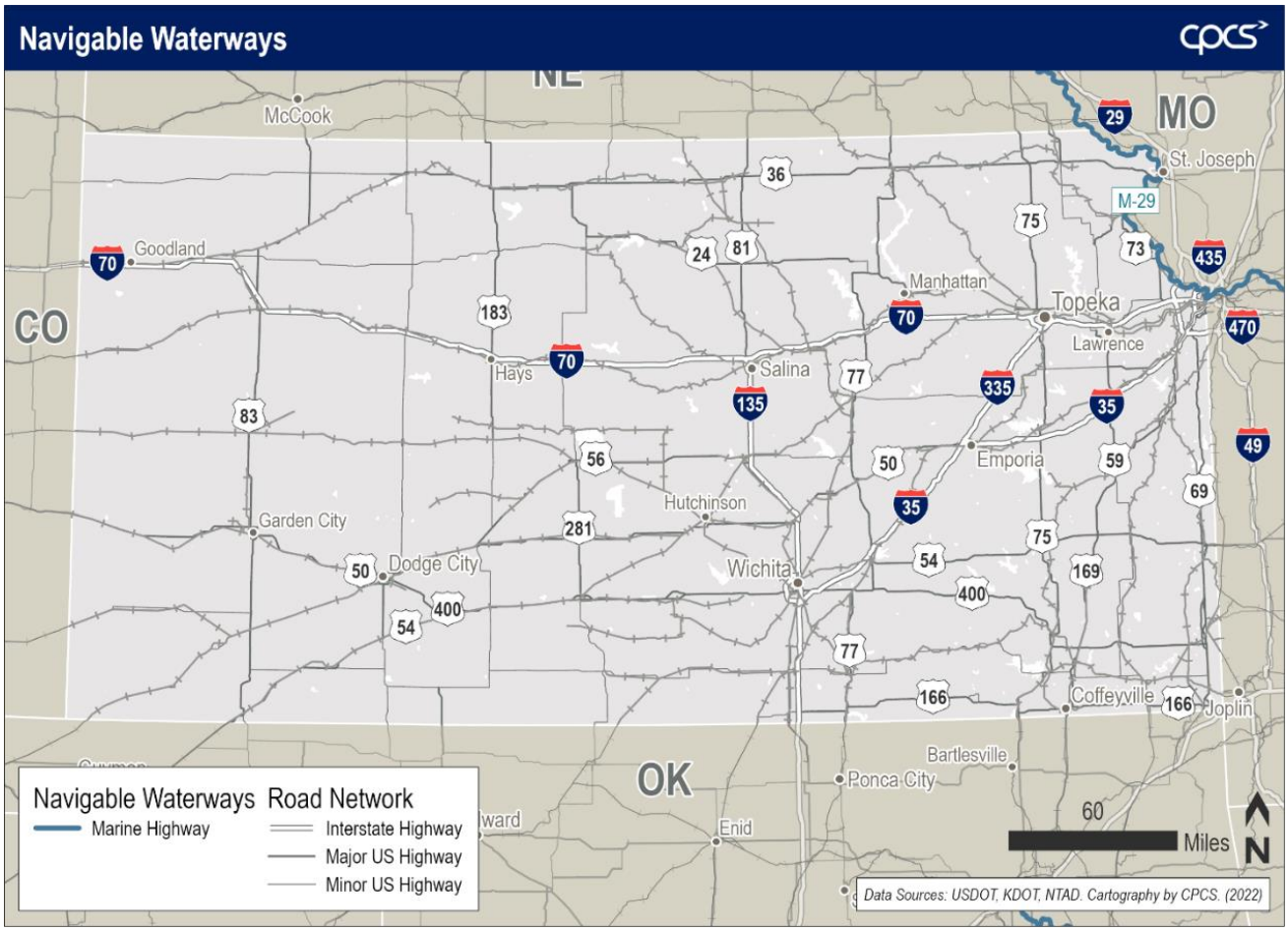
Kansas has 121 Marine Highway miles designated by the US Department of Transportation Maritime Administration (MARAD) and 6 active docks supporting freight movements by water.

121	6	M-29
Marine Highway Miles	**Docks**	**Marine Highway Route in Kansas**

Source: USACE; MARAD

The Missouri River, the longest river in North America, flows between the states of Kansas and Missouri before turning east at Kansas City (Figure 4-40). A portion of the river is designated by the US Department of Transportation Maritime Administration (MARAD) as Marine Highway M-29 (M-29).[63] M-29 starts from the middle section of the Missouri River in Sioux City, Iowa, and ends at M-70 in Kansas City, MO. Approximately 121 miles of M-29 run along the northeast corner of Kansas, supporting six public and private ports and docks and providing businesses in Kansas direct access to inland barge transportation.

Figure 4-40: Navigable Waterway in Kansas



[63] The Marine Highway system is a series of all-water routes that serve as extensions of the surface transportation system. The routes provide relief to landside corridors that suffer from traffic congestion and environmental pollutions from excessive air emissions.

Waterway System

Kansas Docks

The US Army Corps of Engineers (USACE) identifies six active docks in Kansas, which are listed in Figure 4-41. These docks process a various range of commodities, including chemical and agricultural products. USACE also records five inactive docks, listed in Figure 4-42.

Figure 4-41: USACE Identified Docks in Kansas (2021)

Owner and Operator	Location	River Mile	Commodity
The Kansas City-Wyandotte County Joint Port Authority	Kansas City	367.6	Shipment of grain.
Ergon Asphalt & Emulsions, Inc.	Wolcott	386.4	Receipt of calcium chloride and asphalt.
ADM/Growmark, subsidiary of Archer-Daniels-Midland Co.	Wolcott	386.6	Shipment of grain.
Drexel Chemicals	Leavenworth	395.9	Receipt of liquid fertilizer.
Maczuk, Industries, Inc.	Atchison	423.1	Receipt of liquid fertilizer.
White Cloud Grain Co., Inc.	White Cloud	488	Receipt of liquid- and dry-bulk fertilizer; shipment of grain.

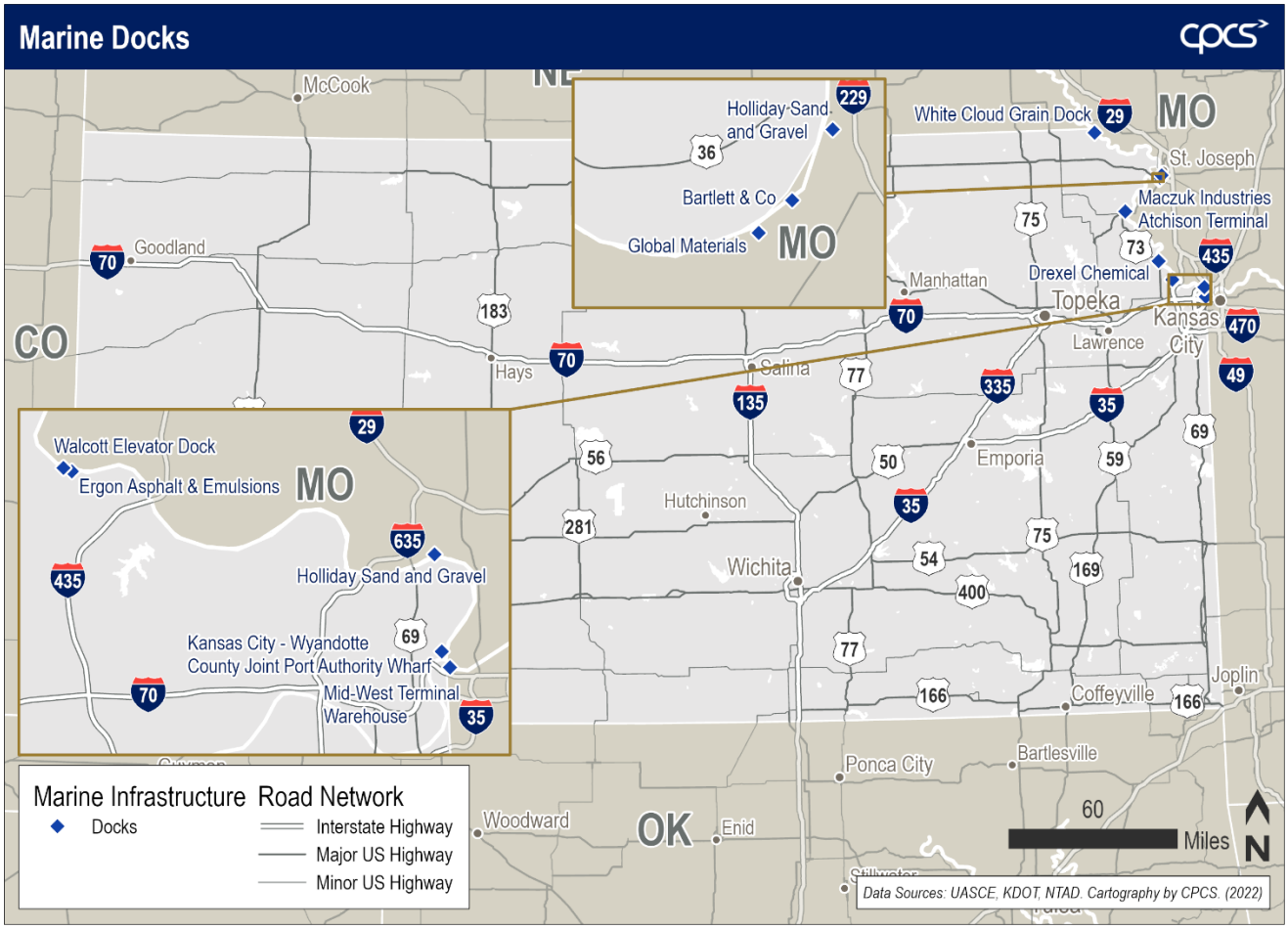
Source: USACE

Figure 4-42: Inactive Docks (2021)

Owner and Operator	Location	Commodity
Smoot Grain Co., Salina Terminal Elevator Dock	Kansas City	NA
AGP Grain Cooperative	Atchison	NA
AGP Grain Cooperative, Barge Dock.	Atchison	Shipment of grain
AGP Grain Cooperative, North Dock	Atchison	N/A
Farmland Industries Grain Elevator	Kansas City	Shipment of grain

Source: USACE

Figure 4-43: USACE Identified Docks



Missouri Docks

Figure 4-44 identifies active and inactive docks on the Missouri side of the Missouri River. The four active docks mainly ship grains, fertilizers, and sand and gravel.

Figure 4-44: Docks on the Missouri River in Missouri (2021)

Owner and Operator	Location	Status	Commodity
Global Materials	St. Joseph	Active	NA
Bartlett and Co St. Joseph Wharf	St. Joseph	Active	Shipment of grain.
Holliday Sand and Gravel Co.	St. Joseph	Active	Receipt of sand and gravel.
Mid-west Terminal Warehouse Co. Wharf	Kansas City	Active	Receipt and shipment of miscellaneous bulk materials; and receipt of salt and dry-bulk fertilizer.
AG Processing St, Joseph Dock	St. Joseph	Inactive	NA
Intercontinental Engineering-Manufacturing Corp Wharf	Riverside	Inactive	Shipment of heavy-duty winch equipment; and handling miscellaneous heavy-lift commodities.
Massman Construction Co	Waldron	Inactive	Handling contractor's supplies and equipment.

Source: USACE

Nearby Ports and Facilities

Port of Kansas City, Missouri

Port of Kansas City is an inland port on the Missouri River at river mile 367.1. It is on Marine Highway M-70, which connects M-29 from Sioux City, Iowa to New Orleans, Chicago, Minneapolis, and other major cities in the eastern United States.[64] Even though it is located in Missouri, the proximity to Kansas makes the Port a choice for freight shippers in Kansas.

The Woodswether Terminal at Port of Kansas City is about nine acres and is served by the Union Pacific Railroad. The Terminal and the Port have undergone a series of renovations since it reopened in 2015.

Port of Catoosa, Oklahoma

The Port of Catoosa is located at the head of navigation for the McClellan-Kerr Arkansas River Navigation System, near the city of Catoosa in Oklahoma. The Port has five public terminals that provide connections between barges, trucks, and railroads. Since its opening in January 1971, the Port has shipped 87 million tons of goods.

How Congested Ports Impact Kansas Exports

Container ports are major gateways to international trade in the US, handling nearly 70 percent of the country's international goods movement by volume in 2021.[65] In the past few years, the Ports of Los Angeles and Long Beach (LA/LB) – the busiest US port complex – experienced severe congestion and only got some relief when the shipping backup shifted to East Coast and Gulf Coast ports in early 2022.[66] The impacts of overwhelmed ports on shippers are soaring ocean freight rates and long unloading time: the average international shipping rates reached $10,174/FEU in August 2021, a 466 percent increase over the previous year; the backup at the Ports of LA/LB caused more than 80 vessels loitering offshore and waiting to be unloaded and reloaded in October 2021, and now similar backups are appearing at the Port Houston.[67,68,69]

These impacts threaten Kansas exporters:

- **Aerospace Manufacturing Industry**: A stakeholder from the aerospace industry in Kansas revealed that many of their supplies are from California or international ocean shipments through California. The backup at LA/LB impacted timely deliveries of their supplies. The company also ships time-sensitive aerospace products to domestic and international customers using air cargo. The skyrocketing ocean shipping rates inflated the air freight market, increasing the company's air shipping costs.[70]
- **Agricultural Industry**: Agricultural and food products accounted for nearly 30 percent of foreign exports by volume in 2017, of which 51.2 percent was transported via water. Near 40 percent of the agricultural and food products were shipped to Texas and California before being transported across oceans to their foreign destinations.[71] The increasing ocean shipping cost and the port congestion are likely to burden Kansas' agricultural product manufacturers.

[64] America's Marine Highway Route Designations. https://cms.marad.dot.gov/sites/marad.dot.gov/files/2021-08/Route%20Designation%20one-pagers%20Aug%202021.pdf
[65] US – International Freight Trade by Transportation Mode. https://www.bts.gov/browse-statistical-products-and-data/freight-facts-and-figures/us-international-freight-trade
[66] U.S. Shipping Backups Shift to East Coast and Gulf Coast Ports, the Wall Street Journal, Aug. 17, 2022. https://www.wsj.com/articles/u-s-shipping-backups-shift-to-east-coast-and-gulf-coast-ports-11660755401
[67] Freightos Baltic Index: Global Container Freight Index, Freightos, Oct. 4, 2022. https://fbx.freightos.com/
[68] Is the ports logjam really getting better? The numbers don't tell the whole story, The Los Angeles Times, Dec. 3, 2021. https://www.latimes.com/business/story/2021-12-03/officials-say-the-ports-logjam-is-easing-but-numbers-dont-tell-the-whole-story
[69] Ibid.
[70] Stakeholder Consultation with Spirit AeroSystems, Sep. 12, 2022.
[71] CPCS Analysis of FAF 5.

4.5 Pipelines

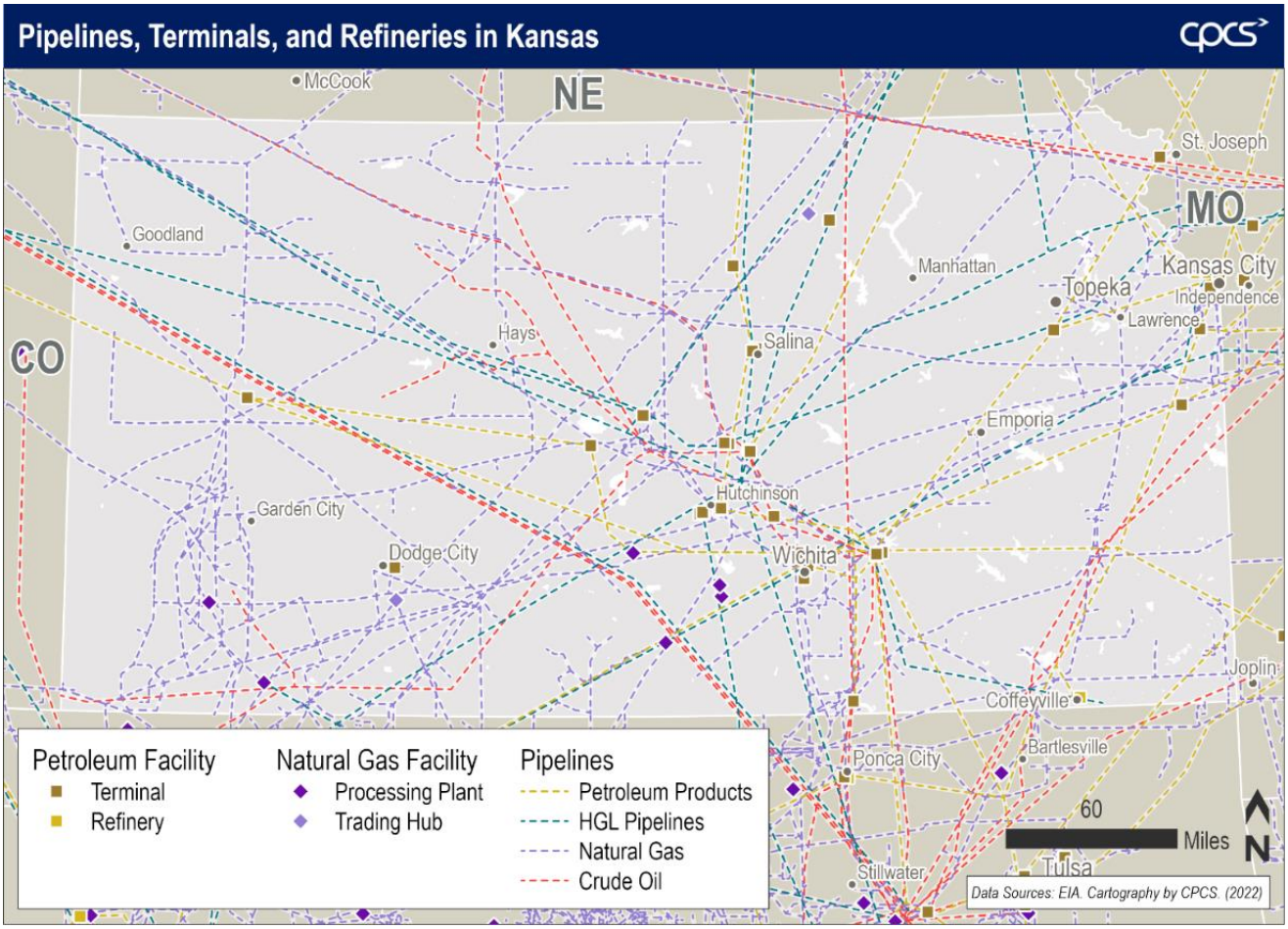
Kansas supports an extensive network of pipelines carrying natural gas, crude oil, and various petroleum products.

48,639	11,769	3	16
Gas Pipeline Miles	**Hazardous Liquid Pipeline Miles**	**Refineries**	**Underground Natural Gas Storage Fields**

Source: CPCS analysis of USDOT, Pipeline and Hazardous Materials Safety Administration, and EIA data

Over 60,400 miles of pipeline deliver crude oil, natural gas, hazardous liquid, and other energy products to and from Kansas. The state is also home to 3 crude oil refineries, which provide a production capacity of 403,800 barrels per calendar day, as well as 16 underground natural gas storage fields.

Figure 4-45: Pipeline in Kansas



The Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates and oversees the safety operations and secure movement of daily shipments of hazardous materials by pipeline. The Kansas Corporation Commission (KCC), certified by PHMSA, enforces federal and state pipeline safety regulations over three large natural gas distribution utilities, including ATMOS Energy Corporation, Black Hills / Kansas Gas Utility CO., and Kansas Gas Service, a division of ONEOK, Inc.

In addition, KCC also oversees the rate and tariff activities of a few interstate pipelines that provide service to Kansas.[72]

Pipeline System

Approximately 60,400 miles of gas and hazardous liquid pipelines pass through Kansas, carrying over 9.7 billion worth of natural gas, crude oil, highly volatile liquids, refined petroleum products, etc.[73] Figure 4-46 demonstrates the pipeline mileage, number of tanks, and number of operators breakdown by commodity.

Figure 4-46: Kansas Pipeline Miles and Operators (2020)

Commodity Type		Pipeline Miles	Number of Tanks	Number of Operators
Gas Transmission		13,657.3	NA	46
Gas Gathering		17.7	NA	7
Gas Distribution		34,964.1	NA	65
Hazardous Liquid	Crude Oil	3291.5	55	16
	CO2	29.0	0	2
	HVL	5081.6	17	12
	Refined Petroleum	3,367	103	9
Liquefied Natural Gas		N/A	N/A	N/A
Total		60,408.2	175	-

Source: CPCS analysis of the US Department of Transportation Pipeline and Hazardous Materials Safety Administration data, 2021

Crude Oil and Refineries

Due to Kansas' central location, multiple major crude oil pipelines pass through the state. The majority of the twelve crude oil pipelines in Kansas deliver crude oil from Oklahoma and Texas to Midwest and the Great Lakes regions (Figure 4-47). The Platte Pipeline and the Keystone Pipeline originate from Canada and transport the crude oil from the north to the refineries in the US.

Kansas is an oil-refinery state. The three refineries have a production capacity of 403,800 barrels per day.

The three refineries in Kansas include:

- **CHS McPherson Refinery Inc.** is located in McPherson, Kansas. The refinery receives the majority of the feedstock from local Kansas producers and supplies fuel across the Midwest and Southern US.[74] The CHS refinery produces alkylates, hydrogen, isomers, marketable petroleum coke, and sulfur and has a capacity of 109,800 barrels per calendar day.[75,76]
- **Coffeyville Resources Refining & Marketing, LLC** operates a crude oil refinery in Coffeyville, Kansas. The refinery processes moderately heavy, medium sulfur crude oil from various domestic and international sources and produces primarily clean transportation products, such

[72] Kansas Corporation Commission FY2021 in Review. https://kcc.ks.gov/images/PDFs/legislative-reports/Fiscal%20Year%202021%20In%20Review.pdf
[73] CPCS Analysis of FAF 5 Data, 2022.
[74] CHS Refined Fuels. https://www.chsinc.com/our-businesses/refined-fuels
[75] EIA Production Capacity of Operable Petroleum Refineries. https://www.eia.gov/dnav/pet/pet_pnp_capprod_dcu_SKS_a.htm
[76] EIA Table 5. Refiners' Total Operable Atmospheric Crude Oil Distillation Capacity as of January 1, 2021. https://www.eia.gov/petroleum/refinerycapacity/table5.pdf

as gasoline, diesel fuels, and propane. The capacity of the refinery is 132,000 barrels per calendar day. The gasoline, diesel fuel, and natural gas liquids are distributed through Magellan's Central and Mountain pipelines and NuStar LP pipelines and serve markets in Arkansas, Iowa, Kansas, Missouri, Nebraska, Oklahoma, and South Dakota.[77]

- **HollyFrontier El Dorado Refining LLC** has a refinery in El Dorado, Kansas with a crude oil refining capacity of 162,000 barrels per calendar day.[78] The refinery has direct access to the Cushing, Oklahoma hub and has the flexibility to choose from diverse types of crude oil. The refined products include Alkylates, asphalt and road oil, hydrogen, isomers, marketable petroleum coke, and sulfur and serve markets in eastern Colorado, eastern Wyoming, and the plain states.[79][80]

Figure 4-47: Crude Oil Pipeline in Kansas

Operator	Pipeline	Length (Miles)	Volume (Billion Barrel-Miles)
BP Pipeline	Cushing – Whiting	132.3	29.9
CHS Energy	Jayhawk Pipeline	681.9	NA
	Kaw Pipeline	NA	
Enbridge	Midcontinent (Ozark)	5	140.9
	Spearhead	245.4	
Spectra Energy (owned by Enbridge)	Platte Pipeline	NA	
Magellan Midstream Partners	Osage	60.3	112.6
	Saddlehorn Grand Mesa Pipeline	363.2	
Plains All American Pipeline	Coffeyville	101.1	341.5
Tallgrass Energy	Pony Express Pipeline	366.2	93.4
TransCanada	Keystone	310.4	312.6
Western Gas	White Cliffs Pipeline	283.3	11.8

Source: EIA; PHMSA

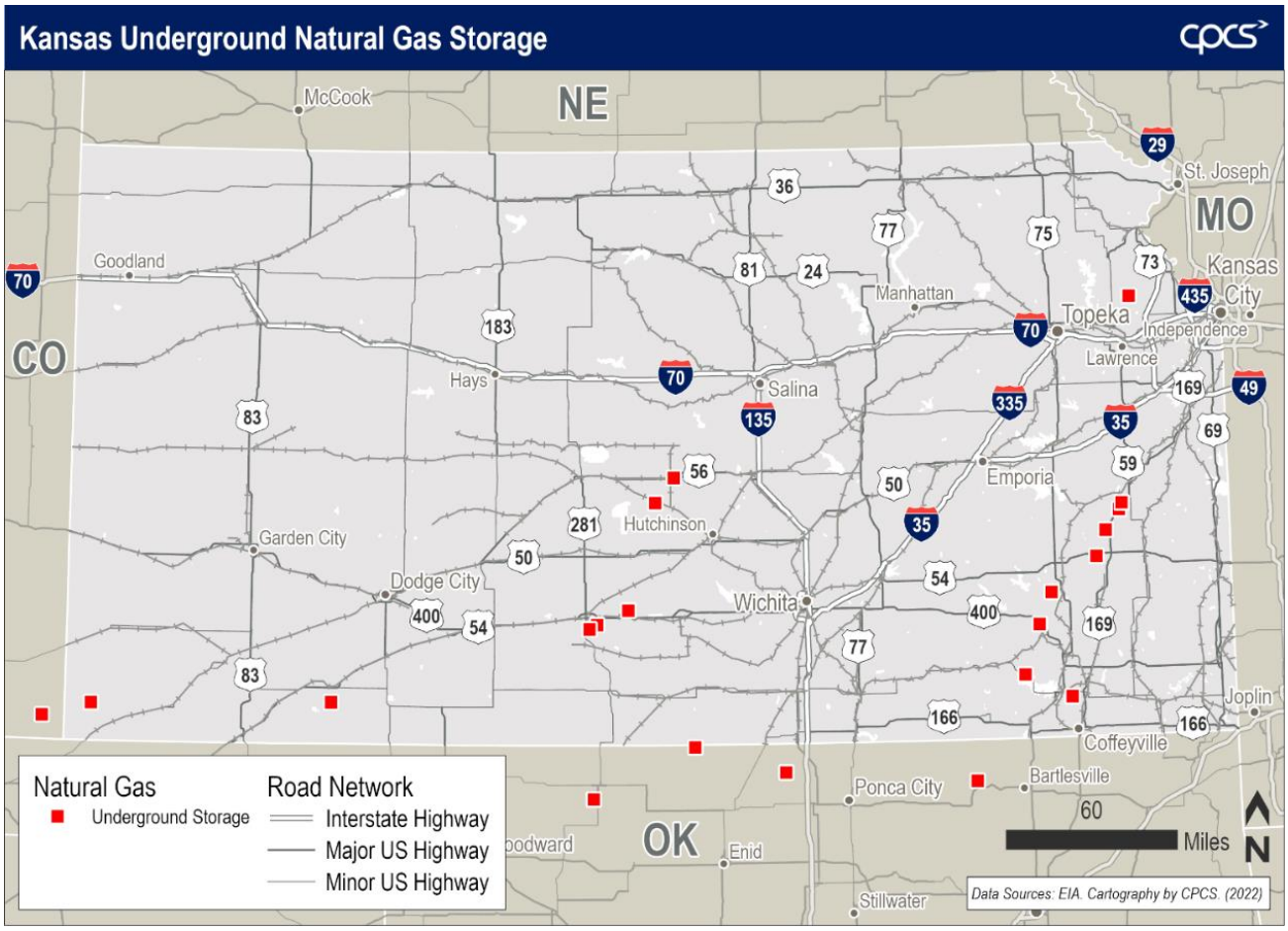
Natural Gas

Kansas' annual marketed natural gas production is 163,356 million cubic feet in 2020, accounting for 0.5 percent of the total US production.[81] The Hugoton Gas Area, located in Southwestern Kansas and parts of Oklahoma and Texas, is one of the largest natural gas fields in North America. The fields produced 53,884,229 thousand cubic feet of natural gas in 2021.[82] Hugoton Gas Area also contains high concentrations of helium. As a byproduct of natural gases, helium is delivered through pipelines to the National Helium Reserve in Amarillo, Texas.

[77] Coffeyville Resources Refining & Marketing Petroleum Refining & Marketing. https://www.coffeyvillecrude.com/#/corp-info/prm
[78] EIA Table 5. Refiners' Total Operable Atmospheric Crude Oil Distillation Capacity as of January 1, 2021. https://www.eia.gov/petroleum/refinerycapacity/table5.pdf
[79] HollyFrontier El Dorado Refinery. https://hollyfrontier.com/operations/facilities/el-dorado/default.aspx
[80] EIA Production Capacity of Operable Petroleum Refineries. https://www.eia.gov/dnav/pet/pet_pnp_capprod_dcu_SKS_a.htm
[81] EIA Kansas State Energy Profile. https://www.eia.gov/state/print.php?sid=KS
[82] Kansas Geological Survey Hugoton Gas Area – Oil and Gas Production. https://chasm.kgs.ku.edu/ords/oil.ogf4.IDProdQuery?FieldNumber=1000148164

Kansas has 16 underground natural gas storage fields, making up three percent of storage capacity nationwide.

Figure 4-48: Kansas Underground Natural Gas Storage Locations



Twelve natural gas operators managed the natural pipelines in Kansas in 2020. Figure 4-49 lists the length and volume of each natural gas transmission pipeline. The natural gas pipeline that carries the most volume in 2020 was the ANR Pipeline, which delivered gas from Northern Texas and Western Oklahoma to the Midwest and Great Lakes region. The total length of the ANR Pipeline is 1,800 miles, of which 832.1 miles are in Kansas.

Figure 4-50 lists the locations of each underground natural gas storage locations and their capacities. In total, the 16 storages offer 282,986 million cubic feet of total storage in 2020. The storage capacity has been consistent since the early 1990s.[83]

[83] EIA Underground Natural Gas Storage Capacity. https://www.eia.gov/dnav/ng/NG_STOR_CAP_DCU_SKS_A.htm

Figure 4-49: Natural Gas Transmission Pipelines in Kansas (2020)

Type	Operator	Length (Miles)	Volume (Million SCF per Year)*
Interstate	ANR Pipeline Co	832.1	1,905,371
	Cheyenne Plains Pipeline Co	N/A	N/A
	Cimarron River Pipeline	61.4	1,311,447
	Colorado Interstate Gas Co	340.1	2,094,897
	Enable Gas Transmission	33.1	1,230,700
	Natural Gas PL Co of Am	689.8	1,901,516
	Northern Natural Gas Co	1,633.3	1,367,395
	Panhandle Eastern PL Co	1,788.2	792,636
	Rockies Express Pipeline	96.2	1,337,382
	Southern Star Central Gas PL Co	3,250.2	437,634
	Tallgrass Interstate Gas Transmission	1,627.7	138,894
Intrastate	Peoples Gas Co	N/A	N/A

Source: EIA; PHMSA. Note: Million standard cubic feet per year is a unit of measurement for gases

Figure 4-50: Kansas Underground Natural Gas Storage Locations and Capacities

Company Name	County	Working Gas Capacity (Mcf)	Total Gas Capacity (Mcf)	Max Daily Delivery (Mcf)
Atmos Energy Corporation	Montgomery	3,239,000	5,539,000	45,000
Mid Continent Market Center	Pratt	696,198	1,059,216	10,000
		1,989,320	3,884,990	35,000
Cherokee Wells LLC	Wilson	180,000	360,000	3,000
		160,000	360,000	3,000
Northern Natural Gas Company	Rice	8,000,000	24,000,000	130,000
	Pratt	40,916,000	62,000,000	755,000
Southwest Gas Storage	Meade	28,372,187	63,453,413	350,000
Southern Star Central Gas Pipeline	Anderson	4,600,000	12,700,000	149,000
	Rice	4,200,000	14,700,000	134,000
	Anderson	6,700,000	18,300,000	156,000
	Elk	11,800,000	33,300,000	269,000
	Jefferson	2,200,000	14,100,000	224,000
	Anderson	4,400,000	13,300,000	107,000
	Woodson	300,000	3,200,000	16,000
Colorado Interstate Gas Company	Morton	5,229,000	12,729,000	124,000

Source: EA Natural Gas Field Level Storage Data (Annual). Note: Working gas capacity refers to total gas storage capacity minus the volume of natural gas intended as permanent inventory in a storage reservoir (base gas).

4.6 Strategic Defense System

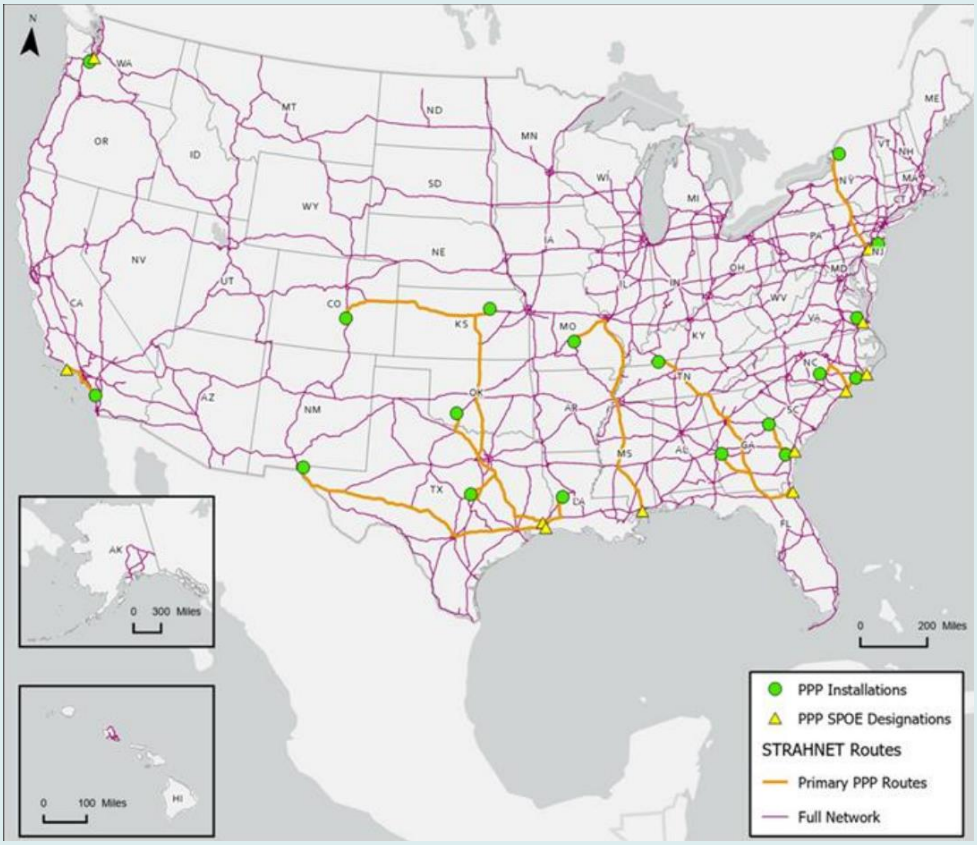
The Department of Defense (DOD) and FHWA designate the Strategic Highway Corridor Network (STRAHNET) as a highway system that provides defense access and allows the movement of personnel and equipment in times of peace and war. The STRAHNET in Kansas, shown in Figure 4-52, contains 828.66 miles of interstate highways and 19.45 miles of non-Interstate connectors. Portions of this network are used to connect to Power Project Platform (PPP) installations like Fort Riley and are crucial in supporting rapid military movements to facilitate national security.

The Strategic Rail Corridor Network (STRACNET) provides rail access to US military installations for wartime mobilization and peacetime transportation of heavy equipment, food, and other commodities. The STRACNET needs to satisfy requirements of maintenance condition, clearance, and gross weight. The STRACNET in Kansas encompasses two UP, three BNSF, and one KCS railroad.

Military Presence in Kansas

There is a major US military presence in Kansas. Two military installations, Fort Riley and Fort Leavenworth, are key freight generators, as well as major consumer markets in the state. Fort Riley, which is located between Junction City and Manhattan, has 15,000 active-duty service members, 18,000 family members, 29,000 veterans, and 5,600 civilian employees based in the region or at the post.[84] Fort Riley is also a PPP installation, meaning it is designed to deploy military forces to Seaports of Embarkation (SPOE) in an emergency. Fort Leavenworth, which is located in Leavenworth, Kansas, about 20 miles northwest of Kansas City, serves as the headquarters for the 35th Infantry Division, Kansas National Guard.

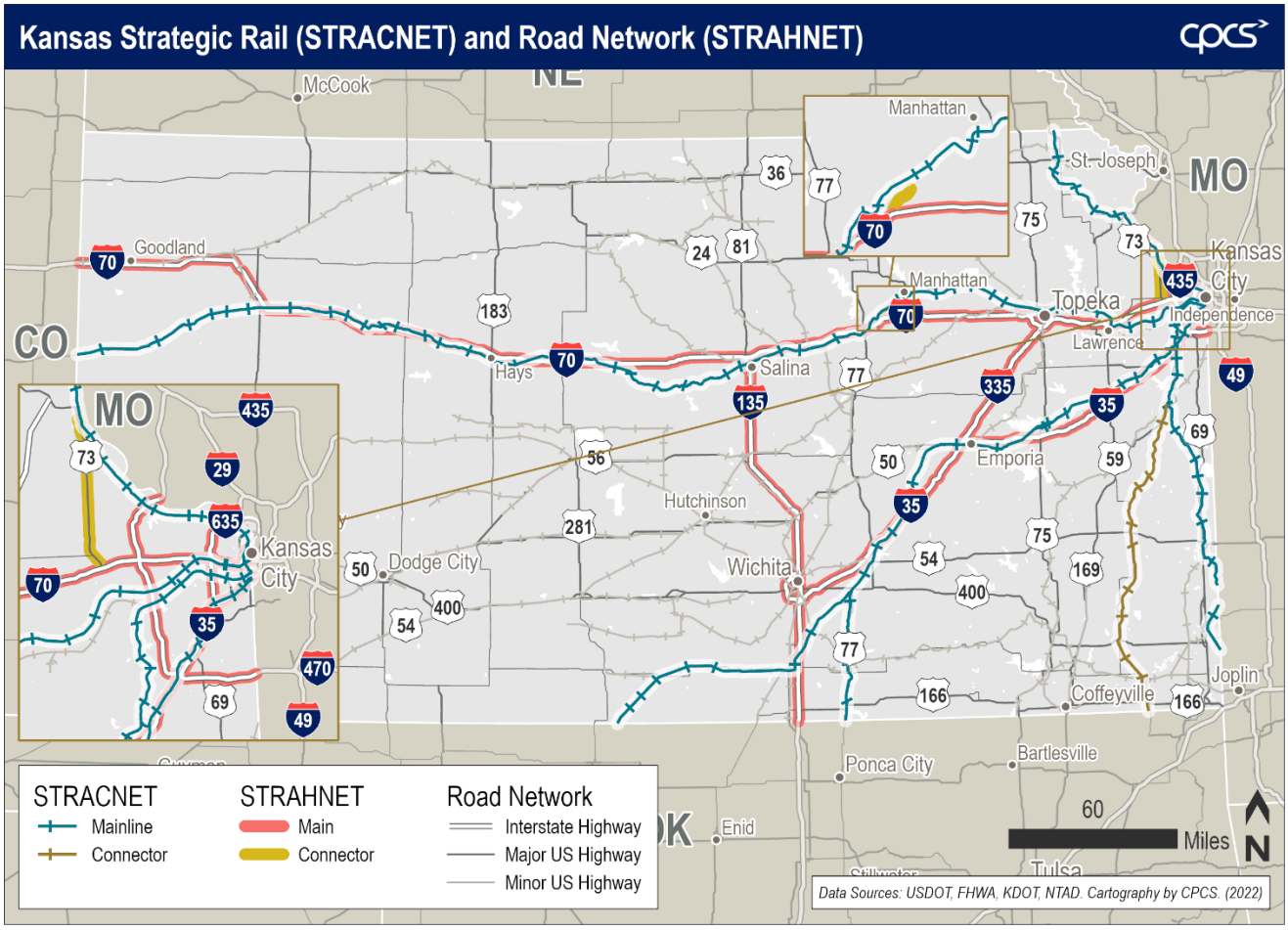
Figure 4-51: STRAHNET and PPP Routes



Source: Military Freight Needs on Highways, USTRANSCOM.

[84] U.S. Army Fort Riley. https://home.army.mil/riley/index.php

Figure 4-52: STRAHNET and STRACNET in Kansas



5 Freight System Assessment

Statewide freight system evaluation measures were developed in alignment with KDOT's Long Range Transportation Plan Vision and Goals. These measures centered in the areas of safety and security, transportation system management, and asset preservation were used to assess the Kansas freight system in two ways. First, an aggregated assessment of Kansas' interstate system was conducted. This was followed by designation of Kansas' Freight Corridors of Significance and select analysis of key freight routes that were not part of the interstate system, to better understand their unique needs.

5.1 Statewide Freight System Evaluation

Freight System Evaluation Measures

Statewide evaluation measures were developed in alignment with KDOT's LTRP vision and goals, to assess the Kansas freight system. The statewide freight system evaluation focuses on measures that examine the safety and security, transportation system management, and asset preservation of the statewide freight system, with evaluation measures spanning the road, rail, and aviation systems (Figure 5-1). Maritime measures were not included due to their limited presence in the state.

Figure 5-1: Statewide Freight System Evaluation Measures

Goal Area	Statewide Evaluation Measures		
	Road	Rail	Air
 **Safety and Security**	• Number of truck-involved fatalities • Truck-involved fatality rate • Number of truck-involved serious injuries • Truck-involved serious injury rate	• Total rail incidents • Highway-rail grade crossing incidents • Highway-rail grade crossing incidents by safety device • Rail-related casualty risk • Rail trespassing risk • Blocked crossing trends	N/A
 **Transportation System Management**	• Truck Travel Time Reliability (TTTR) • Oversize/overweight (OS/OW) permit counts • Truck parking utilization • Percent of weigh stations with weigh-in-motion (WIM)	• Percent of miles with double track • Percent of miles with sidings	N/A
 **Asset Preservation**	• Bridges in good condition and poor condition • Pavement in good condition and poor condition • Vertical bridge clearance	• Percent of mileage that is FRA track Class 4 • Percent of mileage that is 286k pound capable • Percent of mileage that is inactive or abandoned	• Runway pavement conditions • Runway lengths

A summary of the statewide assessment is provided in Figure 5-2. The details of the assessment are provided, following the table, by mode.

Figure 5-2: Freight System Evaluation Summary

Safety and Security

Road

Truck-Involved Fatality Counts (Five-year Rolling Average) *	Fatality Rate*	Severe Injury Counts (Five-year Rolling Average) *	Severe Injury Rate*
14 fatalities (2015-2019)	3.3 truck-involved fatalities per million truck miles traveled on Interstates (2019)	23.4 severe injuries (2015-2019)	5.51 truck-involved severe injuries per million truck miles traveled on Interstates (2019)
↑ **Trend**: increased between 2011-2015 and 2015-2019	⊖ **Trend**: doesn't show a trend between 2015 and 2019.	↓ **Trend**: decreased between 2011-2015 and 2015-2019	⊖ **Trend**: doesn't show a trend between 2015 and 2019.

Rail

Total Rail Incidents	Highway-Rail Grade Crossing Incidents	Highway-Rail Grade Crossing Incident with Safety Devices	Rail-related Casualty Risk	Rail Trespassing Risk	Blocked Crossing Trends
210 incidents (2019)	29 incidents (2019)	Over 58 percent of highway-rail crossing incidents (2019)	90 person injuries and seven fatalities (2019)	11 person injuries and two fatalities (2019)	328 cases (2020), 79 percent of which were blocked longer than 15 minutes.
↓ **Trend:** Decreased by 16 percent between 2010 and 2019	⊖ **Trend:** despite a decrease of 37 percent between 2010 and 2019, the number of incidents increased by 24 percent between 2019 and 2020.	⊖ **Trend**: the share of incidents at crossings with active warning devices has increased by 58 percent, while the share of accidents at crossings with passive warning devices has declined by 32 percent between 2010 and 2019.	⊖ **Trend:** The number of fatalities more than doubled in 2020 compared to 2019, while the number of injuries declined by about 2 percent.	↑ **Trend:** Despite being below the national average, the number of fatalities more than quadrupled in 2020 over the prior year, with the total number of casualties also increasing by 38 percent	⊖ NA

Transportation System Management

Road

Interstate Truck Travel Time Reliability (TTTR)	Interstate Truck Bottlenecks	Oversize/overweight (OS/OW) Permit Counts	Truck Parking Utilization	Percent of weigh stations with weigh-in-motion (WIM)
1.13 (2021)	Top bottlenecks are located in urban areas, including Wichita, Kansas City, Emporia, and Topeka.	77,945 (2021)	Over 80 percent of utilization between 11:00 PM and 6:00 AM statewide	62.5 percent of weigh stations have WIM equipment
Trend: decreased from 1.18 in 2019, meeting the Interstate TTTR target of 1.16	NA	**Trend:** the total issued OS/OW permits peaked in 2019 between 2017 and 2021.	NA	NA

Rail

Percent of Miles with Double Track	Percent of Miles with Siding
7.5 percent (2021)	5.1 percent (2021)

Asset Preservation

Road

Interstate Bridge Condition	Interstate Pavement Condition	Interstate Vertical Bridge Clearance
Good: 64.6 percent (2019), falling short of the state's target of 70 percent. **Poor:** 2.1 percent (2019), meeting the state's target of 3.0 percent.	**Good:** 59.9 percent (2019), falling short of the state's target of 65 percent. **Poor:** 0.4 percent (2019), meeting the state's target of 0.5 percent.	25.5 percent of bridges are lower than 16 feet – the FHWA vertical clearance requirement for new or reconstructed bridges.

Rail

Percent of Class I Mileage that is FRA Track Class 4 or Higher	Percent of Short Line Mileage that is FRA Track Class 2 or Higher	Percent of Mileage that is 286,000-pound capable	Percent of Mileage that is Inactive or Abandoned
83 percent	73 percent	**Class I:** 98 percent **Short Line:** 32 percent **Terminal & Switching:** 100 percent	**Inactive:** 2 percent (142 miles) **Abandoned:** 40 percent (3,192 miles)

Air

Runway Pavement Condition	Runway Length
All nine air cargo airports have runway pavements in at least fair condition.	Four out of nine cargo airports have runway lengths sufficient to serve wide-body long-distance flights (≥ 7,900 feet), including ICT, IAB, FOE, and SLN.

Source: CPCS Analysis.

5.2 Road

Truck Volumes on Interstates

Figure 5-4 illustrates the annual average daily traffic (AADT) in Kansas for 2019. As shown, segments of I-435, I-35, and I-70 in Kansas City – which have eight through lanes – experience high concentrations of truck traffic. AADT is also relatively high in Wichita. Across the state, all Interstates (except for I-335) handle over 10,000 daily trucks. Despite relatively high AADT in urban areas, the percent of trucks (including combination trucks, single-unit trucks, and buses) as a share of total traffic is lower in urban areas compared to rural areas (Figure 5-5).

Estimating Future Truck Traffic Trends

The figure below illustrates estimated growth in truck traffic by corridor between 2019 and 2039. As shown, Interstates and corridors near urban areas will see the most truck traffic growth statewide. I-35 and I-435 near Kansas City, along with I-70 east of Topeka, are projected to experience the largest absolute growth in truck traffic.

Figure 5-3: Estimated Growth in Truck Traffic Between 2019 and 2039

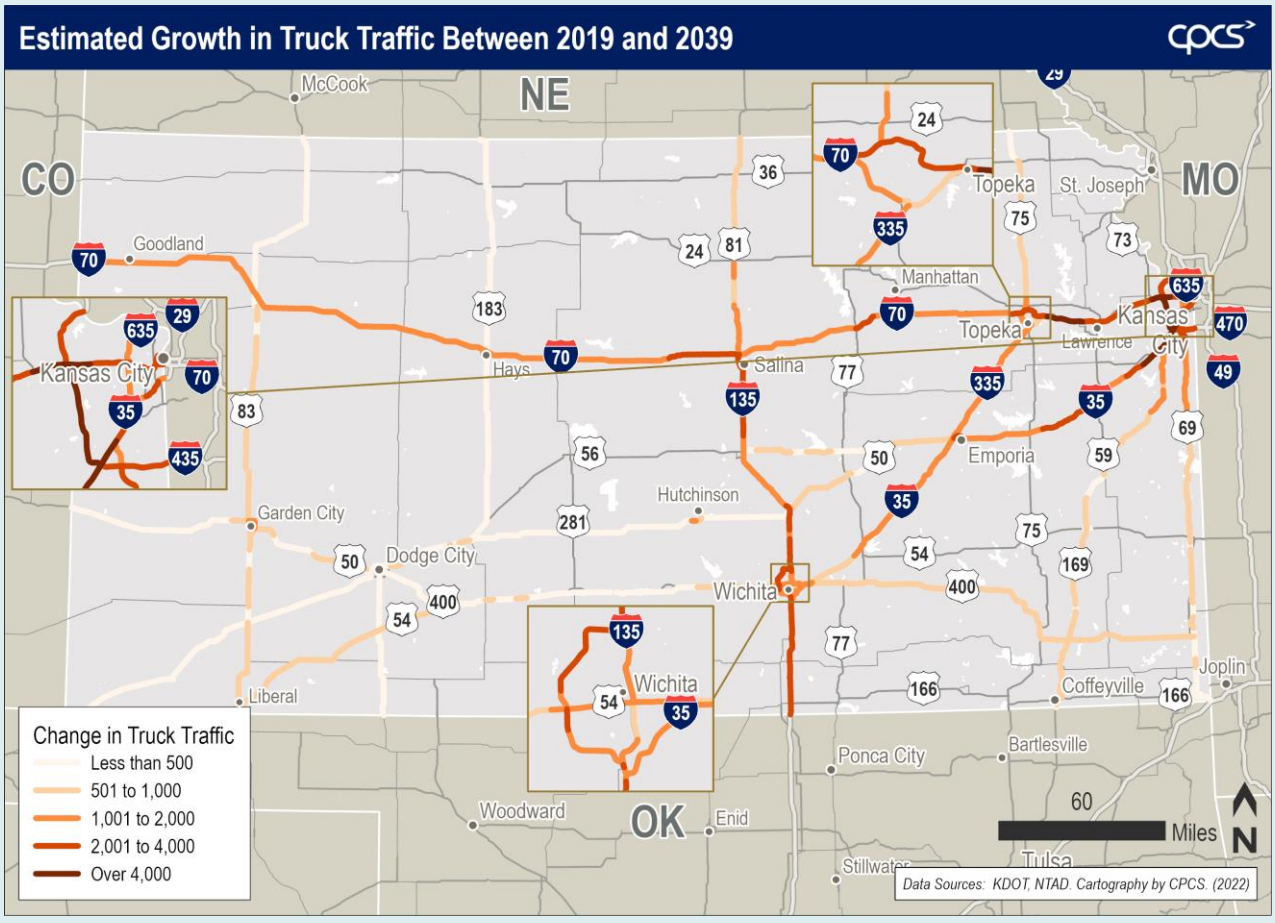
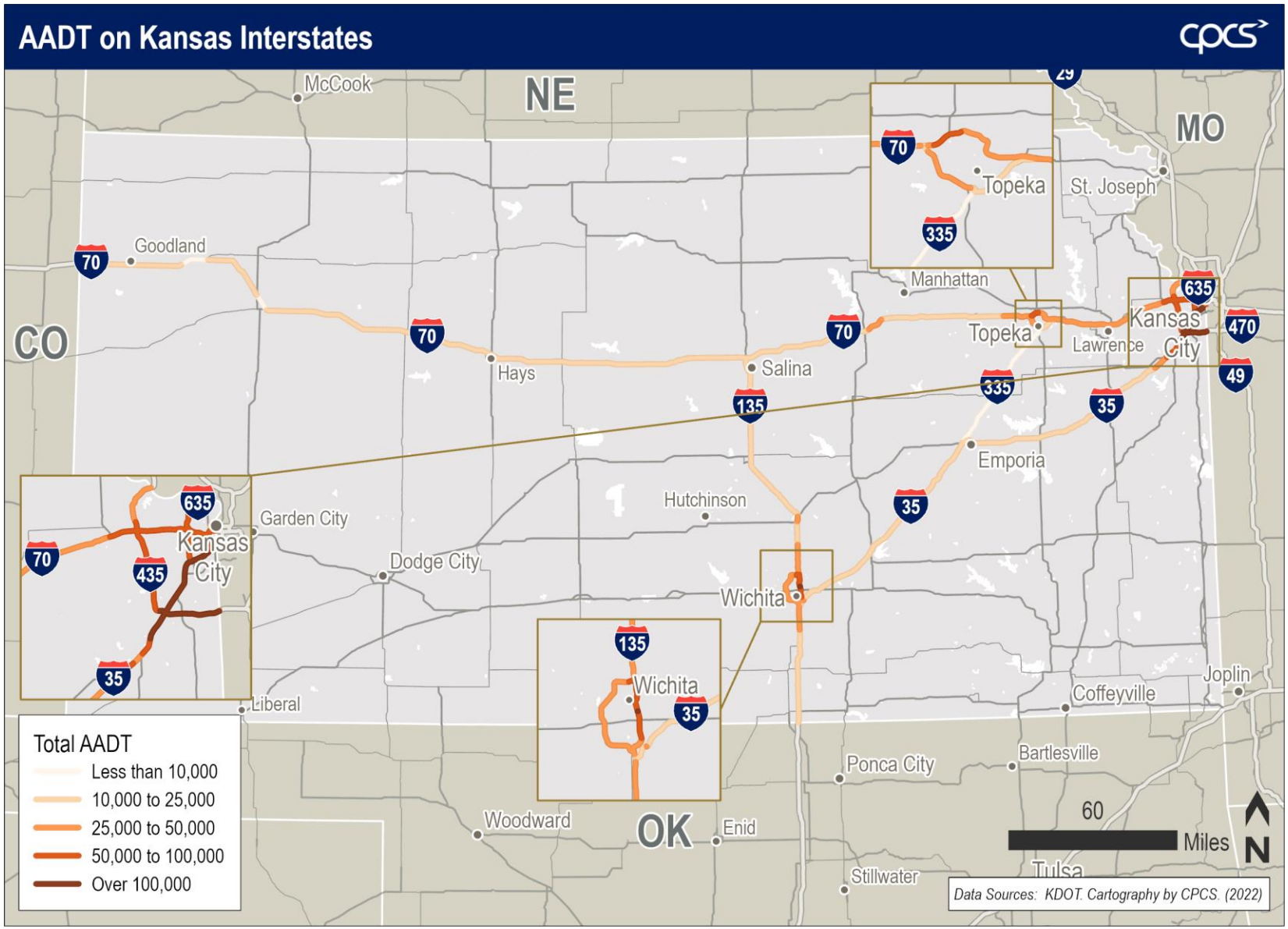
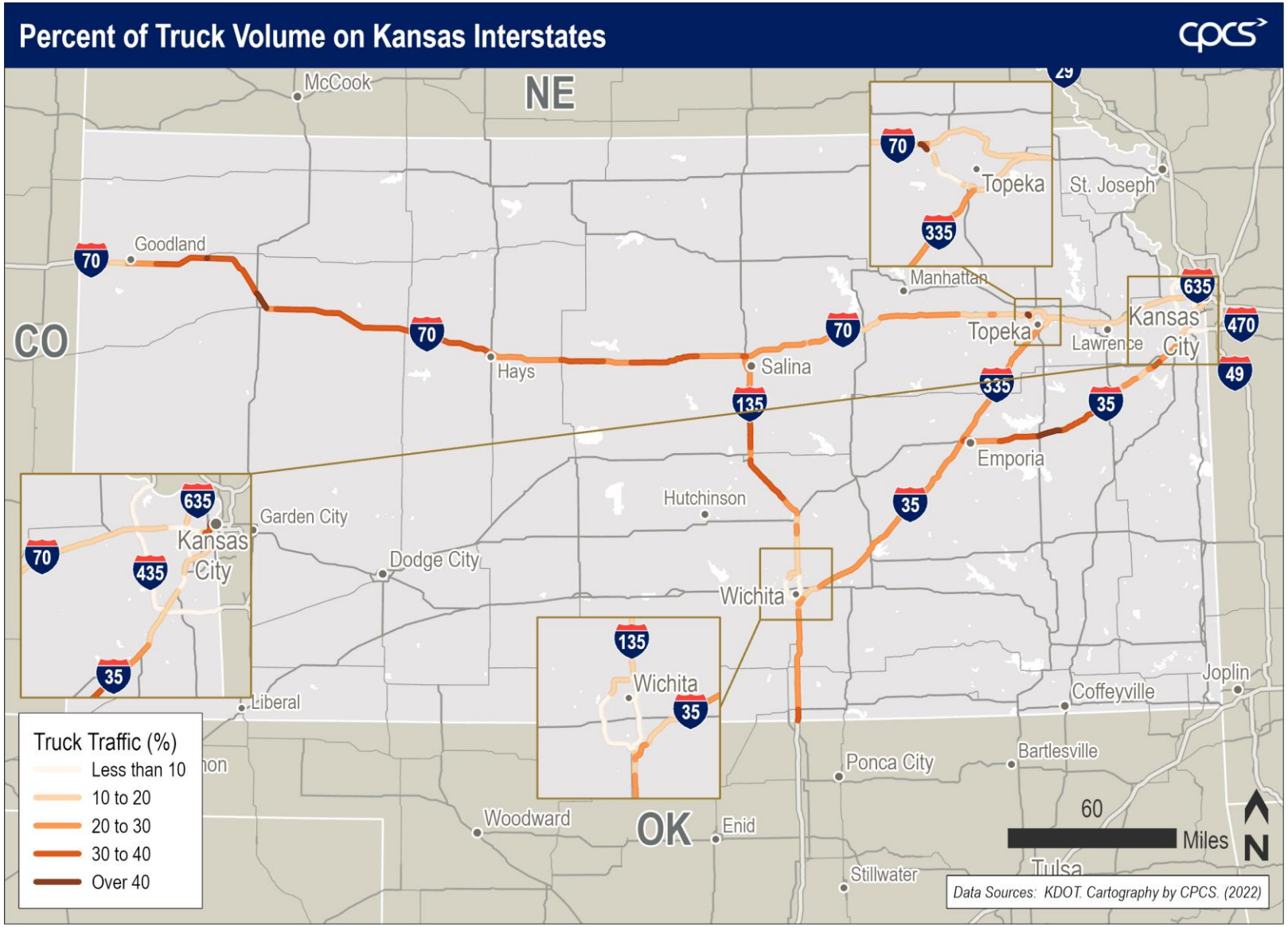


Figure 5-4: AADT Volume on the Interstates (2019)



Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure 5-5: Percent of Truck Volume on the Interstates (2019)



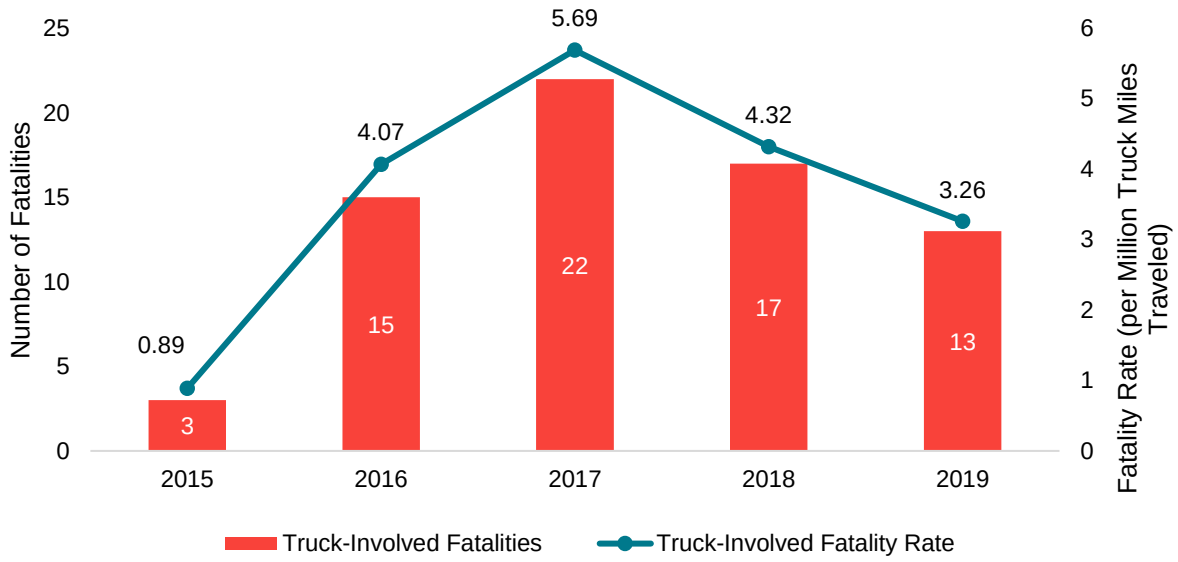
Note: Truck measure includes combination trucks, single-unit trucks, and buses

Safety and Security

Number of Truck-Involved Fatalities and Truck-Involved Fatality Rate

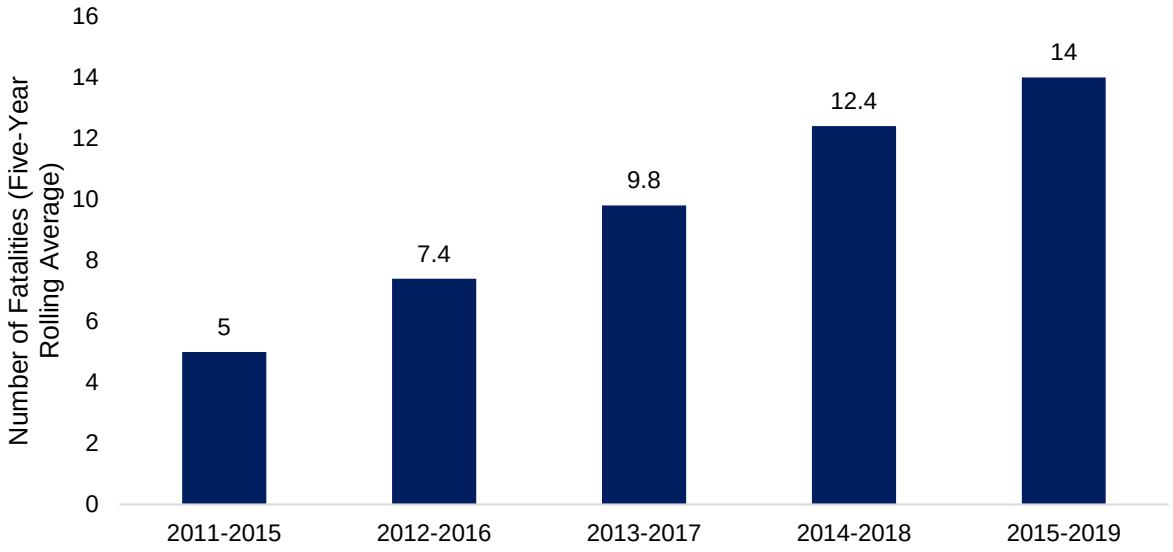
Between 2015 and 2019, 54 truck-involved incidents led to 71 fatalities in Kansas. About 54 percent of truck-involved crashes occurred in Johnson, Wyandotte, and Sedgwick counties. Figure 5-6 demonstrates truck-involved fatalities and truck-involved fatality rates on Kansas' Interstates between 2015 and 2019. The number of fatalities and the fatality rate both peaked in 2017 and have decreased since then. During the period time between 2015 and 2019, the five-year fatality rolling average continuously increased from 5 to 14 (Figure 5-7).

Figure 5-6: Number of Truck-Involved Fatalities on Interstates (2015-2019)



Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure 5-7: Five-Year Rolling Average of Truck-Involved Fatality Counts

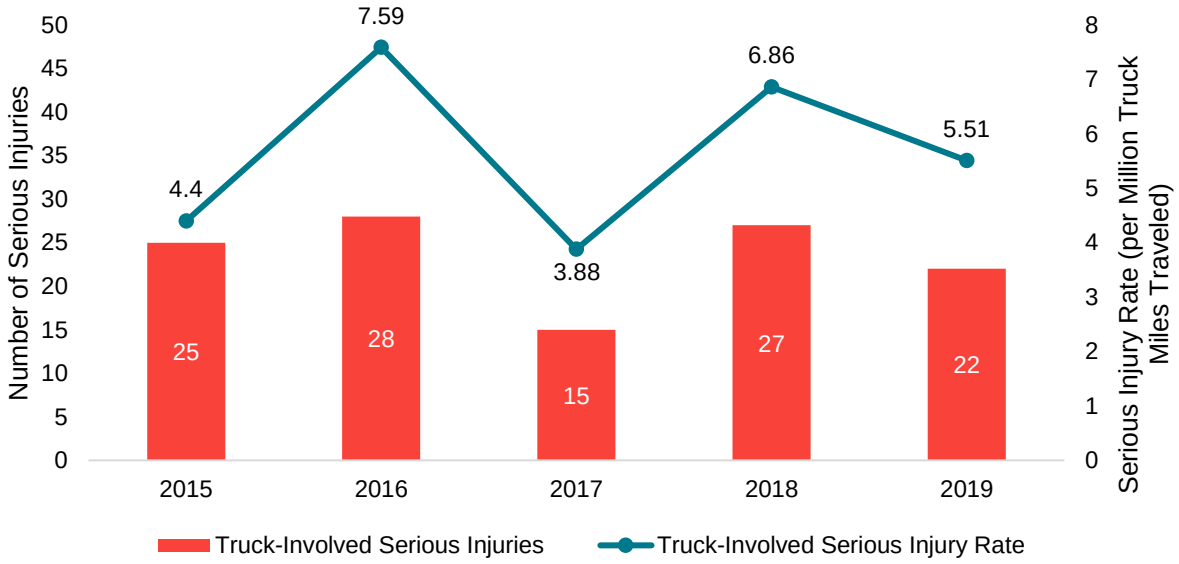


Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Number of Truck-Involved Serious Injuries and Truck-Involved Serious Injury Rate

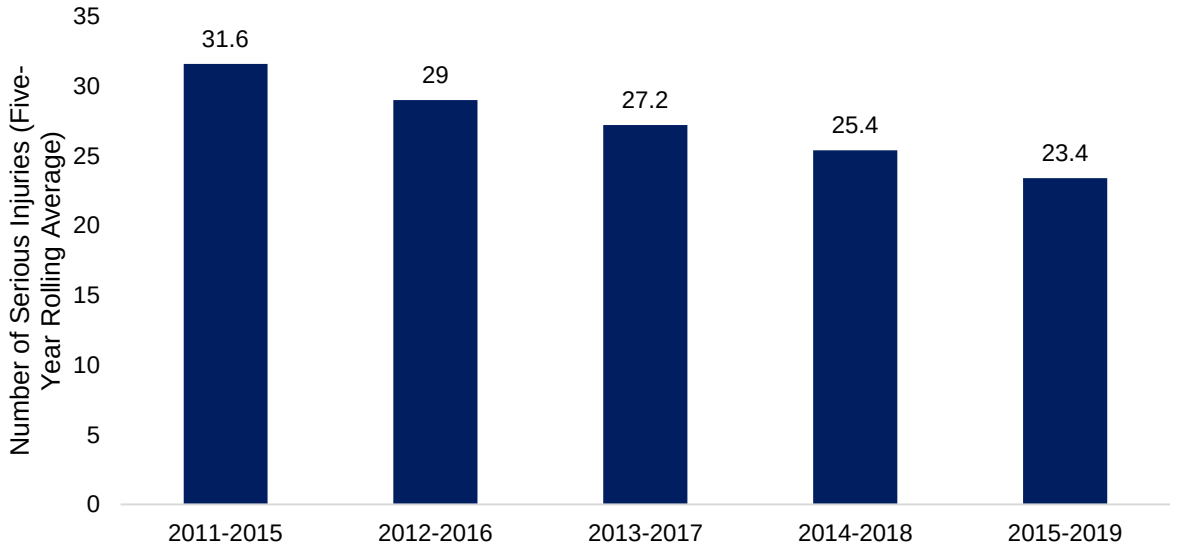
A total of 117 truck-involved serious injuries were reported in Kansas between 2015 and 2019 (Figure 5-8). About 40 percent of serious injuries occurred in Wyandotte, Johnson, and Butler counties during this time. The five-year rolling average of truck-involved serious injuries decreased consecutively between 2015 and 2019.

Figure 5-8: Number of Truck-Involved Serious Injuries (2015-2019)



Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure 5-9: Five-Year Rolling Average of Truck-Involved Serious Injury Counts (2011-2019)



Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Transportation System Management

Truck Travel Time Reliability (TTTR)

As established under MAP-21 and continued by the FAST Act and BIL, states must measure and report the Truck Travel Time Reliability (TTTR) Index to FHWA. TTTR measures consistency and dependability in planned travel time and reflects the extent of unexpected delay. The closer TTTR gets to 1, the fewer unexpected delays have occurred on the roadways of interest.

FHWA provides public agencies with access to the National Performance Management Research Data Set (NPMRDS)[85], which allows states to calculate TTTR using the following formula:

$$Travel\ Time\ Reliability\ Ratio = \frac{95th\ Percentile\ TravelTime}{50th\ Percentile\ Travel\ Time}$$

According to KDOT's Performance Measures for Roadways, the TTTR target on the Interstate System is 1.16. The 2021 TTTR on the Interstates is 1.13 (Figure 5-10), indicating truck reliability is better than the target (1.16). TTTR in 2021 also improved over TTTR in 2019 (1.18). As shown in Figure 5-11, most parts of the Interstates experienced little to no unexpected delay. The majority of the areas with TTTR higher than 1.5 are located around major cities, such as Kansas City, Wichita, and Topeka. Notably, a segment on I-70 between Salina and Topeka, as well as a segment between Salina and Wichita also have TTTR higher than 1.5.

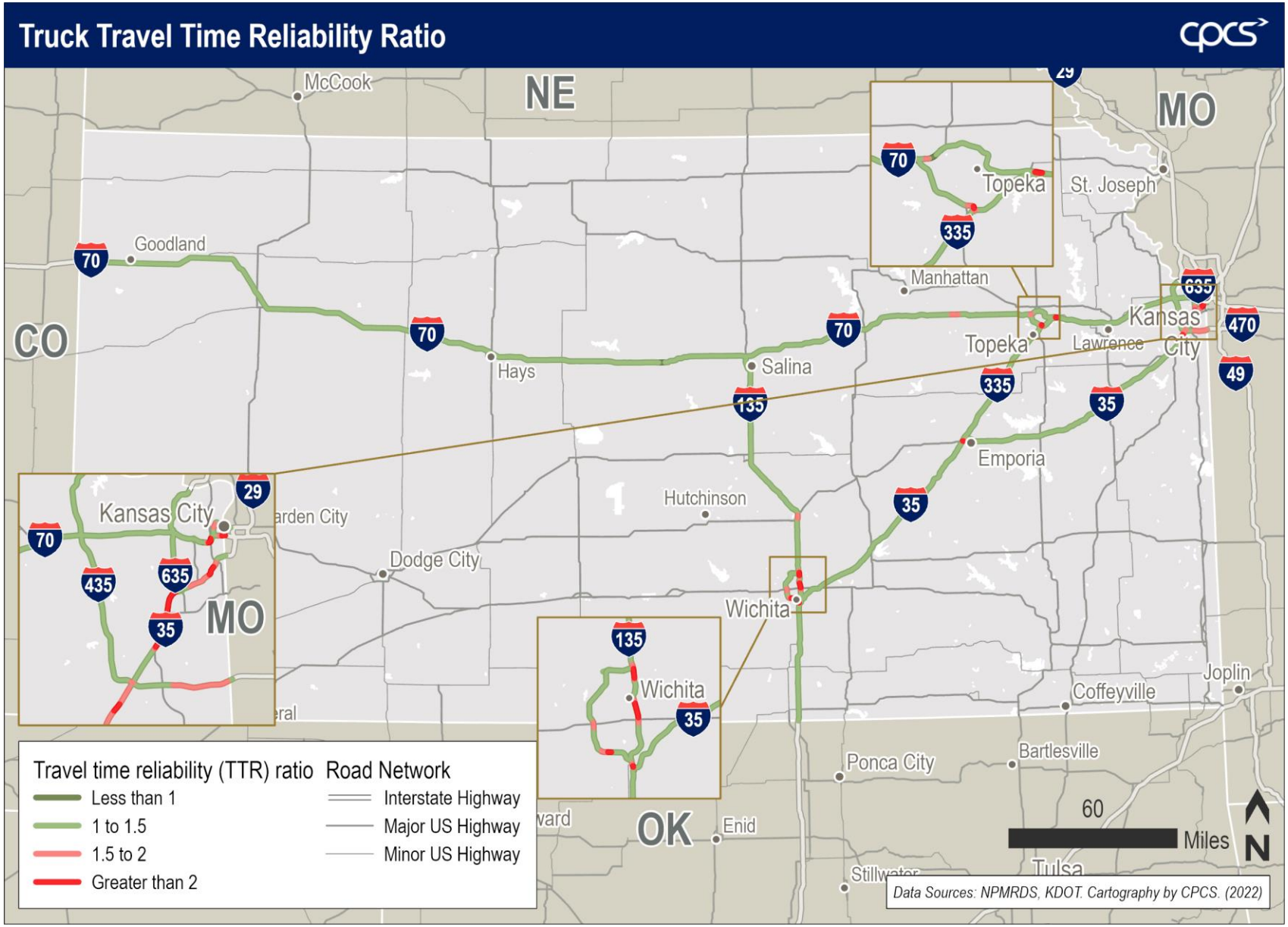
Figure 5-10: Truck Travel Time Reliability (TTTR) on the Interstates (2019 and 2021)

Interstate TTTR (2019)	Interstate TTTR (2021)	Interstate TTTR Target (2021)
1.18	1.13	1.16

Source: CPCS Analysis of NPMRDS (2021); Kansas Long Range Transportation Plan 2020-2045

[85] The NPMRDS contains field-observed travel time and speed data collected anonymously from a fleet of probe vehicles (cars and trucks) equipped with mobile devices. Using time and location information from probe vehicles, the NPMRDS generates speed and travel time data aggregated in 5-minute, 15-minute, or 1-hour increments. The data are available across the National Highway System (NHS). Source: U.S. DOT

Figure 5-11: TTTR on Interstates (2021)



Truck Bottlenecks

Truck bottlenecks refer to highway segments that experience traffic volume exceeding roadway capacity (recurring congestion) and/or congestion caused by transitory events, such as crashes, construction work zones, and extreme weather conditions (non-recurring congestion). The analysis identifies Interstate truck bottlenecks using TTTR and total delays, ensuring the capture of bottlenecks caused by congestion and other factors. Figure 5-12 lists the top 12 bottlenecks on Kansas' Interstates. All the listed bottlenecks are located in urban areas, including Wichita, Kansas City, Emporia, and Topeka. The bottleneck analysis also found that, when looking at bottlenecks on the non-Interstate roadways, half of the top ten truck bottlenecks occurred on segments connecting to Interstates, more specifically, I-35 ramps.

Figure 5-12: Top 12 Truck Bottlenecks on Interstates

Rank	Road Name	Cross Street/ Interchange	County	Segment Length (miles)	TTTR	Delay per Mile (Hours)	Truck AADT
1	I-135 N	From I-235/K-254 (Exit 11) to K-96 (Exit 10)	Sedgwick	1.02	3.31	1,408	7,310
2	I-35 N	From 87th St Parkway (Exit 225) to I-635 (Exit 231)	Johnson	5.67	2.01	1,171	13,586
3	I-35 N	US 50 (Exit 127A)	Lyon	0.58	2.09	911	4,337
4	I-35 S	From E Santa Fe St (Exit 218) to 119th St (Exit 220)	Johnson	3.81	1.92	919	14,042
5	I-35 S	From US 69/18th St Expressway to 24th St (Exit 232	Wyandotte	2.51	1.94	807	11,183
6	I-70 W	From Toll Plaza 183 to I-470/US 40/K-4 (Exit 366)	Shawnee	1.68	2.03	577	4,109
7	I-35 N	Eaton St (Exit 235)	Wyandotte	0.51	1.32	808	10,910
8	I-135 N	From 1st Street to 2nd Street	Sedgwick	0.52	3.77	243	7,061
9	I-35 N	E Santa Fe St (Exit 218)	Johnson	1.19	1.51	566	14,010
10	I-670 E	From Central Ave (Exit 1A) to Genesee St (Exit 1B)	Wyandotte	1.19	1.84	439	7,414
11	I-470 W	From I-335/Kansas Turnpike (Exit 177) to US 75/US 75 Alt (Exit 6)	Shawnee	0.40	2.01	391	2,286
12	I-70 E	From Toll Plaza 183 to I-470 / Kansas Turnpike	Shawnee	1.59	1.70	296	4,209

Source: CPCS Analysis of NPMRDS (2021)

OS/OW Permits

In collaboration with the Kansas Highway Patrol, the Kansas Department of Revenue, and related industry stakeholders, KDOT developed the Kansas Truck Routing and Intelligent Permit System (K-TRIPS), an internet-based platform for truckers and motor carrier companies to apply and pay for most oversize/overweight (OS/OW) permits.[86] In addition to permitting, K-TRIPS also provides routing and mapping of OS/OW routes and permit data reporting.[87]

KDOT issues four types of OS/OW permits to non-divisible truck loads[88] passing through highways in Kansas.[89] Figure 5-13 lists the features of the four permit types.

Figure 5-13: Permit Types and Features

Permit Type	Time Period Covered	Movements Allowed	Loads Allowed
Annual Permits	One year; movements can only occur during daylight hours.	Continuous movements	Oversize or overweight loads, special mobile equipment, manufactured houses, or modular sections of building
Standard Permits	Seven days	Single trip or multiple trip	Oversize or overweight vehicles and loads when the implementation of other types of permits is not appropriate
Superload Permits	N/A	Single trip	Overweight loads that exceed 150,000 pounds of gross weight
Large Structure Permits	30 calendar days	N/A	Oversize loads that exceed the size limitations of the standard permit.

Source: Kansas Administrative Regulations

Permit Counts

Between 2017 and 2021, Kansas issued a total of 414,063 OS/OW permits. The number of permits issued peaked in 2019 with over 94,000 permits issued.

Permits issued in Kansas are classified into four main groups and 29 sub-types, based on load size, commodity type, and the number of trips. As demonstrated in Figure 5-14**,** standard permits have been the most issued permit group over the last five years, followed by annual permits and superload permits. While the number of annual permits issued increased between 2020 and 2021, the number of standard, superload, and large structure permits decreased during this time, by 44 percent, 4 percent, and 28 percent, respectively. In addition, except for the annual permits, the other three groups of permits decreased between 2019 and 2020, possibly impacted by the COVID-19 pandemic.

[86] Kansas State Freight Plan. November 2017. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/KDOTFreightPlan.pdf

[87] Kansas Truck Routing Intelligent Permitting System (K-TRIPS) Company User Guide. https://www.k-trips.com/KTRIPS%20Company%20User%20Guide%20and%20Training.pdf

[88] Non-divisible truck load is one piece or item which cannot be separated into units of less weight without affecting the physical integrity of the load. If it can be divided and it does not exceed 8 man hours to disassemble it then it must be separated.

[89] Kansas Administrative Regulations. Agency 36 Kansas Department of Transportation. Article 1. – Special Permits, Loads and Vehicles. 36-1-38. Types of permits. https://sos.ks.gov/publications/pubs_kar_Regs.aspx?KAR=36-1-38

Figure 5-14: Permit Counts by Permit Group (2017-2021)

Permit Type	2017	2018	2019	2020	2021	% Change (2020-2021)	5-Year Total
Annual Permits	8,843	10,053	10,480	10,462	10,783	3%	50,621
Standard Permits	51,290	58,784	66,265	57,861	55,320	- 44%	289,520
Superload Permits	6,986	8,252	10,121	9,773	7,064	- 4%	42,196
Large Structure Permits	5,660	5,404	7,330	8,554	4,778	- 28%	31,726
TOTAL	72,779	82,493	94,196	86,650	77,945	- 10%	414,063

Source: CPCS Analysis of K-TRIPS OS/OW Data

These permits allowed for the movement of 36 commodity types. 25 commodities have been grouped into six key freight commodity groups (Figure 5-15), with the remaining 11 commodities classified as "Other".[90] Figure 5-16 details the number of permits issued in Kansas by commodity group between 2017 and 2021, which is further illustrated in Figure 5-17. The number of permits issued for transporting wind energy components, containers, and energy (excluding wind energy) decreased between 2020 and 2021 by 40 percent, 14 percent, and 13 percent respectively. Military freight, agriculture, and manufactured goods rebounded in 2021 by 20 percent, 11 percent, and 10 percent respectively.

Figure 5-15: Permit Type and Commodity Group Crosswalk

Commodity Group	Permit Type
Wind Energy Component	Wind Energy - Blades
	Wind Energy - Tower Section
	Wind Energy - Nacelle/Generator/Turbine
	Wind Farm Construction Equipment
Energy (excluding wind energy)	Oil and Gas Industry Equipment
	Pipeline Industry
	Liquid Fuel Temporary
	Well Servicing Rig
	Mining
Containers	Sealed Ocean Containers
Manufactured Goods	Manufacturing
	Manufactured Housing
	Houses and Portable Buildings
Military Freight	Government/Military Equipment

Commodity Group	Permit Type
Agriculture	Agricultural Equipment/Implements
	Overweight Divisible Agricultural Inputs
	Agricultural
	Large Square or Round Hay Bales
	Harvest 30-Day Permit Foreign Based
	Harvest Equipment
	Harvest 30-Day Permit Kansas Based
	Harvest 60-Day Permit Foreign Based
	Cotton Module
	Mobile Farm Machinery
	Cotton

Source: CPCS Analysis of K-TRIPS OS/OW Data

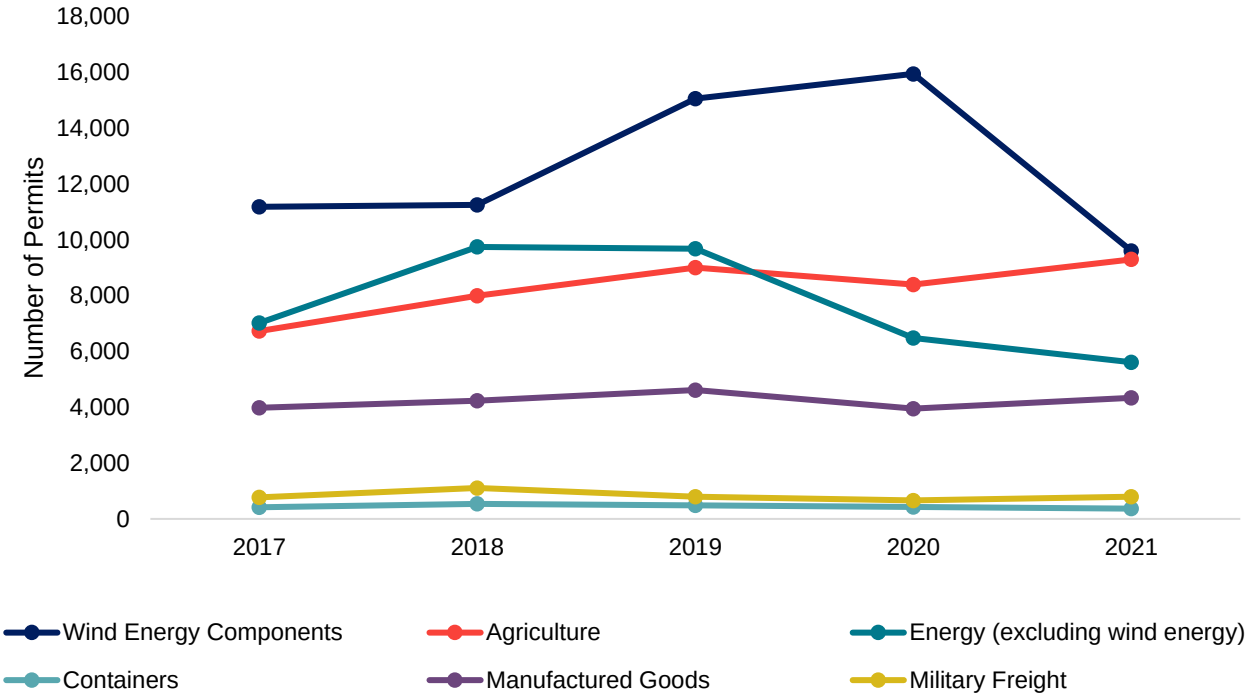
[90] The "Other" commodity group includes Annual Oversize Only, Annual Oversize Overweight Load, Annual Tow Vehicle, COVID Relief and Restoration Supplies, Double and Triple Trailer Combinations up to 125', General Construction Equipment, General Freight, Multiple Items Allowed if not Overweight, Road/Highway Construction Equipment, Telecommunications and Electric Utility, and Triple Combinations.

Figure 5-16: Permit Counts by Commodity (2017-2021)

Commodity	2017	2018	2019	2020	2021	% Change (2020-2021)	5-Year Total
Wind Energy Components	11,184	11,246	15,059	15,946	9,604	-40%	63,039
Agriculture	6,730	7,997	9,007	8,398	9,297	11%	41,429
Energy (excluding wind energy)	7,509	10,342	10,107	6,812	6,025	-12%	40,795
Containers	412	538	486	430	368	-14%	2,234
Manufactured Goods	4,572	4,790	5,526	4,849	5,049	4%	24,786
Military Freight	769	1,109	796	663	795	20%	4,132
Other	41,603	46,471	53,215	49,552	46,807	-5%	237,648
TOTAL	72,779	82,493	94,196	86,650	77,945	-10%	414,063

Source: CPCS Analysis of K-TRIPS OS/OW Data

Figure 5-17: Permit Count Trends by Commodity, Excluding Other (2017-2021)

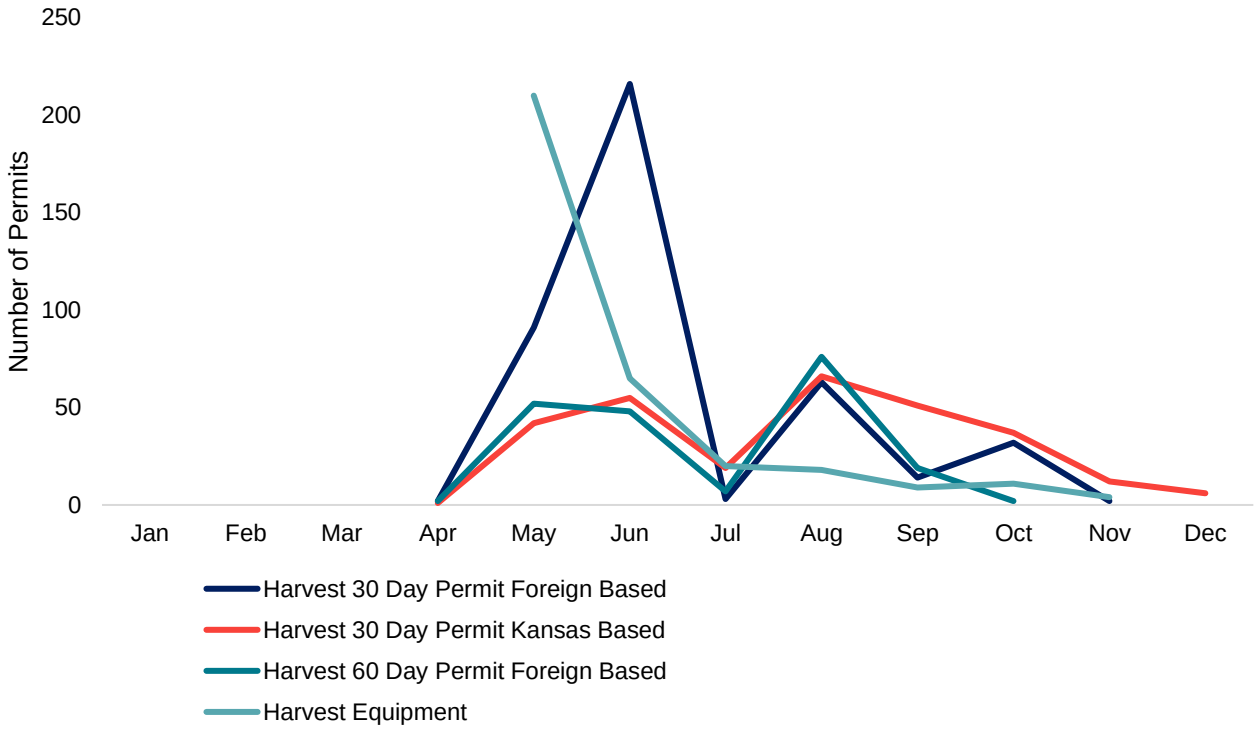


Source: CPCS Analysis of K-TRIPS OS/OW Data

Permit Seasonality

Agriculture is one of the key freight-reliant industries in Kansas. Each year, the owners of Kansas-based and foreign-based trucks or truck tractors who plan to utilize state highways for harvesting operations are required to register and obtain harvest permits. Harvesting operations include transporting farm harvesting machinery, as well as crops and agricultural products harvested, produced, or purchased by permit applicants.[91] Figure 5-18 illustrates the seasonal trends of the four harvest permits between 2017 and 2019. Harvest 30-day and 60-day permits for both Kansas-based and foreign-based applicants peaked in May and June and experienced a smaller second peak in August. The number of issued harvest equipment permits peaked in May and slowly declined until November.

Figure 5-18: Seasonality of Selected Agriculture Permits (2017-2021)



Source: CPCS Analysis of K-TRIPS OS/OW Data

[91] KS Stat § 8-143k (2012) Temporary harvest permit for trucks or truck tractors engage in farm custom harvesting operations. https://law.justia.com/codes/kansas/2012/chapter8/article1/section8-143k

Truck Parking Utilization

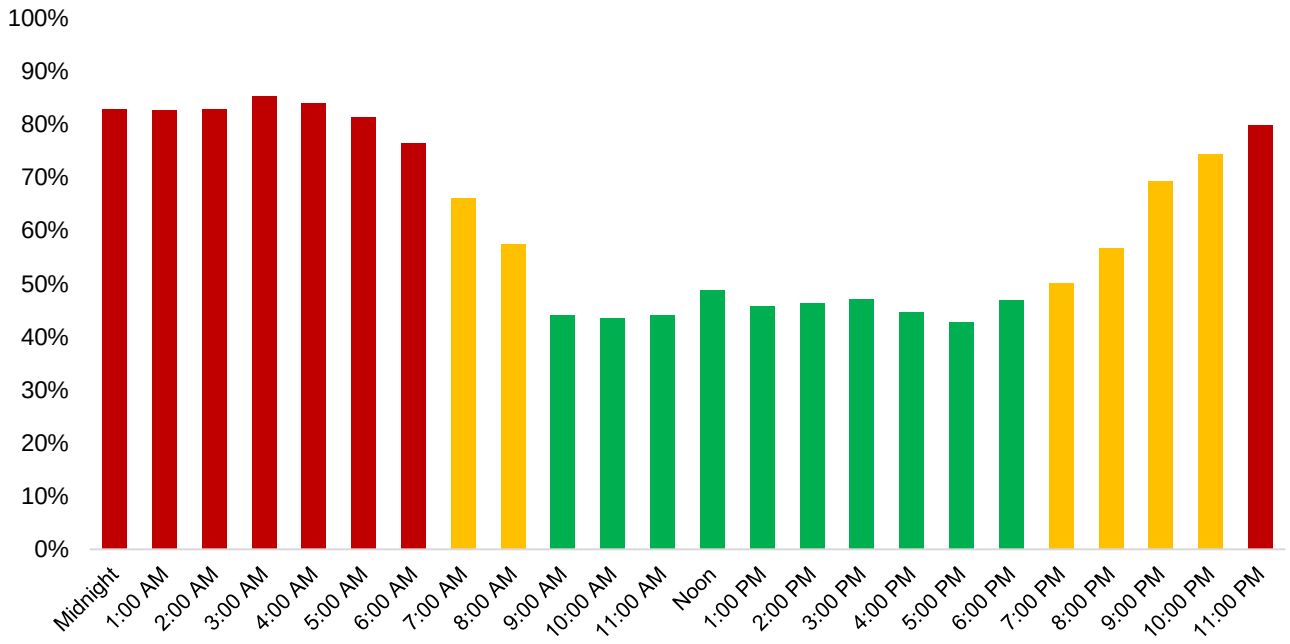
Truck parking utilization provides information about the number of trucks parked at a truck parking location, compared to the number of truck parking spaces provided at the location. The truck parking utilization analysis was informed by Kansas' Truck Parking Information Management System (TPIMS), which collects information about truck parking utilization at 18 truck parking locations in Kansas, and data from TruckerPath, a crowd-sourced application that collects information from truck drivers on the availability of spaces at truck parking locations ("lots" of spaces available, "some" spaces available, or "full" location).

MAASTO TPIMS

The Mid America Association of State Transportation Officials (MAASTO) has developed a regional Truck Parking Information System (TPIMS) to collect and broadcast real-time truck parking availability to drivers in Indiana, Iowa, Kansas, Kentucky, Minnesota, Iowa, and Wisconsin. The project was funded through a $25 million federal Transportation Investment Generating Economic Recovery (TIGER) grant, in combination with matching state funds, with the goal of enabling drivers to proactively plan their routes and make safer, more efficient parking decisions.[92]

As shown in Figure 5-19, truck parking utilization is highest during the overnight and early morning hours, peaking at 85.4 percent from 3:00 to 4:00 am. Truck parking utilization continues to decline throughout the day, before increasing again during evening hours as drivers look for overnight parking.

Figure 5-19: Statewide Truck Parking Utilization

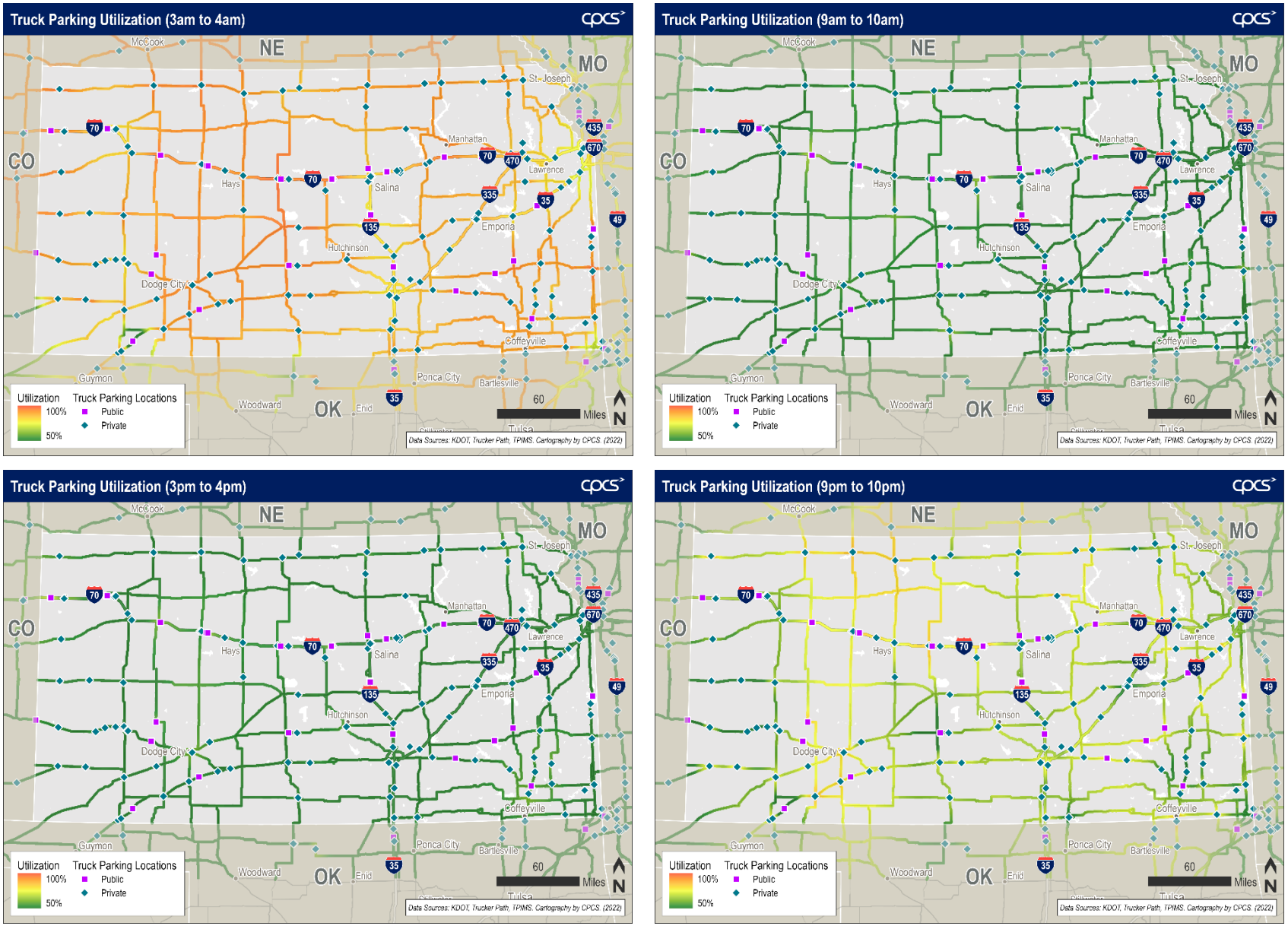


Source: CPCS Analysis of TruckerPath, MAASTO Truck Parking Information System (TPIMS)

Figure 5-20 further demonstrates these trends through an illustration of corridor-based utilization of public and private truck parking facilities during select hours. Note that the maps show truck parking utilization on all Interstates and U.S. highways in Kansas, as well as select state routes along which truck parking facilities are located. Areas of low utilization (50 percent and below) to high utilization (100 percent) are shown on a scale of green (low utilization) to yellow (medium utilization) to red (high utilization).

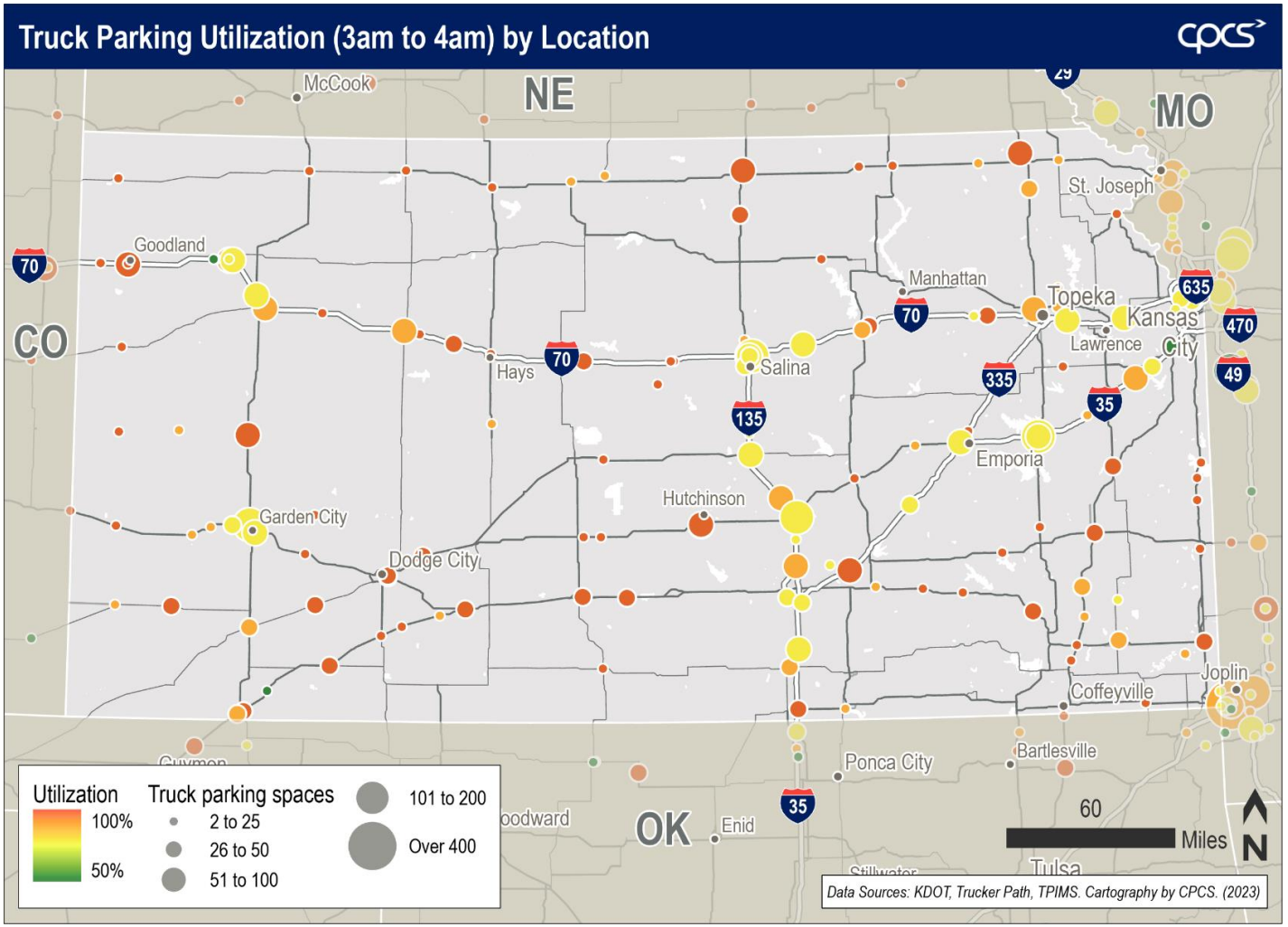
[92] MAASTO, Trucks Park Here

Figure 5-20: Truck Parking Utilization by Hour



During the peak statewide truck parking utilization hour of 3 to 4 am (Figure 5-21), about half of the state's truck parking locations experience utilization of 90 percent or higher. Several public rest areas along I-70 (Russell EB and WB, Ellsworth WB, Manhattan WB, Ogallah WB, Goodland EB, and Grainfield EB) – all of which provide 10 or fewer truck parking spaces – are fully utilized during this time. Private truck stops that experience the highest utilization during this time are scattered across the state and range in size. Often, these highly utilized truck stops are located near freight facilities or on key US or state routes.

Figure 5-21: Truck Parking Utilization (3 to 4 am), by Location



The truck parking utilization analysis, in combination with KFAC and industry input, and a review of relevant completed truck parking efforts – namely the FHWA Jason's Law Survey and Assessment, as well as the Kansas Statewide Freight Network Truck Parking Plan – informed the evaluation of Kansas' truck parking shortages.

- **Jason's Law 2015 Truck Parking Survey:** Kansas ranked among the top 12 states mentioned by American Trucking Association (ATA) drivers and professionals, as well as by the Owner Operator Independent Drivers Association (OOIDA), with a sufficient supply of truck parking.[93]
- **Jason's Law 2019 Update:** Compared to other states, Kansas has fewer locations that experience frequent undesignated, or unofficial, truck parking.[94] Input from Kansas safety enforcement personnel specified three locations on and near US 50 and US 83 in Finney County as locations of frequent unofficial truck parking.[95] However, the fact that survey input from Kansas was limited to one county indicates that these results may not be representative of undesignated truck parking statewide. As part of the survey update, up to a quarter of truck driver respondents cited Kansas as a state with truck parking shortages. While fewer drivers cite shortages in Kansas compared to other states, truck driver input indicates there still exist truck parking shortages in Kansas.
- **Kansas State Freight Plan Outreach:** As part of the plan, KDOT sought feedback from stakeholders, through KFAC meetings and through industry consultations, to better understand the state's existing truck parking needs and issues. Some freight stakeholders have noted that compared to other states, Kansas does a sufficient job of providing truck parking to drivers. However, other freight stakeholders indicate there are not enough truck parking spaces within Kansas to accommodate needs. Areas of undesignated parking include, but are not limited to, I-70 (along on/off ramps) and Garden City, located in Finney County. Specifically, livestock, dairy, and manufacturing activity attract trucks, which park on the side of the road in the area.[96] I-35 and US 196, in addition to industrial last-mile roads generally, were identified by stakeholders as other corridors with a high demand for truck parking.[97]
- **Kansas Statewide Freight Network Truck Parking Plan:** KDOT and KTA developed this Plan in 2015 to identify locations of undesignated parking in Kansas, based on a field review conducted along Kansas' previous Freight Corridors of Significance, between the hours of 10 pm and 6 am during the week of March 16 – 20, 2015. The study reported that a significant number of drivers report parking in illegal locations, some of which can be unsafe, particularly around urban areas. Illegal truck parking was also reported along on/off ramps.[98]

Although stakeholders identify fewer truck parking issues in Kansas compared to other states nationwide, there still exists a shortage of adequate truck parking in the state, particularly along Interstates and near major freight establishments.

[93] USDOT, FHWA, Jason's Law Truck Parking Survey Results and Comparative Analysis, August 2015, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/jasons_law.pdf

[94] USDOT, FHWA, Jason's Law Commercial Motor Vehicle Parking Survey and Comparative Assessment, December 2020, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/2020/mtg/jasons_law_results.pdf

[95] USDOT, FHWA, Jason's Law 2019, Truck Parking Survey for Kansas Enforcement Agencies.

[96] KFAC Meeting 3, October 19, 2022.

[97] Kansas State Freight Plan consultations with freight carriers.

[98] KDOT and KTA, Kansas Statewide Freight Network Truck Parking Plan, February 2016, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/Kansas_Statewide_Freight_Network_Truck_Parking_Plan_2015_2016.pdf

Percent of Weigh Stations with Weigh-in-Motion

Weigh-in-motion (WIM) systems are a series of sensors underneath flat, smooth, and straight roadways that measure trucks at either highway speeds or slow speeds. In Kansas, five out of eight weigh stations are equipped with WIM technology. Figure 5-22 illustrates the locations of those weigh stations.

8	146	5	34
Fixed Platform Scales	**Portable Wheel Weigher Scales**	**Weigh-in-Motion Equipment**	**Weight Enforcement Personnel**

Source: Kansas State Enforcement Plan, 2022.

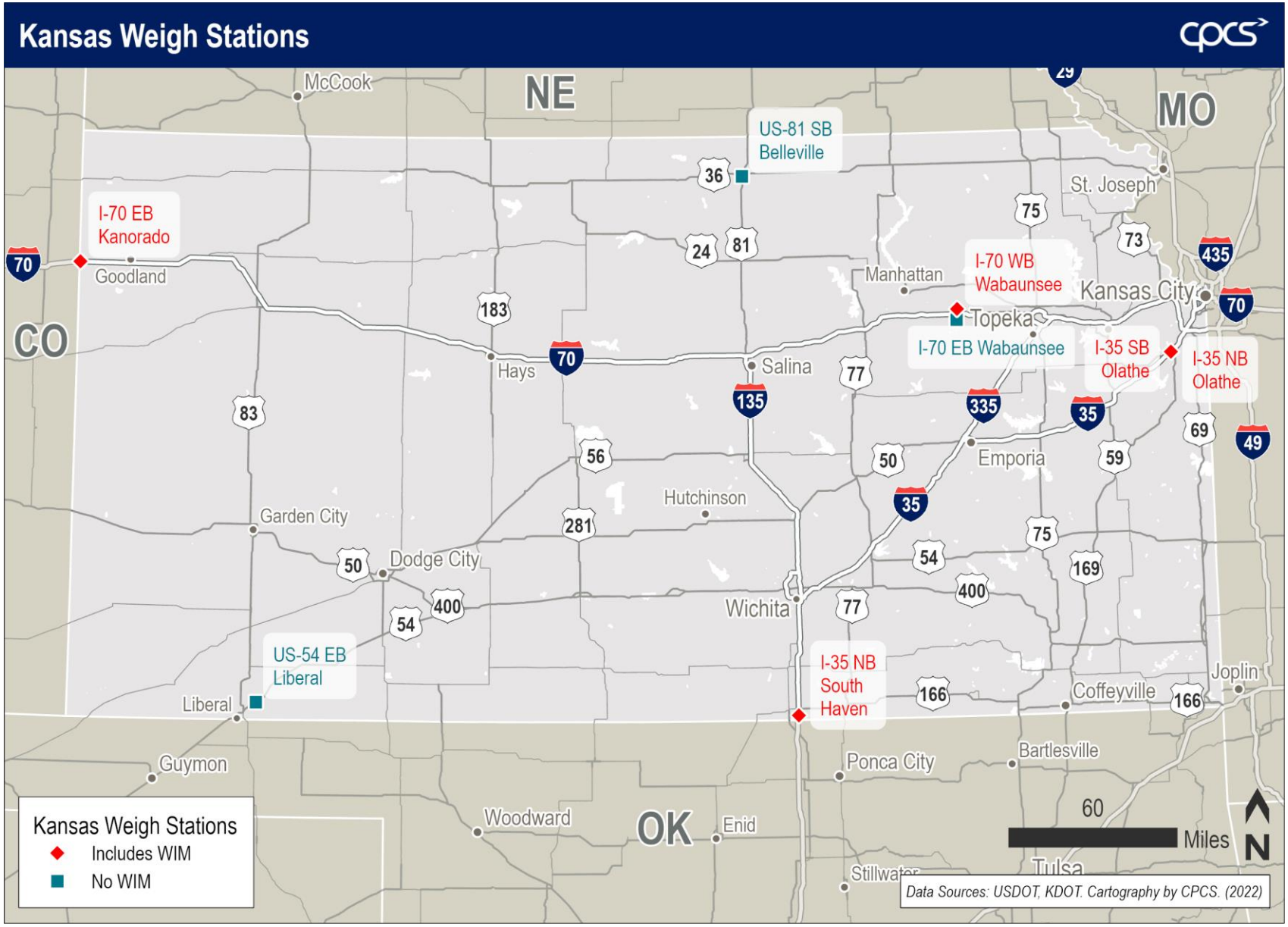
Virtual Weigh Stations

A virtual weigh station (VWS) is a type of truck size and weight enforcement device that does not require continuous staffing and is monitored and controlled from a remote location. The minimum functionality of VWSs include real-time weighing and identifying of commercial vehicles, generating screening decisions based on real-time data, communicating data, such as vehicle photo and weight data, to enforcement personnel.

Kansas does not have any VWSs installed. However, state highway patrol has added VWS into their project plan with the Federal Motor Carrier Safety Administration and will continue discussing installing VWSs in Kansas.

Source: Consultation with Kansas Highway Patrol

Figure 5-22: Truck Weigh Stations in Kansas



Asset Preservation

Bridge Condition

Well-maintained bridges are crucial for supporting efficient freight movements, especially for OS/OW truck movements. According to the National Bridge Inventory, there are 1,424 bridges on Kansas' Interstate system. The average age of these bridges is 40 years old, which suggests the need for more maintenance in the future. As detailed in Figure 5-23 and Figure 5-25, 64.6 percent of Kansas bridges, by deck area, are in good condition. This falls short of the state's target of 70 percent. Meanwhile, 2.1 percent of the state's bridges are rated poor, which exceeds the state's target of 2.1 percent.

Figure 5-23: Kansas Bridge Conditions (Interstates) (2019)

Condition	Percentage (Deck Area)	Number of Bridges	2019 Target
Good	64.6%	1,072	70%
Fair	33.3%	337	N/A
Poor	2.1%	15	3.0%
TOTAL	100%	1,424	--

Source: CPCS Analysis of National Bridge Inventory; Kansas Long Range Transportation Plan 2020-2045

Pavement Condition

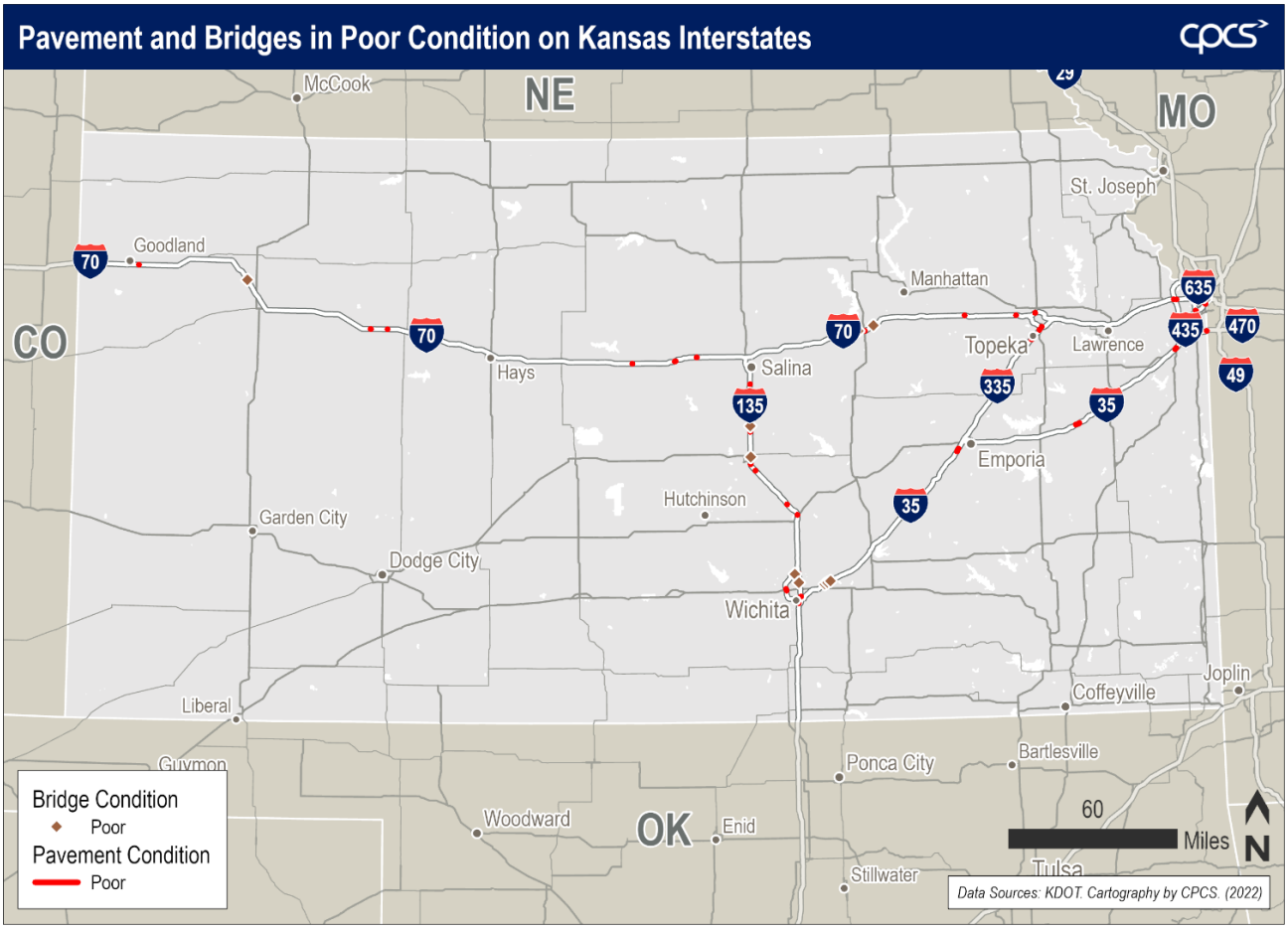
Well-maintained pavement supports the safe movement of freight vehicles. High volumes of OS/OW vehicles can lead to accelerated deterioration of roadways. In Kansas, 59.9 percent of pavement is rated in good condition, while 0.4 percent of pavement is considered poor (Figure 5-24 and Figure 5-25). The percentage of pavement in poor condition meets KDOT's performance target of 0.5 percent, whereas the percentage of pavement in good condition falls slightly short of the 65 percent target.

Figure 5-24: Kansas Pavement Conditions (Interstates) (2019)

Pavement Condition	Percentage	2019 Target
Good	59.9%	65%
Fair	39.4%	N/A
Poor	0.4%	0.5%
N/A	0.3%	N/A
TOTAL	100%	--

Source: CPCS Analysis of KDOT Pavement Data; Kansas Long Range Transportation Plan 2020-2045

Figure 5-25: Bridges and Pavement in Poor Condition on the Interstates (2019)



Vertical Bridge Clearance

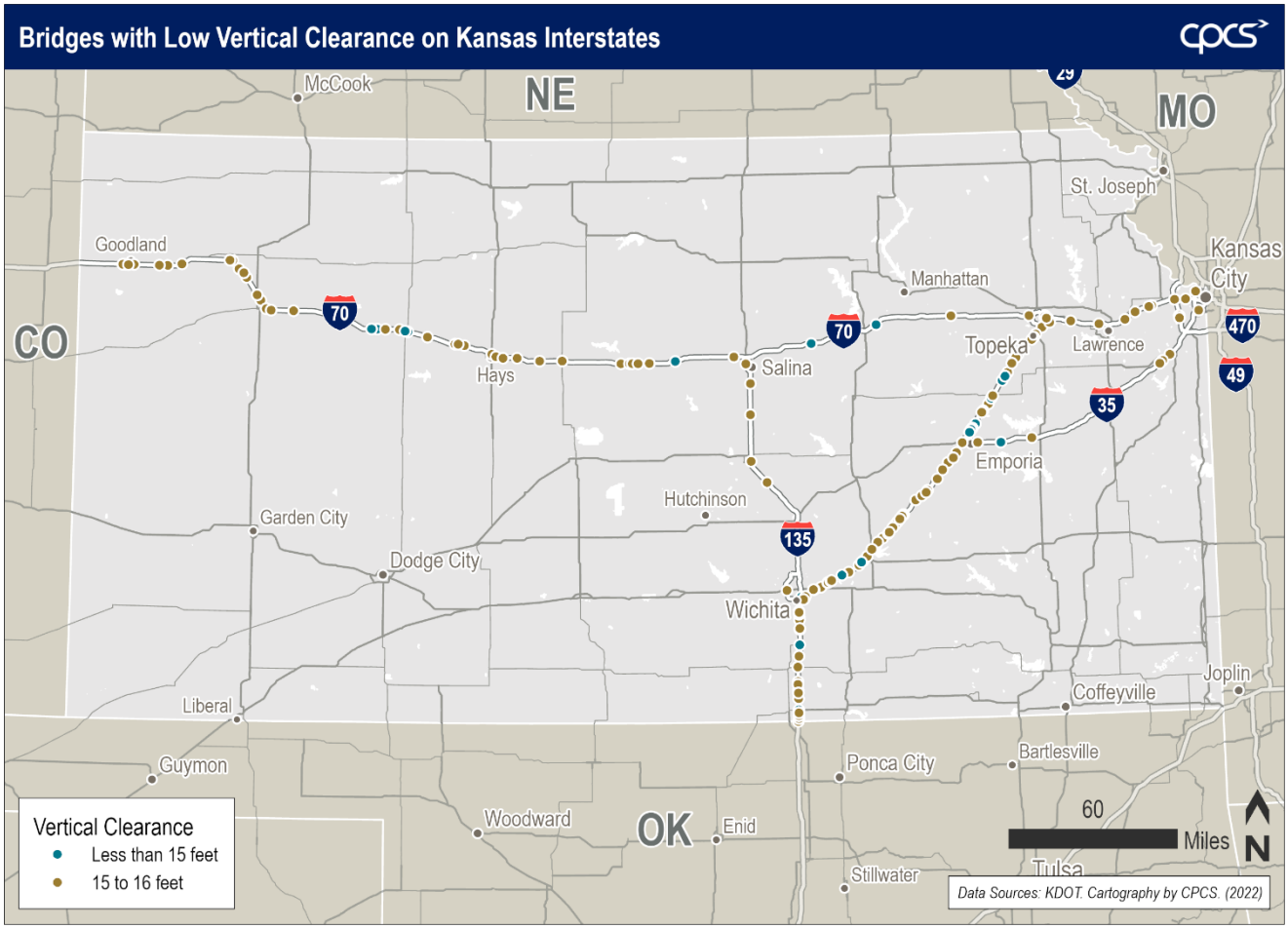
Physical roadway constraints can impact the efficiency of truck movements and may create bottlenecks. Insufficient vertical clearance hinders trucks from traveling on certain roads, requiring drivers to take detours. FHWA requires the vertical clearance of new or reconstructed bridges on Interstates to be no less than 16 ft.[99] Figure 5-26 shows that 25.5 percent of bridges over Kansas' Interstates have a vertical clearance under 16 feet. Most bridges with insufficient vertical clearance (< 16 feet) are located along the Kansas Turnpike – I-70 from Kansas City to Topeka, I-335 from Topeka to Emporia, I-35 from Emporia to Wichita, and I-135 from Wichita to the Kansas-Oklahoma state border.

Figure 5-26: Kansas Bridges by Vertical Clearance (Interstates) (2019)

Vertical Clearance	Percentage	Number of Bridges
Less than 15 feet	4.1%	45
15 - 16 Feet	21.4%	234
Greater than 16 feet	74.5%	817
TOTAL	100%	1,096

Source: CPCS Analysis of KanPlan Vertical Clearances Data

Figure 5-27: Insufficient Vertical Clearance on Kansas Interstates (2019)



[99] A Policy on Design Standards – Interstate System. May 2016. https://www.dot.state.al.us/publications/Design/pdf/DesignStandardsInterstateSystem.pdf

5.3 Rail

Safety and Security

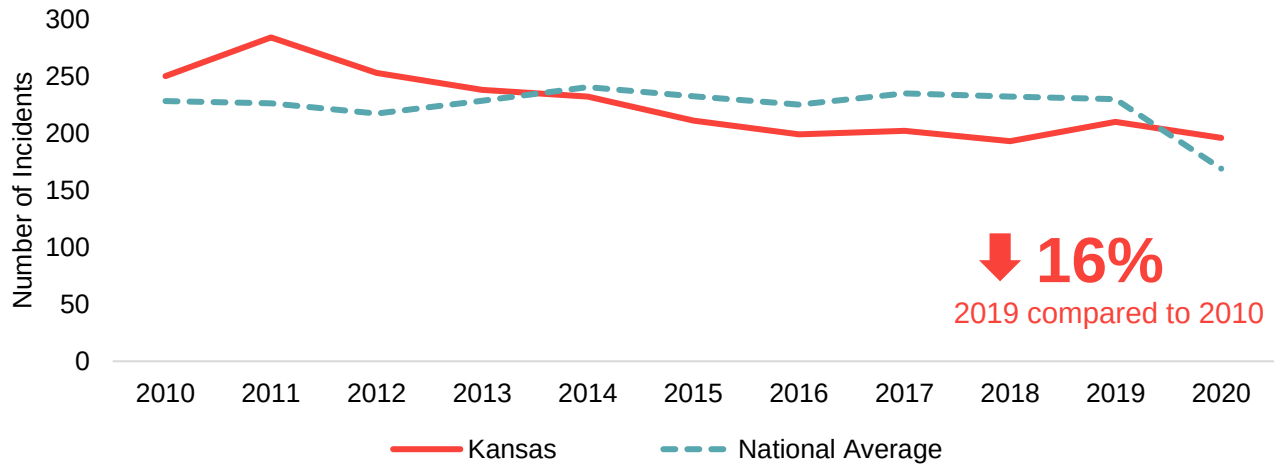
Total Rail Incidents

Nearly 2,470 freight rail incidents happened in Kansas between 2010 and 2020, resulting in 119 deaths and more than 1,100 person injuries. In 2019, Kansas' freight rail system saw 210 incidents in total, which led to 7 deaths and 87 person injuries. Rail equipment incidents accounted for the highest share of the 2019 freight rail incidents in Kansas (40 percent), followed by incidents at highway-rail crossings (14 percent). Over 75 percent of the 2019 casualties were among rail workers, and about 14 percent were trespassers. As Figure 5-28 shows, between 2010 and 2019, the total number of rail incidents in Kansas declined by 16 percent. Between 2014 and 2019, the total number of rail incidents in Kansas remained below the national average. However, the number of incidents in Kansas exceed the national average in 2020, despite a continued decline.

2019 Freight Rail Incidents

29	13	84	71
Incidents at Grade Crossings	Trespassing Casualties	Rail Equipment-Involved Incidents	Rail Workers Killed/Injured

Figure 5-28: Rail Safety Trend



Source: CPCS analysis of FRA Safety Data, 2021.

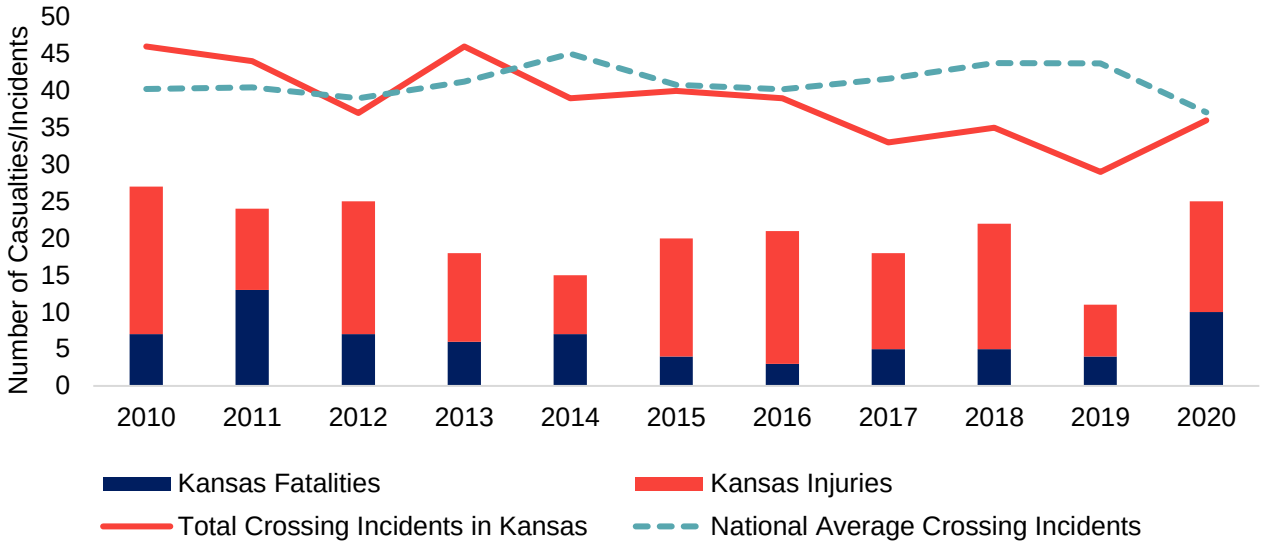
Highway-Rail Grade Crossing Incidents

Between 2010 and 2020, 424 incidents happened at highway-rail grade crossings in Kansas, resulting in 71 deaths and 155 person injuries. In 2019, 29 crossing incidents led to seven injuries and four fatalities. As Figure 5-29 shows, while Kansas' crossing incidents decreased by about 37 percent when comparing 2019 to 2010, the number of incidents increased by 24 percent between 2019 and 2020. According to the Federal Railroad Administration's (FRA) safety data, commercial vehicles were involved in over a quarter of the highway-rail grade crossing incidents that happened over the past ten years in Kansas.

2019 Highway-Rail Crossing Incidents

29	7	4	25%
Incidents	Person Injuries	Person Fatalities	Involved Trucks

Figure 5-29: Rail Crossing Risk Trend



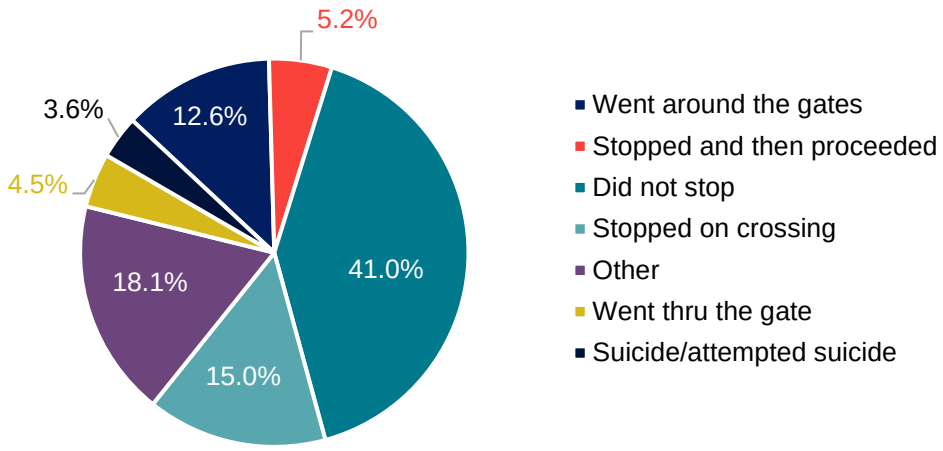
Source: CPCS analysis of FRA Safety Data, 2021.

Fundamental to improving safety at highway-rail grade crossings is the investigation of highway users' behavior at or on approach to a grade crossing. Figure 5-30 summarizes the actions of highway users that have been involved in crossing incidents in Kansas between 2010 and 2020. Over 41 percent of the drivers did not stop for the trains at the crossings, while about 15 percent of the vehicles were stopped over the rail tracks at the crossings and 13 percent tried to cross over the rail tracks while the gates were down to warn the highway users and prevent crossing.

This is in line with the national trends: studies show that drivers, especially those familiar with driving in and around an area, generally do not scan for trains (about 40 percent) when approaching a crossing, and a majority of drivers (about 90 percent) do not prepare to stop at a grade crossing.[100] Noncompliance may also be due to other factors such as drivers' level of risk acceptance, distracted driving and failure to notice the warnings/signs at the passively-controlled grade crossings, and weather and visibility conditions.

[100] FRA, Human Factors in Railroad Operations: Driver Behavior at Highway Railroad Grade Crossings, 2008; FRA, Driver Behavior at Highway-Rail Grade Crossings Using NDS and Driving Simulators, 2020.

Figure 5-30: Action of Highway Users In Crossing Incidents (Kansas, 2010-2020)



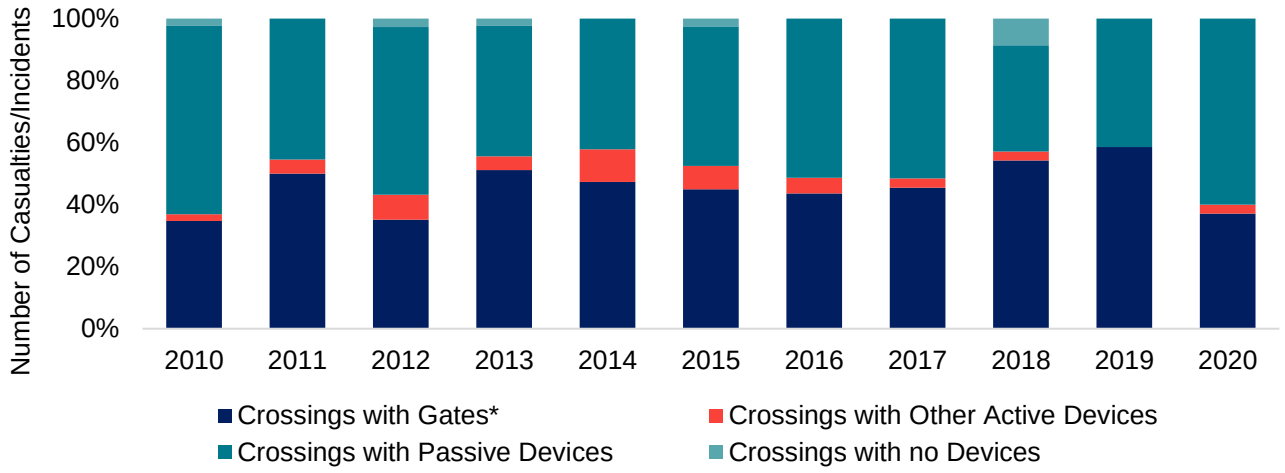
Source: CPCS analysis of FRA Safety Data, 2021.

Highway-Rail Grade Crossing Incidents by Safety Device

The majority of highway-rail grade crossings in Kansas are equipped with active warning devices such as traffic signals and gates. Warning devices are installed at grade crossings to mitigate the risk of conflict between rail and other modes. Specification and guidance on the application of various grade crossing warning devices are provided in the Manual of Uniform Traffic Control Devices (MUTCD), issued by FHWA.[101] In addition to guidance on crossing warning devices, federal law requires train engineers to sound train horns for 15 to 20 seconds in advance of all public grade crossings.[102]

Despite these measures, an assessment of crossing incidents data shows that many crashes happen at crossings that are equipped with warning devices. In Kansas, over 58 percent of highway-rail crossing incidents in 2019 occurred at crossings that were equipped with gates and other passive and active safety devices. However, when comparing data between 2010 and 2019, the share of incidents at crossings with active warning devices has increased by 58 percent, while the share of accidents at crossings with passive warning devices has declined by 32 percent.

Figure 5-31: Rail Crossing Incidents in Kansas by Safety Device



Source: CPCS analysis of FRA Safety Data, 2021. *Includes crossings that have gates and other active devices.

[101] FHWA, Manual on Uniform Traffic Control Devices, Online Guide, Accessed July 2021.
[102] Train Horn Rule, 49 CFR Part 222.

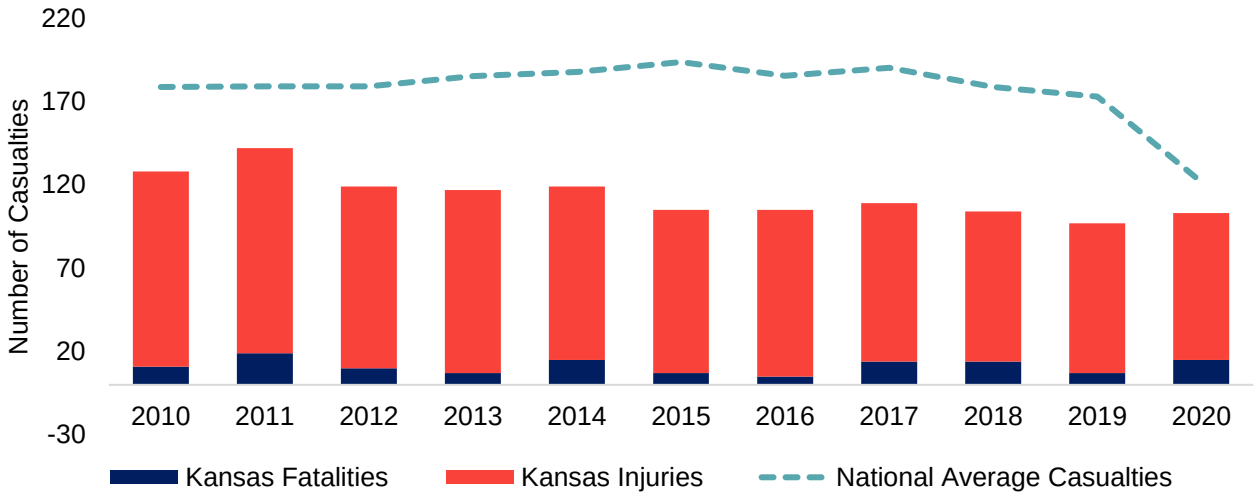
Rail-related Casualty Risk

In 2019, rail-related incidents led to 90 person injuries and seven fatalities in Kansas. About 61 percent of the freight rail-related casualties were railroad employees while on duty (Figure 5-32). As the figure shows, the total number of freight rail-related casualties in Kansas has stayed somewhat constant since 2015 and, in general, below the national average over the past ten years. However, the number of fatalities more than doubled in 2020 compared to 2019, while the number of injuries declined by about 2 percent. Of note is the relatively high number of incidents that happened to trespassers in 2011 (24 compared to 15 in 2010 and 13 in 2019) and incidents that happened to non-trespassers-on railroad property during 2012 (26 incidents compared to 12 in 2011 and 13 in 2019).

2019 Rail-related Casualties

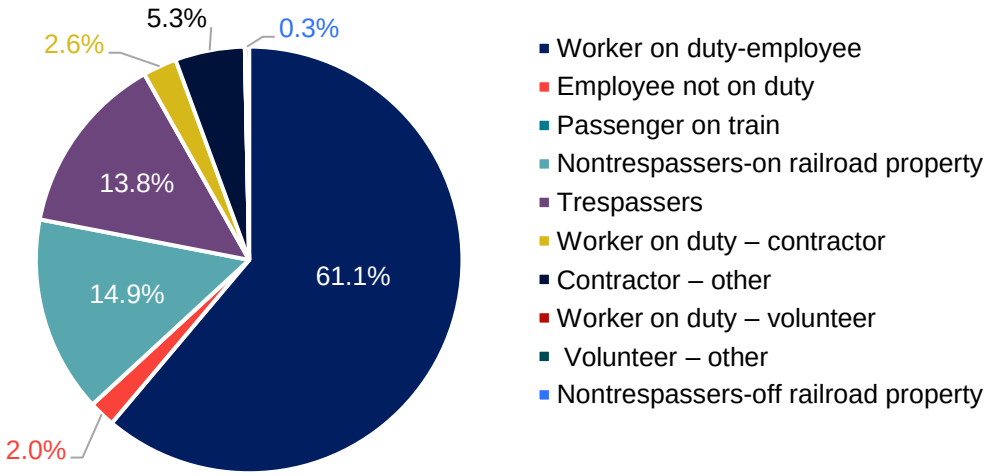
90	7	61%
Person Injuries	Person Fatalities	of victims were railroad employees while on-duty

Figure 5-32: Rail Casualty Risk Trend



Source: CPCS analysis of FRA Safety Data, 2021.

Figure 5-33: Casualty by Person Type (Kansas, 2010-2020)



Source: CPCS analysis of FRA Safety Data, 2021.

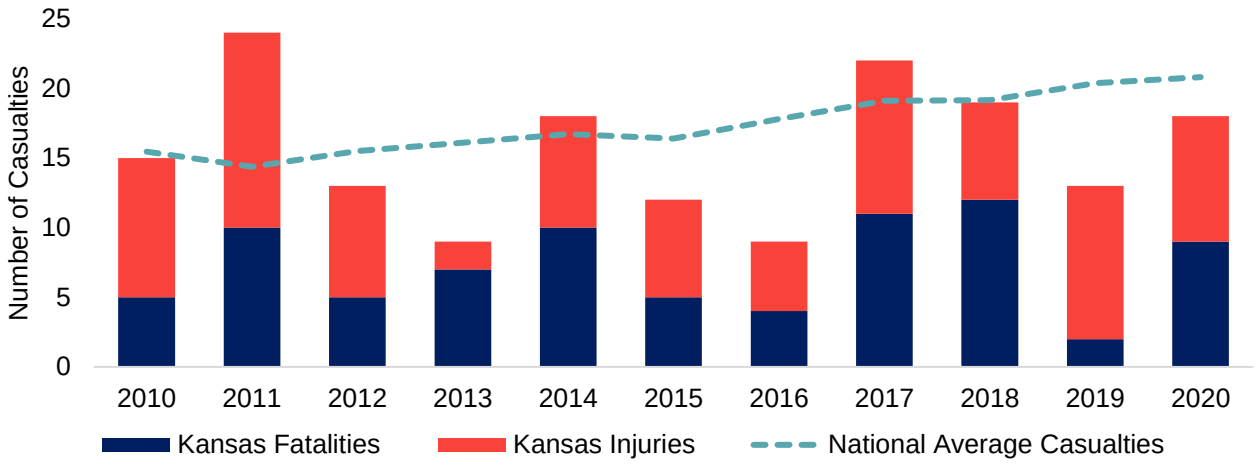
Rail Trespassing Risk

Nationally, nearly 1,000 trespass fatalities and injuries occur each year. Compared to other states in the U.S., Kansas is the 32nd in terms of the annual number of trespassing casualties.[103] Trespassing incidents are the deadliest compared to other rail incident types – 46 percent of Kansas' rail trespassing casualties between 2010 and 2020 have been fatalities. The next highest fatality risk belongs to worker on-duty casualties (around 18 percent). In 2019, rail trespassing incidents led to 11 person injuries and two fatalities in Kansas. As Figure 5-34 shows, although the state's trespassing casualties were well below the national average in 2019, the number of fatalities more than quadrupled in 2020 over the prior year, with the total number of casualties also increasing by 38 percent.

2019 Rail Trespassing Casualties

11	2
Person Injuries	Person Fatalities

Figure 5-34: Rail Trespassing Risk Trend



Source: CPCS analysis of FRA Safety Data, 2021.

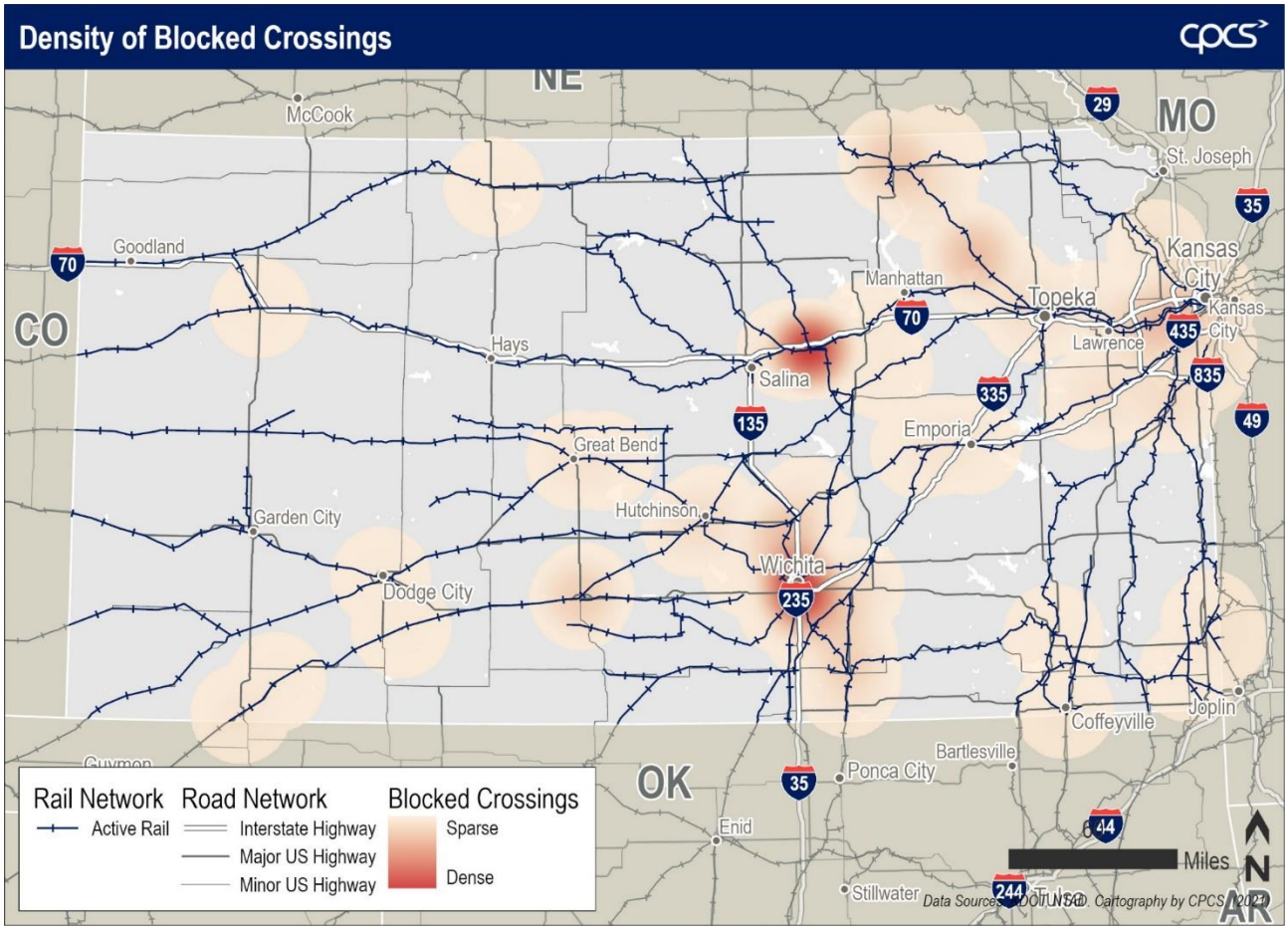
Blocked Crossing Trends in Kansas

Freight trains that sit for long periods at or near busy yards and terminals block road users' access at grade crossings. Studies have shown that drivers will attempt to clear the crossings in front of arriving trains at locations where crossings are known to be routinely blocked for extended periods. Pedestrians may also attempt to cross the blocked crossings by crawling between stopped railcars. To address such safety issues, the FRA is currently collecting inputs from road users and communities living near grade crossings to identify the priority locations and offer effective solutions.[104]

Figure 5-35 shows the density of blocked crossings in Kansas. In total, 328 cases of blocked crossings were reported in Kansas in 2020. The majority (about 79 percent) of these reported crossings were blocked for more than 15 minutes. As the map shows, cases of blocked crossings are mostly reported along the Union Pacific (UP) line in Kansas City and the UP and BNSF Railway (BNSF) lines in Wichita and Abilene. Note that since the map illustrates reported blocked crossings, it is not representative of all blocked crossing incidents in Kansas.

[103] FRA, Trespasser Dashboard, 2021, https://railroads.dot.gov/accident-and-incident-reporting/casualty-reporting/trespasser-incidents.
[104] FRA Newsroom, Federal Railroad Administration Launches Web Portal For Public to Report Blocked Railroad Crossings, 2019, https://railroads.dot.gov/newsroom/press-releases/federal-railroad-administration-launches-web-portal-public-report-blocked-0.

Figure 5-35: Density of Blocked Crossings in Kansas



Source: CPCS analysis of FRA's Blocked Crossing Database, 2021.

Transportation System Management

Percent of Miles with Double Track

Portions of the freight rail system with two or more tracks allow for simultaneous train movements in each direction. Studies have proven that transitioning from single-track operations to two or more tracks can significantly increase capacity and operational train delays.[105] Approximately 7.5 percent of the length of the freight rail system in Kansas has two or more tracks, while the rest of the system runs single-track.

Figure 5-36 presents a summary of the double-track freight rail system in Kansas, and Figure 5-38 shows where these segments are located across the state. As shown, almost the entire (99 percent) length of Kansas' double or more rail tracks system serves the three Class I railroads operating in the state. Among the Class I railroads, BNSF has the highest ratio of segments with two or more tracks to its total operating length.

[105] Samuel L Sogin, Yung-Cheng (Rex) Lai, C Tyler Dick, Analyzing the transition from single- to double-track railway lines with nonlinear, 2015. https://doi.org/10.1177/0954409715616998

Figure 5-36: Double Track System Length in Kansas

Railroad Class	Miles of Double Track or Higher	% of Total Length
Class I[106]	**434**	**12%**
BNSF	277	17%
KCS	0	0%
UP	157	8%
Short Line & Terminal / Switching	4.6	<1%
Short Line	0	0%
Terminal / Switching	4.6	16.5%
TOTAL	438	7.5%

Source: CPCS analysis of National Transportation Atlas Database (NTAD) North American Rail Lines Database, 2021.

Percent of Miles with Sidings

Rail sidings are low-speed tracks running in parallel or close to a mainline segment to allow trains traveling in opposite directions to pass or to provide space for railcar classification, handling, and storage. The presence of sidings can benefit freight efficiency by reducing the time it takes for multiple trains to move through a single-track portion of the rail network. Rail sidings are present along approximately 5 percent of the total length of the freight rail system in Kansas.[107] Figure 5-37 lists the siding mileages in Kansas by railroad class. As shown in Figure 5-39, sidings are more present along the Class I railroad lines in Kansas, with less than one percent of the short line operations being equipped with siding tracks.

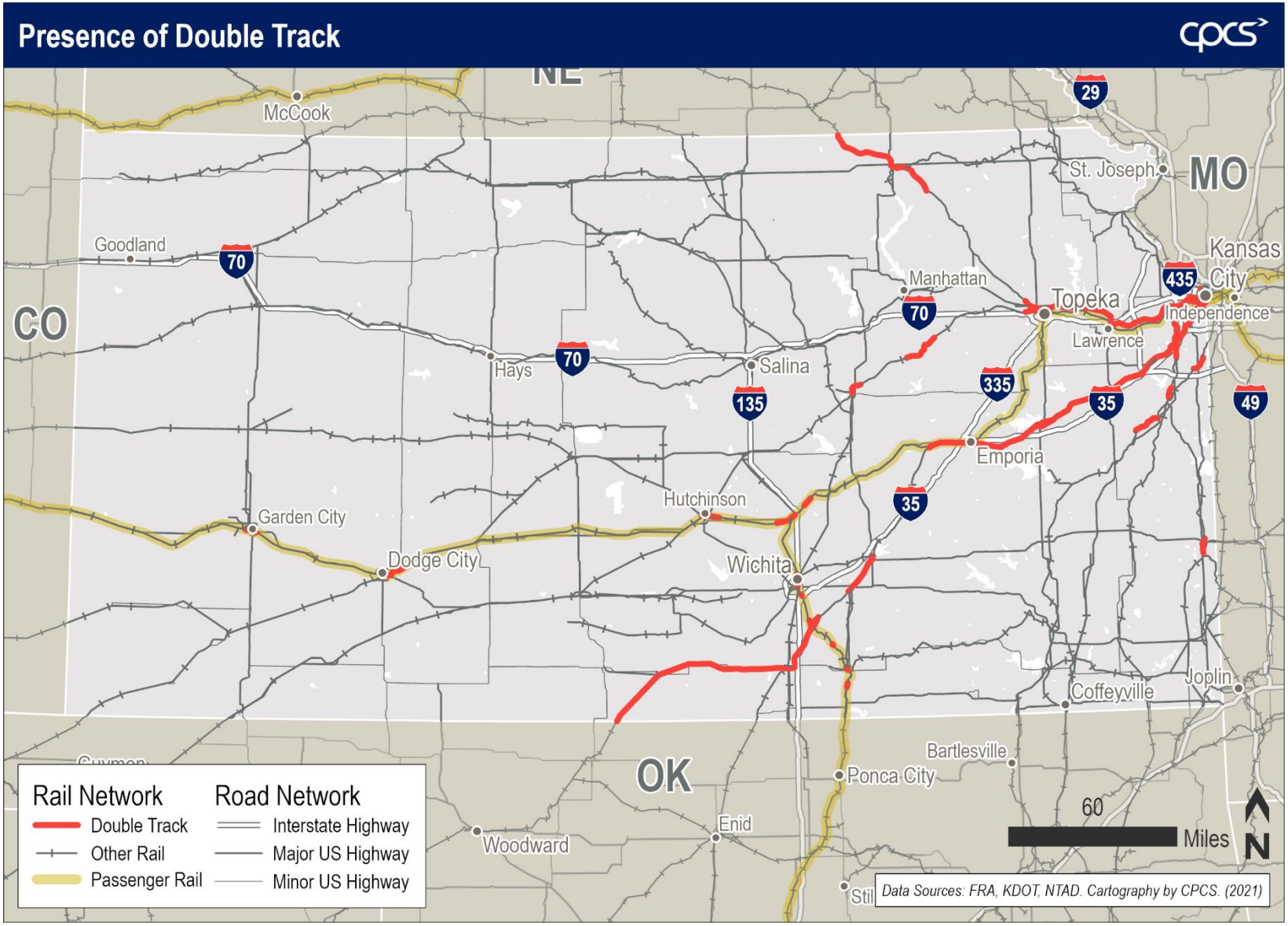
Figure 5-37: Length of Rail Sidings in Kansas

Railroad Class	Miles of Siding	% of Total Length
Class I	**252**	**6.8%**
BNSF	112	6.9%
KCS	0	0%
UP	140	6.8%
Short Line	6.4	0.5%
K&O	1.2	0.1%
KYLE	5.2	1.1%
TOTAL	258.7	5.1%

Source: CPCS analysis of NTAD North American Rail Lines Database, 2021.

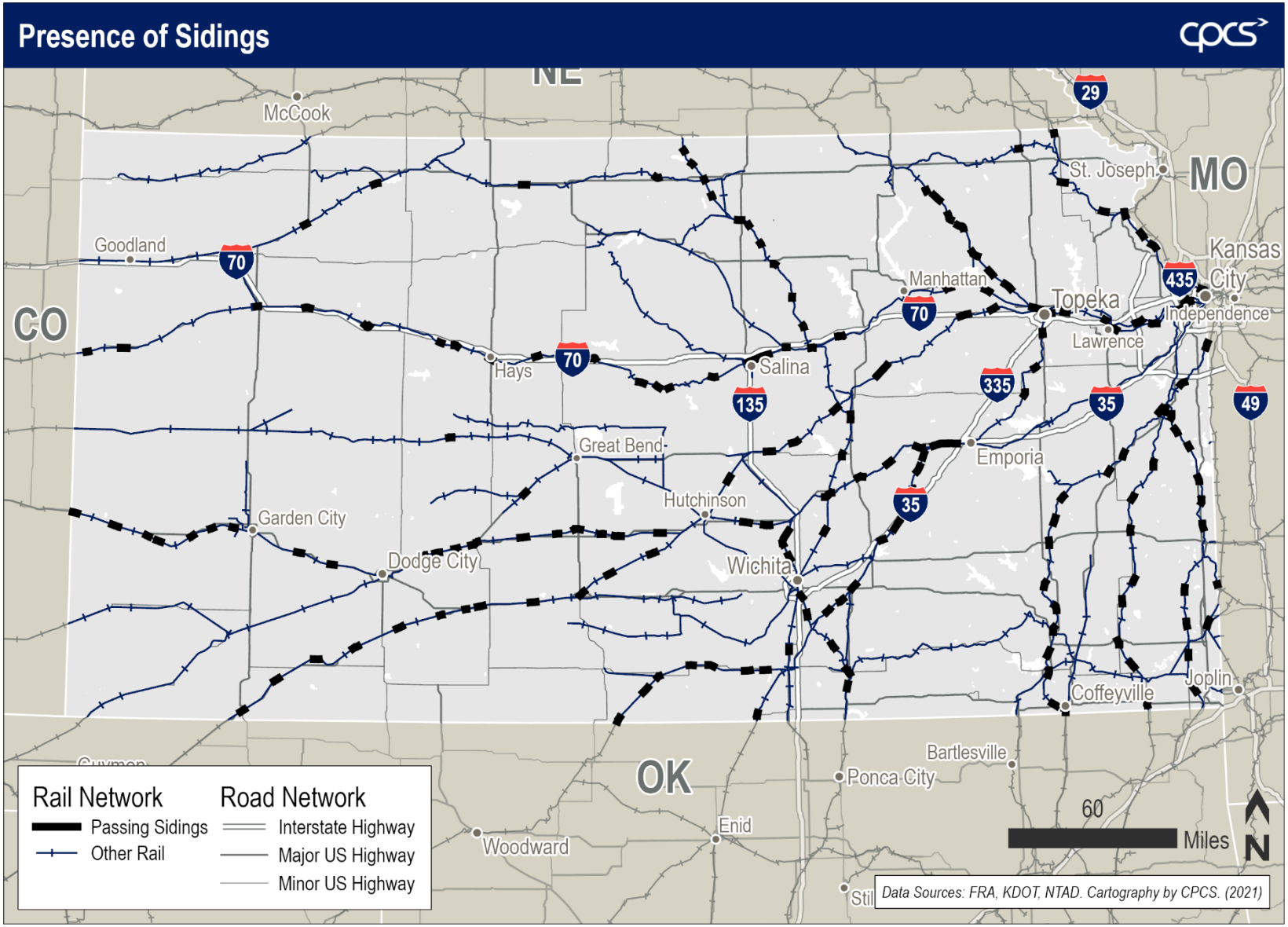
[106] Note: Information pending validation by railroads.
[107] Siding length data is currently under review and validation by KDOT.

Figure 5-38: Presence of Double Track



Source: CPCS analysis of NTAD North American Rail Lines Database, 2021; TranSystems analysis of BNSF network, 2021.

Figure 5-39: Presence of Sidings



Source: CPCS analysis of NTAD North American Rail Lines Database, 2021; TranSystems analysis of BNSF network, 2021.

Asset Preservation

Percent of Mileage that is FRA Track Class 4

The track classification system established by the FRA categorizes rail track segments according to their specific construction details as well as their structural tolerances for carrying passenger and freight trains with various speed limits. The lowest class is known as excepted tracks, which can only accommodate freight trains with a maximum speed of 10 mph and have specific restrictions regarding carrying hazardous material. Track classes 1 to 9 allow for both freight and passenger operations with various restricted speeds. Figure 5-40 details track class speeds for freight operations.

Figure 5-40: FRA Railroad Track Classification System

Track Class	Maximum Speed (MPH) for Freight Trains
1	10
2	25
3	40
4	60
5	80
6	110
7	125
8	160
9	200

Source: 49 CFR § 213.4, 9 & 49 CFR § 213.307, 2021

The FRA track classes indicate the rail equipment safety standards and frequency and category of inspections required. FRA track class 4 is the most common track class in the U.S., which allows for regular commuter and passenger rail operations with a typical range of speed limit. While FRA track class 4 is the standard for Class I railroads, FRA track class 2 – allowing for freight train speeds of up to 25 mph – is the standard for short line railroads. As Figure 5-41 shows, over half of the freight rail system in Kansas is operating on FRA track class 4 or higher. About 73 percent of the short line and switching/terminal rail system is FRA track class 2 or higher, and seven percent is track class 4 or higher. Figure 5-43 shows the extent of class 4 or higher rail tracks in Kansas.

Figure 5-41: Rail Track Classes in Kansas

Railroad	Active Track Mileage			
	Class 1	Class 2 & 3	Class 4 or Higher	% Miles Class 4 or Higher
Class I[108]	177	240	2,331	83%
BNSF	37	152	998	83%
KCS	3	-	18	87%
UP	137	88	1,315	82%
Short Line & Terminal / Switching	401	1,188	120	6.7%
Short Line	394	1,185	120	6.7%
Terminal / Switching	7	3	0	0%
TOTAL	579	1,428	2,452	53%

Source: CPCS analysis of NTAD North American Rail Lines Database, 2021. Note: FRA track class of 121 miles of the state's freight rail system is unknown.

[108] Note: Information pending validation by railroads.

Percent of Mileage that 286,000 Pound Capable

Since the Association of American Railroads (AAR) initiated the Heavy Axle Load (HAL) Research Program in 1988, upgrading the tracks to accommodate larger, heavier railcars have been a major factor in helping freight railroads improve their total payload, and therefore productivity. Before that, the heaviest railcars carried in the US were up to 263,000 lbs. Since the late 1980s, many Class I railroads have strengthened their systems to support heavy railcars (up to 286,000 lbs. or 286k).

As Figure 5-42 shows, almost the entire active Class I system in Kansas is currently 286k capable. However, 14 percent of the active short line system is known to be 286k capable. Meanwhile, information on the weight capacity of 5 percent of active tracks used by the short lines in Kansas is unavailable. The rail lines that cannot accommodate 286k cars would have to upgrade their infrastructure to allow for additional weight and operating speed requirements to address the growing demands. This can lead to the eventual abandonment of rail segments that cannot handle 286k cars. The extent of the 286k compliant active rail network in Kansas is presented in Figure 5-44.

Figure 5-42: Capability to Accommodate 286k Railcars (Active Track)

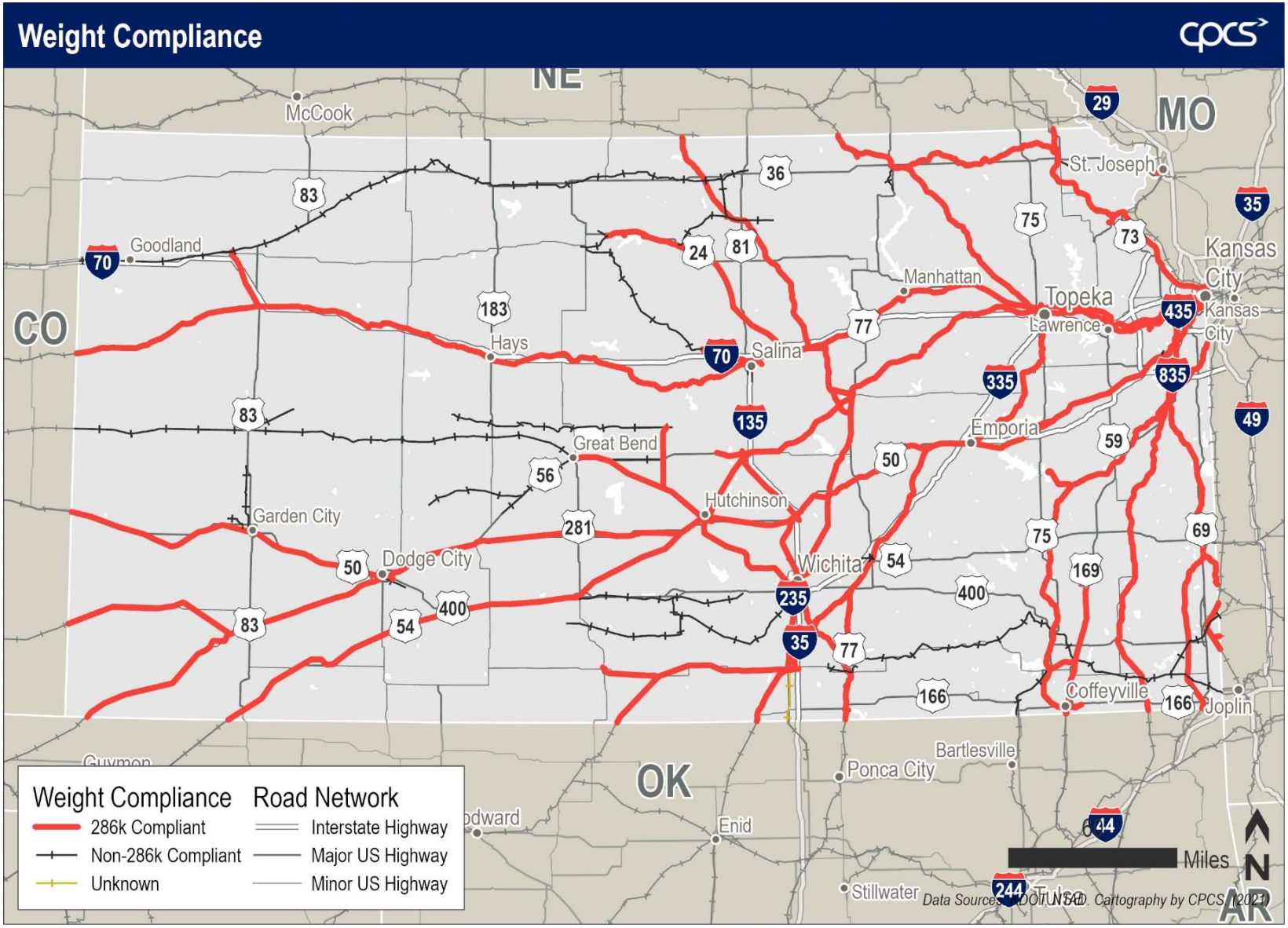
Railroad	% 286k Capable	% not 286k Capable	% Unknown
Class I	**98%**	**2%**	**0%**
BNSF	99%	1%	0%
KCS	100%	0%	0%
UP	97%	3%	0%
Short Line & Terminal / Switching	32%	67%	1%
Short Line	31.5%	67.5%	1%
Terminal / Switching	100%	0%	0%
TOTAL	72%	27%	0.4%

Source: CPCS analysis of KDOT Rail System Data, 2021; Shofstall, Class III / short line system inventory to determine 286,000 lb (129,844 kg) railcar operational status in Kansas and determination of ballast fouling using ground-penetrating radar, 2017; Railroad websites; Railroad consultations.

Figure 5-43: FRA Track Class

Source: CPCS analysis of NTAD North American Rail Lines Database, 2021.

Figure 5-44: Weight Compliance



Source: CPCS analysis of KDOT Rail System Data, 2021; Shofstall, Class III / short line system inventory to determine 286,000 lb (129,844 kg) railcar operational status in Kansas and determination of ballast fouling using ground-penetrating radar, 2017; Railroad websites; Railroad consultations.

Percent of Mileage that is Inactive or Abandoned

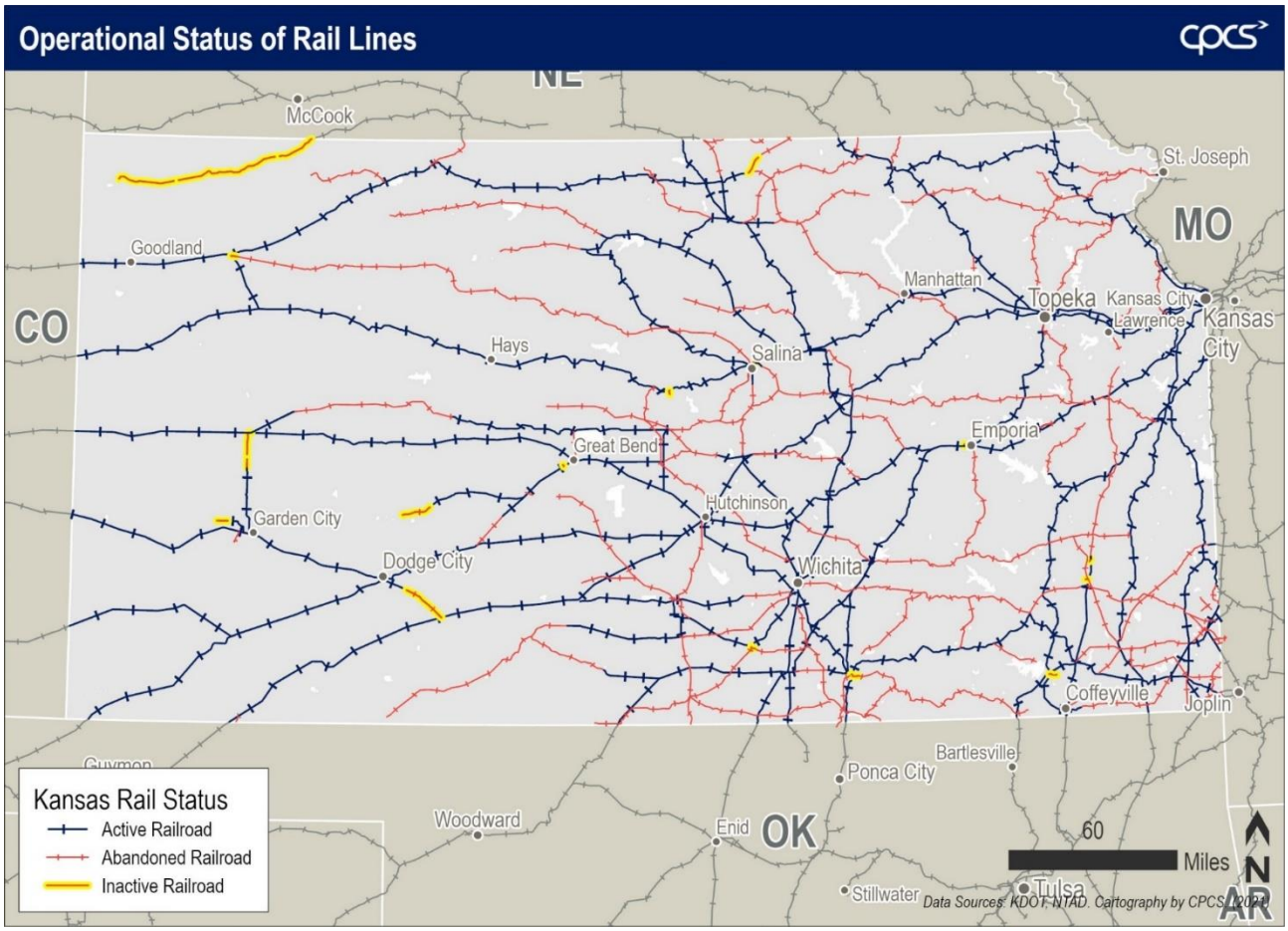
In Kansas, 3,192 miles (40 percent) of the rail track network is abandoned. Abandoned tracks are closed segments of the rail system that are no longer used for rail transportation purposes. Since an abandoned rail segment can affect all the rail users located along a line, the order for authorization of abandonment can only be issued by the Surface Transportation Board (STB) after a comprehensive review of the causes and potential impacts. About two percent of Kansas' freight rail system is inactive. This means that while trains are not operating over these segments, they are still owned by the railroads and can restart operations to serve the shippers. Figure 5-45 details the operational status of rail lines across the state, which is also mapped in Figure 5-46.

Figure 5-45: Freight Rail Operational Status

Status	Active	Inactive	Abandoned	Total
System Miles	4,618	142	3,192	7,953
% of Total	58%	2%	40%	100%

Source: CPCS analysis of KDOT Rail System Data, 2021.

Figure 5-46: Operational Status of Rail Lines



Source: CPCS analysis of KDOT Rail System Data, 2021.

5.4 Air

Asset Preservation

Runway Pavement Condition

Understanding runway surface condition is critical for safe and efficient operations at cargo airports. The Federal Aviation Administration (FAA) monitors runway pavement conditions and recommends a rating system for pavement condition evaluation. Figure 5-47 details the rating criteria, such as distress type, distress quantity, and distress severity, for asphalt and concrete runways.

Figure 5-47: FAA Pavement Surface Condition Rating

Rating	Description	Distress Type/ Distress Quantity/ Distress Severity	
		Asphalt	Concrete
Excellent	No maintenance required	None, or narrow (<1/8”) thermal cracks; pavement less than five years old.	None.
Good	Minor routine maintenance, crack sealing	Additional thermal cracking that is at least 50’ apart; minimal or slight raveling; no distortion;	Hairline or sealed cracks 1/8” wide or less.
Fair	Preservative treatments, crack sealing, and surface treatment	Moderate raveling; thermal cracks and joints generally spaced less than 50’ apart	Several broken slabs; corner cracking on several slabs; slight faulting (<1/4”)
Poor	Structural improvement and leveling (patching then overlay)	Frequent thermal cracks; up to 25 percent of pavement edges contain cracks; up to 20 percent of surface area contains alligator cracks; 1” – 2” distortion.	Many slab cracks and cracks at joints; patches in fair to poor condition; severe or extensive scaling.
Failed	Reconstruction	Widespread, severe cracking with raveling and deterioration; over 20 percent of surface area contains alligator cracking and potholes; distortion over 2”	Many wide cracks with failed sealant and grass; slabs extensively cracked or shattered; numerous faults over ½”

Source: FAA Airfield Pavement Surface Evaluation and Rating Manuals

The nine Kansas airports with cargo operations in 2019 are listed in Figure 5-48 by air cargo volume. Among these airports, four runways have fair pavement condition, including Runway 01R/19L at IAB and Runway 04/22 at HUT, as well as Runway 02/20 and Runway 14/32 at DDC. Pavement condition at the remaining runways is rated good or excellent, based on FAA criteria. Additionally, all cargo airports have good or fair runway marking conditions in Kansas.

Figure 5-48: Kansas Cargo Airport Pavement Condition

Runway	Pavement Surface Type	Pavement Condition	Marking Condition
Wichita Dwight D. Eisenhower National (ICT)			
01L/19R	Concrete	Good	Good
01R/19L	Concrete	Good	Good
14/32	Concrete	Good	Good

Runway	Pavement Surface Type	Pavement Condition	Marking Condition
McConnell Air Force Base (IAB)			
01L/19R	Asphalt-Concrete	N/A	N/A
01R/19L	Asphalt	Fair	Fair
Hutchinson Regional Airport (HUT)			
04/22	Asphalt	Fair	Good
13/31	Asphalt	Excellent	Fair
17/35	Concrete	Excellent	Good
Garden City Regional Airport (GCK)			
12/30	Concrete	Good	Good
17/35	Concrete	Good	Good
Manhattan Regional Airport (MHK)			
03/21	Concrete	Poor	Good
13/31	Concrete	Excellent	Good
Topeka Regional Airport (FOE)			
03/21	Asphalt	Excellent	Good
13/31	Concrete	Excellent	Fair
Salina Regional Airport (SLN)			
04/22	Asphalt	Good	Fair
12/30	Asphalt	Excellent	Good
17/35	Asphalt-Concrete	Good	Good
18/36	Asphalt	Excellent	Good
Liberal Mid-America Regional Airport (LBL)			
04/22	Concrete	Excellent	Good
17/35	Concrete	Excellent	Good
Dodge City Regional Airport (DDC)			
02/20	Asphalt	Fair	Fair
14/32	Asphalt	Fair	Good

Source: FAA Airport Data and Information Portal. Note: IAB is a U.S. Air Force base and is not a part of the NPIAS airports. It is included in the evaluation since it is one of the key cargo airports in Kansas. Note: Information for MHK updated based on information provided by MHK. Additionally, reconstruction for MHK runway 03/21 will occur in the summer of 2023, and following that work, the pavement will be in excellent condition.

Runway Length

The type of aircraft and the amount of weight that can take off and land at airports depend on runway length. Therefore, runway length impacts the capacity and efficiency of each airport. Wide-body aircraft usually require runways that are at least 7,900-foot long. Longer-distance flights or heavier aircraft require even longer runways. As shown in Figure 5-49, ICT, IAB, FOE, and SLN have runway lengths sufficient to serve wide-body, long-distance cargo flights.

Figure 5-49: Kansas Airport Runway Lengths

Runway	Dimension (Feet)
Wichita Dwight D. Eisenhower National (ICT)	
01L/19R	10,301 * 150
01R/19L	7,301 * 150
14/32	6,301 * 150
McConnell Air Force Base (IAB)	
01L/19R	12,000 * 150
01R/19L	12,007 * 150
Hutchinson Regional Airport (HUT)	
04/22	4,405 * 100
13/31	7,003 * 100
17/35	4,012 * 75
Garden City Regional Airport (GCK)	
12/30	5,700 * 100
17/35	7,299 * 100
Manhattan Regional Airport (MHK)	
03/21	7,000 * 150
13/31	5,001 * 75
Topeka Regional Airport (FOE)	
03/21	7,002 * 150
13/31	12,803 * 150
Salina Regional Airport (SLN)	
04/22	3,648 * 75
12/30	6,510 * 100
17/35	12,301 * 150
18/36	4,301 * 75
Liberal Mid-America Regional Airport (LBL)	
04/22	5,000 * 75
17/35	7,105 *100
Dodge City Regional Airport (DDC)	
02/20	4,649 * 100
14/32	6,899 * 100

Source: FAA Airport Data and Information Portal. Note: IAB is a U.S. Air Force base and is not a part of the NPIAS airports. It is included in the evaluation since it is one of the key cargo airports in Kansas.

5.5 Key Freight Corridors Assessment

As part of the Kansas State Freight Plan, KDOT engaged in a process to designate Kansas' Freight Corridors of Significance (FCS) on the highway network. Chapter 5.1 provided a summary of the evaluation of Interstates in Kansas, but KDOT also desired an evaluation of portions of the non-interstate corridors in the FCS. These corridors carry heavy goods linked to the agricultural and manufacturing industries, and awareness of their needs is vital for KDOT to ensure the freight system can be used by even the heaviest vehicles in the state.

Case Studies: Corridor Analysis

The following text provides a summary of the five non-Interstate corridors in Kansas that were identified by KDOT for deeper analysis (Figure 5-50). These are mapped in Figure 5-51 and summarized in Figure 5-52.

Two of the case study corridors (US 50 and US 83) are CRFCs and provide critical connections between the state's Interstates and freight facilities. Three additional corridors were selected based on their importance to current or expected future freight movements in the state.

- **US 50** is a major east-west highway that enters Kansas in Hamilton County and terminates at Interstate 35 in Emporia after traveling through Garden City, Dodge City, and Hutchinson. US 50 stood out among the five case study corridors as the average age of the bridges on this corridor is 53, much higher than the average age of 37.7 for the bridges on the other four corridors.
- **US 83** is a north-south US highway that enters Kansas in Decatur County and exits the state in Seward County after traveling through key cities including Garden City and Liberal. Though US 83 has the lowest average truck AADT (1,107), it has the highest truck share of total volume (35.3%) and the highest truck parking space density (1.87) among the five corridors.
- **US 169 south of US 50** provides a direct connection between Kansas City and Tulsa in Oklahoma. US 169 had the worst safety records among the five corridors, with the highest truck-involved severe injury rate and fatality rate (both at 16) between 2015 and 2019.
- **US 400** between west of Dodge City and south of Pittsburg: an important east-west corridor in Kansas that traverses the City of Wichita. The average truck parking utilization rate is the highest on US 400 between 3 AM and 4 AM (91.5%), in comparison with other case study corridors with truck parking (87.1%).
- The **K-10 corridor**, stretching 24 miles east of Interstate 435 is an east-west corridor that served an average of 2,250 average daily truck traffic in 2019. This stretch of K-10 has the highest truck AADT (2,250) among the five case study corridors and the highest freight-reliant establishments and employment density within a 5-mile radius.

Appendix H provides a detailed analysis for each of the five corridors.

Figure 5-51: Case Study Corridors

Figure 5-52: Summary of Case Study Corridor Evaluation

LRTP Goals	Freight Evaluation Measures	US 50	US 83	US 169	US 400	K-10
Overview	Corridor Length (Miles)	448	240	149	326	24
	Average Truck AADT (2019)	1,285	1,107	1,400	1,400	2,250
	Average Truck Share of Total Volume (2019)	32.5%	35.3%	24.0%	24.7%	5.6%
Safety and Security	Severe Injury Rate [109]	12.5	8.0	16.6	13.3	0
	Fatality Rate[110]	12.6	10.0	16.0	14.3	0
	At-Grade Crossings Density [111]	0.027	0.0375	0.047	0.021	0
	Blocked Crossings Incident Rate[112]	1.67	0.44	0.86	0.286	-
Transportation System Management	Oversize/Overweight Permit Rate[113]	147.8	210.8	108.6	97.0	370.7
	High Speed Score Segment Share[114]	83.7%	91.8%	85.1%	85.7%	60.3%
	Truck Parking Space Density[115]	1.66	1.87	1.19	1.09	0
	Average Truck Parking Utilization Rate[116]	0.874	0.866	0.874	0.915	-
Asset Preservation	Share of Pavement in Good and Fair Conditions[117]	99.7%	98.8%	98.5%	99.4%	100%
	Share of Bridges in Good and Fair Conditions	100%	100%	100%	100%	100%
	Average Age of Bridges	53	35	35	36	45
Freight and Economic Vitality	Commodity Tonnage (million tons)	75.7	8.0	28.7	54.9	36.9
	Freight-Reliant Establishment Density[118]	7.8	6.1	20.7	25.4	70.4
	Freight-Reliant Employee Density[119]	95.5	58.2	258.0	454.4	799.8

[109] Number of truck-involved severe injuries per million truck miles traveled (2015-2019 Rolling Average)
[110] Number of truck-involved fatalities per million truck miles traveled (2015-2019 Rolling Average)
[111] Number of at-grade rail crossings per mile
[112] Number of blocked-crossing incidents (Jan 2020-July 2022) per at-grade crossing
[113] Number of OS/OW permits (2019-2021) per mile. The values for US 169, US 400, and K-10 corridors represent OS/OW permit rate for the entire stretch of the roadways, including segments outside the corridor segment under study.
[114] Share of lane-miles with Speed Score at or higher than 80. Speed Score is a measure that indicates the efficiency of roadway segments by calculating the ratio of actual speed to the free-flow speed of each segment. The higher the Speed Score, the closer the actual speed is to the free-flow speed.
[115] Number of truck parking spaces per mile
[116] Average truck parking utilization rate (between 3 AM and 4 AM, not weighted by number of spaces)
[117] Share of lane-miles with pavement in good or fair conditions
[118] Number of freight-reliant establishments per mile within a 5-mile radius
[119] Number of freight-reliant employees per mile within a 5-mile radius

6 Planning for the Future

In developing the Kansas 2045 Long Range Transportation Plan, KDOT used scenario planning techniques to help understand how various Social, Technology, Environmental, Economic, and Political (STEEP) trends in combination might affect the state's transportation system. The scenarios used in that prior planning process were adapted for the State Freight Plan to aid in considering how, where, and why goods will move on Kansas road and rail systems in the future.

6.1 Key Freight Factors and Trends

STEEP Factors and Trends

"STEEP" is a commonly used analytic framework for evaluating different external factors that may affect an organization including Social, Technological, Environmental, Economic, and Political considerations. Kansas-specific trend highlights are shown in Figure 6-1. In the state freight plan, these five factors are considered in terms of their influence on freight origins, destinations, routing, and commodity loads and therefore in determining future freight system needs, issues, and opportunities.

Figure 6-1: STEEP Trends Impacting Kansas' Freight System

STEEP trends shape freight both directly and indirectly via four pressure points: freight origins, freight destinations, freight routing, and freight volume/value.

- **Freight Origins:** Types of raw materials and other commodities and where they originate.
- **Freight Destinations:** Types of raw materials and other commodities and where they are destined, for consumption or other uses.
- **Freight Routing:** How (mode choice, connections) and where (pathway) goods are routed.
- **Freight Volume and Value:** The volume and value of commodities moved on the freight system.

The impacts of the STEEP trends are summarized in Figure 6-2 and are used to inform planning scenarios in Section 6.2.

The remainder of Chapter 6.1 provides an overview of the STEEP trends impacting Kansas. Additional detail on these trends can be found in **Appendix I**.

Figure 6-2: Summary of STEEP Impacts

Social	Technological	Environmental	Economic	Political
Impact on Freight Origins				
• Land-use patterns that develop to accommodate the population can change the economics of where materials are stored or accessed. • A growing population will require more goods and in turn, broader markets supplying goods. • An increase in income may result in a demand for higher-value goods.	• As new technology is adopted, the demand for raw materials may change. Battery-electric vehicles, for example, require lithium components for batteries. • If automated or electric freight vehicles are adopted, transportation costs may decrease along CAV and EV corridors. Manufacturers and consumers may choose raw materials and goods from locations connected via CAV or EV corridors.	• As resiliency threats grow, locations for material storage or production may be relocated to avoid risks such as flooding. • If certain routes are less resilient and as a result less reliable, costs to move freight along those routes may increase resulting in higher costs to ship.	• More efficient additive manufacturing (3D printing) will have impacts on the manufacturing supply chain including a higher demand for raw materials. • The health of the agriculture industry and food processing industries impacts the supply of farms and food goods. • The introduction of new advanced manufacturing facilities potentially with automation and/or 3D printing in new locations on larger footprints may require raw materials from new locations.	• Sourcing patterns for manufacturers may change with fluctuations in international trade relations (i.e., if tariffs are added or removed relevant to raw materials). • A continued focus on growing industries like advanced manufacturing, energy, food production, and agriculture will increase demand for the raw materials needed for these industries potentially to new locations.
Impact on Freight Destinations				
• Following population growth, final miles destinations will migrate towards where end consumers are located. • Rural connections will still be important for key industries like agriculture and energy as well as those aging in rural areas or the institutions that serve an aging population.	• If technological trends, such as CAVs and remote work, influence people to live in areas served by broadband, technology can impact destinations. • If technology allows for more efficient manufacturing and transportation, more raw materials may be moved to existing manufacturing facilities than today, and freight may move further distances for less cost.	• Businesses and final consumers may adjust their locations to avoid resiliency risks such as flooding impacting the destinations of freight. • A lack of resiliency or redundancy in the transportation system may result in businesses or residents migrating to other cities, towns, or states.	• Changes to consumer preferences and demand can introduce new trading partners. • As other states deal with extreme weather events, Kansas industries may serve more locations/have greater reach. • Continued growth in key industries such as agriculture, advanced manufacturing, and energy may result in Kansas industries serving more diverse locations.	• The number and scale of destinations can grow, shrink or shift based on trade agreements and tariffs. • Focus on the growth of key industries may broaden the diversity of destinations served by Kansas industries. • Expansion to other industries or types of goods manufactured may impact the destinations served.

Social	Technological	Environmental	Economic	Political
Impact on Freight Routing				
• Warehouse facilities may locate further from urban centers as urban areas sprawl to accommodate growing populations. • Truck routing may adjust to avoid increasing congestion in urban areas. • There may be increased demand (potentially from new locations) for goods serving institutions (such as healthcare) for an aging population in rural areas.	• Smart technology helps ensure efficient routing through smart corridors and other transportation technology. • Last-mile delivery trips can be fulfilled by drones. • Growth in e-commerce moves goods from stores to warehouses before reaching the consumer. • Shippers using EVs or CAVs will choose routes along enabling corridors.	• The number of routing options expands to build redundancy and resiliency into shipping networks. • Shippers may choose to avoid transportation segments vulnerable to weather impacts.	• Changes to consumer demand and preferences or businesses attracted to Kansas can open or alter markets for existing industries.	• Routing changes due to political trends are uncertain.
Impact on Freight Commodity Volume and Value				
• More consumers from a growing population will increase commodity volume. • Increasing consumer incomes will also result in additional spending potentially on higher-valued goods.	• Autonomous and electric trucking makes truck freight more cost-competitive with rail freight and brings more goods to the roadway.	• Responding to and preparing for transportation system resiliency to threats creates costs that will be passed onto producers, shippers, and consumers.	• Continued aerospace and potentially other manufacturing (through automation and 3D printing) success increases overall commodity value. • Manufacturing and agriculture growth increases overall commodity volume.	• The volume of goods increases as more goods are produced for both international trade and domestic trade through new trade partnerships and a focus on economic growth.

Social Factors & Trends

Demographics

Kansas' demographic trends could alter future supply and demand patterns for goods, particularly in terms of the type and quantity of goods coming to, from, or moving within the state. This in turn could affect where freight transportation improvements are needed, the type of improvements that will best serve state needs, and the sustainability of revenues to pay for maintaining and improving freight transportation.

Population

- **Population growth** in Kansas has seen a growth rate of 0.39 percent annually since 2010. The population is projected to continue to grow to 3.46 million by 2044.[120] However, population growth is expected to be slower than in the US overall.
- **Population distribution** has been concentrating in northeast Kansas over the last decade. By 2045 over 43 percent of Kansans are expected to live in either Sedgwick County (~614,000) or Johnson County (~887,000).[121] Rural areas are experiencing and will continue to experience population decline.
- **Population age** is expected to increase as people live longer and population growth slows. Today 15 percent of the population is over the age of 65; by 2045, it will be closer to 24 percent. This will lead to a reduced working age population and more demand for services and goods related to medicine and health.

Education and Income

- **Educational attainment** in Kansas is steadily increasing. If Kansas follows national projections for educational attainment levels, the state may see more residents with higher incomes and a corresponding increase in consumer spending. A more educated workforce may lead to a shortage of skilled technical workers.
- **Household income** grew 2.8 percent in Kansas between 2010 and 2019, reaching a median of $59,597. Among the highest-paying occupations statewide are those in the medical field. Workers in the hospitality and food and beverage industries are among the workers with the lowest wages statewide.[122]

Employment

- **The labor force** has grown in Kansas, with the employed population[123] rising from 1.40 million in 2010 to 1.45 million in 2021. The labor force has remained steady at 1.50 million.[124] Meanwhile, the state's unemployment rate has also declined. However, an aging population will reduce the state's labor force. Workforce challenges during the COVID-19 pandemic have accelerated the use of automation.
- **Trucking industry labor shortages** continue, especially for long-haul services. An aging population threatens to exacerbate this shortage. The trucking industry may need to hire 1.1 million new drivers (110,000 per year) through 2030.[125]

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[120] Wichita State University, Center for Economic Development and Business Research, (2016). Forecast: Kansas Population. Retrieved 07 25, 2021, from Kansas Economy: https://kansaseconomy.org/local-forecasts/kansas-population-forecast

[121] U.S. Census, Estimates of the Components of Resident Population Change for Counties, April 1, 2010 to July 1, 2019.

[122] Kansas Department of Labor, Kansas Labor Information Center, Labor Market Data, Income & Wages 2021. https://klic.dol.ks.gov/vosnet/Default.aspx

[123] People are considered employed if they did any work at all for pay or profit during the survey reference week. This includes all part-time and temporary work, as well as regular full-time, year-round employment (as defined by BLS).

[124] Source: Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS), Labor force data by county. Analysis by CPCS, 2022.

[125] Costello, Bob and Karickhoff, Alan, "Truck driver shortage analysis 2015", American Trucking Associations, July 2019, https://www.trucking.org/sites/default/files/2020-01/ATAs%20Driver%20Shortage%20Report%202019%20with%20cover.pdf

- **Job growth** will see 2.6 percent growth from 2018 to 2028, with the greatest increases in the professional, scientific, and technical services industry and the highest absolute growth in health care and social assistance. Transportation and warehousing job numbers are projected to grow by 9.8 percent. Jobs in goods-producing industries are projected to decline at a rate of 0.1 percent per year.[126]

Technological Factors & Trends

Mass adoption of new technology can profoundly alter how the world works. For instance, twenty years ago, no one owned a smartphone and fewer than half of adults across the US had access to the Internet. Just like changes in demographics, the diffusion of new transportation technology in Kansas could affect where transportation improvements will be needed, the type of improvements that will best serve community needs, and the financial sustainability of revenues to pay for transportation.

Broadband

Broadband provides a high-speed connection to the Internet of the kind needed for connected transportation technologies, such as intersection signalization hardware that learns and responds to traffic patterns, Mobility as a Service (MaaS), and a variety of infrastructure sensors. It also provides better rural access to technology-driven innovations such as telemedicine, precision agriculture, and remote working that create economic and public health advances.

- **Broadband access** is a priority of the Kansas Legislature, which established a Statewide Broadband Expansion Task Force through House Bill 2071 to identify and close broadband coverage gaps in the state. In 2020, the task force set a goal for the state to ensure every Kansan has access to broadband services at a speed of at least 25 Megabits per second (Mbps) (download)/3 Mbps (upload).[127]
- **Upgraded broadband networks** are the goal of the Broadband Acceleration Grant program created in 2020 to bring critical broadband access to underserved Kansas communities. KDOT awarded $5 million in grants resulting in over $10 million in total investment to 11 recipients under this program in 2022.[128]

Smart Technology

The proliferation of smart technology – including smartphones, wearable devices, as well as the rise of the "Internet of Things" – physical objects that are linked through wired and wireless networks – will continue, providing increased information connectivity.

- **Connected infrastructure** includes intersection controls that learn from and respond to traffic patterns, MaaS options, smart corridors, infrastructure sensors, and new safety solutions that rely heavily on steady, reliable, and deep streams of data. These transportation technologies are generating a wealth of data for both private and public stakeholders that is helping to improve operations.
- **Smart corridors** mean that vehicles will be able to pair with smart highway infrastructure (known as Vehicle-to-Infrastructure, or V2I) to bring about new operations and safety solutions. Connected vehicles will share real-time data about road conditions and their surroundings, becoming sensors that feed smart corridors with valuable data. Vehicles will also receive

[126] Kansas Department of Labor, Kansas Labor Information Center, 20280 Employment Projections, https://klic.dol.ks.gov/gsipub/index.asp?docid=800

[127] Report of the Statewide Broadband Expansion Planning Task Force to the 2020 Kansas Legislature, (January 2020), http://www.kslegresearch.org/KLRD-web/Publications/CommitteeReports/2019CommitteeReports/statewide_brdbnd_exp_planning_tf-cr.pdf

[128] Kansas, Governor Laura Kelly Announces Recipients of $10 Million Investment Expanding Broadband Access Across Rural Kansas, May 2022.

information from systems like smart traffic lights, streetlights, lane markers, street signs, and smart parking sensors.

Connected and Autonomous Vehicles (CAVs)

CAVs in freight can eliminate some labor demand while operating beyond the scope of a human's waking hours. Full automation is still being developed and faces significant hurdles regarding testing, infrastructure reliability, and regulatory requirements.

- **CAV market uncertainty** continues, though Frost & Sullivan estimates autonomous trucks will enter the market in the next decade and contribute to 6.4 percent of total U.S. freight tonnage movement per year in 2040.[129]
- **The Kansas Statewide Connected and Autonomous Vehicle Vision Plan** identifies a framework to maximize CAV deployments and realize benefits for Kansas. The plan projects that CAVs would improve freight safety and efficiency and spur economic development but notes the need to expand and develop a CAV-relevant workforce.[130]
- **Policy developments** will guide the future of CAVs. The American Trucking Association (ATA) is developing policy positions on the regulation of automated truck and platooning technologies at state and local government levels.

US 83 Great Plains Rural Freight Technology Corridor Project

Kansas is successfully stewarding a project that will demonstrate the implementation of many technologies discussed in this section, including broadband, smart technologies, and connected devices.

Location: 100-mile stretch of US-83

- Anchors five counties (Thomas, Logan, Gove, Scott, Finney) key to Kansas' agriculture industry

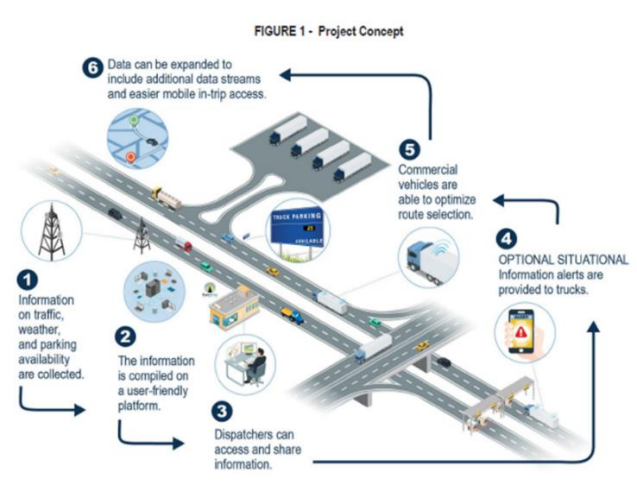
Project Size: $14.6 million, supported by $6.7 million ATCMTD grant (awarded August 2022)

Description:

- Install fiber-optic cable
- Acquire real-time data (weather, traffic, truck parking)
- Expand the KanDrive system and develop other means to report conditions to drivers
- Install other connected technologies (DMS, signal phase and timing)

Benefits: Improve safety and economic productivity

Figure 6-3: Project Concept



[129] Frost and Sullivan, Description of "Opportunities and Use Cases for Autonomous Trucking, Forecast to 2040", (July 2020), https://www.researchandmarkets.com/reports/5134325/opportunities-and-use-cases-for-autonomous

[130] Kansas Department of Transportation. "Kansas Statewide Connected and Autonomous Vehicle Vision Plan", (2019), https://www.ksdot.org/Assets/wwwksdotorg/bureaus/divInnovTech/KS_CAV_Vision_Plan.pdf

Drone Technology

Drones are being deployed in increasingly diverse contexts to enhance infrastructure inspections and delivery services. As of July 2021, numerous companies operating in Kansas, including Amazon and UPS, have received Federal Aviation Administration approval for use of drone delivery beyond operators' line of sight.[131]

- **The Kansas Statewide Unmanned Traffic Management (UTM) Initiative** resulted in Kansas' DOT being the first to deploy a statewide Unmanned Traffic Management (UTM) initiative. Today, the Kansas Unmanned Aerial System (UAS) Integration Pilot Program (IPP) is one of ten pilot efforts nationwide conducting advanced UAS operations aimed at gathering sufficient data to support federal rulemaking in this field.

Zero-Emissions Vehicles (ZEVs)

Zero-emissions vehicles promise to reduce transportation-related emissions. ZEVs continue to see growing adoption in both the U.S. and Kansas. Automobile companies have been making investments to build ZEVs in Kansas; in 2020 Ford invested $100 million in its plant in Kansas City to build a zero-emissions transit van.[132]

- **Fast-evolving ZEV technology** means that the options for zero-emissions freight vehicles will continue increasing, with battery-electric vehicles leading the way. Some battery-electric trucks are expected to reach cost parity with diesel trucks by 2030 or sooner, and ranges of up to 620 miles per charge may be feasible as soon as 2024.[133]
- **ZEV fleet growth** is inevitable. About 31 percent of medium- and heavy-duty vehicle sales in 2040 will be ZEVs with no new policy measures introduced to support their growth.[134] Asa result, more charging stations will be needed on key freight routes and at freight facilities.

Auxiliary Power Units (APUs)

Idling reduction technologies, such as APUs, can reduce emissions from rail locomotives. APUs are diesel-powered engines installed on a locomotive to provide electrical power for heating/air conditioning, lighting, and appliances, allowing for the use of these features when the train engine is shut down[135].

- **Kansas railroads are deploying APUs**, including WATCO (Kansas and Oklahoma Railroad and South Kansas and Oklahoma Railroad) and Cimarron Valley Railroad (CVR).

Cybersecurity

Over the last 20 years, the integration of digital elements within transportation systems has increased the risk of cyber-attacks that compromise infrastructure systems. Investment in cybersecurity is critical for protecting the advanced computer systems on which transportation increasingly relies.

- **Cyberattacks are an increasing risk.** In May 2021, U.S. DOT issued emergency measures to restore fuel supply after a ransomware attack on the country's largest fuel pipeline stopped

[131] Palmer, Annie, "Amazon wins FAA approval for Prime Air drone delivery fleet", (August 31, 2020), Retrieved from CNBC at https://www.cnbc.com/2020/08/31/amazon-prime-now-drone-delivery-fleet-gets-faa-approval.html

[132] Automotive Fleed, "Ford Assembling E-Transit in Kansas City & Builds Out $3.2B in North America EV Manufacturing", (November 10, 2020), https://www.automotive-fleet.com/10129944/ford-assembling-e-transit-in-kansas-builds-out-3-2b-in-north-american-ev-manufac

[133] MacDonnel, O., & Facanha, C. "How Zero-Emission Heavy-Duty Trucks Can Be Part of the Climate Solution. Drive to Zero", (2021), https://globaldrivetozero.org/site/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf; Phadke, A., Khandekar, A., Abhyankar, B., Wooley, D., & Rajagopal, D. Why Regional and Long-Haul Trucks are Primed for Electrification Now, (2021), International Energy Analysis Department, Lawrence Berkeley National Laboratory, https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

[134] BloombergNEF, "Electric Vehicle Outlook 2021", (2021) https://about.bnef.com/electric-vehicle-outlook/

[135] United States Environmental Protection Agency (EPA), Verified Technologies for SmartWay and Clean Diesel, (2021), https://www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-locomotives

operations along 5,500 miles of pipeline.[136] With the growth of connected and other advanced technologies, DOTs and the freight industry must protect their systems, devices, components, and communications from cyber threats, unauthorized access, damage, or other threats that can interfere with safety functions.

- **Blockchain** is a secure record attached to data. It can greatly improve the traceability of product movements through the supply chain, capable of tracking orders, payments, accounts, and production. Because blockchain is decentralized, it greatly improves data security. In the shipping industry, blockchain can minimize delays in real-time transactions, improve the transparency of transactions from remote areas, and keep track of containers.

Environmental/Resiliency Factors & Trends

Environmental events – both extreme weather events and changes in long-term environmental conditions – have the potential to damage infrastructure and disrupt freight and passenger movements. The need to prepare and respond to these events has become increasingly important, with agencies planning and preparing to avoid, adapt to, and recover from – in other words, remain resilient to – these environmental disruptions.

Catastrophic Events

Kansas is especially prone to severe weather events – notably six EF5 (Enhanced Fujita Scale) tornadoes have occurred in Kansas since 1950. Only two other states have experienced a greater number of severe tornadoes.[137] Extreme weather events are occurring more frequently in Kansas. As shown in Figure 6-4, five billion-dollar-disaster events occurred in the state in 2020 with an average of 3.7 events per year occurring during the last decade.

Figure 6-4: Kansas Billion-Dollar Disaster Statistics (CPI-Adjusted), 1980-2020[138]

Period	Billion-Dollar Disasters	Events/Year	Cost	Percent of Total Cost
1980s (1980-1989)	8	0.8	$2.0B – $5.0B	13.0%
1990s (1990-1999)	8	0.8	$2.0B – $5.0B	14.3%
2000s (2000-2009)	19	1.9	$5.0B – $10.0B	20.7%
2010s (2010-2019)	37	3.7	$10.0B – $20.0B	48.1%
Last 5 Years (2016-2020)	17	3.4	$2.0B – $5.0B	12.2%
Last 3 Years (2018-2020)	13	4.3	$2.0B – $5.0B	10.4%
Last Year (2020)	5	5.0	$1.0B – $2.0B	3.7%
All Years (1980-2021)	78	1.9	$20.0B – $50.0B	100.0%

Source: National Oceanic and Atmospheric Administration (NOAA), Centers for Environmental Information

[136] Dean, Grace, "The US issued emergency transport measures after its largest fuel pipeline was hit by a ransomware cyberattack…" (May 10, 2021), retrieved from Business Insider at https://www.businessinsider.com/colonial-pipeline-us-issues-emergency-measures-after-fuel-cyberattack-2021-5

[137] Frankson, R., K. Kunkel, L. Stevens, D. Easterling, X. Lin, and M. Shulski, Kansas State Climate Summary, (2017). NOAA Technical Report NESDIS 149-KS, 4 pp.

[138] NOAA National Centers for Environmental Information (NCEI), U.S. Billion-Dollar Weather and Climate Disasters", (2021), https://www.ncdc.noaa.gov/billions/, DOI: 10.25921/stkw-7w73

Long-term Environmental Changes

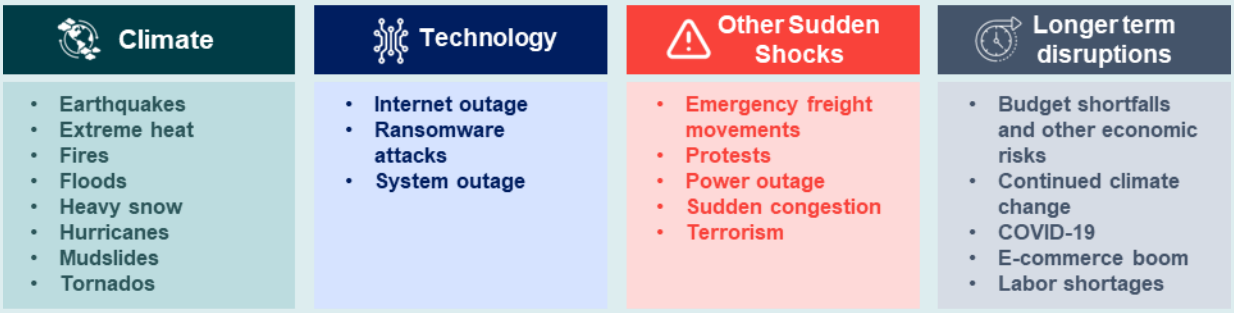
Changes in long-term environmental conditions can impact the economy, quality of life, and infrastructure. For example, the High Plains/Ogallala Aquifer, which provides 22 percent of the water for farmland irrigation, was once considered a limitless "underground ocean." However, some areas within the aquifer are showing less than 25 years of water availability.[139]

Over the long term, KDOT must learn how to design and maintain infrastructure to handle persistently extreme weather such as extreme heat and drier or wetter climates. One academic paper estimates the U.S. may face $19 billion in extra paving costs by 2040 if engineering standards of practice for asphalt are not updated to reflect warmer average temperatures.[140]

Resiliency

Resiliency refers to the ability to recover from or adjust easily to misfortune or change. In the case of the freight system, this misfortune or change may be caused by a variety of factors (Figure 6-5), including but not limited to environmental and climate factors. A resilient transportation network can avoid, adapt to, and recover from the stressors on physical infrastructure and operations (both users and organizations) caused by this misfortunate or change.

Figure 6-5: Freight System Disruptions



Source: CPCS

Infrastructure and operations that are not prepared for sudden shocks or long-term changes may result in serious impacts on safety and security, transportation system management, asset preservation, and freight and economic vitality. Strategic investments in tactical improvements to infrastructure (e.g., incorporate more hard-wearing design and construction practices where needed and develop strategic system redundancies) will help improve freight system resiliency. Investing in mitigating strategies yields significant savings in terms of safety, preventing property loss, and minimizing disruption of day-to-day life. Resiliency has become an increasingly important topic for freight planning and operations. The Bipartisan Infrastructure Law (BIL) has outlined new requirements and opportunities focused on improved resiliency nationwide, including adding resiliency to State Freight Plan requirements, using resiliency as a key criterion to award federal funding under existing programs, and establishing new funding programs focused on resiliency.

[139] Buchanan, R. C., Wilson, B. B., Buddemeier, R. R., & Butler, J. J., The High Plains Aquifer. Kansas Geological Survey Public Information Circular 18 (January 2015). http://www.kgs.ku.edu/Publications/pic18/PIC18R2.pdf

[140] Underwood, B.S, Guido, Z., Gudipudi, P., and Feinberg, Y., "Increased costs to US pavement infrastructure from future temperature rise", (2017), Nature Climate Change 704-707. https://doi.org/10.1038/nclimate3390.

Impacts on Supply Chain

Severe weather events in Kansas have led to damage to infrastructure and pose challenges to continued goods movement through the state.

- **Heat waves** can cause pavement and other materials to buckle, crack, or explode. In June 2022, deteriorating steel combined with extreme heat caused a highway barrier wall on I-70 in Topeka to collapse (Figure 6-6).[141] This heat event also led to the death of thousands of cattle.[142] During extreme temperatures, rail operators are often faced with "slow orders" that require reductions in the speed of travel.[143]
- **Tornados** are a risk for Kansas. In 2016, an EF4 tornado near north-central Kansas bent railroad tracks in Chapman (Figure 6-7), damaged portions of I-70, and destroyed vehicles.[144] Another tornado in 2015 derailed a 34-car freight train on BNSF tracks in Lyon County.[145] Strong winds are perilous too, capable of blowing over trucks, including a rolled-over truck that blocked traffic on I-70 in Salina in 2021.[146]
- **Winter weather** can wreak havoc on transportation infrastructure. Kansas will soon cross the 15-year anniversary of an ice storm disaster in late 2007 that caused hundreds of millions of dollars in damage, left thousands without power for weeks, prevented travel, and damaged countless infrastructure assets.[147] A winter storm in late 2019 closed I-70 in Western Kansas (Figure 6-8).[148] More recently, a winter storm left over two feet of snow in parts of western Kansas in early 2022 and closed parts of I-70 and K-27.[149] In 2021, freight railroads, including Kansas City Southern, curtailed some operations as a result of inclement weather.[150]

Figure 6-6: Heat Wave Impact on Highway Barrier Wall

Figure 6-7: Tornado Impact to Railroad

Figure 6-8: Winter Weather Impact to Roadway

[141] Hrenchir, T., "Officials didn't know steel connected to Topeka's I-70 viaduct was failing. Then a barrier wall fell." USA Today (June 2022). https://www.cjonline.com/story/news/2022/06/14/kansas-interstate-70-viaduct-collapse-official-explains-why-barrier-wall-plunged/7624233001/

[142] Cheng, A., "Extreme heat and humidity kill thousands of cattle in Kansas." The Washington Post (June 2022). https://www.washingtonpost.com/nation/2022/06/16/cattle-dead-kansas-heat-wave/

[143] Austin, N., "Excessive heat can impact rails as well as driver health." Freight Waves (July 2019). https://www.freightwaves.com/news/excessive-heat-can-impact-rails-as-well-as-driver-health

[144] Sincavage, H., "Visiting the Chapman, Kansas, EF-4 Tornado Damage." iWeatherNet.com (July 2016). https://www.iweathernet.com/thunderstorms/revisiting-the-chapman-kansas-ef-4-tornado

[145] Vaughn, J., "Kansas authorities say tornado derailed freight train, damaged homes and farms." Fox4KC (May 2015). https://fox4kc.com/news/kansas-authorities-say-tornado-derailed-freight-train-damaged-homes-and-farms/

[146] Schmidt, H., "High winds too much for some 18-wheelers on Missouri, Kansas highways." Fox4KC (December 2021). https://fox4kc.com/weather/wind-is-too-much-for-18-wheelers-on-missouri-and-kansas-highways/

[147] "10 Year Anniversary of Worst Ice Storm in Kansas History." KSAL.com (December 2017). https://www.ksal.com/10-year-anniversary-of-worst-ice-storm-in-kansas-history/

[148] Small, K., "I-70 closed in western Kansas due to winter storm." Fox4KC (November 2019). https://fox4kc.com/news/i-70-closed-in-western-kansas-due-to-winter-storm/

[149] "Winter storm slams W. Kansas, some snowfall totals top 25 inches." KWCH12 (January 2022). https://www.kwch.com/2022/01/25/westbound-i-70-closed-goodland/#:~:text=The%20snow%20led%20to%20multiple%20road%20closures%20in,asked%20to%20delay%20travel%20or%20find%20alternative%20routes.

[150] March, J., "Freight railroads curtail operations as extreme winter weather blasts through." Freight Waves (February 2021). https://www.freightwaves.com/news/freight-railroads-curtail-operations-as-extreme-winter-weather-blasts-through#:~:text=Kansas%20City%20Southern%20%28NYSE%3A%20KSU%29%20is%20stopping%20all,the%20railroad%20said%20in%20a%20service%20update%20Wednesday.

- Although Kansas is at quite a distance from the ocean and is not at risk for coastal flooding, the state is not immune to **riverine flooding** events. In 2019, floods overwhelmed roads, damaged well systems, caused billions of gallons of sewage to overflow into rivers and streams, and damaged 11 dams. Total damage costs were in the millions.[151]

The occurrence of severe natural events, such as wildfires, hurricanes, and floods, in locations outside of Kansas still impacts freight moving to, from, and through Kansas, as the impacts of these events travel down the supply chain.

- **Wildfires** can force roadway and track closures, which impacts goods movement by highway and rail. In August of 2016, wildfires halted both UP and BNSF railway services in California for two days which disrupted rail freight movement in Kansas.[152] Fires also cause longer-term rail freight disruptions by destroying critical infrastructure such as bridges.
- **Hurricanes,** growing in frequency and strength, impact freight movement nationally and in Kansas. When transportation and energy hubs like Houston, TX, or New Orleans, LA experience strong winds, flooding, power loss, and other impacts, road and rail closures and sometimes increased fuel costs result. The average national price of fuel increased by 15 percent in the wake of Hurricane Harvey.[153] Railroad washouts caused by flooding in Iowa have also caused rail service disruptions to Kansas Class I railroads including UP and BNSF.[154]

Economic Factors & Trends

Making smart investments in the freight transportation system provides cost-competitive options for Kansas businesses to get their products to both domestic and global markets. An improved freight transportation system can lower transportation costs, provide economic development opportunities, and serve as a catalyst for job creation.

Freight System Use

Figure 6-9 demonstrates the modal splits of Kansas' goods movements. Figure 6-10 displays the modal share of goods movement to, from, and within Kansas in 2017, compared to the 2045 forecast.

- **Share of Freight Handled by Truck**: Trucks make up the largest share of the goods movement by both volume and value, accounting for 63 percent and 75 percent, respectively. The share of freight volume by truck is forecast to increase by 1.4 percent in 2045.
- **Share of Freight Handled by Rail:** Kansas' rail system handles 9 percent of the state's total freight movements by tonnage and 2.3 percent by value. Although the share of total goods moved by rail is projected to decrease between 2017 and 2045, the absolute volume of rail movements is projected to increase by 1.6 percent during this time, while the value of rail movements will increase by 49 percent.
- **Share of Freight Handled by Air and Multiple Modes & Mail**: Air and multiple modes & mail both carry high-value goods, moving a large share of goods by value (2 percent and 12 percent respectively), but a smaller share by tonnage (0.01 percent and 3 percent respectively).

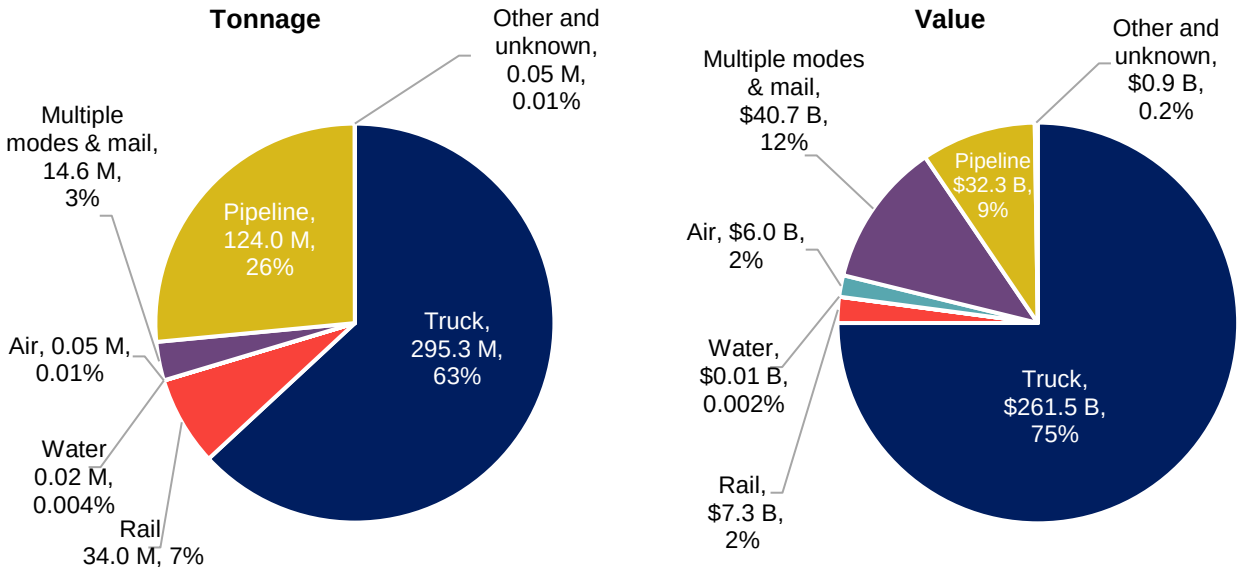
[151] Shorman, J., "'Land of extremes': In Kansas, a year of damaging floods and forecast of more to come." The Wichita Eagle (November 2019). https://www.kansas.com/news/politics-government/article237295564.html

[152] Uranga, R., "The Blue Cut fire could cost Southern California's shipping industry $1 million a day." The Sun (August 2016). https://www.sbsun.com/2016/08/17/the-blue-cut-fire-could-cost-southern-californias-shipping-industry-1-million-a-day/

[153] U, April, "The Impacts of Hurricanes on the Logistics & Transportation Industry", (2018), https://www.pennlease.com/blog/impact-hurricanes-logistics-transportation-industry/

[154] Railway Age, "Contractors, Railroads Battle Catastrophic Flood Damage", (March 2019). https://www.railwayage.com/news/contractors-railroads-battle-catastrophic-flood-damage/

Figure 6-9: Total Tonnage and Value by Mode (2017)



Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

Figure 6-10: Kansas Modal Share of Total Flows – 2017 and 2045

Mode	Share of Total Flows (Tonnage)			Share of Total Flows (Value)		
	2017	2045	Trend	2017	2045	Trend
Truck	59.9%	61.3%	▲	74.5%	74.2%	▼
Rail	9.0%	7.1%	▼	2.3%	2.1%	▼
Water	0.003%	0.003%	▬	0.001%	0.001%	▬
Air	0.01%	0.02%	▲	1.6%	1.8%	▲
Multiple modes & mail	4.0%	4.5%	▲	12.7%	15.3%	▲
Pipeline	27.0%	27.1%	▲	8.4%	6.3%	▼
Other and unknown	0.03%	0.03%	▬	0.4%	0.4%	▬

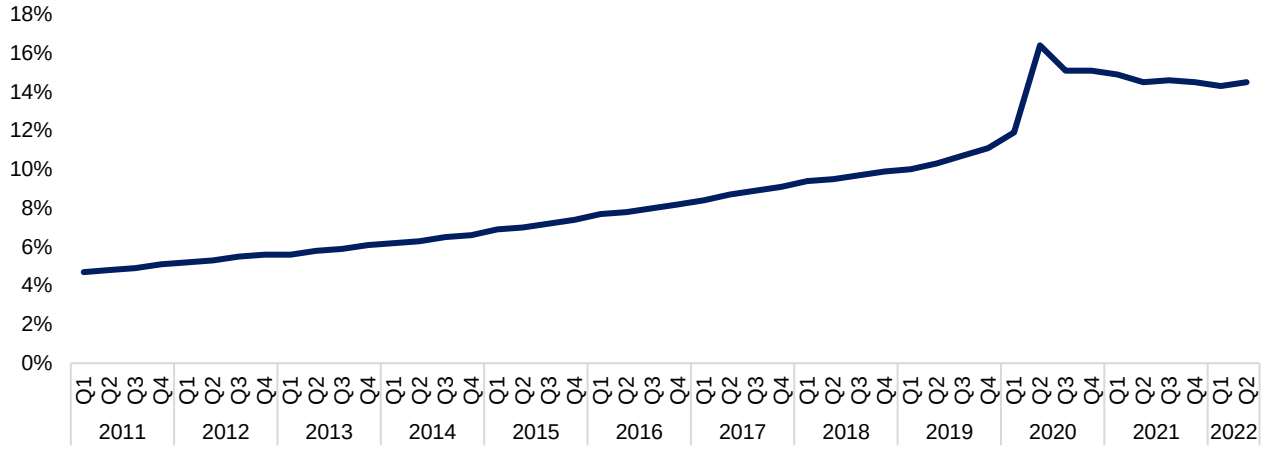
Source: FHWA FAF5. Analysis by CPCS, 2021. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

E-commerce

US E-Commerce Trends

E-Commerce Sales: E-commerce is increasingly replacing a growing fraction of traditional 'brick and mortar' sales, with e-commerce retail sales accounting for over 14 percent of total retail sales in the second quarter of 2022 (Figure 6-11). Although this is below the spike experienced during the second quarter of 2020 at the onset of COVID-19, the share in the second quarter of 2022 still represents nearly a 22 percent increase compared to the first quarter of 2020.

Figure 6-11: US Quarterly E-Commerce Sales as a Percent of Total Retail Sales



Source: CPCS analysis of Federal Reserve Bank of St. Louis data, 2022.

Warehousing and Distribution: The growth of e-commerce leads to a denser network of warehousing and distribution centers near urban areas. According to JLL, the second quarter of 2022 saw record-high asking rents for warehouse and distribution real estate in the US, surpassing 21 percent year-over-year. Moreover, the industrial vacancy rate in the US fell to 3.4 percent, which is the lowest ever. In response to the persistent demand, the warehouse and distribution real estate market hit another record high with over 184 million square feet of facilities delivered and more than 567 million square feet under construction in the first half of 2022.[155]

The continued increase in e-commerce demand and the need to increase stocks to counter potential supply chain disruptions will continue to cause strain on prices. Asking rents are expected to continue rising while vacancy rates remain at record lows, despite new development.[156] Access to existing industrial space as well as access to potential new development is critical in attracting and accommodating e-commerce retail businesses.

Consumer Shopping Habits and Demands: Consumers are increasingly turning to e-commerce to fulfill their purchasing needs, from groceries, electronics, and hardware/home improvement products to furniture. Consumers are also increasingly demanding shorter delivery times, such as one-day and same-day delivery from online retailers which also contribute to a further increase in delivery traffic.

Kansas E-Commerce Trends

Focusing on Kansas (Figure 6-12), e-commerce growth is accompanied by growth in employment and businesses in the transportation and warehousing sectors (see detailed industry profiles in Chapter 3.2). Kansas saw an increase in non-store retailer employment between 2010 and 2019 while the state also experienced reducing the number of employees who work in department stores, in line with national trends.

In terms of industrial land use, the number of warehousing and distribution establishments in Kansas grew at a rate exceeding the national rate during the 2010s. The Kansas City area continues to break records for new industrial developments, becoming one of 16 industrial markets in the US with more than 300 million square feet of industrial space.[157] During the first half of 2022, the Kansas City area's industrial market showed steady growth with a lower year-to-year vacancy rate and high net absorption during the first half of 2022. The industrial market in the greater Wichita region also remains robust,

[155] United States Industrial Outlook – Q2 20222, Aug. 15, 2022. https://www.us.jll.com/en/trends-and-insights/research/industrial-market-statistics-trends
[156] CBRE, U.S. Industrial & Logistics Figures - Q2 2021, (2021), https://www.cbre.com/
[157] The Newmark Zimmer's Kansas City Industrial Market Report – 3Q21. https://nmrkzimmer.com/market-research/kansas-city-market-reports/

with two Amazon warehouses coming to the area in 2021 and multiple speculative warehouses in the pipeline.[158]

Figure 6-12: Kansas E-Commerce Trends

Indicators			Trends	Statistics
Employment	Transportation and warehousing employment		↑	**45%** Employment in the transportation and warehousing sectors in Kansas grew by 45 percent between 2010 and 2019, higher than the national growth rate of 39 percent.[159]
	Department store retail employment		↓	**-55%** Department store employment in Kansas dropped by 55 percent between 2010 and 2019, indicating a more drastic impact of e-commerce on Kansas's retail industry when compared with the national rate of 28 percent.[160]
	Non-store retailer employment[161]		↑	**17%** Non-store retailer employment in Kansas grew by 17 percent between 2010 and 2019, while the national increase rate was 39 percent during the same period.[162]
Land Use	Number of warehouses and distribution centers		↑	**56%** The number of warehousing and distribution establishments in Kansas increased by 56 percent between 2010 and 2019, more than doubling the national increase rate of 24 percent.[163]
	Vacancy Rate	Kansas City	↓	**4.5%** Kansas City's industrial market vacancy rate decreased by 0.8 percent between 2021 and 2022, slightly higher than the US year-over-year decrease of 0.4 percent.[164]
		Wichita	↓	**5.0%** Wichita's industrial market vacancy rate in 2022 decreased by over 5 percent from 10.57 percent in 2021, exceeding the national decrease of 0.4 percent.[165][166]
	Net Absorption (Kansas City)		↑	**5.3 million square feet** The year-over-date net absorption of the industrial market in the Kansas City region increased by 1.7 million square feet, keeping pace with the inflow of new space. [167][168]

[158] Retail, Industrial Brokers in Wichita Market Remain Busy, Rebusiness Online. https://rebusinessonline.com/retail-industrial-brokers-in-wichita-market-remain-busy/
[159] Bureau of Economic Analysis, Employment by State, https://www.bea.gov/
[160] Ibid.
[161] Industries in the Nonstore Retailers subsector establishments include mail-order houses, vending machine operators, home delivery sales, door-to-door sales, party plan sales, electronic shopping, and sales through portable stalls.
[162] Bureau of Economic Analysis, Employment by State, https://www.bea.gov/
[163] Ibid.
[164] Ibid.
[165] 2021 Commercial Market Trends Report, J.P. Weigand & Sons, Inc. https://www.weigandcommercial.com/shared/fs/0830/company/Commercial/pdfs/2021_16pg_FINAL_web_p.pdf
[166] 2022 Commercial Market Trends Report, J.P. Weigand & Sons, Inc. https://www.weigandcommercial.com/shared/fs/0830/company/Commercial/pdfs/2022_Forecast.pdf
[167] Kansas City MarketBeat Reports, Q2 2021. https://cw-gbl-gws-prod.azureedge.net/-/media/cw/marketbeat-pdfs/2021/q1/us-reports/industrial/kansascity_industrial_marketbeat_q12021.pdf?rev=a3ac34ffe61941e0bd1f539a366bd5d7
[168] Kansas City MarketBeat Reports, Q2 2022. https://cw-gbl-gws-prod.azureedge.net/-/media/cw/marketbeat-pdfs/2022/q2/us-reports/industrial/kansas-city_industrial_marketbeat_q2_2022.pdf?rev=335f4d7a8519471b84c2e0b0e039cdb4

Key Freight Impacts

Statewide Truck VMT	The increase in e-commerce and higher demand for next- or second-day deliveries can transform trips made by individual consumers to truck trips generated by freight services. Between 2014 and 2019, Kansas already saw a 13.7 percent increase in truck vehicle miles traveled, with the share of truck volume growing nearly 20 percent.
First/Last-Mile Delivery	E-commerce typically relies on smaller commercial vehicles that travel on local and residential roads to make first- and last-mile deliveries. This increased freight traffic can increase congestion, generate emissions, worsen pavement deterioration, and cause safety concerns for pedestrians on local streets. E-commerce delivery is also increasingly accomplished using the personal vehicles owned by gig workers. In urban areas, there has been recent interest in using cargo bikes to reduce the congestion and emissions produced by typical freight vehicles.
Air cargo activities	Eighteen percent of air cargo volumes in the US in 2019 can be attributed to e-commerce packages, and this share is expected to rise to 22 percent in 2022.[169] With Kansas's air-dependent commodity tonnage projected to increase by 82 percent from 2017 to 2045, the state is expected to see increased air cargo services. For example, Amazon launched daily cargo services at Wichita's Eisenhower National Airport, beginning in January 2022, to provide greater capacity for shipping packages throughout the Wichita area and central Kansas.[170]

Planning for Growing E-commerce Demands

KDOT can study e-commerce freight trip patterns and industrial land use demands, working with regional and local stakeholders to plan for growing freight demand driven by the growth of e-commerce. This may include identifying the most efficient set of roadways for handling first/last-mile delivery, improving road conditions near warehousing and distribution centers to handle expected freight demand, and investigating alternative freight modes (e.g., cargo bikes) to carry out first/last-mile deliveries.

Key Freight-Reliant Industries in Kansas

The Kansas Department of Commerce launched the *Kansas Framework for Growth* in February 2021, which identifies strategic opportunities focused on five industries:

- Advanced Manufacturing;
- Aerospace;
- Distribution, Logistics, and Transportation;
- Food and Agriculture; and
- Professional and Technical Services.

Manufacturing

Manufacturing in Kansas includes industries ranging from food processing to aerospace. Kansas is particularly well-known for its aviation manufacturing; about one-third of all general aviation planes built in the U.S. are built in Kansas[171] and nearly 70 percent of the world's embedded aviation fleet is built

[169] The STAT Trade Times, "Is E-commerce the air cargo industry's one bright spot?", (2022), https://www.stattimes.com/latestnews/is-e-commerce-the-air-cargo-industrys-one-bright-spot-1345029
[170] City of Wichita, "Amazon Air Takes Flight at Wichita Airport", (2022), https://www.wichita.gov/News/Pages/2022-01-20a.aspx
[171] Kansas Department of Commerce, "Aerospace & Defense", (2021) https://www.kansascommerce.gov/industry/aerospace/.

in the state.[172] Educational and research institutions such as the National Center for Aviation Training, Wichita State, Kansas State University, and the University of Kansas excel in areas like research, hands-on training, and aerospace engineering and combine to create a pipeline of talent for the industry. The supply of qualified aircraft technicians may not meet demand; the 2018-2028 Global Fleet & MRO Market Economic Assessment projects a nine percent gap between supply and demand for aircraft technicians by 2027.[173]

- **Manufacturing is critical to the Kansas economy,** contributing 15.6 percent of the state's freight-generated GDP from 2000 to 2019. Manufacturing-related GDP in Kansas grew two to three percent annually between 2009 and 2019, which is faster than the nation as a whole.[174] Manufacturing jobs make up 11.2 percent of total employment in Kansas.[175] However, manufacturing jobs are expected to decrease by 3.2 percent between 2018 and 2028, according to the Kansas Department of Labor.
- **Technology advances** mean that the future of manufacturing in Kansas will be heavily influenced by innovation. Additive manufacturing (also referred to as 3D printing) is increasingly common in specialized applications or as an alternative to maintaining inventories of specialized product components. The aerospace and medical industries are using the technology to produce custom devices on demand for just-in-time delivery, significantly reducing inventory costs. Robotics will continue to replace humans for high-volume production, repetitive movement, or heavy object placement,[176] and can offer cost savings due to the increased speed of production and because of safety improvements compared to human labor.[177]

Deloitte Smart Factory

Deloitte's first Smart Factory in the US opened on the Wichita State University Innovation Campus in 2022. The factory integrates a host of novel technologies from a variety of partners, including artificial intelligence, the Internet of Things, advanced analytics, cybersecurity, and a renewable smart grid into a single manufacturing operation. The Smart Factory trailblazes the future of industry, where the human workforce is augmented by innovative technologies, efficiency brings down costs, safety is prioritized, cybersecurity is preserved, and sustainability is achieved. Some anticipated benefits include automated quality inspection, smart climate control, predicted equipment failure, effortless product customization, and more. Deloitte projects that the facility will draw at least 5,000 visitors annually, as industry partners come to explore the future of industry.[178]

The Smart Factory not only draws from and fosters research and innovation at Wichita State University, but it also manufactures products to inspire the next generation of thinkers. Deloitte has partnered with Elenco Electronics to manufacture STEM education products at the facility. These will be donated to schools around the country.

[172] Kansas Department of Transportation, "Kansas Aviation Economic Impact Study," (2017), https://www.ksdot.org/Assets/wwwksdotorg/bureaus/divAviation/pdf/2016EISFinalReport.pdf.
[173] Aeronautical Repair Station Association, "Global Fleet & MRO Market Economics Assessment, 2018-2029," http://arsa.org/wp-content/uploads/2018/03/CAVOK-MarketReport-ExecSum-20180305.pdf.
[174] National Institute of Standards and Technology, "Where Manufacturing is Growing (and Where It Is Not)," (Gaithersburg, MD: November 2020), https://www.nist.gov/blogs/manufacturing-innovation-blog/where-manufacturing-growing-and-where-it-not.
[175] Kansas Department of Commerce, "Build it in the Middle", (2021), https://issuu.com/kdcmarketing/docs/advanced_manufacturing_brochure_kdc3.26.2021?fr=sODEzYTI5NDgzODM.
[176] McKinsey & Company, "Automation, robotics, and the factory of the future," (September 2017), https://www.mckinsey.com/business-functions/operations/our-insights/automation-robotics-and-the-factory-of-the-future.
[177] Manufacturing Tomorrow, "Robots in Manufacturing Applications," (August 2, 2016), https://www.manufacturingtomorrow.com/article/2016/07/robots-in-manufacturing-applications/8333.
[178] The Smart Factory @ Wichita, accessed October 2022. https://www.thesmartfactory.io/home# | Deloitte Opens New US Smart Factory in Wichita, Kansas, Convenes Ecosystem of Innovators to Make Industry 4.0 a Reality, Deloitte, June 2022. https://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/deloitte-opens-new-us-smart-factory-in-wichita-kansas.html

- **COVID-19 impacts** disrupted numerous manufacturing processes and supply chains, highlighting potential resiliency concerns and improvement opportunities. Between May 2020 and May 2021, prices of commodities rose by 19 percent (as tracked within the Produce Price Index), the largest year-over-year cost increase since 1974.[179] Price increases paired with unpredictable demand swings caused inventory liquidation at the beginning of the pandemic and industries later found themselves unable to bring inventories back to pre-pandemic levels when the economy began to recover.[180] International manufacturing disruptions highlighted the importance of domestic production and the ability to move goods within the U.S.

Aerospace

Kansas has a storied history in the aerospace industry. Boeing's B-29 Superfortress and B-52 bombers were produced in the state in the 1940s and 50s.[181] Kansas continues to be a major international player in the aerospace sector, building some of the world's most sophisticated aircraft. The state is home to national and regional headquarters for many leading aerospace, aviation, and navigation equipment manufacturers, including Spirit AeroSystems, Textron Aviation, Garmin International, Bombardier Learjet, and TECT Aerospace.[182] The aerospace industry is relatively labor intensive, demanding a higher share of employment to sales volume than other industries.[183] As a result, the aerospace industry relies on the freight transportation system not only to transport goods but also to carry the workers who manufacture these goods.

- **Aviation is important to the Kansas economy,** with the state delivering 35 percent of all general aviation airplanes built in the nation in 2019.[184] The aerospace industry directly contributes $7 billion annually to the Kansas GDP and accounts for almost 20 percent of the state's total exports.[185] Supporting this industry is the third largest concentration of aviation workers in the country.
- **Wichita is the Air Capital of the World** due to its numerous aerospace industries. Textron Aviation, Cessna Aircraft Company, Airbus, Bombardier, and Spirit AeroSystems all have operations in the region. Blue Origin signed contracts with several aerospace manufacturers in Wichita in 2021.[186] As a result, Wichita does not only have a workforce specialized in aerospace but is ranked as the most specialized region in the US for manufacturing overall, likely given the labor demands of producing aircraft.[187]
- **Many aerospace education, training, and research programs** are offered in Kansas, including the National Center for Aviation Training, the National Institute for Aviation Research, the Wichita State University Innovation Campus, Kansas State University Polytechnic, and the University of Kansas. Wichita State University is ranked as the #1 college for industry-funded aerospace research. These programs provide the necessary workforce pipeline to support Kansas' impressive aerospace industries.[188]

[179] Helper, Susan and Evan Soltas, "Why the Pandemic Has Disrupted Supply Chains", (June 17, 2021), retrieved from the U.S. White House at https://www.whitehouse.gov/cea/blog/2021/06/17/why-the-pandemic-has-disrupted-supply-chains/
[180] Ibid.
[181] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace/
[182] Ibid.
[183] CPCS analysis of Data Axle, Business Establishment Data, 2021.
[184] Air Capital of the World, "Fueling A Heritage of Innovation." https://www.aircapitaloftheworld.com/
[185] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace/
[186] Business Wire, "Blue Origin Signs Long-Term Agreements with Four Kansas Companies to Support New Glenn Heavy-Lift Launch Vehicles and Engine Programs" (October 2021). https://www.businesswire.com/news/home/20211029005478/en/
[187] Air Capital of the World, "Fueling A Heritage of Innovation." https://www.aircapitaloftheworld.com/
[188] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace

Agriculture

Kansas is the nation's largest wheat producer and third largest livestock producer.[189] The Kansas agricultural sector also includes renewable energy production, food processing, research and education, and agribusiness.

- **Agriculture is key to the Kansas economy,** with direct agricultural products contributing $19.6 billion annually to the Kansas GDP – three percent of the total GDP contributed by private industry. The Kansas Department of Agriculture estimates agriculture is the largest single economic driver in Kansas, valued at $64 billion in 2018.[190] The agriculture sector in Kansas employs more than 238,000 people, almost 13 percent of the entire workforce in the state.[191]
- **Technology advances** are already beginning to change agriculture in Kansas. Connected and autonomous equipment will make planting and harvesting more efficient. The use of drones will help monitor crops and livestock, with the U.S. market for agricultural drones expected to expand at a compound annual growth rate of 34.2 percent, reaching over $5.06 billion by 2027.[192] Blockchain is expected to greatly improve the traceability of livestock and agricultural product movements through the supply chain, bringing transparency to enhance food safety.[193]
- **Environmental impacts** will affect Kansas' agricultural industry. Warmer temperatures will decrease agriculture yields by approximately 50 percent if fields cannot be irrigated. Higher temperatures create an inhospitable environment for corn, decreasing production even on irrigated fields. Warmer springs and shorter winters may allow for a longer growing season but may shorten dormancy for winter crops which can lead to crop loss during spring freezes.[194]

Energy and Natural Resources

While energy demand will grow, driven by a growing economy and population, energy efficiency will likely offset some future needs. The EIA's *Annual Energy Outlook 2021* projects electricity demand will grow at an annual rate of less than or around one percent through 2050.[195]

- **Kansas is a leader in wind energy.** In 2020, renewable energy sources generated 44 percent of Kansas' in-state electricity, nearly all of it coming from wind power.[2] Kansas is among the top five states in the U.S. for total wind energy generation, with 6,900 megawatts of wind generating capacity already installed as of January 2021. Four new wind projects with a capacity of over 1,000 megawatts are planned to come online in 2021.
- **Kansas has the potential for significant energy diversity.** Kansas is among the top ten states in the production of biofuels, benefiting from access to agriculture. Kansas is also among the top ten states in terms of the number of sunny days experienced, which provides great potential for solar energy production.[196] The petroleum industry has hundreds of oil and natural gas wells throughout the state with nearly 43,000 active wells in 2021.[197]

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[189] Ibid.
[190] Kansas Department of Agriculture, "2019 Strategic Action Plans for Kansas Agricultural Growth", (2019), https://agriculture.ks.gov/docs/default-source/ag-growth-summit/january-2018-documents/2019-growth-book_final_web.pdf?sfvrsn=69298ac1_8.
[191] Ibid.
[192] Market Watch, " Agricultural Drones Market Share 2022 Industry Outlook, Global Size, Business Strategies, Product Demand, Forecast 2027," (December 8, 2022), https://www.marketwatch.com/press-release/agricultural-drones-market-share-2022-industry-outlook-global-size-business-strategies-product-demand-forecast-2027-2022-12-08.
[193] USDA, "A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies," (Washington, DC.: April 2019), https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf.
[194] U.S. EPA, What Climate Change Means for Kansas EPA 430-F-16-018, (2016), https://www.kansasforests.org/resources/resources_docs/climate-change-ks%202016.pdf
[195] Ibid.
[196] Kansas Department of Commerce, "Energy and Natural Resources", https://www.kansascommerce.gov/industry/energy-natural-resources/
[197] University of Kansas, Kansas Geological Survey, "State Production and Historical Info", (August 2, 2021), http://www.kgs.ku.edu/PRS/petro/state.html

- **Future energy production** will be needed to keep Kansas running in a future age of technology. All major electric utility providers in Kansas are members of the Southwest Power Pool (SPP) which reports on projects related to energy capacity and use. Of the nine electric utility generators included in the SPP's 2021 Biennial Report, six are projecting a 2038 system capacity deficiency.[198] Wind and solar generation are projected to account for a significant share of future energy production.[199] Home to numerous institutions offering training programs for the renewable energy workforce, Kansas resources will come into play as renewable energy occupies a larger share of the nation's electricity generation.

Major New/Planned Freight Facilities

Several new and planned major freight-related projects in Kansas will grow the economic impact of freight in Kansas, while also increasing demand on the state's freight system, particularly on roads and railways. Figure 6-13 to Figure 6-17 provide overviews of the facilities and detail each facility's impacts on the freight system.

Figure 6-13: Bartlett Soybean Crushing Facility

Bartlett Soybean Crushing Facility	Status: Expected to begin operations in 2024	Location: South of Cherryvale
 Source: KDOT	**Facility Overview** The facility will create 50 permanent jobs and will be capable of processing **up to 115,000 bushels of soybeans per day and 40 million annually**. The facility will also include enough **storage for about 4 million bushels of soybeans**. Products produced by the facility will include soybean meal, refined soybean oil, and feedstocks used in producing food, renewable fuels, and animal feed. The facility has rail access to three Class I railroads (UP, BNSF, and KCS) and will be directly served by South Kansas and Oklahoma Railroad (SKOL – WATCO). **Impacts on the Freight System** The facility is in proximity to numerous US and State highways and will support significant local and regional truck traffic, amounting to **roughly 244 semi-truck trips per day** and **up to 600 a day during harvest season**. In addition to truck access, the site will receive $39 million in mainline track and bridge infrastructure upgrades to improve rail infrastructure to 286K capability at 25 mph, **supporting the movement of 12,000 to 15,000 rail carloads** of inbound soybeans and outbound products annually. Through additional investments, there will also be a capacity for over 300 rail cars on 4 miles of track within the facility.	

[198] Kansas Department of Commerce. Electric Supply and Demand Biennial Report 2021, (Topeka, KS: 2021), https://kcc.ks.gov/images/PDFs/legislative-reports/2021_Electric_Supply__Demand_Report.pdf

[199] Dubin, K., "EIA projects renewables share of U.S. electricity generation mix will double by 2050", (February 08, 2021), Retrieved from Today in Energy: https://www.eia.gov/todayinenergy/detail.php?id=46676

Figure 6-14: Seaboard Energy Facility

Seaboard Energy Facility	Status: In operation	Location: Hugoton

Source: KDOT

Facility Overview

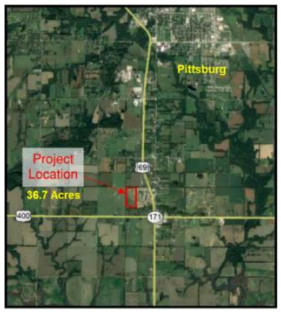
The facility creates **65 permanent jobs** and produces about **85 million gallons of renewable diesel and biodiesel annually**. The Seaboard Energy project also included $15 million in rail infrastructure improvements to **connect the facility to BNSF via the Cimarron Valley Railroad (CVR)**.

Impacts on the Freight System

These commodities will generate demand for **between 12,000 and 15,000 new annual truckloads of cargo**. This investment will offer a rail alternative to truck movements and is anticipated to generate **about 5,500 inbound and outbound rail carloads per year**.

Figure 6-15: FedEx Distribution Center

FedEx Distribution Center	Status: Construction started in October 2021	Location: Crawford County



Source: KDOT

Facility Overview

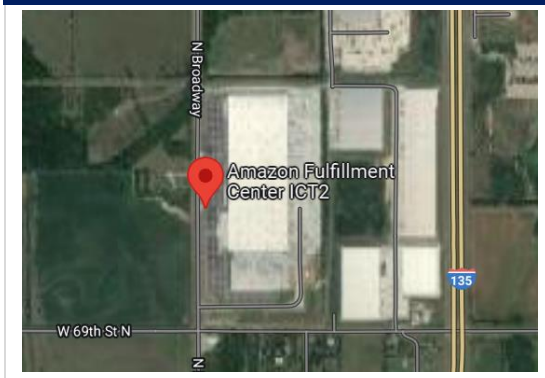
FedEx is developing a **250,000-square-foot distribution center** that will generate about **150 new full- and part-time jobs**.

Impacts on the Freight System

In addition to the distribution center, there are also **proposals to incorporate highway layout improvements** in the area and conduct **a site drainage study**. The site is anticipated to generate **256 new daily truck trips and 320 new daily van trips**.

Figure 6-16: Amazon Fulfillment Center

Amazon Fulfillment Center	Status: In operation as of August 2021	Location: Park City



Source: Google Maps

Facility Overview

The **one-million-square-foot** fulfillment center started its operation in August 2021, providing between **700 and 1,000 jobs** throughout the year.

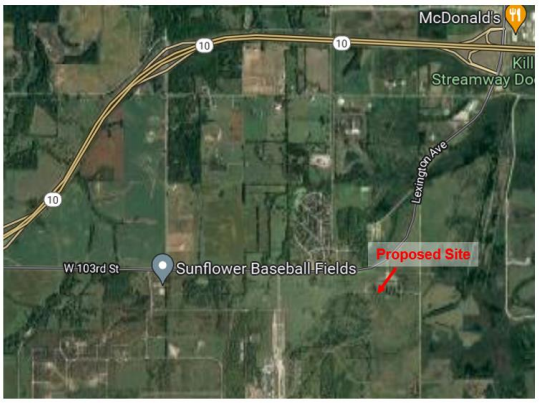
Impacts on the Freight System

Park City built **a roundabout at 77th and Broadway Street** to accommodate the facility's needs. Additionally, the city also invested $1.5 million to **construct a sewer line stretching one and a half miles from 77th Street to 61st Street**. Located next to the I-135, the fulfillment center will handle bulky or large-sized items such as patio furniture, outdoor equipment, or rugs.[200]

[200] The Wichita Eagle, "Massive Amazon fulfillment center to start local work Sunday," Aug.14, 2021. https://www.kansas.com/news/business/article253481734.html.

Figure 6-17: Panasonic EV Battery Plant

Panasonic EV Battery Plant	Status: Planned	Location: De Soto



Source: Google Map

Facility Overview

In July 2022, Panasonic announced its plans to build **a $4 billion EV battery plant – the world's largest – to manufacture and supply lithium-ion batteries** to EV makers. This project will be the largest economic development project in Kansas' state history. Planned for the Kansas City region, at the former Sunflower Army Ammunition plant south of KS 10, the new facility is expected to provide **up to 4,000 new jobs**, which would make Panasonic one of the state's largest non-governmental employers. These new jobs will provide an annual income of just over $50,000. Panasonic will be eligible for $829 million in tax credits, exemptions, and other incentives. De Soto is also expected to provide a local property tax incentive.[201]

Impacts on the Freight System

The impact on the freight system is still unclear, but the EV battery plant could potentially increase the truck traffic on the nearby KS 10.

Political Factors & Trends

Policies at the international, national, statewide, and local levels have the potential to impact freight movements and operations in Kansas. By planning for and adapting to policy changes, KDOT can identify how to take advantage of freight-friendly policies and address policies that pose a challenge to safe and efficient freight movements across the nation and the world. Funding is also a political consideration and is further discussed in Chapter 7.

International Trade

International trade policies have an impact on trade in the U.S. and Kansas. In 2020, Kansas exports totaled nearly $10.4 billion, with the top export countries being Mexico, Canada, Japan, and China.[202] Evolving U.S. trade policies could have important implications for the future of trade between the U.S. and its trading partners, including those closest to the U.S. – Canada and Mexico – as well as fast-growing China.

- **Trade with Mexico and Canada** is guided by the United States-Mexico-Canada Agreement (USMCA) which took effect on July 1, 2020. The USMCA provides Kansas farmers, ranchers, and agribusinesses a degree of certainty and instills confidence in the state's top trade partners and neighbors that the U.S. can be counted on as a reliable supplier of food and agricultural commodities.[203] Mexico and Canada have historically been stable trading partners with Kansas.
- **Trade with China** is important for Kansas. In 2018, the U.S. and China entered a trade war of escalating tariffs which resulted in falling exports to China. National and Kansas exports to China reached a ten-year low in 2019. Tariff exclusions began in March 2020 to support trade commitments and to help establish a more normal flow of goods between the two countries. The

[201] Tech Crunch, "Panasonic to build $4B EV battery plant in Kansas," July 13, 2022, https://techcrunch.com/2022/07/13/panasonic-to-build-4-billion-ev-battery-plant-in-kansas/

[202] Kansas Department of Commerce. "2020 Kansas Exports by Country", (February 2021), Retrieved from Kansas International Trade Summary: https://www.kansascommerce.gov/wp-content/uploads/2021/02/2020-Kansas-Exports-by-Country-Updated.pdf

[203] Kansas Office of the Governor. "Governor applauds Congressional passage of USMCA," (January 16, 2020), https://governor.kansas.gov/governor-applauds-congressional-passage-of-usmca/

policy change created an approximate $1 billion increase in exports from Kansas to China between 2019 and 2020.[204]

Regulations

Freight operations are regulated by state and federal policies. The following exemplifies how these regulations could impact truck and rail movements in Kansas.

- **Truck restrictions** on vehicle weight are generally comparable to bordering states. However, Colorado allows heavier tandem axle vehicles, and Oklahoma, Missouri, and Nebraska have higher gross weight limits on non-Interstate highways.
- **Rail regulations** include the recently proposed Crew Requirements regulation which requires at least two crew members in the control department of trains operating within Kansas.[205] The FRA proposed federal rulemaking regarding minimum crew staffing in March 2016. Short line railroads and agricultural industry groups tend to advocate against crew-size legislation, arguing that such legislation at the federal or state level would decrease efficiency and increase labor costs with no impact on safety.[206] KDOT's proposed Crew Requirements regulation was denied by the Kansas Attorney General in September 2020 and the proposed federal rulemaking on train crew staffing requirements was withdrawn in 2019.[207] However, as of July 2022, a Notice of Proposed Rule Making was again issued by the FRA requiring a minimum of two train crewmembers for over-the-road railroad operations.[208]

6.2 Scenario Analysis

Scenario planning is a technique used by planners for developing a shared vision of the future by analyzing how important forces could change transportation networks and investment needs. It allows transportation experts and stakeholders to explore uncertainty in trends and to stress test the transportation system against different potential futures. This helps experts and stakeholders understand possible outcomes and manage potential risks with a range of responses.

Baseline Scenario

A baseline scenario uses data (when available) and general assumptions (when quantifiable data is unavailable) about historical STEEP trends and anticipated future projections to project 'business as usual.' A baseline scenario for 2045 Kansas can be described as follows:

- **Social**: Population crosses 3.46 million with growth occurring mostly in and around urban areas. Those 65 and older make up nearly a quarter of the population.
- **Technological**: While the pace of technological advancements is hard to estimate, technological trends that will be more prevalent by 2045 include:
    - High-speed Internet is available statewide.

[204] U.S.-China Business Council,"2021 State Export Report", (May 2021), https://www.uschina.org/sites/default/files/state_export_report_2021_full_report.pdf

[205] Kansas Department of Transportation, "Kansas Department of Transportation Proposes Safety Rule Regulating Minimum Railroad Crew Size", (July 2020), https://governor.kansas.gov/kansas-department-of-transportation-proposes-safety-rule-regulating-minimum-railroad-crew-size/

[206] American Short Line and Regional Railroad Association, "Oppose Train Crew Size Legislation", (February 2019). http://files.aslrra.org/images/news_file/Crew_Size_2-15-19.pdf

[207] Schmidt, D., "Re: K.A.R. 36-43-1", (September 2020). https://d39l22i8npk6ka.cloudfront.net/app/uploads/20201007083302/20201007_Ms.-Gelene-Savage-Kansas-Department-of-Transportation-E_001.pdf; Federal Railroad Administration, "Withdrawal of Proposed Rulemaking: Train Crew Staffing", (May 2019), https://railroads.dot.gov/elibrary/withdrawal-notice-proposed-rulemaking-train-crew-staffing#p1_z10_gD_lLR_lLI_lLN_lLP_kcrew

[208] Federal Railroad Administration, "FRA Issues Proposed Rule to Enhance Train Safety, Codify Train Crew Size Requirements", (July 28, 2022), https://railroads.dot.gov/newsroom/press-releases/fra-issues-proposed-rule-enhance-train-safety-codify-train-crew-size-0#:~:text=WASHINGTON%20%E2%80%93%20To%20enhance%20safety%2C%20the,operations%20and%20circumstances%20where%20mitigating

  - Battery-electric vehicles reach price parity; 15 percent of the medium- and heavy-duty fleet is electric and 31 percent of new medium- and heavy-duty vehicles are ZEVs.
  - Five percent of truck freight tonnage is moved by CAVs.
  - Drones are more prevalent in the sky and are delivering goods in some areas.
  - Infrastructure and people are more connected than ever. Travelers, freight operators, and transportation providers have more data.
- **Environmental**: Kansas experiences two or three independent billion-dollar weather events per year, hotter spring days, and variable amounts of precipitation.
- **Economic**: Kansas's economy is strong, supported by manufacturing and agriculture and growing opportunities in energy and natural resources markets.
- **Political**: Economic growth continues to be a priority.

Long Range Transportation Plan Scenarios

As part of the Long Range Transportation Plan (LRTP) development process, three scenarios were presented to nearly 2,000 participants at Local Consult meetings to generate feedback about the future needs of the Kansas transportation system. The scenarios represent different potential futures:

- Regional Hubs in 2045,
- Resiliency Challenged in 2045, and
- Cities and Advanced Agriculture Win the Day in 2045.

The three scenarios, their relationships with the STEEP trends (using the legend below), and the implications for freight relative to the baseline scenario are summarized in the following sections.

Figure 6-18: Scenario Icon Legend

A right-facing arrow indicates, the scenario does not create a drastically different result than the baseline scenario for the STEEP trend.	An upward-facing arrow indicates the components or impacts of the STEEP trend will be accelerated compared to the baseline scenario. The trend could occur with greater speed, intensity, or range of impact.	A downward-facing arrow indicates the components or impacts of the STEEP trend will fall short of the baseline scenario. The trend could have different impacts or lower intensity impacts.	Used only for Political trends, a grey question mark indicates the trend may or may not divert from the baseline scenario. The results of the trend are unknown.	Used only for Political trends, a green delta symbol indicates the trend is likely to change from the baseline scenario, but it is not clear how the trend will divert from the baseline.

A **red** arrow indicates the trend is likely to have negative impacts

A **green** arrow indicates the trend is likely to have positive impacts

A **yellow** shape indicates a stable or unknown impact

Regional Hubs in 2045

Under this scenario, technology helps sustain and invigorate the prosperity of rural areas of Kansas, which are buoyed by growing area hubs. New technology and mobility solutions in these areas are key to supporting economic growth, quality of life, and access to critical services like healthcare.

Scenario Requirements					
Social Trends must change course to mitigate rural population loss. **Technology Trends advance quickly.** Broadband must be established in rural areas, creating additional technological opportunities.					
Impact on Trends					
	Social	**Technological**	**Environmental**	**Economic**	**Political**
Change from Baseline					
Results	Beyond the population shift, social demographics are not altered by Regional Hubs.	More CAVs and drones established in rural areas, changing delivery and mobility options.	Resiliency and clean energy provide both concerns and opportunities for Regional Hubs.	Revitalized rural hubs and connected infrastructure raise economic opportunities.	Political trends may or may not be impacted by Regional Hubs.

Key Freight Takeaways

Reliability improves	Many people work, consult a doctor, earn a degree, or attend events from a distance using high-speed internet and smart technology. With less reliance on residential and work trips to urban areas, congestion decreases. Freight reliability increases as fewer people need to travel for work and appointments.
Destinations altered	Fast delivery is available with low-cost autonomous trucks and drones, allowing orders from a range of stores to reach residents outside major metropolitan areas within just an hour or two.
Freight adapts to changing patterns of demand	Automation of trucking has lowered the cost of transporting goods, accelerated deliveries, and allowed for trucks to be autonomous and more fuel-efficient. Manufacturing is quickly changing with new 3D printing opportunities that change when and where materials need to be available.
Broadband opportunities	With industry benefiting from broadband investments, opportunities for shared learning and funding arise.
Cybersecurity intensifies	With a large percentage of the population working and conducting business at home using a plethora of connected technology, cybersecurity needs intensify.

Resiliency Challenged in 2045

Under this scenario, weather extremes hit infrastructure hard and create unprecedented economic and social disorder, forcing difficult choices about where to invest scarce dollars in resiliency improvements.

Scenario Requirements					
Environmental Trends are accurate or greater than expected. Resiliency shocks and stressors create more financial and social impacts than expected.					
Impact on Trends					
	Social	**Technological**	**Environmental**	**Economic**	**Political**
Change from Baseline					
Results	Weather extremes worsen and the impact on economics decreases immigration and increases migration out of Kansas, especially of younger individuals. Population growth slows and the population ages faster than expected.	Technology may be harder to adapt if private and public resources are dedicated to resiliency improvements or responses. Alternatively, technology trends provide solutions to reaching people with CAVs or drones that can potentially avoid climate hazards.	Environmental trends are worsening faster than expected.	The agriculture industry takes a hit. The transportation industry is challenged by a lack of resiliency and reliability.	Political trends change as decision-makers decide how and where to dedicate scarce resources.

Key Freight Takeaways

Extreme weather impacts freight reliability	Weather creates impacts on road, rail, water, and air freight traffic. Shippers look for alternative routing to provide more options across the infrastructure.
Freight industry decreases	The declines in reliability and agricultural production present fewer outbound shipping opportunities for food and agriculture commodities. The freight transportation industry faces slight decreases in the demand for the export of goods and must rely on others to import longer distances to reach Kansas consumers.
Technology and weather challenge electric grid	Electric grid failures are created by extreme temperature changes and consumer needs. Electric utilities struggle to adapt to higher grid demands.

Cities and Advanced Agriculture Win the Day in 2045

Under this scenario, people across America embrace city-oriented, tech-driven lifestyles. Population growth is concentrated in places like the Kansas City region or Wichita that absorb most out-of-staters moving to Kansas, job growth, and new housing. This growth is often in areas with more dense housing offering services and entertainment within easy walking distance. Advanced agriculture, benefitting from a tech revolution, means productivity increases and economic viability strengthens.

Scenario Requirements					
Social Trends continue as expected. **Technological Trends** advance quickly. Broadband must be established to support advanced agriculture.					
Impact on Trends					
	Social	**Technological**	**Environmental**	**Economic**	**Political**
Change from Baseline					
Results	Social trends continue as expected. Populations continue to grow in urban areas. Urban populations trend younger while rural residents are aging in place.	Mobility technologies such as ZEVs and CAVs grow faster with a more concentrated population but struggle to reach shrinking rural populations. However, broadband presence in rural areas increases access to remote social and economic resources.	Environmental trends continue as expected.	Advancements in agriculture contribute to growing GDP. Broadband investments that support precision agriculture also enable other industries.	Exports can be strengthened by the increase in agricultural output. Planning and policies should ensure ongoing equity between urban and rural areas.

Key Freight Takeaways

Last-mile connections are key for urban areas	As urban areas continue to attract population and urban residents continue to use e-commerce, the number of urban home deliveries will increase. Last-mile connections can be facilitated by CAVs, drones, or other freight technology.
Freight safety is challenged with more urban congestion and alternative modes	With more users and mobility technologies on the road, urban areas have increased demand, but congestion may be reduced during peak hours due to increased use of public transit, walking, and biking. There remain conflicts between passenger and freight modes on a shared system that need to be mitigated
Rural and interstate infrastructure investment needed	To support agricultural industry connections and internal trade opportunities, rural and interstate infrastructure continues to be of critical importance. Increasingly heavy freight vehicles (due to battery-electric trucks and the movement of large agriculture equipment) cause faster road deterioration.

6.3 Strengths, Weaknesses, and Threats

The strengths, weaknesses, and threats for Kansas' freight system have been identified based on an evaluation of KDOT's statewide multimodal freight system, as well as a review of social, technological, economic, environmental, and political trends with the potential to impact the freight system. This analysis was conducted for each goal area with the intent of these results driving the policy, program, and investment opportunities identified in Chapter 7.

Safety and Security

Safety and Security: Enhance the safety and security of the transportation system for all users and workers.

Figure 6-19: Safety and Security SWOT

Strengths	Weaknesses
• Five-year rolling average of truck-involved serious injury counts has decreased from 2011-2015 (average of 31.6 serious injuries) to 2015-2019 (average of 23.4 serious injuries). • The number of freight rail casualties in Kansas remains below the national average. • The number of freight rail incidents and the number of highway-rail grade crossing incidents in Kansas have decreased since 2010.	• Five-year rolling average of truck-involved fatalities has increased from 2011-2015 (average of 5 fatalities) to 2015-2019 (average of 14 fatalities). • The number of freight rail incidents in Kansas was higher than the national average in 2020. • The number of freight rail-related fatalities more than doubled and the number of highway rail-grade crossings increased by 24 percent in Kansas between 2019 and 2020. • 328 cases of blocked crossings were reported in Kansas in 2020, with 79 percent blocked for more than 15 minutes.
Threats	
• Trains are getting longer, increasing the likelihood of blocked grade crossings when trains are stopped. • Potential for cyber-attacks that compromise freight infrastructure and vehicles.	

Transportation System Management

Transportation System Management: Maximize the performance of the existing system by investing in transportation choices and technologies that improve the operations and resiliency of the system.

Figure 6-20: Transportation System Management SWOT

Strengths	Weaknesses
• TTTR on Kansas' Interstates has improved from 1.18 in 2019 to 1.13 in 2021. This also exceeds the state target of 1.16.	• Enforcement facilities are outdated and require infrastructure upgrades to meet current and future technology needs. Three out of the state's eight weigh stations lack weigh-in-motion capabilities.

• Kansas provides access to major interstates (I-35, I-70, I-135, I-335), over 4,600 active Class I and short line rail miles, Marine Highway M-29 on the Missouri River, nine airports that provide air cargo services, and over 60,400 miles of pipeline for multimodal freight movements. • Due to the rural nature of Kansas, the state's surface transportation system encounters fewer roadway obstacles that enable enhanced mobility. • KDOT is planning for the future of freight and exploring opportunities to leverage new technologies to enhance freight movements statewide. Through the Kansas Statewide Connected and Autonomous Vehicle Vision Plan, the state has identified a framework to maximize CAV deployments and realize benefits for Kansas. • Statewide utilization at truck parking facilities remains below 90 percent at peak utilization hour. • Compared to other states nationwide, truck parking issues are less prevalent in Kansas.	• Over one-fourth of bridges over Kansas' interstate roads have a vertical clearance under 16 feet (FHWA standard), with four percent of bridges having a vertical clearance under 15 feet. As a result, OS/OW vehicles may be forced to take alternate routes. • The majority of Kansas' rail system remains single track, with a need for more double track to account for maintenance needs and network disruptions. The insufficient number and length of sidings on Kansas' rail system also leads to blocked crossings and rail stoppage. • At many locations statewide, rail maintenance and issues cannot be serviced during night hours when it is dark. • About half of truck parking locations in Kansas individually experience utilization of 90 percent or higher at the state's peak utilization hour, with several smaller public rest areas – all on I-70 – fully utilized. • Kansas enforcement identified roadway shoulders in Finney County as locations of frequent illegal truck parking. • Truck drivers cite shortages of truck parking in Kansas. • Industry stakeholders identify a high demand for truck parking, with a presence of undesignated parking, on key freight corridors (e.g., I-35, I-70, US 169) and last-mile roads (e.g., near Garden City, Edgerton).
Threats	
• New, large freight facilities in Kansas put increasing strain on the state's existing infrastructure. • Trains are getting longer, and many existing sidings are not built to accommodate train lengths of the future. • OS/OW vehicles are getting larger, and many existing roads are not built to handle or do not allow for the maneuvering of longer, wider, and taller vehicles. • Expected growth in freight traffic on Kansas' highways will drive an increased demand for truck parking. • Port and container volume growth (e-commerce boom), combined with system disruptions (COVID-19 and others), impact the availability of equipment and capacity. A shortage of containers, boxcars, chassis, and other equipment limits capacity and threatens efficient and reliable freight movements. • The uncertain CAV market, especially for freight movements, in combination with patchwork CAV policies nationwide, poses challenges to planning and regulation for widespread CAV integration.	

Asset Preservation

Asset Preservation: Address risks and maintain and harden assets against issues including the impacts of extreme weather, natural disasters, stormwater runoff, and flooding through investments that provide high-value returns and make the best use of limited funds.

Figure 6-21: Asset Preservation SWOT

Strengths	Weaknesses
• Kansas exceeds its targets for the percentage of bridges rated in poor condition (2.1 percent, compared to a target of 3 percent) and for the percentage of pavement rated poor (0.4 percent, compared to a target of 0.5 percent). • The majority of Kansas' rail system meets FRA track class standards (class 4 or higher for Class I and class 2 or higher for short lines). Additional Class 4 track upgrades are expected to further improve efficiency and operations. • Almost the entire (98 percent) active Class I system in Kansas is currently 286K capable. • Among the runways at Kansas' nine cargo-handling airports, the majority are rated good or excellent. Additionally, all Kansas cargo airports have good or fair runway marking conditions.	• Kansas falls short of its targets for the percentage of bridges rated in good condition (64.6 percent, compared to a target of 70 percent) and for the percentage of pavement rated good (59.9 percent, compared to a target of 70 percent). • Due to annual carload volumes and revenues, short lines have difficulty making investments for needed rail infrastructure maintenance and upgrades. Currently, less than one-third of the active short line system is known to be at the industry-standard 286K capable, and 25 percent of the state's short line system remains below FRA track class 2. • Five of Kansas' nine cargo-handling airports do not have runway lengths sufficient (at least 7,900 feet) to serve wide-body, long-distance flights.
Threats	
• Increasing customer demand and growing traffic put increasing stress on aging freight infrastructure, especially on first/last-mile roads and the short line rail system. Meanwhile, the limited capacity of select freight routes (e.g., limited speed and weight capacity, size/weight restrictions) and freight facilities/equipment limit the ability to capture growing customer needs and demands. • The increasing frequency of catastrophic events and long-term environmental changes threaten freight infrastructure and operations.	

Freight and Economic Vitality

Freight and Economic Vitality: Improve reliability and increase flexibility for cost-efficient movement of people, goods, and information to strengthen the Kansas economy.

Figure 6-22: Freight and Economic Vitality SWOT

Strengths	Weaknesses
• Kansas' central location makes the state critical to goods movement nationwide. • KDOT has designated Freight Corridors of Significance that can inform optimal investment decisions for the state's freight system and economy. • Several new major freight facilities have recently been completed or are ongoing construction. Additionally, the recently announced $4 billion Panasonic EV Battery Plant is expected to be the largest economic development project in the state's history. • Kansas issued nearly 78,000 oversize/overweight permits in 2021. • Kansas' short line rail system makes up 39 percent of the state's active rail infrastructure and transported 2.7 percent of total carloads in Kansas. Short lines provide competitive shipping costs and lower emissions compared to trucks. • Kansas is advancing efforts to expand access to broadband and upgrade broadband networks, through the Statewide Broadband Expansion Task Force and the Broadband Acceleration Grant program.	• Kansas' freight system heavily relies on the road network, with trucks carrying 63 percent in tonnage and 75 percent in value of goods moving to, from, and within the state. • A high share of freight movements in Kansas includes through movements with origins and destinations outside the state. This represents a significant amount of freight volume and value that is utilizing Kansas' freight system but is not contributing significant economic benefit to the state.
Threats	
• Growth in e-commerce has led to higher demand from and increasing strain on the existing freight system, notably on local first/last-mile roads near warehousing and distribution centers and residential areas. • Low vacancy and high rates for warehousing and distribution space. • Limited and aging grain handling facilities and grain storage capacity, while crop volumes increase. • Rail rates are highly controlled by Class I's, exacerbated by potential mergers. • International trade policies.	

Stewardship

Stewardship: Continuously improve the quality of the transportation system and reduce its impact on surrounding communities, local air pollution, and wildlife habitats..

Figure 6-23: Stewardship SWOT

Strengths	Weaknesses
• In 2020, renewable energy sources generated 44% of Kansas' in-state electricity. Kansas is also a top 5 state for total wind energy generation. • KDOT is planning for the integration of electric vehicles. • KDOT coordinates and partners with railroads on large capital projects for rail improvements and accommodations, and administers Section 130 funds for highway-rail grade crossing projects. • KDOT supports and on occasion has provided matching funds for federal grant applications. • KDOT administers several state-funded rail programs that allocate funding to assist short lines and shippers with rail system maintenance and upgrade projects and siding improvements.	• Many roadway project needs remain unfunded. Freight projects must compete against other non-freight projects to secure state funding, and there currently does not exist a framework that integrates freight as a criterion for prioritization. • Many short line rail project needs remain unfunded. Due to lower volumes, short line projects require outside funding support to invest in rail system infrastructure improvements.
Threats	
• Need to mitigate the impact of freight on surrounding communities, local air pollution, and wildlife habitats. • Need for continued authorization and appropriation of funding for federal and state transportation programs.	

Workforce

Workforce: Get the best from our workforce by attracting and retaining talent, modeling diversity, supporting professional development, and inspiring action.

Figure 6-24: Workforce SWOT

Strengths	Weaknesses
• Kansas higher education institutions are investing in specialized training and research to support manufacturing sector needs. • Transportation and warehousing job numbers are projected to grow by 9.8 percent by 2028, compared to 2018, according to Kansas Department of Labor projections. • Kansas rail stakeholders emphasize positive feedback for KDOT's existing rail-dedicated workforce and the rail programs administered by KDOT.	• Difficulty recruiting and maintaining Kansas' private sector rail workforce, due to factors including rural job locations, undesirable and/or unreliable work hours, a limited pool of workers with rail experience, and a post-COVID-19 workforce shortage. • A limited/diminishing public sector rail-dedicated workforce limits the ability to focus staff time on freight efforts.
Threats	
• Kansas' labor force is expected to erode due to the aging population and out-migration of 20- to 24-year-olds. Additionally, increasing traditional educational attainment could lead to a shortfall in skilled technical workers. • Private sector workforce challenges are exacerbated by unique, industry-specific work conditions (e.g., a lack of reliability of train schedules, stress finding truck parking). • Turnover or retirement of public and private sector workforce threatens the loss of institutional knowledge and efficiency of future rail efforts and programs administered by KDOT.	

7 Freight System Investment Plan

KDOT has identified freight policy, program, and project opportunities based on data analysis and performance evaluation of the state's multimodal freight transportation system, Kansas Freight Advisory Committee (KFAC) meetings and consultations with other freight stakeholders, and a strengths, weaknesses, opportunities, and threats (SWOT) assessment.

7.1 Policy and Program Opportunities

Freight policy and program opportunities have been identified based on data analysis and performance evaluation of the Kansas multimodal freight system, stakeholder consultations and KFAC meetings with freight stakeholders, and a SWOT assessment, with consideration of social, technological, economic, environmental, and political trends that have the potential to impact the freight system. As shown in Figure 7-1, the identified policy and program opportunities for Kansas' freight system have been developed in line with KDOT's goals for the multimodal freight system.

Figure 7-1: Freight System Policy and Program Opportunities and Corresponding Plan Goals

Policy and Program Opportunities	Safety & Security	Transportation System Management	Asset Preservation	Freight & Economic Vitality	Stewardship	Workforce
Address congestion, delay, and improve freight system resiliency		✓		✓	✓	
Improve safety and efficiency of freight system operations	✓	✓	✓	✓		
Preserve and improve roadways used by heavy vehicles		✓	✓	✓		
Address extreme weather, air pollution, flooding, and wildlife and habitat loss		✓	✓	✓	✓	
Strengthen coordination and partnerships	✓	✓	✓	✓	✓	✓
Guide freight-related transportation investment in Kansas	✓	✓	✓	✓	✓	
Address freight-related workforce needs in Kansas						✓

The following section further details each of the policy and program opportunities and identifies action concepts KDOT can consider advancing to enhance multimodal freight in Kansas.

Address congestion, delay, and improve freight system resiliency

Although truck travel time reliability (TTTR) on Kansas' Interstates continues to improve (from 1.18 in 2019 to 1.13 in 2021) and meet the state's target, congestion is still a challenge in urban areas – notably Kansas City and Wichita – which experience high unexpected delays. Additionally, new major freight facilities, including the Bartlett Soybean Crushing Facility, the Seaboard Energy facility, and the future Panasonic Electric Vehicle Battery Plant, will increase freight movements, putting further stress on the state's roadway network.

The following actions will help KDOT mitigate existing bottlenecks and handle the anticipated increase in freight demand:

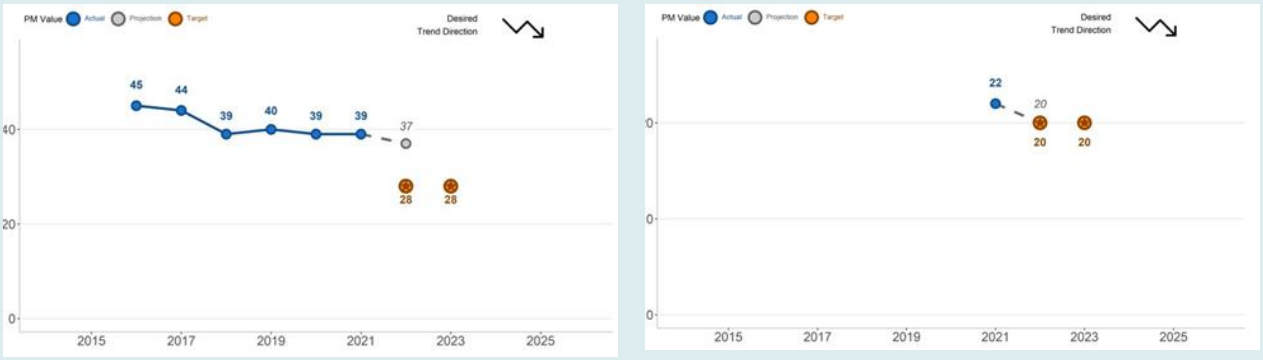
- Conduct plans and studies to understand freight system needs and issues (e.g., State Rail Plan, State Freight Plan)
- Conduct performance measurement and monitoring of the freight system
- Address urban area bottlenecks (i.e., Kansas City, Wichita)
- Consider/support multimodal freight system opportunities (i.e., opportunities that place less reliance on the highway system, alone).

Using Technology to Address Urban Area Concerns

KDOT, in collaboration with cities, counties, MPOs, the Kansas Highway Patrol (KHP), Kansas Turnpike Authority (KTA), and others, has deployed ITS infrastructure, such as cameras and traffic sensors, statewide. KDOT currently uses this information for traveler information collection and dissemination, with information such as incidents, construction, rest areas, weigh stations, traffic speeds, weather radar, and live traffic footage available to the public on the KanDrive website[209] and through a mobile application. This real-time traffic information allows roadway users to avoid areas of delay and alleviates congested segments from additional traffic. In addition to traveler information, Kansas ITS applications include wind and flood warnings broadcasted on DMS and truck rollover prevention alerts on ramps.[210]

Additionally, to address urban area bottleneck concerns, KDOT tracks clearance time data collected by ITS devices in the Kansas City and Wichita regions and uses this data as one of its roadway performance measures. This measure helps KDOT monitor the progress of roadway emergency response time and mitigate the impacts of urban bottlenecks.[211]

Figure 7-2: Average Clearance Times and Targets (Left: Kansas City; Right: Wichita)



Source: KDOT

[209] KanDrive, https://kandrive.org/.
[210] Stakeholder consultation with KDOT, Aug. 9th, 2022.
[211] KDOT Planning & Development Presentation.

Improve safety and efficiency of freight system operations

Kansas faces safety challenges on its freight system: the number of truck-involved fatalities in the state increased between 2011 and 2019, and the number of freight rail incidents in the state exceed the national average in 2020. Blocked rail crossings are a large concern in Kansas, posing not only safety issues for pedestrians and motor vehicle drivers, but also disrupting roadway traffic flows. Meanwhile, trains are becoming longer, increasing the likelihood of blocked grade crossings when trains are stopped. Other challenges, such as underinvestment in weigh stations (including limited truck parking at those sites), impact freight system safety and efficiency, and call for strategic improvements and innovative solutions.

The following actions will help KDOT continue to improve the safety and efficiency of the state's freight system:

- Evaluate and integrate new technologies into Kansas' freight system
- Work with the trucking industry, freight industry, and local agencies to identify opportunities to expand truck parking capacity where needed, including at locations of new or expanded freight facilities
- Maintain and improve Kansas' Truck Parking Information Management System (TPIMS)
- Conduct an assessment and develop a strategic investment plan for Kansas' weigh stations
- Implement Kansas' Grade Crossing Safety State Action Plan, including recommendations for blocked crossings

Weigh Stations

In compliance with federal and state safety regulations, trucks must undergo inspections at weigh stations or other inspection sites, which ensure that the more than 13 million large trucks registered nationwide operate safely. In Kansas, there are 8 weigh station facilities at 6 locations statewide.[212] Weigh stations in Kansas suffer from chronic underinvestment, with maintenance problems (deteriorating structures, concrete, flooring, and technology), limited truck parking on-site, and heating, ventilation, and air conditioning (HVAC) issues. Some Kansas weigh stations also have short ramps, insufficient barrier walls, and pest problems. **Appendix J** provides further information about Kansas' weigh stations.

KHP has proposed a number of technological and engineering upgrades to help modernize the state's weigh stations. These include:

- Installing Weigh-in-Motion technologies
- Installing tire anomaly machines
- Installing registration readers
- Installing USDOT number readers
- Construction barrier walls to protect scale house facilities
- Adding truck parking capacity
- Building inspection pits
- Installing additional exterior and interior cameras

Figure 7-3: Weigh Station in Kansas (Wabunsee County)

Source: Kansas Highway Patrol

[212] USDOT, FMCSA, Pocket Guide to Large Truck and Bus Statistics, 2021, https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2022-01/FMCSA%20Pocket%20Guide%202021.pdf

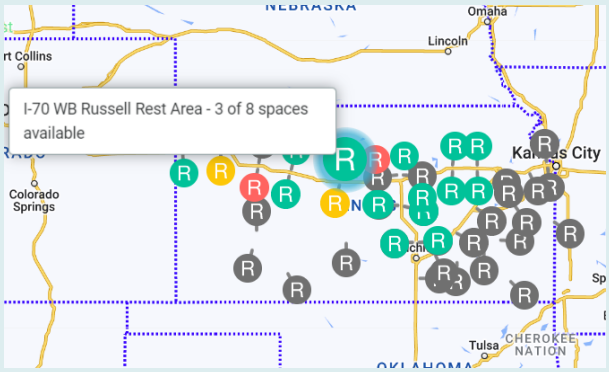
Truck Parking Information Management System (TPIMS)

TPIMS aggregates real-time truck parking availability data and disseminates this information to truck drivers. Data is collected from truck parking facilities using ITS devices, such as cameras and sensors, and shares information with truck drivers through DMS, online dashboards, mobile applications, and in-cab applications.

A 2018 Trucker Path survey found that nearly half of drivers spend an hour or more a day searching for truck parking.[213] TPIMS saves drivers time by closing the information gap between truck parking supply and demand. This not only improves the quality of life for truck drivers but also reduces the impact these operations have on surrounding communities. When drivers are able to find safe and adequate parking quickly, they do not need to drive in circles searching for parking, or parking in undesignated locations. Truck parking solutions, such as TPIMS, support a freight system that operates more efficiently, safely, and unobtrusively.

KDOT led MAASTO to secure a $25 million TIGER grant to develop a regional TPIMS system. The system, which began implementation in 2017, provides a coordinated truck parking management system across eight MAASTO states. In Kansas, DMS update every 5 minutes to inform truck drivers about available truck parking at 18 rest areas along I-70. This information is gathered automatically using 3D images at truck parking facilities.[214]

Figure 7-4: Kansas TPIMS



Source: KanDrive

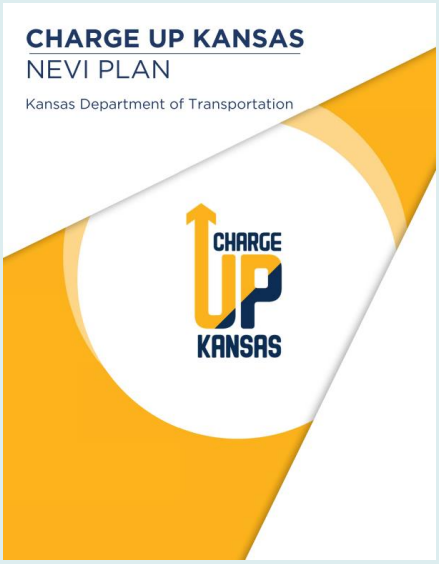
[213] Trucker Path, Truck Parking Report, July 2018, http://files.truckerpath.com/web/trucker-path-parking-white-paper-2018.pdf

[214] FHWA, USDOT, National Coalition on Truck Parking: Technology and Data Working Group – Truck Parking Availability Detection and Information Dissemination. https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/technology_data/product/best_practices.htm; KDOT, Truck Parking Information Management System project underway, 2017. http://ksdot.org/Assets/wwwksdotorg/Headquarters/PDF_Files/pressrelease2017/TPIMS_Release.pdf; KDOT, MAASTO TPIMS Project. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/TPIMS_Summary.pdf

Research and Pilots for Wireless Charging

As electric vehicles begin to replace internal combustion engine technology, the nonmaterial nature of electricity is prompting both public and private industries to rethink the traditional stop-and-refuel system. Significant investment is being made in electric charging stations, which will remain crucial in the short term to facilitate electrification. In September 2022, USDOT approved Kansas' National Electric Vehicle (EV) Infrastructure (NEVI) Plan, which will provide the state with almost $40 million through BIL to install a network of electric chargers on Alternative Fuel Corridors.[215] Nevertheless, Kansas, alongside other states including Utah, Indiana, and Michigan, is beginning to prepare for a future where charging can occur wirelessly while vehicles are in motion.[216] This would reduce and ultimately eliminate the need to stop and recharge, improving the efficiency of road-based transportation. The technology would also decrease "range anxiety" and encourage further adoption of EVs. There is even a possibility that the ability to charge wirelessly would lessen the need to have large batteries, thus reducing vehicle weight and improving safety.

Figure 7-5: Kansas NEVI Plan



Source: KDOT, Charge Up Kansas NEVI Plan

The most promising means to wirelessly charge vehicles is via in-road technologies to effectively create an electromagnetic pavement. Lenexa, Kansas, in a partnership with Integrated Roadways, is retrofitting five intersections with smart pavement that not only pilot wireless charging technology but also in-road traffic sensors and antenna systems.[217] KDOT is sponsoring a Kansas State University Transportation Center report entitled "Predicting Wireless Charging Revenues from Kansas Pavements" which is aimed at assessing the feasibility of using wireless charging pavements as a source of revenue.[218]

Preserve and improve roadways used by heavy vehicles

Growing consumer demand, combined with new developments that generate freight, increase freight traffic to Kansas, stressing the state's aging transportation infrastructure, especially along first-/last-mile roads. Additionally, ever-advancing technology in critical freight industries results in freight loads with increased size and weight. For instance, the wind energy industry has been manufacturing and transporting larger and large wind turbine components, increasing the burden on Kansas' roads.[219]

The following actions will help KDOT continue to preserve and improve the state's roadways, especially those used by heavy vehicles:

- Identify and improve infrastructure that supports Oversize/Overweight (OS/OW) movements
- Identify and prepare sites in Kansas for large-scale industrial development along both highway and railroad corridors
- Conduct traffic impact studies for new freight facilities

215 Kansas to receive nearly $40M to build EV charging network (fox4kc.com)
216 INDOT: Wireless Electric Vehicle Charging Solution for Highway Infrastructure | Gov. Whitmer Announces First-in-the-U.S. Wireless Electric Vehicle Charging Road System Contract Awarded by MDOT (michigan.gov) | ASPIRE Engineering Research Center and Electreon to Launch Electrified Roadway Demo in Utah (usu.edu)
217 Smart pavement powers data collection, EV charging, wireless access, edge computing - GCN
218 Predicting Wireless Charging Revenues from Kansas Pavements (trb.org)
219 Stakeholder consultation with a transportation and logistics company, Sep. 7th, 2022.

Access Management

KDOT's Access Management Unit (AMU) is responsible for ensuring the safety and efficiency of Kansas' state highways and supporting mobility for current and future business and residential communities. All six KDOT Districts have a District Access Management Plan that identifies growth corridors and areas of ongoing or anticipated developments. In addition, 23 access planning studies, such as area transportation plans and corridor management plans, have been completed since 2008.[220] These plans and studies provide local planning agencies and KDOT with a foundation for coordinated capacity management and roadway preservation.[221]

Figure 7-6: KDOT Districts

Source: KDOT Districts

According to KDOT's Access Management Policy, the AMU also works to issue state highway access permits to property owners. As a part of the permit application, applicants who request new, improved, or temporary highway access for commercial, industrial, institutional, and recreational use, as well as local road connections, must submit a traffic impact study (TIS). A TIS determines the impacts of a proposed development on the surrounding transportation system and proposes recommendations to mitigate the identified impacts.[222] The results of a TIS help KDOT determine locations and design criteria of the new, improved, or temporary highway access and better accommodate the transportation needs of existing and future freight facilities.

Address extreme weather, air pollution, flooding, and wildlife and habitat loss

The increasing frequency of catastrophic events and long-term environmental changes threaten freight infrastructure and operations in Kansas. Extreme weather events, such as heat waves, tornados, winter weather, and flooding, have caused damage to infrastructure and disruptions to goods movements throughout the state.

The following actions will help KDOT strengthen the resiliency of the state's freight system, address climate change impacts, and protect wildlife and habitat.

- Update KDOT design standards to harden against extreme weather, flooding, and other events
- Incorporate extreme weather considerations in asset management planning
- Support transportation programs and projects that actively protect wildlife habitats, manage flooding and stormwater, and mitigate other potential environmental impacts
- Partner with Kansas Department of Health and Environment, Kansas Department of Wildlife, Parks and Tourism, and other sister agencies to plan and create climate-conscious and eco-friendly freight infrastructure
- Encourage the adoption of alternative fuel vehicles for goods movement

[220] KDOT Access Management Website, KDOT. https://www.ksdot.org/AccessManagement/default.asp
[221] Stakeholder Consultation with KDOT, Aug.23rd, 2022.
[222] KDOT Access Management Policy, KDOT. https://www.ksdot.org/Assets/wwwksdotorg/PDF_Files/Access_Management_Policy_Jan2013.pdf

Existing Environmental Programs

Figure 7-7: Sand Hills State Park in Kansas

Source: Kansas Department of Wildlife and Parks, Kansas State Parks Guide

KDOT has an extensive history of undertaking nationally recognized environmental programs. In 2006, the state was recognized by the Federal Highway Administration (FHWA) for its effort to preserve roadside prairies, many of which were endangered ecosystems. Kansas used new seed mixes and erosion control to help restore these ecosystems and conducted public outreach to educate the public about the importance of these habitats. KDOT's focus on preserving the native ecosystem on its 150,000 acres of right-of-way continued well beyond 2006. KDOT continued to make use of seed blends with native wildflowers, mulch instead of pesticides to control weeds, a reduced mowing schedule, and other practices. In addition to offering much-needed beauty alongside busy roads, KDOT reported that these practices reduced maintenance costs. In 2018, KDOT committed to improving pollinator habitat along I-35, again by prioritizing seed blends with native plants. The goal is to help stem the decline in bee and butterfly populations.

In late 2019, KDOT announced a plan to use less salt in its de-icing mixtures, responding to research on its negative impacts on road conditions, drinking water quality, and the environment. The new mixture uses beet juice or saltwater brine, which helps to amplify the effects of the remaining salt.

Other recent efforts include securing a Diesel Emission Reduction Act (DERA) grant for the reduction of diesel emissions of rail locomotives and the construction of noise walls on US 69.[223]

[223] KDOT, Environmental program earns KDOT, state partner's national recognition, 2006. https://www.ksdot.org/bureaus/offTransInfo/News06/Environmental_Program.asp; AASHTO Center for Environmental Excellence, Kansas DOT Roadside Management Policy Evident as Wildflowers Bloom 2009. https://environment.transportation.org/case_study/kansas-dot-roadside-management-policy-evident-as-wildflowers-bloom/; Kansas Transportation blog, KDOT continues to protect pollinators, 2018. http://kansastransportation.blogspot.com/2018/06/kdot-continues-to-protect-pollinators.html; KSNT, Scientists say de-icing salt harmful to environment, KDOT using less, Lindley Lund, 2019. https://www.ksnt.com/capitol-bureau/scientists-say-de-icing-salt-harmful-to-environment-kdot-using-less/; EPA, KDOT Awarded $127,536 to Reduce Locomotive Diesel Emissions in SW Kansas, SE Colorado, and Oklahoma Panhandle, 2021. https://www.epa.gov/newsreleases/kdot-awarded-127536-reduce-locomotive-diesel-emissions-sw-kansas-se-colorado-and; Fox4, KDOT releases environmental study for US 69 Highway toll project, Sydnie Holzfaster, 2021. https://fox4kc.com/news/kansas-news/kdot-releases-environmental-study-for-us-69-highway-toll-project/

National Electric Vehicle Formula Program

The Bipartisan Infrastructure Law (BIL) established the NEVI Program, which outlines minimum standards for the deployment of EV charging infrastructure and aims to create a national EV charging station network that is reliable, equitable, and convenient for all users.[224] The NEVI Program provides Kansas with approximately $39.5 million between 2022 and 2026 to improve the EV charging network and requires KDOT to submit an EV deployment plan to FHWA annually.[225]

Prior to the NEVI Formula, KDOT led an analysis to identify charging gaps across Kansas and strategically funded seven EV charging station projects on I-70 and I-35 using nearly $2 million Volkswagen Mitigation Trust Funds. Although the projects are not committed to meeting NEVI standards, KDOT will keep an open dialogue with funding recipients and site hosts to upgrade the stations to be NEVI compliant. Kansas also has six (ready and pending) Alternative Fuel Corridors (AFCs) approved by FHWA, including I-70, I-35, I-135, I-335, US 400, and US 81 from I-70 north to the Nebraska state line. The EV charging infrastructure will be planned and installed along these AFCs. The NEVI Program funding will equip approximately 1,600 miles of Kansas interstates and highways with EV charging facilities.[226]

Figure 7-8: Target Locations for Future EV Infrastructure Deployment

Source: Charge Up Kansas NEVI Plan, KDOT

Strengthen coordination and partnerships

Freight planning requires cross-sector, multi-jurisdictional collaborations, since freight movements know no boundaries, and freight infrastructure and services impact diverse stakeholders. KDOT oversees the KFAC, which convenes stakeholders from the public sector, industrial groups, freight shippers, and freight service providers to discuss and provide feedback on the state's freight efforts, including the State Freight Plan development process. Additionally, as part of the State Freight Plan, many one-on-one consultations were conducted with freight stakeholders to further understand Kansas' freight needs and opportunities. KDOT also engages with regional partners as a member of MAASTO and as a contributor to freight planning discourses organized by MAASTO's freight arm, the Mid-America Freight Coalition (MAFC).

The following actions will enable KDOT to continue strengthening its relationships and collaborative efforts with freight stakeholders:

- Continue to convene the KFAC and the RPAC for freight and rail planning, respectively
- Continue to collaborate with neighboring states on freight planning (e.g., state freight plan, state rail plan), including through multi-state freight coalitions (e.g., MAASTO, MAFC)
- Continue to collaborate with MPOs, cities and counties, KDOT sister agencies, and others on mutually beneficial projects

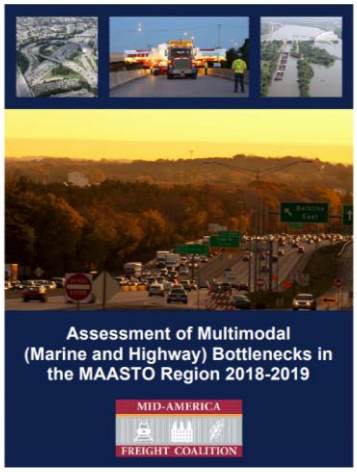
[224] National Electric Vehicle Infrastructure Formula Program Guidance, FHWA. https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf
[225] KDOT set to receive $39.5M for next five years to build EV charging infrastructure, KDOT. https://www.ksdot.org/Assets/wwwksdotorg/Headquarters/PDF_Files/pressrelease2022/sept/EV_Set_to_Receive_$39M.pdf
[226] Charge Up Kansas NEVI Plan, KDOT. https://www.fhwa.dot.gov/environment/nevi/ev_deployment_plans/ks_nevi_plan.pdf

Mid-America Freight Coalition (MAFC)

KDOT participates in many multijurisdictional partnerships to support Kansas' multimodal freight system, including MAFC, the freight arm of MAASTO. Formerly known as the Mississippi Valley Freight Coalition, MAFC is a 10-state coalition that cooperates in the planning, operation, preservation, and improvement of transportation infrastructure to ensure that freight can move reliably, safely, and efficiently within and through the region. Given the success of MAFC in multistate freight collaboration, FHWA recognized MAFC as a major freight corridor coalition.[227]

KDOT actively participates in the annual MAFC meeting to facilitate the exchange of best practices in freight planning, freight advisory committees, freight data, multimodal freight programs, and freight professional development.[228] KDOT also provides key inputs to various MAFC research projects, including a recent project on bottleneck identification across multistate freight corridors,[229] a study on developing a regional regulatory approach to truck platooning in the MAASTO region,[230] and an analysis of surface transportation board waybill data for freight planning and operations.[231]

Figure 7-9: MAFC Report



The KFAC has also invited MAFC staff and experts as guest facilitators, panel speakers, and presenters at committee meetings to contribute to discussions on Kansas' freight issues and programs.[232]

Guide freight-related transportation investment in Kansas

Strategic investments are crucial to maintaining and improving freight infrastructure, as well as supporting freight-reliant businesses in Kansas. KDOT has a strong history of providing application guidance and matching funds to secure federal grants for freight projects in the state. KDOT also administers several state-funded programs that provide funding to freight-related projects. These include the Rail Service Improvement Fund (RSIF), Short Line Rail Improvement Fund (SLRIF), and Economic Development Program. However, many freight-related road and railway projects remain unfunded. Funding for freight projects is especially challenging, as they must compete against other non-freight transportation projects to secure funding.

The following actions can help guide KDOT to invest in freight transportation projects strategically:

- Use Kansas' Freight Corridors of Significance (FCS) as a KDOT project selection factor
- Provide grants and other funding to improve the safety, condition, and efficiency of the multimodal freight system
- Submit and support freight-related applications for US Department of Transportation (USDOT) discretionary grant funding (ex. Bridge, Rebuilding American Infrastructure with Sustainability and Equity (RAISE), Rural Surface Transportation)
- Advance investments identified in the Kansas State Rail Plan and Kansas State Freight Plan

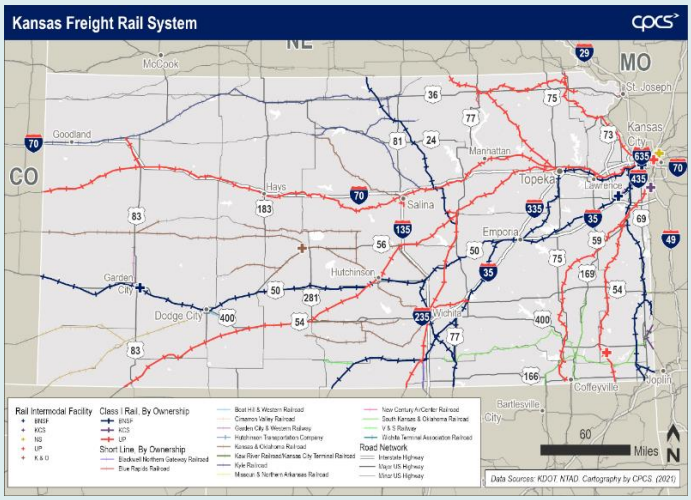
[227] Major Corridor Coalitions, FHWA, accessed September 2022. https://ops.fhwa.dot.gov/freight/corridor_coal.htm
[228] MAASTO Regional Freight Alignment: Assets for Freight Movement and Economic Development, MAFC, accessed September 2022. https://midamericafreight.org/wp-content/uploads/2022/08/Final-MAFC_MAASTO_Regional_Freight_Alignment-22.pdf
[229] Assessment of Multimodal (Marine and Highway) Bottlenecks in the MAASTO Region 2018-2019, MAFC, accessed September 2022. https://midamericafreight.org/wp-content/uploads/2019/05/MAASTO-Bottleneck-Study_Final.pdf
[230] Developing a Regional Regulatory Approach to Truck Platooning in the MAASTO Region: A Literature Review of the History, Progress, and Benefits of Truck Platooning, MAFC, accessed September 2022. https://midamericafreight.org/wp-content/uploads/2018/08/MAFC-Truck-Platooning-2018-08-13.pdf
[231] Analysis of Surface Transportation Board Waybill Data for Freight Planning and Operations, MAFC, accessed September 2022. https://midamericafreight.org/wp-content/uploads/2020/10/Analysis_of_STB_Waybill_Data_for_FreightPlanning_and_Ops.pdf
[232] Kansas Freight Advisory Committee meeting minutes, KDOT, accessed September 2022. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/KFACMeeting2Summaries.pdf

Kansas State Rail Plan

The 2022 update of the Kansas State Rail Plan[233] details KDOT's efforts in maintaining and improving Kansas' freight and passenger rail system through rail system improvement advocacy, technical and funding support for federal grant applications, and state rail improvement programs administration.

Federal: Four projects on Kansas' short line rail system have received federal funding support through TIGER, Consolidated Rail Infrastructure and Safety Improvements (CRISI), and DERA grants since 2010, enabling projects with a total cost of $68.4 million, of which $57.3 million was invested in improvements for Kansas. In addition to federal grant awards, KDOT has received federal funding support for rail projects through the American Recovery and Reinvestment Act (ARRA) and other special federal projects.

Figure 7-10: Kansas Freight Rail System



Source: KDOT, Kansas State Rail Plan, 2022.

State: Through jointly funded safety-oriented projects, KDOT coordinates with Class I railroad partners to provide funding support for crossing service projects, as well as signal installation and upgrades. For short line rail infrastructure rehabilitation and improvement, KDOT has provided ongoing funding support through the RSIF, SLRIF, and other funding programs:

- Since 2000, KDOT has enabled 95 projects, through the RSIF program, to improve the condition and accessibility of Kansas' railroad network, with over $87 million in loans and grants provided.
- In its first two years of funding, the SLRIF program has provided over $9.3 million in grants to support 21 projects that maintain, reconstruct, or replace short line rail infrastructure.
- KDOT has awarded nearly $5.9 million to rail projects under the Economic Development Program and Cost Share Program between 2019 and 2021.

As part of the State Rail Plan update, the Kansas Rail System Investment Plan identifies planned and potential railroad projects in the state, identified through a review of existing project lists, stakeholder input, and data analysis, including:

- Ready rail projects, which address rail needs at a specific location, with developed project details. These include four projects totaling nearly $75 million in total project costs and three projects with project costs yet to be determined.
- Rail projects in development, which address rail needs at a specific location but still remain under development to identify detailed project costs and benefits. These include 17 projects amounting to $212.4 in estimated project costs.
- Other rail project opportunities, which address statewide rail needs, but remain in the concept phase, with project details yet to be determined. Project types include those that increase capacity and improve aging infrastructure.

[233] KDOT, Kansas Rail Plan, 2022, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/2022/KansasStateRailPlan_2021-2022.pdf.

Address freight-related workforce needs in Kansas

Kansas' freight workforce, together with freight infrastructure, serves as the backbone of the state's freight-reliant industries. However, the private sector has faced difficulties recruiting and retaining the workforce, while Kansas' public sector has a limited freight-dedicated workforce.

The following actions will help KDOT continue to address workforce needs:

- Develop a staffing plan for the KDOT Freight and Rail Unit
- Support projects that enhance workforce mobility to and from freight-related job centers
- Coordinate efforts with public and private freight stakeholders to promote the freight workforce, such as education for new truck drivers

7.2 Freight System Investment Plan

National Highway Freight Program Opportunities

Building off the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act, the BIL continues the National Highway Freight Program (NHFP), which provides formula funding to states for freight projects. States become eligible for program funds upon FHWA approval of a State Freight Plan, which must be completed every four years. The State Freight Plan must include a freight investment plan that includes a list of priority projects and describes how NHFP funds will be invested and matched.[234]

Figure 7-11 on the following page details the projects KDOT has identified for NHFP funding.

[234] 49 U.S.C. § 70202

Figure 7-11: National Highway Freight Program (NHFP) Funded Projects

Project Name	Project Number	Project Description	FY22[235]	FY23	FY24	FY25	FY26	FY 27	Matching Funds	Project Total
I-70 Pavement in Geary County	KA-6062-01	I-70: Pavement Replacement (4.7 miles) beginning 1 mile East of Junction US-77/I-70, East to the East City Limits of Grandview Plaza in Geary County.	$14,684,486	$355,278					$1,671,085	**$16,710,849**
I-470 Bridge in Shawnee County	KA-5766-01	I-470: Bridge #046 located 0.21 miles Northwest of 10th Street in Shawnee County		$5,113,624					$568,181	**$5,681,805**
I-35 Bridge in Johnson County	KA-5060-01	I-35: Replace Bridge #009 over I-35 on S Gardner Road located 5.75 miles northeast of the Miami County line in Gardner, KS		$7,631,456	$9,832,144				$1,940,400	**$19,404,000**
US 83 pavement in Haskell County	KA-1008-02	US 83: Pavement Replacement (4.1 miles) from Sublette (1000 ft. north of the US 83/US 56 junction), North to 1.75-mile South Junction US 83/US 160 in Haskell County			$3,530,222	$13,629,613	$3,051,802		$5,052,909	**$25,264,546**
I-70/K-18 Interchange in Geary County	KA-6018-01	I-70/K-18 Interchange in Geary County					$10,850,403	$4,705,181	$1,728,398	**$17,283,982**
US 83 Pavement in Finney County	KA-1008-04	US 83: Pavement Replacement (12.7 miles) from 2.5 miles north of the Haskell/Finney County Line, North to the south EWS of Bridge #015 over the Arkansas River in Finney County						$9,197,024	$46,765,346[236]	**$55,962,370**
		TOTAL	**$14,684,486**	**$13,100,358**	**$13,362,366**	**$13,629,613**	**$13,902,205**	**$13,902,205**	**$57,726,319**	**$140,307,552**

Source: KDOT

[235] FY22 carryover $14,684,486.05.
[236] A portion of the $46.765 million would use future NHFP Funds if available after 2027.

Other Freight Project Opportunities

KDOT has also identified Other Freight Project Opportunities that KDOT would consider providing support to. These project types were identified based on data analysis and a SWOT assessment, supplemented by stakeholder input. These opportunities may address freight transportation needs in Kansas but remain in the concept phase, with project details – including location – yet to be determined. These concepts must also be further explored in order to identify potential costs, benefits, and other impacts of implementation. Figure 7-12 provides an overview of Other Freight Project Opportunities in Kansas, and the following section further describes each concept's typical work components and potential cost ranges.

Figure 7-12: Other Freight Project Opportunities

Project	Project Description	Project Need(s)	Goal Area(s)
Intersection Improvements	Construct intersection improvements along key corridors	• Improve intersection operation and enhance safety	• Safety and Security • Asset Preservation • Transportation System Management • Freight and Economic Vitality
Capacity Expansion	Build new lane capacity for increased traffic volume expected with development	• Increase roadway capacity	• Asset Preservation • Transportation System Management • Freight and Economic Vitality
Truck Parking	Build new and/or expand existing truck parking	• Enhance truck parking facility options	• Transportation System Management • Freight and Economic Vitality • Stewardship • Workforce
Grade Crossing Upgrade	Improve highway-rail grade crossing infrastructure – upgrade crossing surface.	• Improve aging infrastructure	• Safety and Security • Asset Preservation
Grade Crossing Upgrade	Improve safety at highway-rail grade crossing locations by upgrading safety devices and adding overhead lighting at crossings.	• Reduce highway-rail grade crossing incidents	• Safety and Security • Asset Preservation
Inspection Facility	Construct new or expand existing inspection facility	• Improve freight operation and efficiency	• Freight and Economic Vitality • Stewardship

Intersection Improvements

Intersection improvements enable Kansas to maintain adequate operations as overall (and freight) traffic volumes continue to increase within the state. Improvements could include turn lane or traffic signal installations, based on warrant analysis. More large-scale improvements may include an overpass with highway access ramps. Developing areas may benefit from these improvements, which enhance the safety of all drivers and passengers, in addition to improving the operation of intersections. Improved intersection operation can lead to faster deliveries and improved vehicle efficiency.

All improvements require additional engineering studies to determine the proper mitigation strategy. KDOT has an extensive Access Management Policy manual that lays out statewide planning and

design standards. This manual shall be used to determine the appropriate mitigation strategy and design criterion.

Figure 7-13 provides cost ranges for the project types and components that may be involved in an intersection improvement.

Figure 7-13: Intersection Improvement Cost Estimates

Project Type	Cost Range	Project Components
Minor		
Add turn lane	$500,000 - $1,000,000 per lane	Design and construction to add a turn lane at an intersection to accommodate truck turns; could include curb, sidewalk, and traffic signal modifications.
Install traffic signal	$250,000 - $400,000 each	Design and construction for poles, controller, and traffic signal equipment.
Major		
Two-lane overpass with interchange ramps	$8,000,0000 to $11,000,000	Design and construction with a 1 to 4 span bridge and four ramps. Intersection control assumed to be stop signs for ramps.
Four-lane overpass with interchange ramps	$12,000,000 to $20,000,000	Design and construction with a 2 to 4 span bridge and four ramps. Assumed turn lanes on the overpass roadway at the ramp terminal intersections. Intersection control assumed to be traffic signals or roundabouts.

Source: TranSystems, Recent project bid prices, KDOT standard practice.

Capacity Expansion

Capacity expansions provide extra lanes for traveling vehicles or additional access to a facility. Additional lanes can greatly improve the flow of traffic and increase mobility within the area. Adding capacity reduces congestion, which reduces overall travel time and vehicle emissions. Capacity-related projects may be needed in growing areas and may spark additional development, especially freight-related development. Figure 7-14 provides cost ranges for the project types and components that may be involved in a project to upgrade roadway capacity.

Figure 7-14: Capacity Expansion Cost Estimates

Project Type	Cost Range	Project Components
Add through lane	$3,000,000/per mile without shoulder $4,500,000/per mile with shoulder	Design and construction for grading and paving to add a highway lane to an existing highway.
Add driveway	$40/per foot of length	Design and construction of a new (12’ width) industrial driveway.

Source: TranSystems, Recent project bid prices, KDOT standard practice.

Truck Parking

Truck parking must be available for freight operations to run smoothly, as truck drivers require access to safe and secure truck parking to meet hours-of-service requirements,[237] access basic amenities, and stage as they wait for pick-up/drop-off appointments. Truck parking shortages are a major concern nationwide. If truck drivers are unable to find safe and adequate parking, they may have to drive extended hours, potentially when tired, or may park their truck at unsafe, undesignated locations, such

[237] FMCSA, Summary of Hours of Service Regulations, March 28, 2022, https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations#:~:text=14%2DHour%20Limit,extend%20the%2014%2Dhour%20period.

as along roadway shoulders or on/off ramps. Additional availability of safety and adequate truck parking can help assure a safe environment for truck drivers and the general driving public.

Figure 7-15 provides cost ranges for the project types and components that may be involved in a truck parking installation. The costs within the table do not include the cost of right-of-way (ROW) acquisitions. ROW can be more costly in urban versus rural areas.

Figure 7-15: Truck Parking Cost Estimates

Project Type	Cost Range	Project Components
Expand existing truck parking lot	$15,000 - $30,000 per stall	Design and construction for heavy-duty pavement, drainage, striping, lighting, and fencing
Construct new truck parking lot*	$20,000 to $35,000 per stall	Design and construction for heavy-duty pavement, drainage, striping, lighting, fencing, and driveways

Source: TranSystems, Recent project bid prices, KDOT standard practice. *Note: ROW acquisition is not included in the cost estimate.

Grade Crossing Upgrades

A highway-rail grade crossing surface is the treatment used where a roadway crosses the railroad tracks. Timber or asphalt surfaces are often used on low-volume roadways, but they can deteriorate over time due to water damage, uneven surface, or use. A crossing surface upgrade often consists of an installation of segments of precast concrete panels, with steel borders. The use of these panels allows installation time to be minimized, provides a smooth (but skid-resistant) surface, and has proven to be very long-lasting. If necessary, they can be removed temporarily to permit repair of the track underneath. Segments can be custom-made to provide for crossings located on curved track or other special situations. Figure 7-16 provides cost ranges for the project components that may be involved in a crossing surface upgrade project at a grade crossing.

Figure 7-16: Grade Crossing Upgrade (Crossing Surface) Cost Estimates

Project Type	Cost Range	Project Components
Crossing Surface	$1,000 per track foot (TF)	Crossing surface replacement to concrete or rubber and track rehabilitation through the crossing

Source: TranSystems, Recent project bid prices, Class I Railroad standard practice.

There are two types of highway-rail grade crossings – passive and active. A crossing controlled with passive warning devices may include crossbucks, yield or stop signs, advance warning signs, and pavement markings for paved roadways. An upgrade to an active warning device-controlled crossing includes the installation of flashing lights, bells, and gates. These devices require a nearby power source and integration into the railroad's signal system. Figure 7-17 provides cost ranges for the project components that may be involved in an active warning device upgrade project at a grade crossing.

Figure 7-17: Grade Crossing Upgrade (Active Warning Device) Cost Estimates

Project Type	Cost Range	Project Components
Active Warning Device	$200,000 - $500,000	Installation of flashing lights, bells, and gates; track circuitry

Source: TranSystems, Recent project bid prices, Class I Railroad standard practice.

Installation of street lighting includes a light pole and fixture, along with a connection to a nearby power source. Street lighting at a crossing provides higher visibility to vehicles and pedestrians by illuminating the street at an intersection. Figure 7-18 provides cost ranges for the project components that may be involved in installing street lighting at a grade crossing or intersection.

Figure 7-18: Street Lighting Cost Estimates

Project Type	Cost Range	Project Components
Street Lighting	$40,000 - $100,000	Design and construction for poles, fixtures, conduit, controls

Source: TranSystems, Recent project bid prices, Class I Railroad standard practice.

Inspection Facilities

Inspection facilities are a vital part of freight operations. Proper standards are set to ensure vehicles operate safely and meet the state operating guidelines. Highway scales are needed to inspect commercial motor vehicles, per Federal Motor Carrier Safety Administration (FMCSA) standards, to maintain the safety of the traveling public and enforce size and weight restrictions to protect highway infrastructure. Kansas has completed minimal upgrades to facility buildings, equipment, and infrastructure at its current inspection facilities. Modernization is needed to meet the changing requirements of freight transportation and the location of shipments in Kansas. Upgrades may include updated facilities, technology, number of parking stalls, and inspection pits. Prioritizing freight facilities and roadway characteristics will improve overall freight flow, reduce freight delay, and improve the livelihood of truck drivers and facility employees. Figure 7-19 provides cost ranges for the project types and components that may be involved in an inspection facility.

Figure 7-19: Inspection Facility Improvement Cost Estimates

Project Type	Cost Range	Project Components
Facility		
Building Structure at existing site	$260 - $280/per square foot (SF)	Design and construction for new building at existing site to include office space, relief facility, storage, HVAC, server room, other building components
Building Structure at new site*	$260 - $280/per SF	Design and construction for new building at new site to include office space, relief facility, storage, HVAC, server room, other building components
Resurface Parking lot	$2 to $10 per SF	Design and construction for parking resurfacing using asphalt overlay with restriping and select deep repairs and utility adjustments
Parking lot*	$10 to $25 per SF	Design and construction for a new parking lot at a new site
Inspection Pit	$75,000 to $100,000 each	Design and construction of reinforced concrete structure and lighting.
Roadway		
Access ramps	$500,000 to $1,000,000	Design and construction for the demolition and reconstruction with concrete pavement.
Scale	$200,000 to $2,000,000	Design and construction of scale facility. May include a scale house building with small parking lot.
Electronic signs	$7,000 - $15,000 each	Install small blankout sign and connect to traffic signal/controller
Electronic signs	$400,000 - $600,000 each	Install large DMS and sign structure
ITS	Roughly $75,000 each	Install radar detector
ITS	Roughly $500,000 per site	Install height/weight restriction signage and detection

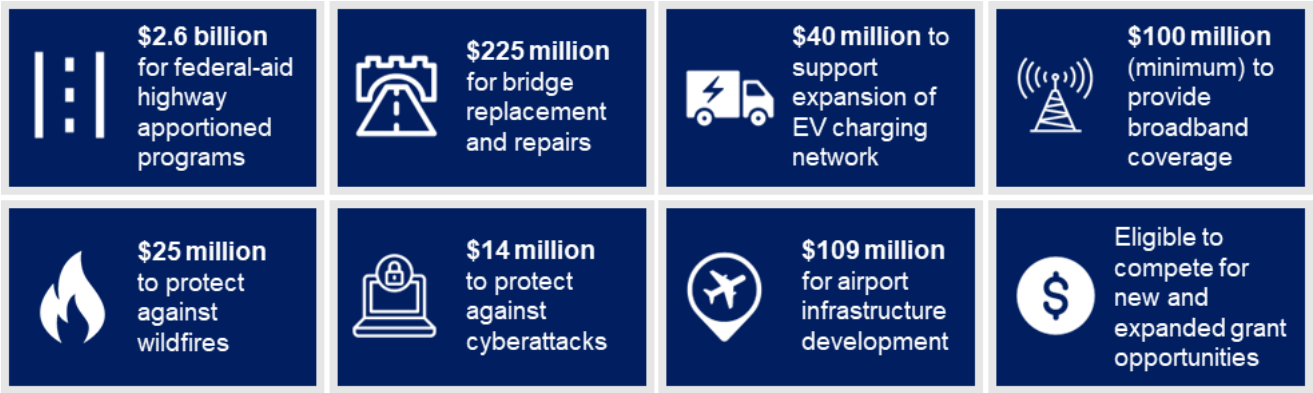
Source: TranSystems, Recent project bid prices, KDOT standard practice. *Note: ROW acquisition is not included in the cost estimate

7.3 Kansas' Freight System Funding and Development

Federal

Federal agencies administer a variety of freight-eligible funding programs, including those expanded and established under the Bipartisan Infrastructure Law (BIL), the surface transportation and infrastructure legislation enacted in November 2021. Figure 7-20 provides an overview of funding for Kansas under BIL, detailing the amount of formula funds the state will receive over five years for federal-aid highway apportioned programs, bridge replacement and repairs, EV charging, broadband, protection against wildfire and cyberattacks, and airport infrastructure development.

Figure 7-20: BIL Funding for Kansas



Source: White House, IIJA Kansas Fact Sheet, https://www.whitehouse.gov/wp-content/uploads/2021/08/KANSAS_Infrastructure-Investment-and-Jobs-Act-State-Fact-Sheet.pdf

BIL has also expanded and established several competitive funding programs. Figure 7-21 details a selection of major BIL funding programs that freight projects are eligible for.

Figure 7-21: Select BIL Grant Programs

Program	Category	Description
National Infrastructure Project Assistance (Mega Projects)	Roads, Bridges, and Major Projects	Supports large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits.
Local and Regional Project Assistance (RAISE)	Roads, Bridges, and Major Projects	Supports projects that will have significant local or regional impact and improve transportation infrastructure.
Nationally Significant Multimodal Freight and Highway Projects (INFRA)	Roads, Bridges, and Major Projects	Supports multimodal freight and highway projects of national or regional significance.
Rural Surface Transportation Grant Program (RURAL)	Roads, Bridges, and Major Projects	Supports projects to improve and expand surface transportation infrastructure in rural areas.
Bridge Investment Program	Roads, Bridges, and Major Projects	Supports projects to improve bridge and culvert condition, safety, efficiency, and reliability.
National Culvert Removal, Replacement, and Restoration Grant	Roads, Bridges, and Major Projects	Supports projects to replace, remove, and repair culverts or weirs.
Consolidated Rail Infrastructure and Safety Improvements (CRISI)	Freight and Passenger Rail	Supports projects that improve the safety, efficiency, and reliability of intercity passenger and freight rail.

Program	Category	Description
Railroad Crossing Elimination Program	Safety	Supports highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods.
Port Infrastructure Development Program (PIDP) Grants	Ports and Waterways	Supports projects that improve the resiliency of ports, as well as projects that reduce or eliminate port-related criteria pollutant or greenhouse gas emissions.
Reduction of Truck Emissions at Port Facilities	Ports and Waterways	Supports projects that reduce truck idling and emissions at ports, including through the advancement of port electrification.
Advanced Transportation Technologies & Innovative Mobility Deployment (ATTAIN)	Roads, Bridges, and Major Projects	Supports projects to deploy, install, and operate advanced transportation systems.
Strengthening Mobility and Revolutionizing Transportation (SMART)	Technology	Supports demonstration projects focused on advanced smart community technologies and systems in order to improve transportation efficiency and safety.
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)	Resilience	Supports planning, resilience improvements, community resilience, evacuation routes, and at-risk coastal infrastructure.
Airport Infrastructure Grants	Airports and FAA Facilities	

Source: White House, Build.gov, https://www.whitehouse.gov/build/?utm_source=build.gov; USDOT, SMART Grants Program, https://www.transportation.gov/grants/SMART.

For roadway projects, KDOT has led and supported projects, in partnership with other localities and states, that have received federal grants. Selected projects are detailed below.

- **TIGER (2015):** KDOT – in partnership with other MAASTO states of Indiana, Iowa, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin – secured $25 million for an eight-state Regional Truck Parking Information and Management System (TPIMS) project using ITS technology on major freight routes.
- **BUILD (2020):** The City of Wichita secured $21 million for the North Junction Gold Project to construct a collector-distributor system to connect I-235 to I-135 and SR 96, replace outdated single-lane system ramps with new two-lane system ramps as well as a new flyover ramp, add new continuous auxiliary lanes on mainline sections, and resurface and improve bridge conditions.238
- **BUILD (2018):** Led by the Unified Government of Wyandotte County, the Interstate 70 and Turner Diagonal Interchange Improvements project secured $13.84 million to replace the existing interchange at I-70 and Tuner Diagonal with a more efficient diverging diamond interchange.

For rail projects, KDOT has provided technical and financial support to state partners to secure federal grants for freight projects in the state.

- **CRISI (2021):** KDOT supported the successful application of two CRISI grants in 2021, providing $500,000 in matching funds to secure $9.4 million for the KYLE Railroad Gateway

[238] KDOT, Wichita North Junction Project Fact Sheet, October 2020, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/wichitaMetro/PDF_Files/North%20Junction%20Fact%20Sheet_Oct2020.pdf

Project, and $500,000 in matching funds to secure nearly $11 million for the Southwest Kansas Infrastructure Upgrade Project on the CVR.[239]

- **Diesel Emissions Reduction Act (DERA) (2021):** KDOT, in cooperation with CVR, was awarded a $127,500 grant for locomotive auxiliary power units.
- **CRISI (2019):** In partnership with Oklahoma DOT and SKOL, KDOT provided $1 million in matching funds, successfully securing a $27 million grant for the SKOL 286K Bi-State Project.[240]
- **TIGER (2011):** KDOT provided $0.4 million in matching funds, in collaboration with KYLE Railroad, for the Solomon Rural Rail Upgrade, which was awarded a $6.6 million grant.[241]
- **TIGER (2010):** KDOT provided $1.7 million in matching funds, in collaboration with South Kansas & Oklahoma Railroad (SKOL), to secure a $14.9 million grant for the Great Plains Freight Rail project.[242]

State

KDOT provides a number of state-funded programs that provide financial support to private and public partners for multimodal freight transportation projects in Kansas.

- **Economic Development Program:** The Economic Development Program offers funding to local governments for transportation projects that bring economic development, job growth, and capital investments to Kansas. KDOT awarded over $14.6 million to six roadway projects and over $6.4 million to four rail projects between 2019 and 2021. This funding was leveraged to provide over $21 million in total funding.[243]

Project Homeland

The Economic Development Program awarded $4.25 million to this project in Shawnee to improve roadway access to accommodate existing traffic to Holiday Sand and Gravel, Amazon Distribution, as well as the expected traffic increase due to the planned Heartland Logistics Park in the future. The total project cost is $5.8 million.

Project Rise

Project Rise is a major expansion of the Schwan's Company and Tony's Pizza, which will add a new 400,000-square-foot facility and bring 225 new full-time jobs. The Economic Development Program awarded $2.1 million to support the $3.0 million project that would improve truck access and accommodate the increasing truck volume.

- **Cost Share Program:** The Cost Share Program provides financial support to all freight modes, including but not limited to road, rail, and air. Funding is provided, in the form of a grant match, to support construction projects that address a key need of enhancing safety, improving access or mobility, improving condition, relieving congestion, or supporting job retention and growth. Between 2019 and 2021, the program funded 13 roadway projects and one railway project with over $10 million, leveraging over $21 million.[244]
- **State Rail Service Improvement Fund (RSIF):** RSIF supports local governments, railroads, port authorities, and shippers to carry out projects that improve the condition and accessibility

[239] FRA, Consolidated Rail Infrastructure and Safety Improvement (CRISI) Program, FY2021 Selections, https://railroads.dot.gov/sites/fra.dot.gov/files/2022-06/FY21-CRISI-Selections_PDFa.pdf
[240] FRA, FY19 Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program Project Selections, 2019.
[241] U.S. DOT, FY 2011 TIGER Awards, https://www.transportation.gov/policy-initiatives/tiger/fy-2011-tiger-awards
[242] U.S. DOT, FY 2010 TIGER Capital Grants, https://www.transportation.gov/policy-initiatives/tiger/fy-2010-tiger-capital-grants
[243] KDOT Economic Development Program Fact Sheet. http://www.ksdot.org/TWorks/EcoDevo/downloads/edfact.pdf; Consultation, KDOT Economic Development Programs, May 3, 2021.
[244] KDOT, Cost Share Program webpage, accessed August 2021. https://www.ksdot.org/CostShare/CostShareProgram.asp

of Kansas' railroad network. In order to receive a grant, projects must have a benefit cost of 1.0 or above. Since 2000, KDOT has supported 95 projects with over $87 million in loans and grants through the RSIF program. This includes eight short line rail projects and seven shipper projects funded by the most recent round of SRIF funding in SFY 2022, with $10.1 million in grants awarded across the 15 projects.

- **Short Line Rail Improvement Fund (SLRIF):** SLRIF provides funding for projects that maintain, reconstruct, or replace short line rail infrastructure, including tracks, bridges, industrial leads, and sidings.[245] The program distributes $5 million annually to qualified projects from SFY 2021 through 2023. In its first two years of funding, the SLRIF program has provided over $9.3 million in grants to support 21 projects. This includes five short line rail projects and six shipper projects in its most recent round of funding for SFY 2022.
- **Kansas Airport Improvement Program (KAIP)**. Established under CTP and continued under T-WORKS and IKE, this program provides funding through reimbursable grants to improve and maintain Kansas' public-use airports (except those classified as Primary airports), including for projects that enhance economic opportunities involving air travel and air freight.
- **Broadband Acceleration Grant:** This competitive grant opportunity funds broadband infrastructure projects in Kansas. Launched in 2020, the grant is funded by KDOT's IKE program and is set to provide $85 million over 10 years. The first round of the program awarded $5 million to 14 recipients in 2021, resulting in a $10 million total investment. The awarded projects provided broadband access to 20 cities and counties. In 2022, the second round of the program awarded $5 million to 11 recipients, resulting in another $11 million total investment, enabling high-speed broadband access across 10 rural counties.[246]

7.4 KDOT Approach to Advancing Freight Opportunities

As part of developing the Kansas State Freight Plan, KDOT sought to assess and articulate how freight – including the designated Freight Corridors of Significance (FCS) – could be incorporated into broad KDOT policies, project planning, decision-making, and investments. The process involved several discussions held among KDOT's Executive Team and policy experts, which included representatives from the Bureau of Transportation Planning, Bureau of Freight and Rail, Division of Multimodal Transportation and Innovation, and Division of Program and Project Management.

This unique approach undertaken by KDOT as part of the State Freight Plan demonstrates the agency's commitment to embracing freight as part of the agency's future planning, programming, decision-making, and investments.

[245] Kansas State Legislature Section 75-5095 – Short line rail improvement fund. https://casetext.com/statute/kansas-statutes/chapter-75-state-departments-public-officers-and-employees/article-50-department-of-transportation/section-75-5095-short-line-rail-improvement-fund; KDOT, Short Line Rail Improvement Fund Program Guidelines, 2020.

[246] Broadband Acceleration Grant Program. Kansas Department of Commerce. https://www.kansascommerce.gov/program/community-programs/broadband-acceleration-grant/

The KDOT Executive Team group discussed Kansas' freight network designation, evaluation criteria to identify freight uses and needs along the state's roadway network, and freight integration into program and funding guidance. In total, three meetings were held:

- **Meeting 1: Policy Options for Designating a Freight Network (June 2022).** The group discussed different purposes for designating a freight system and reviewed KDOT's process for updating the state's freight designation – the Kansas FCS – as part of the State Freight Plan process.
- **Meeting 2: Review Proposed Criteria to Incorporate Freight Into Project Selection (August 2022).** The group further discussed the Kansas FCS, including the designation of Kansas' Critical Rural Freight Corridors (CRFCs). Information was also presented on the evaluation measures used to assess select key freight corridors in the state, and how certain criteria are more or less useful in assessing corridors. **Appendix K** details these evaluation criteria for KDOT's future consideration.
- **Meeting 3: Refine Approach to Incorporate Freight into Project Selection (September 2022).** The group finalized discussions related to the Kansas FCS designation, KDOT use of NHFP funds for projects along the FCS, and what elements of the State Freight Plan and freight assessment could be used by KDOT for future decision-making and funding allocation.

At the culmination of these discussions, the KDOT Executive Team expressed interest in using the FCS designation as an evaluation factor when determining where to invest funds, intending to prioritize projects that are located on the state's FCS network.