AUGUST 2024

MINNESOTA STATE FREIGHT PLAN

Providing an integrated system of freight transportation in Minnesota that offers safe, reliable, sustainable, and competitive access to statewide, national and international markets.

MINNESOTA GO

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ACRONYMS

ACRONYM	DEFINITION
ATRI	American Transportation Research Institute
ATRI	American Transportation Research Institute
BIL	Bipartisan Infrastructure Law
BNSF	BNSF Railway
BT2	Barge Terminal Two
BTS	Bureau of Transportation Statistics
CAV	Connected and/or Autonomous Vehicle
CAV-X	Office of Connected and Automated Vehicles
CPKC	CPKC Railroad
CRFC	Critical Rural Freight Corridors
CTS	Center for Transportation Studies
CUFC	Critical Urban Freight Corridors
DATP	Driver-Assistive Truck Platooning
DEED	Minnesota Department of Employment and Economic Development
DMS	dynamic message signs
EJ	Environmental Justice
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration's
GDP	gross domestic product
HCAADT	Heavy Commercial Annualized Average Daily Traffic
HCAADT	Heavy Commercial Average Annual Daily Traffic
IIJA	Infrastructure Investment and Jobs Act
MFAC	Minnesota Freight Advisory Committee
MHFP	Minnesota Highway Freight Program
MMA	Minnesota Manufacturing Association
MnDOT	Minnesota Department of Transportation
MPO	Metropolitan Planning Organizations
MSP	Minneapolis-St. Paul International Airport
MTA	Minnesota Trucking Association
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
NPMRDS	National Performance Management Research Data Set
O-D	origin-destination

ACRONYM	DEFINITION
OFCVO	Office of Freight and Commercial Vehicle Operations
OSPH	Office of Sustainability and Public Health
OTSM	Office of Transportation System Management
OTST	Office of Traffic, Safety, and Technology
PCA	Packaging Corporation of America
PDDs	Personal Delivery Devices
PHFS	Primary Highway Freight System
PQI	Pavement Quality Index
RDO	Regional Development Commissions
RST	Rochester International
SMTP	Statewide Multimodal Transportation Plan
SPPM	Sustainability, Planning, and Program Management
STB	Surface Transportation Board
STRAHNET	Strategic Highway Network
STRACNET	Strategic Rail Corridor Network
TDA	Transportation Data and Analysis
TFA	Transportation Forecasting and Analysis
TEUs	twenty-foot equivalent unit
TPIMS	Truck Parking Information management System
TTTRI	Truck Travel Time Reliability Index
TVF	Thief River Falls Regional
UAVs	Unmanned Aerial Vehicles
UP	Union Pacific
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USMCA	United States-Mexico-Canada Agreement
YoY	year-over-year

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Minnesota State Freight Plan
Executive Summary

What is the need for a statewide freight plan?

Federal regulations require each state to develop a State Freight Plan, which must comprehensively address the State's freight planning activities and investments (both immediate and long-range).

The State Freight Plan must cover a five-year forecast period, be fiscally constrained, include a freight investment plan with a list of priority projects and describe how the State will invest and match its National Highway Freight Program Funds. The Minnesota Department of Transportation (MnDOT) is updating the State Freight Plan to improve freight access, reliability and connections across the state. Freight helps deliver goods purchased online and food, which can involve multiple modes of transportation. The State Freight Plan considers all types of modes and freight facilities and how they impact broader transportation conditions throughout the state, including:

- **Trucks, roadways and truck stops**
- **Freight trains, railroads and railyards**
- **Cargo ships, waterways and waterway ports**
- **Cargo planes and airports**
- **Pipelines**
- **Multiple modes of freight**

The Plan is vital to identify key investments in the statewide freight system and to better support the transportation of goods and services across multiple modes. MnDOT has worked with public, nonprofit and private partners across various industry sectors to identify future investments to better connect future freight investments with key freight bottlenecks, first- and last-mile connections, safety improvements and intermodal sites.

How does the statewide freight plan connect with other transportation plans?

The Minnesota State Freight Plan serves as a critical component of the broader Minnesota GO Vision, ensuring the safe, efficient and sustainable movement of goods across the state.

By aligning with the Minnesota GO Vision, the Freight Plan supports a multimodal transportation system that is integrated with other state and regional transportation strategies and plans. It connects seamlessly with MnDOT's major modal plans and Metropolitan Planning Organization (MPO) plans, fostering coordination across urban and rural areas and ensuring that freight movement supports the state's economic vitality while enhancing quality of life for all Minnesotans. The plan's integration with other transportation plans ensures a cohesive approach to addressing the current and future freight needs of the state, aligning infrastructure investments and policy initiatives with Minnesota's long-term transportation goals.

- Statewide Multimodal Transportation Plan
- MN Statewide Freight System and Investment Plan
- State Transportation Improvement Program
- Minnesota State Rail Plan
- MN State Aviation System Plan
- MN Statewide Ports and Waterways Plan
- MN RR Grade Crossing Action Plan
- MN Weight Enforcement Investment Plan
- Clean Fuels Standard Summary Report
- Statewide Intelligent Transportation Systems Plan
- Statewide Intelligent Transportation Systems Architecture Update
- Mn Truck Parking Study
- Metro District Manufacturers Perspective Study
- Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet

What are the goals of the statewide freight plan?

1 

Freight System Stewardship

Prioritize improvements in multimodal freight system infrastructure to ensure critical segments are available and in a state of good repair. This is essential for Minnesota to meet expected demand.

2 

Improve Freight Safety

Design roadways that can safety accommodate freight vehicles and separates freight vehicles from other vehicles, and research investments in incident management and new freight technologies.

3 

Connect Minnesotans and Businesses

Minnesota can make investments that improve first/last-mile freight connections, support a healthy and efficient freight mode balance and support the efficient operation of Minnesota's freight system.

4 

Safeguard Minnesota's Health & Environment

It is necessary to plan, design, develop and preserve the freight system in a way that respects and complements the natural, cultural and social context of Minnesota.

5 

Support Minnesota's Economy

Minnesota can support economic activities by maintaining and investing in the freight system while also supporting activities that improve and expand the freight industry workforce.

What does Minnesota's freight look like today?

814 miles of Interstate

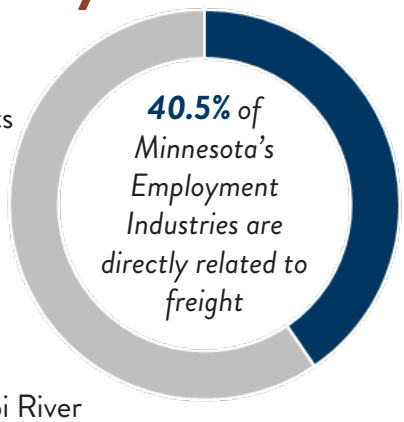
10,891 miles of US and State Highways

4,534 miles of rail lines

14 Cargo-handling Airports

20,000+ miles of pipelines

7 Ports: 3 on Lake Superior
4 on the Mississippi River



Top Commodities by:	TONNAGE	VALUE
TRUCK	**Cereal Grains:** 87 million tons	**Machinery:** $27 billion
RAIL	**Cereal Grains:** 21.2 million tons	**Cereal Grains:** $3.3 billion
WATER	**Metallic Ores:** 5 million tons	**Cereal Grains:** $312 million
AIR	**Precision Instruments:** 81.5 thousand tons	**Precision Instruments:** $13 trillion
PIPE	**Natural Gas/Fossil Products:** 99 million tons	**Natural Gas/Fossil Products:** $19 billion

Industries that account for the largest share of freight trips include:

- Agriculture
- Forestry
- Fishing and Hunting
- Mining, Quarrying and Oil and Gas Extraction
- Utilities
- Construction
- Manufacturing
- Wholesale Trade
- Retail Trade
- Transportation and Warehousing

Some challenges facing Minnesota's Freight system today include:

Global Trade and Supply Chain Disruptions

- COVID-19 Residual Impacts
- United States-Mexico-Canada Agreement
- On/Near-Shoring
- Labor Disputes
- Port and Shipping Lane Disruptions
- War in Ukraine

Changing Market Dynamics

- Increased Demand
- Increased Shipping Costs
- E-Commerce Impacts
- Crude Oil Modal Shifts

Demographic and Workforce Changes

- Aging Workforce Population
- Workforce Shortage

Climate Change and Equity Impacts

- Seasonality
- Low-Water Droughts
- Alternative Fuels

Innovations and Trends:

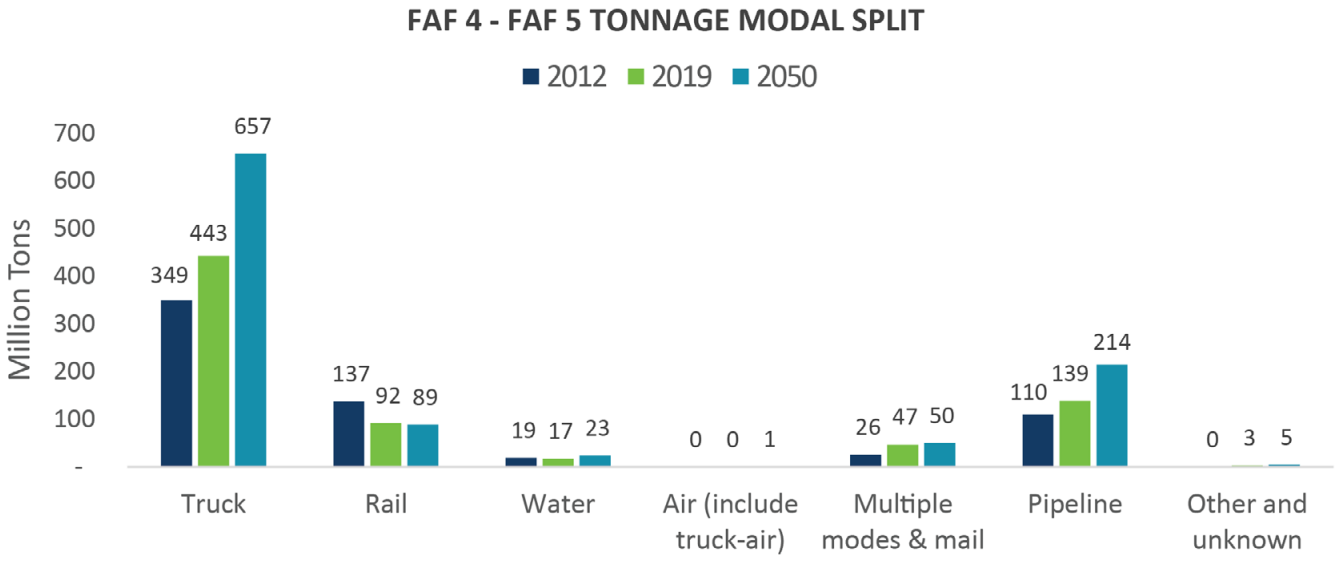
- Connected/Autonomous Vehicles
- Drone/Automated Deliveries
- Truck Platooning
- Big Data

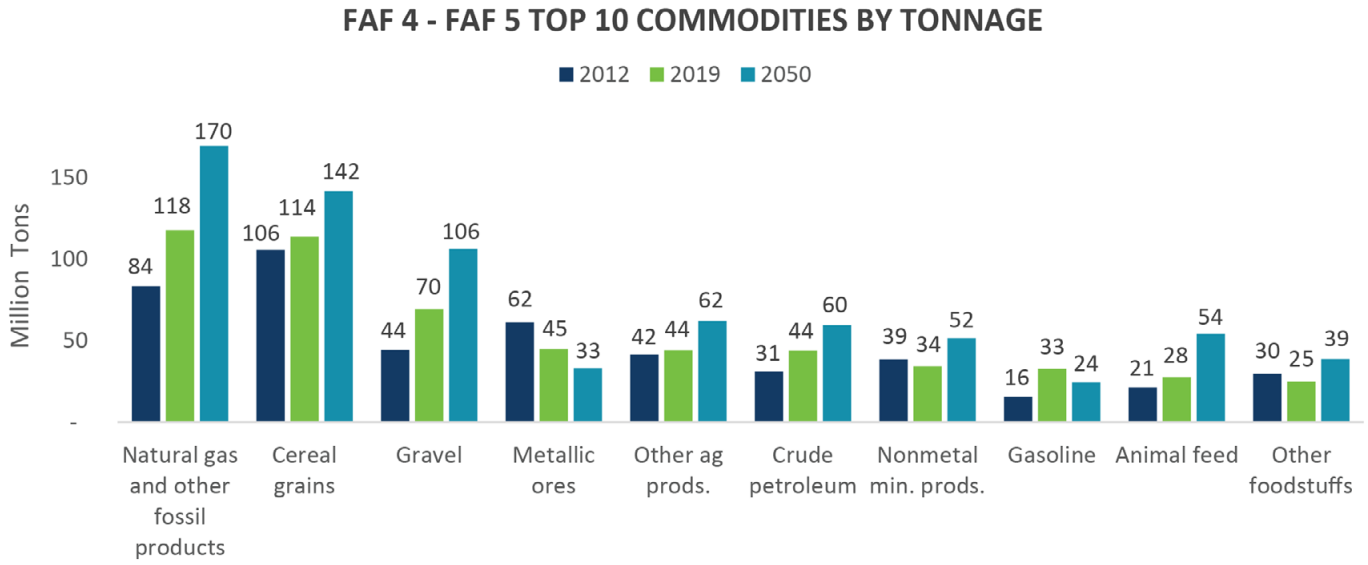
Truck Parking Shortages:

- 98% of truck drivers struggle to find safe and sufficient parking
- 58% of truck drivers admit they park in unauthorized spots at least 3 times per week

What is the future of Minnesota's freight?

Understanding trends of freight movements by mode is critical to understanding the supply chain, whether the movement is within, through, or into or out of Minnesota. Minnesota freight flows have increased 16% between Freight Analysis Framework (FAF) 4 2012 data and FAF 5 2019. Modal share has shifted over time. Rail tonnage has dropped 33% between 2012 and 2019 while tonnage of pipeline freight movement has increased 26%. This shift has made pipelines the second highest mode of freight movement by tonnage in the state, behind trucking.





Minnesota Highway Freight Program (MHFP)

The FAST Act and the NHFP (National Highway Freight Program) provide flexibility to the states in determining how each state will spend NHFP funding. MnDOT developed a centralized competitive solicitation, the MHFP, to solicit projects from a wide variety of state and local partners. The MHFP was developed at the recommendation of local stakeholders on the Statewide Freight Investment Committee and other groups. Since 2017 there have been three formal MHFP solicitation rounds that have awarded funding to partners for various freight projects, including freight mobility, safety, first and last mile connections and intermodal improvements.

What is the Minnesota Freight Action Agenda?

The Freight Action Agenda is a set of actions created by MnDOT in partnership with the Minnesota Freight Advisory Committee to implement the State Freight Plan. The Action Agenda provides guidance in how to improve the freight network statewide in Minnesota along with opportunities to collaborate on how to better maximize the health of the economy, people and environment. Each Action ties into one of the established Goal areas.

1 Freight System Stewardship

- Encourage and Support Partnerships
- Freight Education and Advocacy
- Improve Freight-Related Data Collection
- Develop a Freight Investment Plan
- Prioritize Maintenance of the National Multimodal Freight Network
- Integrate Freight into All Planning Projects
- Preserve Key Rail Corridors
- Maintain MnDOT Superload Corridors
- Targeted Freight System Investments

2 Improve Freight Safety

- Establish Incident Management and Emergency Response Plans
- Design for Freight Safety
- Address Truck Parking Needs
- Improve Freight System Safety
- Invest in New Freight Technology

3 Connect Minnesotans and Businesses

- Improve First- and Last-Mile Connections
- Support Freight Modal Balance
- Support Multimodal Freight Options and Expansions

4 Safeguard Minnesota's Health and Environment

- Explore Urban Goods Movement Programs
- Implement Sustainable Freight Efforts
- Mitigate Impacts on Environmental Justice Populations
- Integrate Freight into Land Use Planning and Policies

5 Support Minnesota's Economy

- Improve and Expand Freight Industry Workforce Development

MnDOT's Minnesota State Freight Plan is an all-encompassing approach to Minnesota's Freight system, including an analysis of the freight network as it exists today; the issues that the system faces; the innovations that will guide the future of freight; the future forecasts of Minnesota's freight system; and the funding processes that are critical to the success of the freight system as it grows.

The State Freight Plan offers goals and strategies that can be implemented to help alleviate issues that the freight system faces, as well as preparing the freight system for the future.

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INTRODUCTION

Minnesota's State Freight Plan provides guidance and strategies to improve the freight system in Minnesota over the next 20 years. Developed in collaboration with the Minnesota Freight Advisory Committee, it contains key policy and investment recommendations to guide decisions by the Minnesota Department of Transportation (MnDOT).

This Minnesota State Freight Plan is a holistic look at the freight transportation system, its conditions and performance and the state-led funding processes critical to supporting Minnesota's economic growth. This plan meets the requirements of the National Highway Freight Program (23 U.S.C. 167) as established by the Fixing America's Surface Transportation Act (FAST) and continued by the Infrastructure Investment and Jobs Act (IIJA). This includes the development of a state freight plan which addresses the state's freight planning activities, trends and investments, both immediate and long-term.

Since the completion of its first State Freight Plan in 2005, Minnesota has committed itself to a freight policy that has integrated the state's approach to freight planning and economic activity. Through the use of strategic planning and integrated statewide goals across agencies through Minnesota GO, a world-class transportation network that supports the dynamic needs of Minnesota's residents and businesses has been created. It continues to position the state as a national leader in freight innovations as well as a global partner in trade. Minnesota was the first state in the country to form a public-private freight advisory committee, has collaborated in multi-state freight planning coordination efforts and has a strong commitment to outreach to and engagement with disadvantaged population groups. This plan is intended to continue that trend and ensure Minnesota remains a global leader in freight transportation. This plan is intended to continue that trend and ensure Minnesota remains a global leader in freight systems planning.

CHAPTER CONTENTS

ALIGNMENT WITH SMTP OBJECTIVES

This update of the State Freight Plan aligns closely with the six objectives of the Statewide Multimodal Transportation Plan (SMTP) — Transportation Safety, System Stewardship, Climate Action, Critical Connections, Healthy Equitable Communities and Open Decision Making. These objectives cut across all transportation topics, guide priorities for the multimodal freight system and improve the resilience of the freight system and its ability to recover from shocks and stresses created by the natural and built environment.

Transportation Safety:
Changes in travel behavior, partly due to the impacts of COVID-19, have led to a significant step backward in transportation safety. 2021 was the deadliest year on Minnesota roads in more than a decade. A mix of traditional and new practices and methodologies is needed to prevent and mitigate human error and foster changes in driver behavior to encourage patience, reduce excessive speeding and eliminate distracted driving.

System Stewardship:
Infrastructure across the country is aging. As the system ages, more resources go to maintenance and repairs so the system can serve communities as intended. Many parts of Minnesota's transportation system show signs of deterioration and require attention.

Climate Action:
Minnesota's climate is changing. Temperatures are increasing and larger, more frequent extreme weather events are occurring year round. Climate change will impact the way transportation is used, built, designed, operated and maintained. It will also affect people's transportation experience, safety and access. Transportation needs to shift to combat climate change and to provide people with environmentally friendly choices to ensure their daily travel needs are met.

Critical Connections:
A variety of transportation options support how people and goods move across the state, throughout a region or within a community. Collaboration is required to ensure the transportation system offers safe, convenient. and affordable options for moving people and goods.

Healthy Equitable Communities:
Policy, design and operations decisions have led to inequities for underserved communities and especially Black, Indigenous and People of Color communities. Advancing transportation equity requires understanding how the transportation system, services and decision-making processes help or hinder the lives of people in underserved communities in Minnesota.

Open Decision Making:
Transportation decision makers bear the responsibility for making informed choices that reflect the needs of many stakeholders. Open, transparent and equitable decision making is essential to building better relationships and ensuring learning, understanding and trust.

STAKEHOLDER OUTREACH

The development of this plan was undertaken by the Minnesota Department of Transportation (MnDOT) in partnership with public and private sector freight stakeholders throughout the state as shown in Figure 0-1. This outreach was critical in the establishment of the freight plan goals. Stakeholder outreach for this plan included a variety of tools including online engagement and in-person one-on-one meetings. Over 1,300 interactions with Minnesotans from all walks of life were recorded and incorporated into the plan. Additional information regarding stakeholder engagement can be found in Working Paper 8: Stakeholder Engagement Summary.

Figure 0-1: Stakeholder Input

WHAT WE HEARD

Comments and questions from stakeholders covered a wide variety of topics. Some of the more frequent items discussed were the impacts of freight on traffic, infrastructure, the environment, the rising costs of delivery and the need for additional truck parking. Figure 0-2 summarizes six of the most frequently discussed topics during the engagement efforts.

Figure 0-2: Freight Engagement Summary

Traffic & Infrastructure

Residents mentioned truck traffic adds to congestion, creates safety issues with difficult merges, degrades pavement quality.

Truck Parking

Truckers said finding parking spots can be challenging; meanwhile, many residents concerned about trucks parking in their neighborhoods.

Environmental Impacts

Those living near highways, airports, and railroads all expressed concerns about air quality and noise pollution.

Mode Shift

Many recommended increasing freight rail relative to other freight modes due to its higher efficiency.

Rail Safety

Concerns over rail safety including derailments, aging railroad infrastructure, rail crossings, and transportation of hazardous materials.

Rising Cost of Delivery

Many expressed concerns about high fuel costs impacting deliveries and the trucking industry.

STATE FREIGHT PLAN GOALS AND OBJECTIVES

By analyzing and tying together the SMTP Objectives and the needs derived from the stakeholder outreach and assessment of the state's freight system conditions and performance, a series of goals and objectives were developed specific to the current and future needs of Minnesota's freight system. These goals and objectives also directly support the goals of the National Multimodal Freight Policy.

GOAL 1: FREIGHT SYSTEM STEWARDSHIP

In 2019, 740 million tons of freight moved over Minnesota's transportation system. By 2050, that volume is expected to increase to 1.04 billion tons, an increase of 40% overall. This growth in freight transportation will stress Minnesota's transportation infrastructure. Strategic improvements in multimodal freight system infrastructure to ensure critical segments and connections are both available and in a state of good repair are essential for Minnesota to meet expected demand. Minnesota can support this stewardship through a variety of strategies including supporting and encouraging partnerships with stakeholders, developing targeted freight system improvements and prioritizing the maintenance of key freight networks like the National Multimodal Freight Network and Minnesota's Primary Highway Freight System.

- **Objective –** Preserve and Improve Minnesota's Freight Infrastructure: Invest in infrastructure projects that maintain a state of good repair for Minnesota's highways, bridges, railroads, airports and waterways.
- **Objective –** Strategically Invest in New Freight Infrastructure: Identify and invest in projects that expand freight service to new modes or to new markets.

GOAL 2: IMPROVE FREIGHT SAFETY

Safety is a high priority for both public and private organizations involved in freight transportation. Due the size and weight of vehicles involved, crashes involving trucks, trains and other freight vehicles are often more likely to result in fatalities or severe injuries. Freight safety strategy begins early in the process through the design of roadway features that can safely accommodate larger freight vehicles and provide adequate separation between freight vehicles, passenger vehicles and non-motorized users where appropriate. Investments in incident management programs and new freight technologies are also key to continuing to improve freight safety in the state.

- **Objective –** Improve Freight System Safety: Reduce the frequency of crashes on Minnesota's freight system.

GOAL 3: CONNECT MINNESOTANS AND BUSINESSES

The day-to-day freight needs of the public and industry can be hindered in a number of ways, including difficult last-mile access, poor system condition and limited freight transportation options. Minnesota can support these users by targeting investments that improve first- and last-mile freight connections, support a healthy and efficient freight mode balance and support the efficient operation of Minnesota's freight system.

- **Objective –** Improve Freight Mobility, Velocity and Reliability: Reduce the impacts of truck bottlenecks, eliminate physical barriers to freight movement and improve freight system reliability.
- **Objective –** Consideration of All Freight Modes in Planning and Design: Continue to educate stakeholders on freight needs and encourage the inclusion of freight at all levels of planning and design.

GOAL 4: SAFEGUARD MINNESOTA'S HEALTH AND ENVIRONMENT

While the state and national freight system is critical for the safe and efficient movement of goods, the system itself can sometimes negatively impact adjacent communities and the environment. These impacts can relate to air quality and noise, the presence of truck in neighborhoods and freight land use conflicts. In some cases, the negative impacts of the freight system can have outsized impacts on traditionally underrepresented groups such as minority and low-income communities.

It is necessary to plan, design, develop and preserve the freight system in a way that respects and complements the natural, cultural and social context and is consistent with the principles of context sensitive solutions.

- **Objective –** Reduce Freight's Impact on the Environment: Support programs and projects that reduce vehicle emissions and wildlife habitat loss.
- **Objective –** Increase Freight System Resiliency: Support projects and programs that result in a freight system more resilient to major disruptions such as severe weather events.
- **Objective –** Minimize Disparate Freight Impacts to Underserved or Overburdened Communities: Support programs, projects and policies that reduce the impacts of the freight system on overburdened communities.

GOAL 5: SUPPORT MINNESOTA'S ECONOMY

The ability of businesses and industries in Minnesota to compete in the marketplace relies in part on an efficient freight transportation system that effectively moves goods and raw materials within Minnesota and to other locations throughout the country. Minnesota can support these economic activities by maintaining and investing in the freight system while also supporting activities that improve and expand the freight industry workforce.

- **Objective –** Support and Grow Minnesota's Freight Industries: Support projects that improve the competitiveness of Minnesota's freight industries through lower costs and better freight service.

LINKS TO NATIONAL FREIGHT GOALS

While this plan is a critical blueprint to ensuring Minnesota remains at the cutting edge of industry, it is part of a greater national effort to improve freight nationwide. The USDOT has established National Freight Policy goals that MnDOT is meeting to ensure it supports the country as well as Minnesota as shown in Table 0-1.

Table 0-1: Federal and MnDOT Freight Plan Goals

National Multimodal Freight Policy Goals	MnDOT Freight Plan Goal
1. To identify infrastructure improvements, policies and operational innovations that (A) strengthen the contribution of the National Multimodal Freight Network to the economic competitiveness of the United States, (B) reduce congestion and eliminate bottlenecks on the National Multimodal Freight Network and (C) increase productivity, particularly for domestic industries and businesses that create high-value jobs	Support Minnesota's Economy Connect Minnesotans and Businesses Freight System Stewardship
2. To improve the safety, security, efficiency and resiliency of multimodal freight transportation	Improve Freight Safety
3. To achieve and maintain a state of good repair on the National Multimodal Freight Network	Freight System Stewardship
4. To use innovation and advanced technology to improve the safety, efficiency and reliability of the National Multimodal Freight Network	Connect Minnesotans and Businesses
5. To improve the economic efficiency and productivity of the National Multimodal Freight Network	Support Minnesota's Economy
6. To improve the reliability of freight transportation	Freight System Stewardship
7. To improve the short- and long-distance movement of goods that—(A) travel across rural areas between population centers, (B) travel between rural areas and population centers and (C) travel from the Nation's ports, airports and gateways to the National Multimodal Freight Network	Freight System Stewardship Connect Minnesotans and Businesses
8. To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity	Connect Minnesotans and Businesses
9. To reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network	Safeguard Minnesota's Health and Environment
10. To pursue the goals described in this subsection in a manner that is not burdensome to State and local governments	Safeguard Minnesota's Health and Environment

STATE FREIGHT PLAN GUIDE

In combining the objectives of the SMTP with the freight needs of the State, utilizing stakeholder outreach to develop goals and freight plan objectives for the improvement of the state freight system and utilizing data to analyze trends and system needs and issues, this plan was authored as a guide for equitable and sustainable improvements to the State's freight transportation system. The blueprint established here is concise and proactive to ensure Minnesota remains a safe and prosperous state for its people using integrated systems of transportation and will meet the needs of the Federal Criteria as established in the FAST Act. It will also meet the needs of the National Multimodal Freight Policy, the criteria of the FAST Act and the IIJA.

The following provides a summary of the freight plan chapters and related materials included as appendices and working papers.

CHAPTER 1: IMPORTANCE OF FREIGHT TO MINNESOTA

This chapter summarizes Minnesota's key freight-dependent industries and how they relate to and support the state's economy.

CHAPTER 2: CURRENT AND FUTURE FREIGHT TRENDS AND ISSUES

This chapter outlines many of the freight trends experienced by Minnesota since the previous State Freight Plan which have been driven by multiple global trade and supply chain disruptions, changing market dynamics, demographic and workforce changes and continued impacts of climate change.

CHAPTER 3: FREIGHT SYSTEM ASSETS, CONDITIONS AND PERFORMANCE

This chapter provides additional detail on the multimodal freight system in Minnesota including highways, railroads, waterways, airports, pipelines and military freight. Some of the key issues discussed include truck parking availability, the movement of crude oil by rail versus pipeline and the importance of air cargo for the shipment of low weight, high value goods.

CHAPTER 4: FREIGHT FORECASTS

This chapter uses national freight data sources to provide estimates of freight tonnage and value flowing into, out of and within the State of Minnesota for existing conditions and forecast to the year 2050. These forecasts provide insight into many of the anticipated freight challenges facing the state in the near future.

CHAPTER 5: FREIGHT POLICIES AND STRATEGIES

This chapter describes the set of detailed strategies that MnDOT and its freight partners will use to implement the goals of the State Freight Plan. Each of the 22 items in the Freight Action Agenda specifies the key actors leading and supporting the implementation of the strategy, the timeframe for the strategy and the connection of each strategy to the overall plan goals.

CHAPTER 6: SUSTAINABLE TRUCK TRENDS AND STRATEGIES

This chapter describes specific goals and strategies developed as part of this plan to reduce the impacts of greenhouse gas emissions from medium and heavy duty truck freight.

CHAPTER 7: FREIGHT INVESTMENT IMPLEMENTATION

This chapter details the freight system investments MnDOT has programmed through the Minnesota Highway Freight Program. The chapter describes the overall approach used to score applications to the program and reviews the evolutions of the program over the three rounds of award.

APPENDICES

This plan includes three appendices. Appendix A summarizes the locations and extents of the federally allocated mileages for Critical Urban Freight Corridors (CUFCs) and Critical Rural Freight Corridors (CRFCs) in the state. Appendix B provides a summary of freight performance measures used by MnDOT to monitor progress on freight goals and objectives. Appendix C provides a summary of federal State Freight Plan requirements and serves as a guide for located those requirements within this plan.

- Appendix A: Critical Urban and Rural Freight Corridors
- Appendix B: Freight Performance Measures
- Appendix C: IIJA State Freight Plan Requirements

SUPPORTING DOCUMENTS

In addition to the main chapters and appendices outlined above, the State Freight Plan is supported by a number of working papers that helped lay the groundwork for the goals, policies and strategies proposed in the plan document.

These working papers can be found on the Minnesota State Freight Plan webpage: www.minnesotago.org/final-plans/state-freight-plan

- Working Paper 1: Existing Plan and Document Review
- Working Paper 2: Freight Trends
- Working Paper 3: Freight Performance Measures
- Working Paper 4: Economic and Freight System Profile
- Working Paper 5: Summary of Statewide Freight Needs
- Working Paper 6: Environmental Justice Analysis
- Working Paper 7: Sustainable Truck Trends and Strategies
- Working Paper 8: Stakeholder Engagement Results

CHAPTER 1

IMPORTANCE OF FREIGHT TO MINNESOTA

Freight-related industries make up approximately 40% of all employment in Minnesota and directly or indirectly support many of the non-freight-related industries in the state. Each industry has unique needs and impacts on the state's multimodal freight system.

Freight-related industries include, but are not limited to, manufacturing, warehousing and distribution, agriculture, food production and mining. Products and goods must be transported to the right place at the right time to drive Minnesota's production-led economy. The multimodal freight transportation system is the platform that supports supply chains by facilitating the efficient, reliable and safe movement of freight.

CHAPTER CONTENTS

OVERVIEW

Freight impacts all aspects of Minnesotan's lives. From how and where we live and work, to what and how much we consume, freight plays a key role in the economic well-being and quality of life throughout the state. The dynamic nature of a market-led economy includes constant activity between sellers and buyers and frequent changes depending on cost, availability and quality of goods, transportation costs, seasonality, trends, technology, buyer behavior and other factors. Each freight mode is necessary to be cost-effective and meet the needs of customers specifically within those industries unique to Minnesota.

According to the U.S. Bureau of Labor Statistics, the labor force participation rate in Minnesota had been above 70% of all residents from October 1980 through to the summer of 2016, having reached a high of 76% in February of 2001. The labor rate was volatile through the pandemic period of the early 2020s, with the most recent levels at 68.5% in August 2023, well below pre-pandemic labor force participation rate levels. The relative lack of the working age population employed in the state's economy has, in principle, limited the growth of the economy. While the state Gross Domestic Product (GDP) has rebounded, the economy could be more robust with more of the labor force actively participating as wage earners in the state's economy. The percent of total employment by industry is shown in Table 1-1: Minnesota Employment by Industry Sector below. Though almost all industries are reliant on the movement of goods for supplies and equipment for their operations, those that are directly freight related account for over 40% of the employment in Minnesota.

Manufacturers, in particular, are vital to the economy in Greater Minnesota, not only in the community they operate in, but to the broader region. The urban and rural freight systems in Minnesota are highly interdependent and the success of both systems provides benefits to all Minnesotan's.

Table 1-1: Minnesota Employment by Industry Sector

Industry Sector	% of Total Employment	Directly Freight Related
Agriculture, forestry, fishing and hunting and mining	2.2%	■
Construction	6.4%	■
Wholesale trade	2.6%	■
Retail trade	11.0%	■
Transportation and Warehousing and Utilities	5.0%	■
Manufacturing	13.3%	■
Sub-Total: Freight-Related Industries	40.5%	
Information	1.3%	
Finance and insurance and real estate and rental and leasing	7.2%	
Professional, scientific, management and administrative and waste management services	10.4%	
Educational services and health care and social assistance	25.7%	
Arts, entertainment and recreation and accommodation and food services	6.7%	
Other services, except public administration	4.4%	
Public administration	3.8%	
Sub-Total: Non-Freight-Related Industries	59.5%	

MINNESOTA FREIGHT INDUSTRIES AND THE ECONOMY

Freight industries are those that facilitate or are producers/consumers of freight, which is consistent with the Minnesota Statewide Freight System Investment Plan. The Minnesota industries that account for the largest share of freight trip production and/or attraction include:

- Agriculture, Forestry, Fishing and Hunting
- Mining, Quarrying and Oil and Gas Extraction
- Utilities
- Construction
- Manufacturing
- Wholesale Trade
- Retail Trade
- Transportation and Warehousing

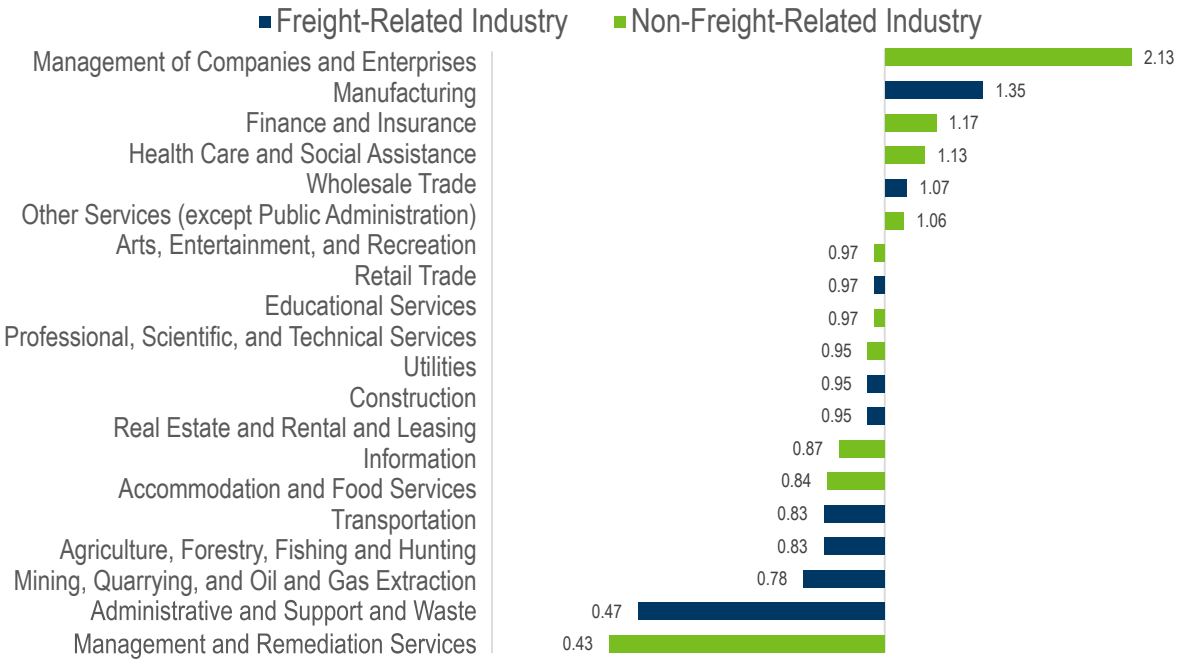
Each of these industries have unique freight transportation needs and geographic footprint in terms of employment, market reach and impact to the state's economy.

Following the approach used in previous freight plans, this plan effort reviewed each industry using a location quotient approach.

Under this method, the proportion of employment within each industry at the state level was compared to the proportion of that industry employment at the national level. This ratio—or location quotient—provides an indication of how specialized the state is within each industry. A location quotient value above 1.0 indicates a state is more specialized in that industry while a location quotient value below 1.0 indicates a state is less specialized in that industry.

The location quotient values for various industries in Minnesota are shown in Figure 1-1. For freight-related industries, Manufacturing is the most specialized at 1.35. Notably, while some industries show a low location quotient value at this level of aggregation, sub-industries within these categories often show differing results. For example, Mining, Quarrying and Oil and Gas Extraction shows the lowest location quotient at 0.47. However, the sub-industry of Metal Ore Mining results in a location quotient of 3.97 , highlighting the extreme specialization of this industry in Minnesota.

Figure 1-1: Minnesota Energy Consumption by End-Use Sector (2021)



Additional information regarding Minnesota's freight industries can be found in Working Paper 4: Economic and Freight System Profile.

AGRICULTURE, FORESTRY, FISHING AND HUNTING

There are over 3,100 commercial businesses in the state of Minnesota in the combined category of Agriculture, Forestry, Fishing and Hunting. There is broad, relatively even distribution of these enterprises throughout the state's rural and urban areas, though fewer in the far north and eastern peninsula portions of the state.

The Minnesota agricultural economy generates substantial volumes of freight from across all counties, with row crops, hay, orchards, vegetables, livestock and other categories of sustainable production supporting food, fiber and fuel. The agricultural sector employs nearly 112,000 with a total market value of agricultural products sold of $18.4 billion. Primary farm sales revenues are from crops which generate $10.2 billion across the state annually, while $8.2 billion is generated from livestock, including products.

Nearly all agricultural products are delivered from the farm by truck, often by the producer themselves, but increasingly by a specialized hauler using grain trailers, able to drive throughout the year hauling production for numerous farmers to increase cost-effectiveness for agricultural producers and haulers alike.

The destinations for row crops are local, national and international. The commodities are transferred through local and regional grain elevators and transfer facilities, moved to processors for the production of products (meal, renewable biofuels, etc.) or shipped to major terminals for transloading to support exports. These crops are often moved by rail to the Pacific Northwest or barged via the Minnesota or Mississippi Rivers to Gulf ports and via truck/rail to the Port of Duluth-Superior on the Great Lakes.

Forestry and Logging is important to the state's economy and is centered in Northeastern Minnesota. Of the total 17.7 million acres of forest in the state, there are approximately 160,150 acres that are harvested or thinned annually as of 2020. Of the state's total land area, 34.7% is composed of forest according to data from the U.S. Department of the Interior, Forest Service Inventory and Analysis National Office database with less than 1% of the total being harvested.

MINING, QUARRYING AND OIL AND GAS EXTRACTION

Across the state of Minnesota, there are 189 verified businesses within the Mining, Quarrying and Oil and Gas Extraction sector. The locations are geographically dispersed throughout the state. However, revenue generation is centered on the Mesabi Range which is the primary location of the State's iron mines. Minnesota is the leading producer of ferrous minerals, iron ore and taconite in the U.S. To support natural resource extraction, considerable investments have been made in workforce development, freight infrastructure and local support industries. Heavy haul, off-road vehicles transport the dense materials to rail and water modes.

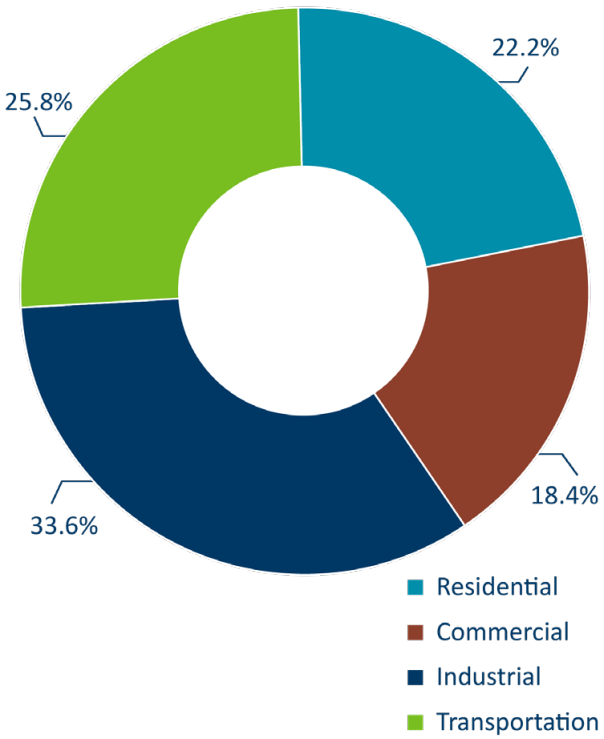
Construction materials such as sand, gravel, crushed stone, kaolin clay, dimension stone, landscape stone and silica sand are transported across Minnesota via specialized truck operations, specific to the product mined. Surface mining operations occur in nearly every county in Minnesota and are used to create concrete and other construction materials. Quarries of bedrock are the source of products such as crushed stone for use as aggregate in construction. Finer-grained kaolin clay is mined in and around the Minnesota River Valley and is used for cement production, tiles and bricks. Similarly, silica sand, a sand composed of fine quartz grains, is mined across Minnesota's southeastern region for glass-making, as a source of silicon and for oil and gas well operations across the Upper Great Plains. Dimensional stone includes granite and quartzite, each of which is used in the construction of homes, buildings and monuments.

The Real GDP for the mining sector contributed $2.1 billion to Minnesota's economy in 2021, excluding oil and gas.

UTILITIES

There are nearly 400 businesses in the Utilities industry in Minnesota. The utilities sector supports energy- intensive construction, food processing, chemical products manufacturing, petroleum refining, agriculture, mining and paper manufacturing industries. These seven industries accounted for one-third of Minnesota's total energy use in 2021. The transportation sector consumed just over one- fourth of the state's total energy which includes energy used by vehicles to transport people and goods and includes cars, trucks, trains, planes and boats. The state was the nation's fifth-largest fuel ethanol producer, primarily for use in transportation, accounting for about 9% of U.S. total production, in 2021. Minnesota's energy consumption by end-use sector is shown in Figure 1-2: Minnesota Energy Consumption by End-Use Sector (2021) below.

Figure 1-2: Minnesota Energy Consumption by End-Use Sector (2021)



Utilities contribute $4.5 billion (2022) to the State's economy largely due to the transition from coal plants to natural gas for electricity generation. In February 2023, Minnesota Senate Bill SF4 became law, establishing a Minnesota carbon-free electricity standard by 2040, resulting in the reduction in coal from 1.2 million tons to 0.8 million tons (July 2022 to July 2023) for electricity generation in Minnesota according to the Energy Information Agency (EIA). The on-going reduction in coal use reduces the need for the transport of coal and minerals used for scrubbers within the utilities industry.

CONSTRUCTION

The construction sector includes over 17,000 businesses within Minnesota as primary operators in the construction field, which are primarily located in more urbanized areas throughout the state. The construction industry requires a wide range of materials and finished products such as materials for residential, commercial and industrial facility construction (structural) and finishing (plumbing, electrical, flooring, fixtures etc.). In addition, the industry supports public and private infrastructure, including utilities, transport, communications networks and security apparatus to support the overall Minnesota economy.

Goods for the construction industry originate throughout Minnesota and the world. These include finished or semi-finished manufactured products such as concrete, lumber, steel, wire, pipe, paint, flooring, etc. The delivery of these materials is to warehouse/distribution facilities prior to retail stores and/or job sites.

MANUFACTURING

The Manufacturing sector is spread across Minnesota with over 9,300 businesses throughout the state, with a concentration of about 60% of these businesses located within the Twin Cities and surrounding Metro area counties.

According to the Minnesota Manufacturing Association (MMA) directory (2023), the leading

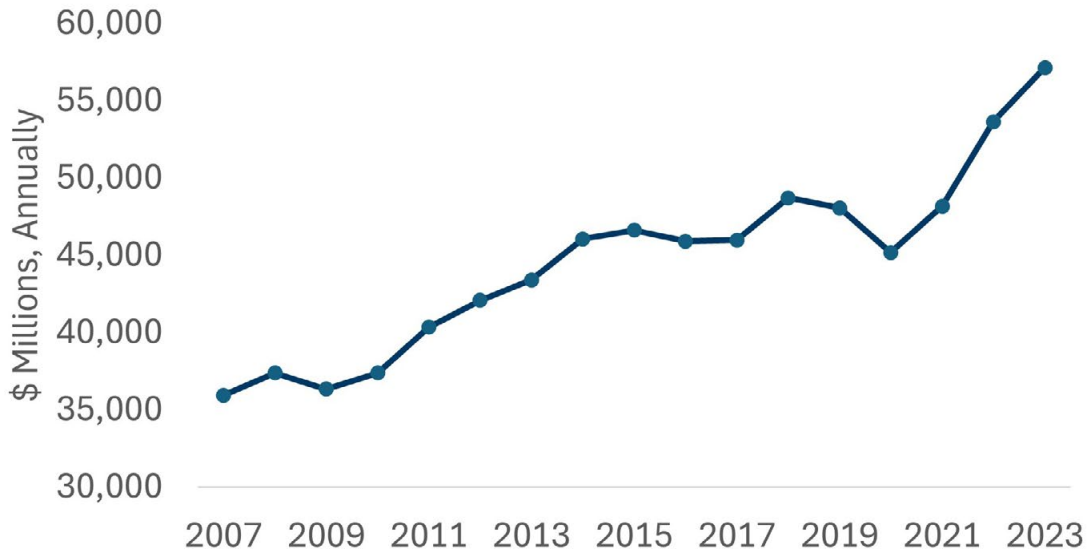
manufacturing industries by total manufacturing employment are:

- Food and kindred products (15%)
- Industrial machinery and equipment (15%)
- Instruments and related products (10%)
- Printing and publishing (10%)
- Fabricated metal products (10%)

State manufactured exports reached $24 billion for 2022, up 12% over 2021. Service exports contributed about $12 billion the most recent year for which statistics are available at the level of the state's economy (2019). USDA estimated that Minnesota exported $9.4 billion in agriculture and food products in 2021, ranking fourth in the nation. In 2021, exports of goods supported an estimated 117,900 jobs in Minnesota.

As shown in Figure 1-3: Minnesota Manufacturing GDP Contribution (2007-2023), the Manufacturing sector contributed $61 billion annually to the Minnesota GDP (2023), which is a 39.6% increase from the low in the second quarter of 2020, in the midst of the COVID 19 pandemic at $43.7 billion. This is equal to 17.3% of the total state economy.

Figure 1-3: Minnesota Manufacturing GDP Contribution (2007-2023)



WHOLESALE TRADE

Wholesale Trade is a substantial freight generating sector in Minnesota where there are a total of 17,930 businesses engaged in wholesale procurement and goods or materials acquisitions for downstream sales across many different markets.

Of the businesses with 20 employees or more and with revenues of $2.5 million or greater, Medical Dental and Hospital Equipment and Supplies leads the category, followed by Packaged Frozen Food Merchant Wholesalers, demonstrating that these businesses tend to be of somewhat larger scale, both in terms of number of employees and in value of sales volumes.

There are nine businesses in Wholesale Trade based in Minnesota whose revenues exceed $1 billion, with another 19 businesses having revenues between $500 million and $1 billion. On the next page, Table 1-2: Minnesota Top Wholesale Trade Industry Companies by Revenue summarizes the largest businesses within the Wholesale Trade industry in Minnesota.

Table 1-2: Minnesota Top Wholesale Trade Industry Companies by Revenue

Businesses	Location	Employees	Annual Revenue	Details
General Mills	Golden Valley	34,000	$17.6 billion	Food processing
Ferrellgas	Buffalo	4,000	$2.0 billion	National supply network for propane and natural gases.
Digi-Key Electronics	Thief River Falls, Pennington County	3,000	$1.8 billion	Online sales of electronic components, equipment and appliances
Bluestem Brands (Fingerhut)	Eden Prairie	1,900	$1 billion	Retail and wholesale distribution.
Emerson Performance Solutions	Eden Prairie	1,500	$1.4 billion	Provides systems control units and regulators.
Quality Pork Processors	Austin, Mower County	1,500	$1.35 billion	Fresh pork production
Boise White Paper	International Falls	850	$1.4 billion	Subsidiary of Packaging Corporation of America (PCA)
Manheim Minneapolis	Maple Grove	400	$1.4 billion	Wholesale automobile distribution

Minnesota Department of Employment and Economic Development. Minnesota Export Statistics. 2023

RETAIL TRADE

With nearly 28,500 businesses in Minnesota in retail trade, the dramatic increase in e-commerce has changed the retail landscape and freight reliance across the state. Historically, retail businesses have been located proximal to population centers, commonly clustered, in shopping districts designated by zoning and facilitated through real estate development. Shopping centers and malls often require shipments from wholesalers and parcel companies by truck curbside or via loading docks for larger establishments. While the number of businesses in retail is dispersed across the state, the number of employees is concentrated in the Twin Cities.

In addition to those businesses whose primary business is retail trade, there are nearly 40,500 enterprises across the state that are involved in retail sales. This may include small businesses that make products and might have a small shop where they are sold.

Data found that 40% of these businesses employ five or fewer workers and nearly 33% have revenue of under $1 million. These small retail establishments generate inventory turnover, have procurement operations with deliveries to their business locations and generate customer trips and parcel freight pick-ups and drop-offs.

The products within the retail category range widely, from Peterbilt heavy trucks to common automobile dealerships, home appliance stores, department stores, grocers, etc. The number of cities with these larger retailers are generally concentrated within population centers throughout the state.

TRANSPORTATION AND WAREHOUSING

Companies within the Transportation and Warehousing industry account for over 37% of Minnesota's GDP with nearly 5,700 companies in the state. This includes a range of services such as taxicabs, services, courier and expedited delivery, freight scales, industrial storage and trucking

companies. Around 8,400 Minnesota companies have either primary or some secondary involvement transport and warehousing.

According to Minnesota Department of Employment and Economic Development (DEED) the number of Laborers and Freight, Stock and Material Movers are estimated to increase 6.5% from 2020 to 2030. Heavy and Tractor Trailer Truck Drivers are projected to rise 4.1% over the period, Dispatchers within the trucking industry are expected to increase 2.2% and Industrial Truck and Tractor Operators (generally referred to as 'forklift operators') are expected to rise in Minnesota 4%. Shipping, Receiving and Inventory Clerks are forecasted to decrease over the decade 6.6%, due to the increase in automation within the industry.

Logisticians are specialists in demand planning, supply planning, sales and operations who work to strike the balance between production and consumption, to minimize waste, excess, or inefficiencies throughout the goods movement processes. Logisticians are responsible for the entire life cycle of a product, including acquisition, distribution, internal allocation, delivery, along with final disposal of resources or returns from customers or transport service providers. These positions are expected to increase 29% by 2030.

Cargo and Freight Agents employment in the Minneapolis-St. Paul, Minnesota region is ninth in the country among major Business Economic Areas and arrange freight locally as well as imports and exports, within and outside the U.S. According to DEED 2020 data, employment in this area is expected to grow 6.5% between 2020 and 2030

Transportation, Storage and Distribution Managers are expected to rise 4% between 2020 and 2030 and are responsible for making management decisions specific to the transport of goods.

INTERNATIONAL TRADE

Previous decades have seen a steady advancement in the extent and complexity of the integration of the global supply chain. Trade policies enacted by the U.S. and other nations over a period of more than half a century reduced price controls, deregulated capital markets and lowered trade barriers and also increasingly intertwined the world's capital goods markets and supply chains. Driven by labor and market incentives, components of finished products, materials and finished goods frequently cross borders and large geographic distances numerous times before reaching a final consumer.

Because the state ships and receives freight to and from locations around the world, Minnesota's globally competitive economic and trade practices are significantly impacted by international trade policies. Minnesota's freight system engages in international trade by a range of modes, including motor carrier, rail, maritime, air and pipeline.

As Minnesota's economy, distribution chains and logistics networks continue to mesh with the global supply chain system with increasingly layered complexity, the state will continue to optimally position its industries to meet emerging opportunities and challenges One method Minnesota used to better understand the challenges facing industries in the state was the Manufacturers' Perspectives Studies. This series of studies, conducted at a District level for all eight MnDOT districts, included hundreds of interviews with manufacturers and freight carriers with the purpose of understanding the unique challenges faced by these businesses and identifying freight system improvements that could help to address these challenges.

Minnesota conducted approximately $70 billion in total trade with 215 countries in 2022, an increase of approximately 21% over 2021. With nearly $43 billion in imports (up 31% over 2021), the state's 2022 trade deficit was about $15 billion. The state's top international exports categories included Medical and Optic products, Machinery, Electrical Equipment, Mineral Fuel and Oil, Vehicles and Plastics. International exports of Minnesota's cereal product was particularly strong, with an increase of 138 percent% over 2021.

Minnesota's strongest international trade partner is Canada, with which Minnesota shares a 547-mile border including the provinces of Manitoba and Ontario. The major truck border crossings between Minnesota and Canada are at International Falls, Grand Portage, Baudette and Warroad. In 2022, Minnesota exported $8.9 billion in exports to Canada, $2.8 billion to Mexico, $2.6 billion to China and $1.1 billion to Japan.

Minnesota also maintains access to international markets via three ports on Lake Superior with access to the St. Lawrence Seaway and four ports on the Mississippi River system. These ports and their associated intermodal infrastructure provide essential transportation connections and access to national and international markets. The Mississippi River provides access to river ports to the south and the Gulf of Mexico via New Orleans; the Great Lakes- St. Lawrence Seaway provides access to other ports along the Great Lakes to the Atlantic Ocean. Additionally, each of the Class I railroads serving Minnesota also provides access to international markets either through border crossings into Canada and Mexico and via connections with coastal ports.

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CHAPTER 2

CURRENT AND FUTURE FREIGHT TRENDS AND ISSUES

The dynamic nature of freight mobility and trends affecting freight movement must be considered when developing policies, programs and projects to address freight needs and issues. While trucks currently dominate the tonnage and values of freight movement in Minnesota, the increased congestion on urban and rural roadways highlights the need to plan for multi-modal and intermodal movement.

CHAPTER CONTENTS

OVERVIEW

The state's freight system is influenced directly and indirectly by overarching global, national and state trends. These include changes in the composition of the state's population, workforce, economy, technologies, consumer preferences and climate. The system is also significantly influenced by macro trends in national and global economies, local and global health trends, materials availability, the international trade environment and supply chain performance. By monitoring and analyzing the progression of these and other factors, Minnesota's planners and policymakers can anticipate future impacts and plan for safer, more efficient and more sustainable freight movements.

GLOBAL TRADE AND SUPPLY CHAIN DISRUPTIONS

Many aspects of Minnesota's economy are directly or indirectly linked to global markets and supply chains. Goods exported accounted for 5.3% of Minnesota's GDP, Minnesota's exports of manufactured products support an estimated 81,000 jobs, 8,121 companies exported goods from Minnesota and 86% of those companies were small and medium enterprises with less than 500 employees. (Source. Office of the United States Trade Representative.) Even small changes to markets, supply chains, or trade policies can have large effects on Minnesota's industries, freight system performance, availability of goods and economic competitiveness. This section describes some of the key trends and issues that have previously impacted Minnesota. The broad range of goods exported from Minnesota that could be impacted by disruptions are shown in Figure 2-1. This section will explore some of the primary global issues affecting Minnesota.

COVID-19

The full impact of the COVID-19 pandemic on Minnesota's economy, especially freight movements and supply chain challenges, will likely continue to linger for years. Beside the initial shock from the pandemic, which limited consumer demand, spending restrictions in travel, entertaining and other services in combination with an influx of cash from stimulus payments shifted consumer preferences away from services to a variety of durable goods and increased e-commerce.

The COVID-19 pandemic laid bare the vulnerabilities to multiple aspects of the integrated supply chains. Global supply chains and logistics sectors are fragile systems consisting of numerous links and were unprepared for unprecedented shifts in consumer demand, the accelerated rise of e-commerce and the challenges in workforce trade policies can have large effects on Minnesota's industries, freight system performance, availability of goods and economic competitiveness. This section describes some of the key trends and issues that have previously impacted Minnesota. The broad range of goods exported from Minnesota that could be impacted by disruptions are shown in Figure 2-1. This section will explore some of the primary global issues affecting Minnesota. Manufacturers and

shippers have been forced to place more emphasis on supply chain resiliency including diversified supply sources, larger inventories and flexible scheduling.

With the onset of lockdowns, quarantines and other public health safety measures intended to slow and reduce the impacts of COVID-19, public mobility was severely impacted. This led to a drastic fall in truck and passenger vehicles crashes that coincided with the January to March of 2020 drop in truck vehicle miles traveled (VMT) of 9%. However, compared to overall highway VMT, truck tonnage levels rebounded much more quickly and recovered to 2019 levels of tonnage in 2022. The overall trend since 2021 has seen an increase in both highway VMT and truck tonnage.

UNITED STATES-MEXICO-CANADA AGREEMENT (USMCA)

In March 2020, the United States-Mexico-Canada Agreement (USMCA) was ratified. With Canada being the greatest export partner of the United States and Mexico surpassing China as the greatest import partner, this long-term agreement has significant potential to strengthen north-south trade ties and increase truck volumes at the border crossings between Minnesota, Manitoba and Ontario. It is also not clear what the long-term impact of the U.S.-China tariffs and increasingly competitive relationship will have on Minnesota's trade and freight practices, but it is possible that the USMCA will be able to assist in easing some of the impacts created by tariffs and trade-wars more globally.

Figure 2-1: Value of Minnesota Exports by Trading Partner

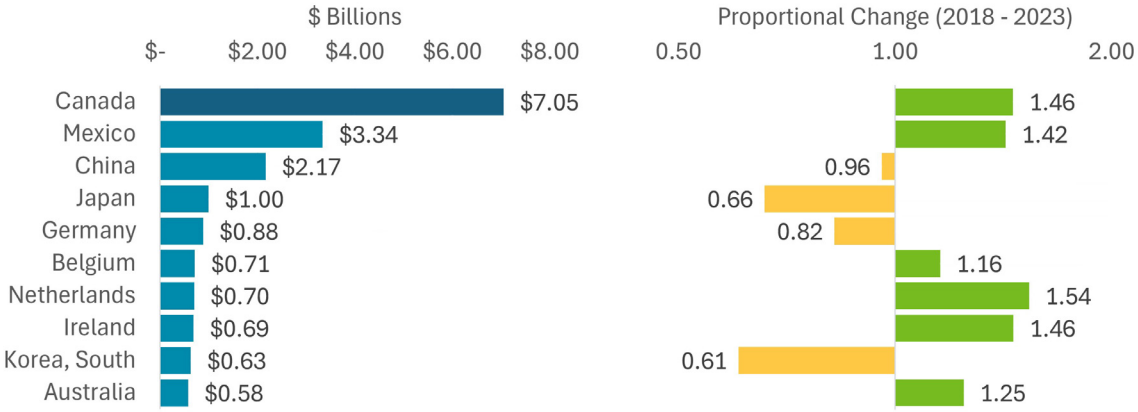
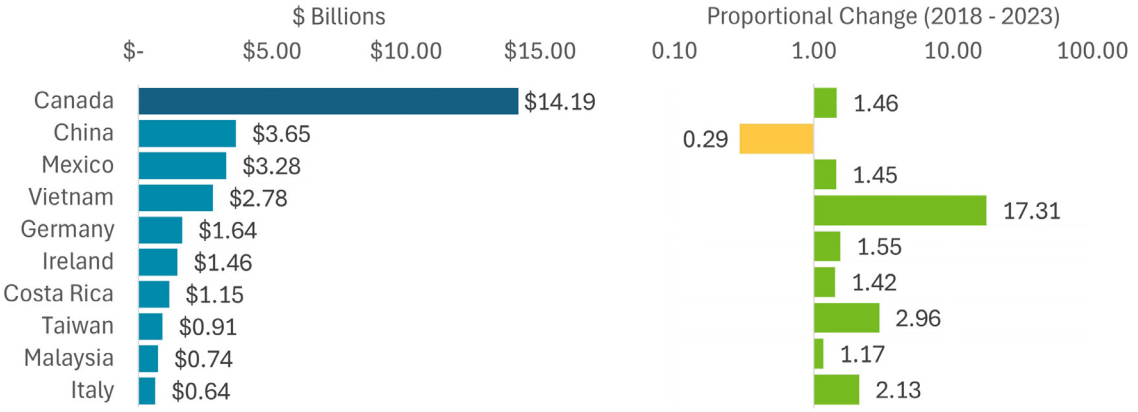


Figure 2-2: Value of Minnesota Imports by Trading Partner



ON/NEAR SHORING

Recent geopolitical tensions and disrupted supply chains during COVID-19 brought to light the challenges related to a single sourcing for international trade. Companies are reconsidering their operating strategies to diversify sourcing by exploring alternative locations to safeguard supply chains. Additionally, as countries like China's cost advantage declines with salaries and cost of living increasing, companies are looking to other low-cost alternatives closer to their main market.

- Near-Shoring: Refers to the relocation of foreign manufacturing or business operations to a new country that is closer to the domestic headquarters while still retaining benefits such as lower labor and materials costs.
- On-Shoring (or Reshoring): Refers to the relocation of foreign manufacturing or business operations to the company's original country. This may be pursued if the reduced transportation costs and increased reliability of shipments outweigh the potential increase in manufacturing costs.

While these trends have been broadly discussed for years, recent studies and surveys have indicated that, in practice, few businesses in Minnesota have been pursuing these strategies in a meaningful capacity. A study by the Minnesota Chamber of Commerce found that more than half of business survey respondents indicated a desire to increase the resiliency of their supply chains by adding backup suppliers, but fewer than 10% indicated the use of near-shoring or on-shoring as a strategy. A frequently cited issue is the higher cost of local suppliers.

LABOR DISPUTES

Despite the continued and steady decrease in the number of U.S. employees that are represented by a union, the labor movement in the U.S. has seen a resurgence in the past few years. In particular, the use of work stoppages has been used by many employees as a negotiating and tactic. Both the number of work stoppages and the number of employees involved in the stoppages has increased between 2020 and 2022. While these numbers are less than the peak work stoppage activity in 2018 and 2019, this data does not include work stoppages involving fewer than 1,000 workers. Notably, many of these strikes—or threats of strike—have been in industries directly tied to the supply chain or freight systems such as dock workers and railroads employees. Two of the most prominent and relevant freight-related labor disputes are the 2023 port labor dispute which impacted the primary ocean gateway for US goods, as it affected operations of both the Port of Los Angeles and the Port of Long Beach and the 2022 railroad labor dispute.

PORT AND SHIPPING LANE DISRUPTIONS

Over 2021 and 2022, the Port of Los Angeles and the Port of Long Beach were subject to record backups and backlogs. The Port of Long Beach reported it handled 807,700 total 20-foot-equivalent units (TEUs) in August 2021, up 11.3% year-over-year (YoY) and up 21.6% from August 2019. The Port of Los Angeles processed 954,380 TEUs in August 2021.

At the time of this writing, port operations have largely normalized, primarily due to a range in operational shifts at the ports including expanding hours to "24/7" operations, improved scheduling processes and an overall stabilization of global supply chains.

WAR IN UKRAINE

The ongoing war, which increased in intensity with the full-scale Russian invasion of Ukraine, has had multiple global impacts for supply chains. The disruption of agricultural production and the ensuing uncertainty of wheat shipments from Russia and Ukraine, who combined account for nearly 30% of global wheat exports, has had a noticeable impact on global wheat supply chains, even in Minnesota. While the conflict has led to an increase in the price of wheat, Minnesota wheat farmers are also facing higher costs for key agricultural inputs such as fertilizer and fuel. Uncertainty and volatility of the global wheat market is likely to continue for the foreseeable future.

SHIPPING LANE DISRUPTIONS

The Suez Canal facilitates approximately 12% of global trade. In March 2021, one of the largest container vessels ever built became stuck in the Suez Canal, blocking the waterway for six days, causing a backlog in marine traffic at both ends of the canal. Attacks on vessels in the Red Sea in 2023 and 2024 have also disrupted trade and caused some container lines to travel a much longer route via the Cape of Good Hope, adding 10 days or more to shipping schedule and cost. The Panama Canal which supports 5% of world trade has been impacted by drought restrictions, reducing the number of vessels that can transit the canal from 36 to 32 per day.

Figure 2-3: Container Ship 'Ever Given' stuck in the Suez Canal, Egypt. March 24th, 2021

CHANGING MARKET DYNAMICS

Changes in consumer demand, shipping costs, freight modal preferences and other market factors continue to impact the way that freight is produced and delivered in Minnesota. Increased demand, particularly increased demand for e-commerce, has had an outsized impact on supply chains and freight systems. Other changes such as the development of new intermodal terminals provide additional capacity and market opportunities for Minnesota businesses.

INCREASED DEMAND

As the global economy has rebounded following the COVID-19 pandemic, latent consumer demand led to an unanticipated "demand pull" to the global supply chain system. Firms and business activities across the supply chain, from materials extraction, processing, manufacturing, inventory, warehousing and freight transportation, struggled to quickly reactivate after pandemic-related slowdowns and stoppages. Border crossings which had been closed due to public health concerns reopened with relative swiftness. Consumers with savings bolstered by stimulus payments and cutbacks on service-sector spending (restaurants, housekeeping, tours, etc.) purchased larger quantities of consumer goods. While many markets have since returned to pre-pandemic operations, some businesses in Minnesota still struggle to find reliable and affordable sources for their supply chains.

INCREASED SHIPPING COSTS

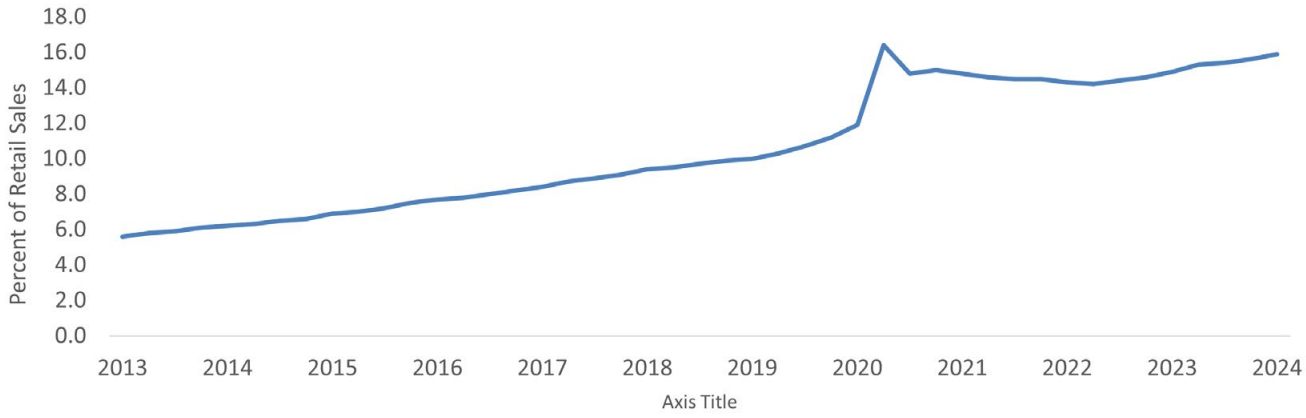
The COVID-19 pandemic revealed the extent to which the global economy is dependent on maritime container trade. Many of Minnesota's distributing, wholesale and retail firms provide consumer goods which originate or pass through major international ports, such as the ports of Los Angeles, Houston, South Louisiana, Rotterdam and Shanghai. As a result, disruptions occurring in what are perceived as "faraway" port operations can directly impact Minnesota's freight system and economy. Shipping costs have risen throughout links of the global supply chain, often resulting in higher consumer purchase prices and market volatility for Minnesota businesses and consumers.

E-COMMERCE IMPACTS

Throughout the United States, commerce and delivery practices continue to evolve. E-commerce continues to grow more rapidly across the country than overall retail growth. Total E-commerce sales for 2023 were estimated at $1.1 trillion and increase of 7.6% from 2022. As E-commerce market share and rapid fulfillment expectations have continued to grow, a shift is taking place from large delivery vehicles to smaller vans and personal vehicles. To accommodate increasing consumer demands for quicker product delivery, large regional distribution centers are supplying smaller fulfillment centers that are located within major metropolitan areas impacting land use, transportation routes and development patterns, as shown in Figure 2-4.

This increase in short-haul and last-mile truck trips further burdens national freight corridors and urban areas. The push for shorter delivery windows has increased air cargo demand while companies look for faster but less expensive methods to ship to consumers. Besides forward shipping, reverse supply chains from online returns significantly impact the national freight system.

Figure 2-4: E-Commerce as a Percentage of Retail Sales



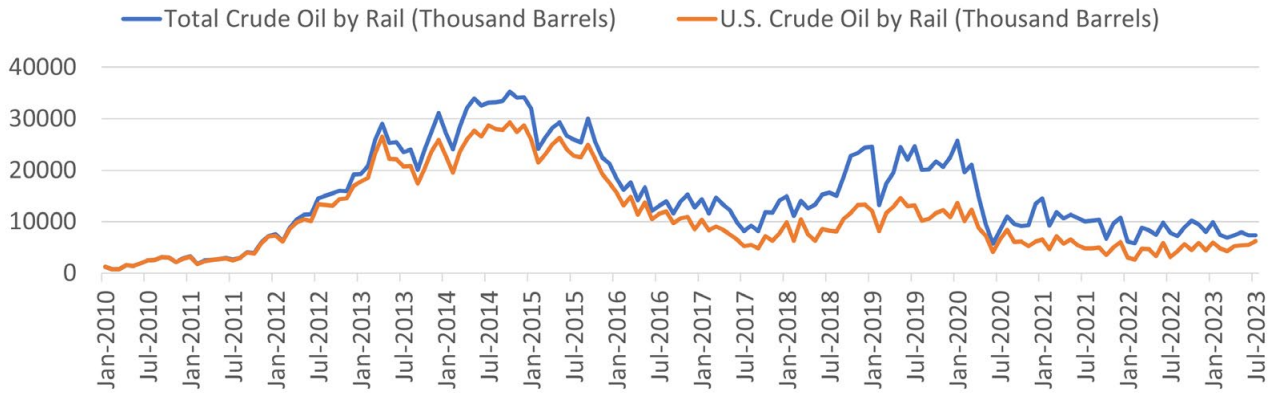
CRUDE OIL MODAL SHIFTS

At the time of the previous Statewide Freight System and Investment Plan release in 2018, the movement of crude-by-rail through Minnesota's rail system was a strong focus of both freight analysis and the development of freight strategies and policies aimed at reducing the potential impacts of crude-by-rail movements. In response to a series of high-visibility safety incidents throughout the country, MnDOT researched the safety of crude oil by rail movements in the state by conducting a study of highway-rail grade crossings with significant safety risks due to an increase in crude-by-rail shipments. Additional funding was made available for short-term investments in rail grade crossing safety improvements.

However, volumes of crude shipped via rail have dropped substantially from the peak volumes seen in 2014 and 2015. Non-U.S. crude shipped via rail is predominantly imported from Canada. After peaking in 2014 and 2015, the volume of crude by rail reduced sharply. The total volumes of crude by rail have leveled off to between 5 million and 10 million barrels per month. The reduction in crude by rail is attributed to developments in pipeline capacity, especially feeding crude south to the Gulf Coast.

Recent trends and strategies identified by MnDOT for grade crossing safety issues can be found in the Minnesota Rail Crossing Safety Action Plan, completed in 2022.

Figure 2-5: U.S. Crude Oil by Rail by Month



TRUCK PARKING CHALLENGES

There continues to be a nationwide shortage of parking for long-haul truck drivers. Truck parking consistently ranks in the top ten industry issues in an annual survey conducted by the American Transportation Research Institute (ATRI).

58% of all drivers admit they park in unauthorized or undesignated spots at least three times per week. Unauthorized locations include highway shoulders and highway on ramps which pose safety concerns. This is due to several factors, including an increase in the overall number of trucks on the road, limited space for parking and restrictive regulations on where trucks can park overnight. Recent industry trends and federal policy changes have increased the visibility and significance of truck parking challenges and have prompted action by both the public and private sectors, including the proposed Truck Parking Safety Improvement Act which would create a U.S. Department of Transportation (USDOT) solicitation program to provide competitive grants to states, metropolitan planning organizations, local governments and tribal governments for projects that improve the safety of commercial motor vehicle operators and provide parking for commercial motor vehicles on federal-aid highways or on a facility with reasonable access to such a highway or a freight facility.

98% of truck drivers report problems finding safe parking, costing drivers more than 56 minutes of drive time per trip, or roughly $5,500 a year – a 12% pay cut.

Truck parking needs are increasingly coming into conflict with concerns from municipalities about safety and reduced quality of life impacts. Most prominently, the cities of Minneapolis and St. Paul recently enacted restrictions for truck parking on many public streets. The Minneapolis ordinance prohibits vehicles weighing more than 6,000 pounds from parking in residential zoning districts, except when loading, unloading, or providing a service. Additionally, any vehicle weighing more than 26,000 pounds or with a registered gross weight over 26,000 pounds are not permitted to "stop, stand or park on any street" in the city unless the vehicles meet certain specified conditions.

In areas where there are not adequate truck loading/unloading zones, ramps or shipping docks, truck drivers are often forced to park their vehicles in travel lanes, bicycle facilities, shoulders or turning lanes to make their deliveries. Delivery parking can be stressful for delivery drivers, delivery receivers and other travelers near the delivery site. At the site level, improving delivery parking conditions can lead to better efficiencies, safety conditions and user experiences. Context-sensitive and thoughtful curb management design can reduce conflicts with people walking, biking, etc. near loading zones.

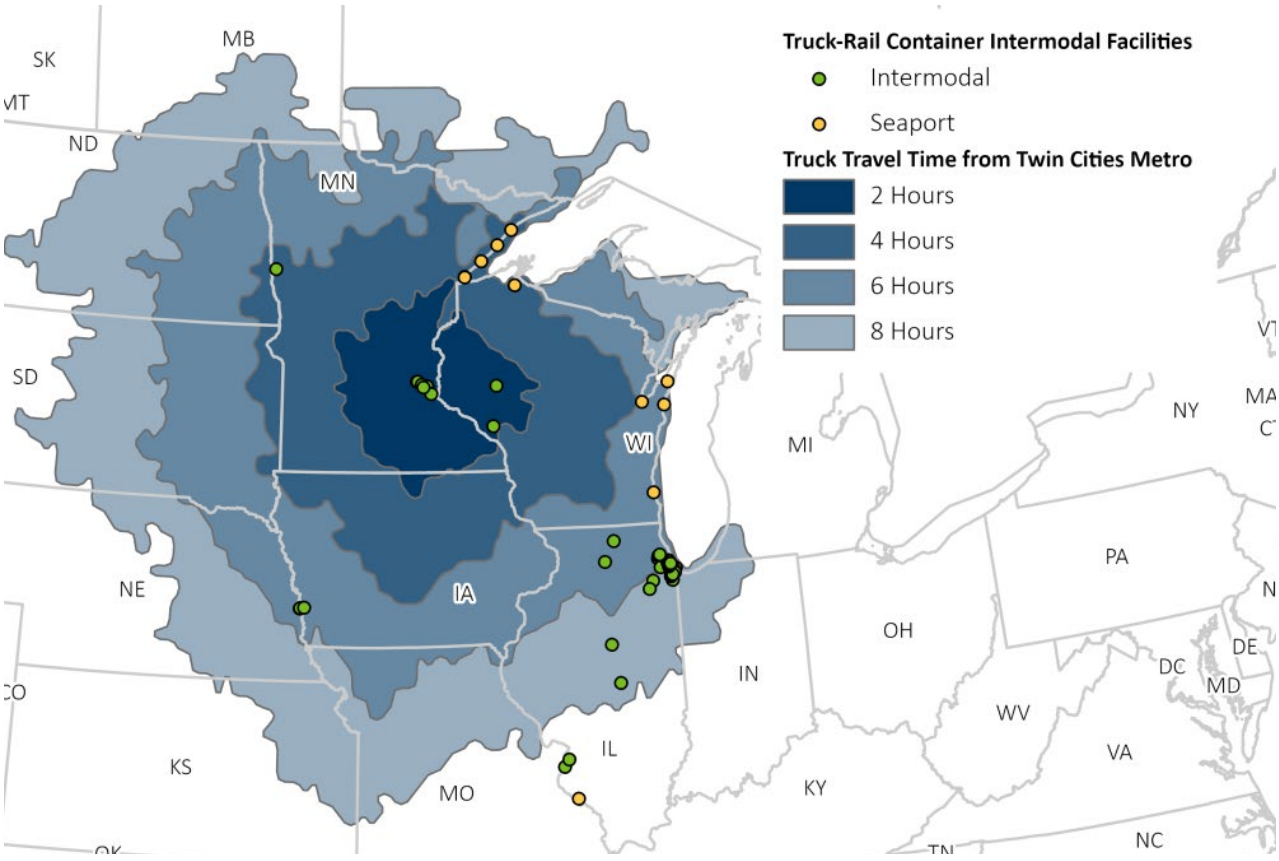
MN legislature recently approved funding for truck parking including $7,750,000 in fiscal year 2025 for land acquisition, predesign, design and construction of expanded truck parking at Big Spunk in Avon and Enfield Rest Areas and for the rehabilitation or replacement of truck parking information management system equipment at Department of Transportation-owned parking rest area locations. Additionally, $4,800,000 in fiscal year 2025 for predesign, design, engineering, environmental analysis and remediation, acquisition of land or permanent easements and construction of one or more truck parking safety projects for the trunk highway system in the Department of Transportation metropolitan district.

INTERMODAL SHIPPING ACCESS

The need for improved and expanded intermodal shipping services for Minnesota has been a long-standing issue well documented in the previous Statewide Freight System and Investment Plan and in other sources. Intermodal services in the state have historically been limited to only the BNSF Intermodal facility in St. Paul and the CP Shoreham Intermodal Facility in Minneapolis. A common complaint from Minnesota shippers has been the need to travel into the Minneapolis-St. Paul metro area to access intermodal shipping options and the limited markets that are served by these facilities. The estimated truck travel time to and from the BNSF and CP intermodal yards in the metro are shown in Figure 2-6. Large portions of Minnesota are located more than a two hour drive from these facilities, particularly in the northern and southwestern portions of the state. Additionally, shipping containers are sometime unavailable for loading in Minnesota. Because of these reasons, it can often be more cost-effective and/or simply more reliable to transport goods to intermodal facilities in the Chicago region.

In recent years, three new intermodal facilities have begun operation in or near Minnesota. These include the UP Twin Cities Intermodal Terminal in St. Paul, the CN New Richmond, WI Intermodal Terminal and the CN Duluth Intermodal Terminal. Each of these new facilities provide expanded intermodal service options for Minnesota customers

Figure 2-6: Truck Travel Time Isochrones from Twin Cities



Source: HDR Travel Time Analysis Using HERE Truck Routing API

DEMOGRAPHIC AND WORKFORCE CHANGES

The Minnesota State Demographic Center has identified three major demographic trends which will continue to shape the workforce and market conditions in Minnesota: population aging, shifts in the labor force and growing racial and ethnic diversity. In the coming decades, Minnesota's workforce will be older and increasingly more racially and ethnically diverse. Each of these demographic trends will continue to impact Minnesota's freight system now and into the future.

AGING POPULATION

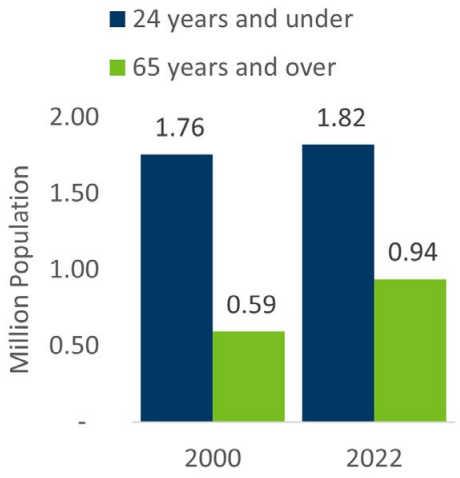
Minnesota's population and workforce will become increasingly older, which will slow the growth of the state's labor force. These changes are partially due to the Baby Boomer generation entering the 65+ group, as well as lengthening life expectancies. Between 2000 and 2022, the population aged 24 years and under increased by only 4%. Meanwhile, the population aged 65 years and over increased by 58%. Additionally, the Minnesota Demographic Center predicts that by the year 2050, the population aged 65 and over will increase by another 18% while the population aged under 65 will only increase by 3.7%.

As Baby Boomers increasingly press into retirement, an immediate and direct implication will be the challenge among employers to properly staff and train the workforce that will replace them. These trends will impact labor availability across a range of industries including freight. Additionally, the higher numbers of older adults and retired persons, combined with expanding e-commerce and continuing trends of these populations' desire to "age in place" is anticipated to accelerate the proliferation of regional distribution centers, shorter deliveries, deliveries made directly to residences and deliveries performed by shuttles or smaller freight vehicles.

Between 2019 and 2028, the Minnesota population aged 25-64 is expected to be reduced by approximately 40,800 people as the Boomers transition out of this age group, replaced by the smaller Generation X within the age group. The U.S. Chamber of Commerce Worker Shortage Index shows that Minnesota has a "More Severe" worker shortage than other states with 51 available workers for every 100 job openings.

This challenge to the statewide labor market is anticipated to be felt acutely within the freight industry, particularly regarding finding and retaining truck drivers. Truck drivers as a workforce are aging out into retirement at a faster rate than they can be replaced, exacerbating the driver shortage issue.

Figure 2-7: Minnesota population 2000-2022



WORKFORCE/TRUCK DRIVER SHORTAGES

An additional factor impacting freight operations is a shortfall of workers relative to the positions required. This shortfall is derived from both a general worker shortage in the broader labor economy, as well as acute labor shortages in the trucking, port and airline industries. The American Trucking Association estimated that in 2021 the truck driver shortage hit a historic high of just over 80,000 drivers and could grow to 160,000 drivers by 2030. This figure is the difference between the total number of drivers currently in the market and the optimal number of drivers based on freight demand, with shortage in long-haul drivers being more acute.

This national driver shortage is reflected in Minnesota. In 2023, the Minnesota Trucking Association (MTA) reported a shortage of nearly 8,000 drivers. The MTA has identified an increase of funding for truck driver and diesel technical training as their number one 2024 legislative priority. According to the Minnesota Department of Employment and Economic Development (DEED), there will be 4,864 job openings for heavy and tractor trailer truck drivers in the next 10 years. DEED identified Transportation and Material Moving Occupations as the fifth most severely understaffed industry in the state in 2022, with a shortage of approximately 13,374 drivers.

Minnesota's Department of Employment and Economic Development (DEED) identified "Transportation and Material Moving Occupations" as the fifth most severely understaffed industry in the state in 2022, with a shortage of approximately 13,374 drivers.

Factors contributing to low workforce include the industry's failure to recruit more women, lifestyle disadvantages of long-haul trucking, the minimum federal driver age of 21 for interstate travel to enter the workforce and inadequate truck parking.

In 2024 the MN legislature approved a commercial driver workforce study to address commercial driver shortages in transportation and transit sectors and propose recommendations to address the challenges posed by driver shortages and the attrition rate of commercial vehicle drivers in Minnesota.

CLIMATE CHANGE AND EQUITY IMPACTS

Ongoing climate change and more severe and unpredictable weather patterns are continuing to challenge freight operations in Minnesota. More persistent drought conditions make barge operations on the Mississippi River and abroad more difficult. At the same time, severe storms pose a safety risk to freight vehicles and infrastructure for all modes. Further, freeze and thaw cycles due to warming climate can create precarious conditions and safety issues for freight drivers and potential conflicts with passenger vehicles on roadways. Identifying projects that support freight system resiliency will be crucial for maintaining adequate freight transportation infrastructure into the future. Minnesota must also consider the environmental impacts of freight infrastructure including vehicle emissions and the potential impact to wildlife habitat.

SEASONALITY

Minnesota's four-season climate presents a range of considerations for all transportation modes. Surface transportation is impacted by inclement weather, resulting in delay, safety and cargo integrity challenges. Minnesota's ports are productive only insomuch as their contributing shipping lanes can facilitate ship passage. Each winter, port decision makers must pause and restart port operations based on weather and ice conditions. Barge operations on the Mississippi River are highly on sufficient water levels for operation. Tug boat activity is often forced to operate primarily within a narrow window of mid-summer to fall due to these conditions.

Each year, MnDOT and Minnesota's roadway jurisdictional agencies issue winter and spring load restrictions. These load restrictions specify seasonal weight limits. Motor carriers are bound by these restrictions, which regulate the maximum legal weight per axle, which dictates the maximum amount of allowable truck weight.

In this way, Minnesota's freight system is governed to a degree by weather and temperature conditions. Changes in weather patterns have associated impacts to state freight movements. For example, as winter temperatures rise and lakes freeze over later into the year, Minnesota's ports may continue operations for extended time periods.

In the U.S., the largest sources of transportation greenhouse gas emissions in 2021 were:

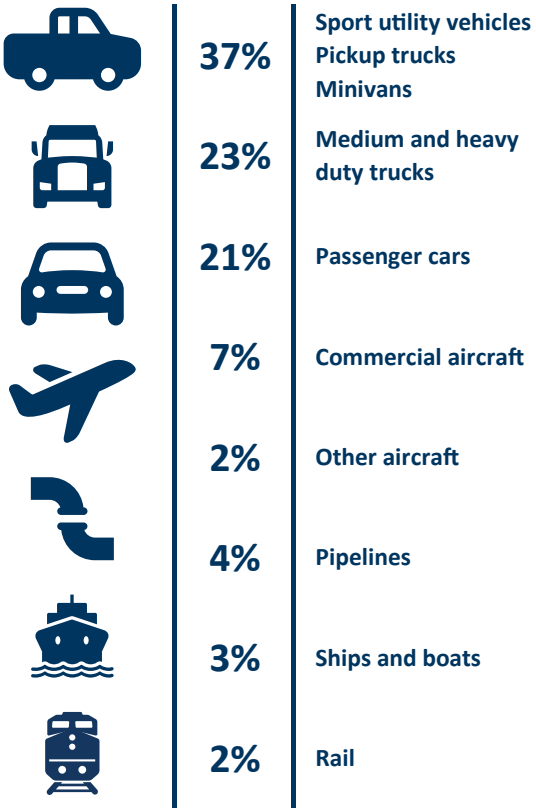
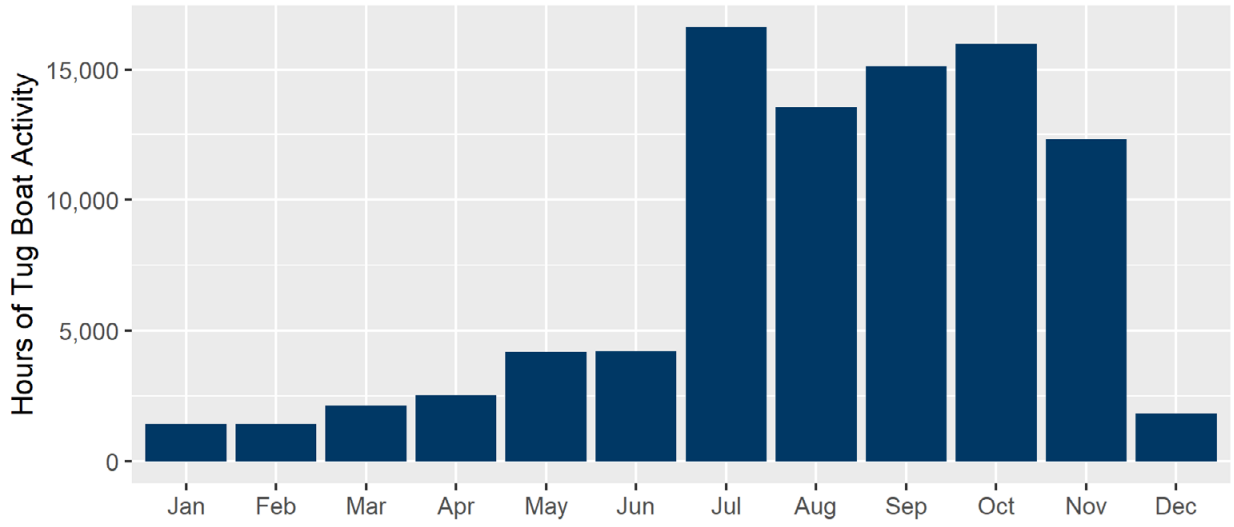


Figure 2-7: Mississippi River Tug Activity by Month (2019)



Source: MnDOT District 6 Freight Plan

EQUITY AND ENVIRONMENTAL JUSTICE

Freight operations and have a significant impact on the health, safety and livability of communities. History presents many examples of highway investment decisions which have followed financial and political incentives to locate infrastructure in communities with lower levels of income and political capital. Recent decades have seen a renewed focus toward advancing equity and environmental justice when making infrastructure investment decisions. Issues of equity and environmental justice are now at the forefront of planning decision-making, as planners and policymakers now place prime importance on understanding both the direct and indirect impacts of transportation infrastructure investment decisions. MnDOT supports environmental justice through every stage of planning, construction and maintenance processes. This ensures MnDOT gains input from the community to help shape how infrastructure is built and maintained.

MnDOT's agency-wide identified strategies to incorporate environmental justice are:

- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

Additional analysis and discussion on the intersection of freight and Environmental Justice Issues can be found in Working Paper 6: Environmental Justice Analysis

MISSISSIPPI LOW-WATER DROUGHT

In September 2022, low water drought conditions began to be experienced throughout the Mississippi River Basin. These historic river lows stranded barges, delayed shipments and resulted in draft restrictions leading to less cargo loaded to each barge. Normal operations resumed in February 2024, when USACE announced all draft restrictions had been lifted.

Waiting times for vessels increased, resulting in ship owners shifting to alternative lengthier routes affecting transportations costs. Combined with the Panama Canal drought issues and other environmental effects there are concerns for prolonged drought which result in further maritime trade disruptions due to climate change which could continue to impact freight movement in the future.

ALTERNATIVE FUELS

A range of incentives continue to drive advancements in fuel diversification away from the traditional gasoline-powered internal combustion engine. Fuel alternatives include biofuels, liquefied natural gas (LNG) and compressed natural gas (CNG), hydrogen and the accelerating integration of batteries capable of drawing power from a range of renewable sources, including solar, wind and hydraulic power.

National trends such as an increasing supply of domestically produced natural gas, higher diesel fuel and gasoline prices, environmental regulations and growing interest in natural gas, hydrogen and electricity as alternative fuel sources may drive the conversion of truck fleets to alternative fuels in the long-term, but short-term conversions will likely remain limited. Heavier engines (that limit the potential commodity load), higher initial purchase price, lower fuel efficiency, higher maintenance costs and limited infrastructure are other factors that currently inhibit conversion of the truck fleet to alternative fuels.

INNOVATIVE TECHNOLOGIES

A wide variety of new technologies and innovations are currently being developed to improve the efficiency, reliability and safety of the freight transportation system. These range from the use of tracking technology to improve the customer experience to the development of self-driving vehicles that promise to substantially reduce the cost of operations in the long-term and the development of freight network optimization models as directed by legislature. Staying abreast of the current technological improvements will help MnDOT to best prepare for adoption and implementation of systems and technologies.

CONNECTED / AUTOMATED VEHICLES

Connected and/or Automated Vehicle (CAV) technologies continue to rapidly advance. MnDOT's Office of Connected and Automated Vehicles (CAV-X) recognizes that CAV technologies hold the potential to support freight transportation in a range of ways, including safety, expanding freight options, improving freight efficiencies and reducing congestion. CAV technologies hold the potential to improve safety via crash reductions, improve carrying capacities and enhance mobility for all transportation users. The U.S. Department of Transportation (USDOT) and the National Highway Traffic Safety Administration (NHTSA) are pursuing the implementation of CAV technologies, which hold the potential to further improve the safety of Minnesota's freight system. Fully automated freight trucks without a driver are being tested but are not widespread, permitted, nor fully proven.

Minnesota is among many states in various stages of testing CAV technologies and their associated integration with existing roadway operations. There is a wide diversity in approaches by different states, municipalities and context in a nationwide series of dynamic demonstrations and licensing processes. This includes a range of testing efforts for automated passenger vehicles throughout the state, including in Monticello, Rochester, White Bear Lake and Grand Rapids. While not specific to freight, these efforts will help set the groundwork for later implementation of automated fright solutions. Decisions on the appropriate implementation of Connected and Automated vehicles in Minnesota will need to be based on thoroughly vetted data-driven decisions.

DRONE / AUTOMATED DELIVERY

The nature of freight deliveries continues to change in both urban and rural settings. Drones, or Unmanned Aerial Vehicles (UAVs) and robots, or Personal Delivery Devices (PDDs), are being tested to fulfill last-mile delivery needs. However, UAV and PDD delivery faces some challenges in their early stages. These include the payload UAVs and PDDs can carry (currently drones can carry up to 1-4 pounds of weight), the safety of the landing area and delivery, ability of PDDs to yield to pedestrians and cyclists, the security of the system controlling UAVs and regulations on where these vehicles can operate. Benefits include significant fuel/time savings for parcel delivery services and a reduction in costs for maintenance of unpaved roads to rural counties.

There are a few State drone laws in Minnesota including Minnesota Administrative Rules Chapter 8800, Aeronautics which requires all commercial drone operators to pay a licensing fee to obtain a Commercial Operations License, Minnesota Statute 360.59 which requires commercial operators to hold drone insurance and Minnesota Statute 360.60 which requires commercial operators to register their drone with the MnDOT. The typical last-mile drone emits much less noise, CO2 and particulate matter than heavy-or mid-size trucks. MnDOT will explore the potential utilization of drones of this type for last-mile deliveries may enact less noise and air-quality burdens on final consumers, thereby advancing state goals toward climate impact and transportation equity.

TRUCK PLATOONING

Truck platooning refers to computer synchronization between multiple freight trucks to allow them to operate close together, one behind another, as shown in Figure 2-8. The system communicates with the trucks to align speed, acceleration and braking. Drivers steer, observe the system and intervene when needed. This practice improves fuel economy for platooned trucks, however most of the efficiency gains are afforded to the rear truck(s). The practice of platooning has been successfully tested on public roadways but is still not widespread nor fully proven. Driver-Assistive Truck Platooning (DATP) is the first iteration of truck platooning.

Minnesota state law permits up to three trucks in a platoon. State statute stipulates that each vehicle in the platoon must have a driver in the driver's seat. The driver tracks the truck's performance and must hold a valid driver's license for the vehicle. In 2019, the Minnesota Legislature passed legislation to direct how vehicle platoons are operated in the state (Statute 169.881). Key elements of the law include:

- Platooning is only allowed on freeways and expressways.
- Interested parties must submit a vehicle platoon plan to MnDOT for review and approval prior to operating a vehicle platoon on Minnesota roadways.
- The basic information required to be in any vehicle platoon plan is outlined in the statute. However, MnDOT may choose to require additional information.
- MnDOT has the authority to approve or deny vehicle platoon plans.

A recent platooning plan in Minnesota took place over 2022-2023, routing from Mankato to Madelia along Trunk Highway 60. This platoon consisted of two commercial trucks with approximately 50 feet between them, for an approximate 210-foot-long platoon.

Figure 2-8: Truck Platooning Examples

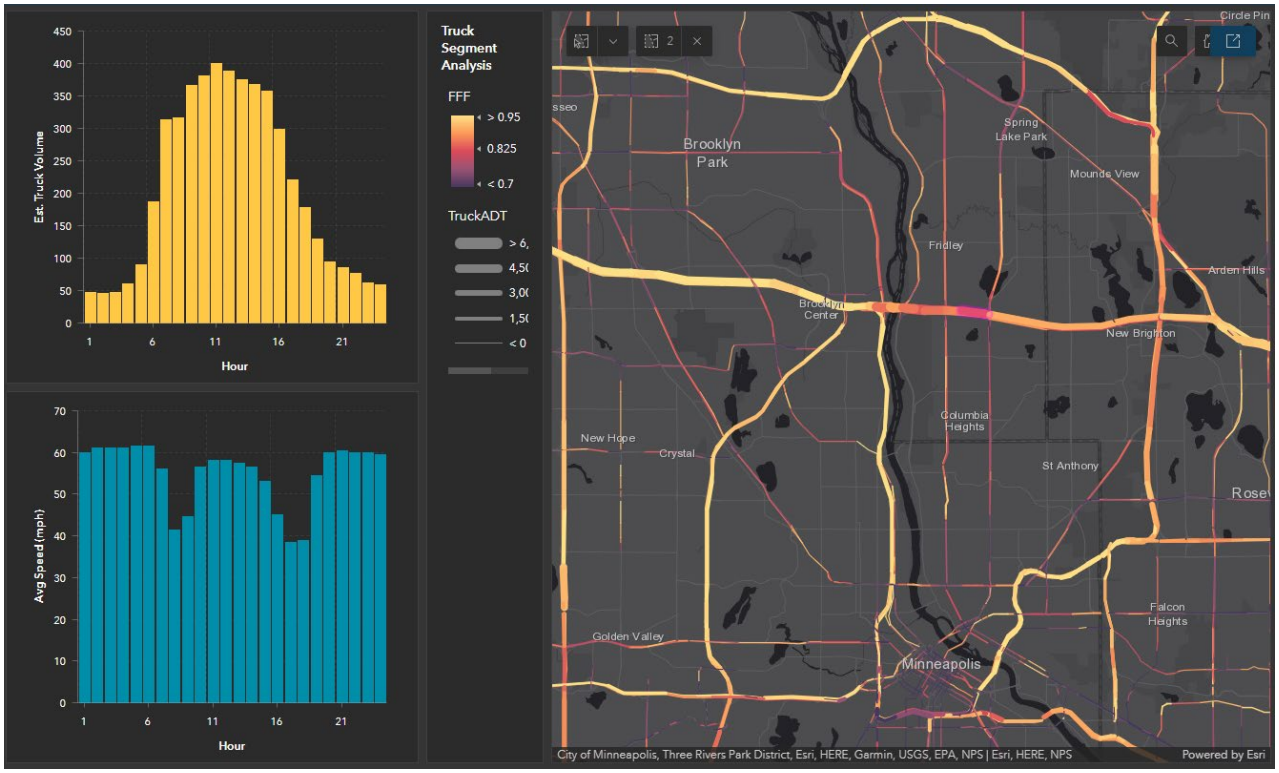
BIG DATA

The term "Big Data" refers to very large data sets that may be analyzed to reveal patterns, trends and associations. A range of emerging traffic analytics software and services are available to freight practitioners. StreetLight and Replica are data vendors that allow for a wide range of Manalyses, including speeds, origin-destination (O-D) and routing. Software applications are in use which aid truck operations, including Trucker's Friend, Park My Truck App, TruckSmart, MyPilot and Trucker Path.

MnDOT maintains a StreetLight Insight license that provides vehicle GIS tracking ('probe') data for a variety of projects. The platform has been used to collect information to help with corridor studies, speed studies, origin-designation analysis and turning movement counts. It's also used for freight-focused studies, like the data dashboard for the Metro District Urban Freight Perspectives Study. It was used to estimate the demographics of highway-rail grade crossing users for the purpose of conducting an environmental justice analysis for the MnDOT Rail Grade Crossing State Action Plan. MnDOT has developed a range of studies and research exploring the utility of big data to meet transportation goals. These include research into volume estimates and ongoing partnerships with firms specializing in traffic data analytics. MnDOT planners, engineers and policymakers utilize Big Data to better understand travel patterns for integration into ongoing studies, research and policy.

Big Data tools also serve as flexible scenario-testing instruments with a goal toward optimizing freight transportation movements and resources. MnDOT is currently exploring the development and implementation of a Freight Network Optimization Tool and would use a combination of data sources to create models to reduce transportation inefficiencies, develop return on investment metrics and analyze site locations for economic development opportunities.

Figure 2-9: StreetLight Truck Data Dashboard



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CHAPTER 3

MINNESOTA'S FREIGHT SYSTEM ASSETS, CONDITIONS AND PERFORMANCE

Minnesota's multimodal freight system is made up of highways, railroads, waterways, airports and pipelines. The system is integrated by intermodal connectors that allow decision-makers to transfer goods and commodities from one mode to another.

To some degree the freight mode compete for market share, but to a much larger degree the freight modes complement each other—all modes are needed. Supply chain managers balance the needs of freight transportation costs and customer service in deciding which freight modes to use. The conditions and performance of all these systems impacts the efficiency, reliability and safety of freight movement throughout the state.

CHAPTER CONTENTS

OVERVIEW

The freight transportation systems in Minnesota are well-suited for efficiently moving a wide variety of goods and services. This includes heavy bulk goods shipped from Mississippi River ports, lightweight precision medical devices flown across the globe and sugarbeets transported from piling grounds to processing factories via truck. Minnesota also has an interconnected road network that links trucks to light industries and intermodal facilities, providing connections to neighboring states and Canada. Key roadways, such as I-94 and US-75, facilitate high levels of truck traffic and connect to important facilities and retail nodes. Additionally, Minnesota is served by four Class I railroads connecting to grain terminals and metallic ores from the Mesabi Iron Range. The state also benefits from access to two commercially navigable water systems that connect to the Gulf of Mexico and the Eastern Seaboard. Minnesota is home to 14 cargo service airports, which handle the distribution of electronic components and time-sensitive materials. Furthermore, Minnesota has a robust network of pipelines, carrying 30% of the nation's crude oil.

Minnesota must continue to maintain and modernize its extensive freight system. Continuous investments are necessary to ensure that the freight network supports consumers and shippers by enabling timely delivery of goods and services, improving supply chain efficiency and enhancing the safety and mobility of the multimodal freight system. Each section provides a high-level overview of individual freight modes and their importance to the overall network, allowing for further assessment and infrastructure funding.

814

Miles of Interstate

10,891

Miles of US and State Trunk Highways

4,534

Rail Line Miles

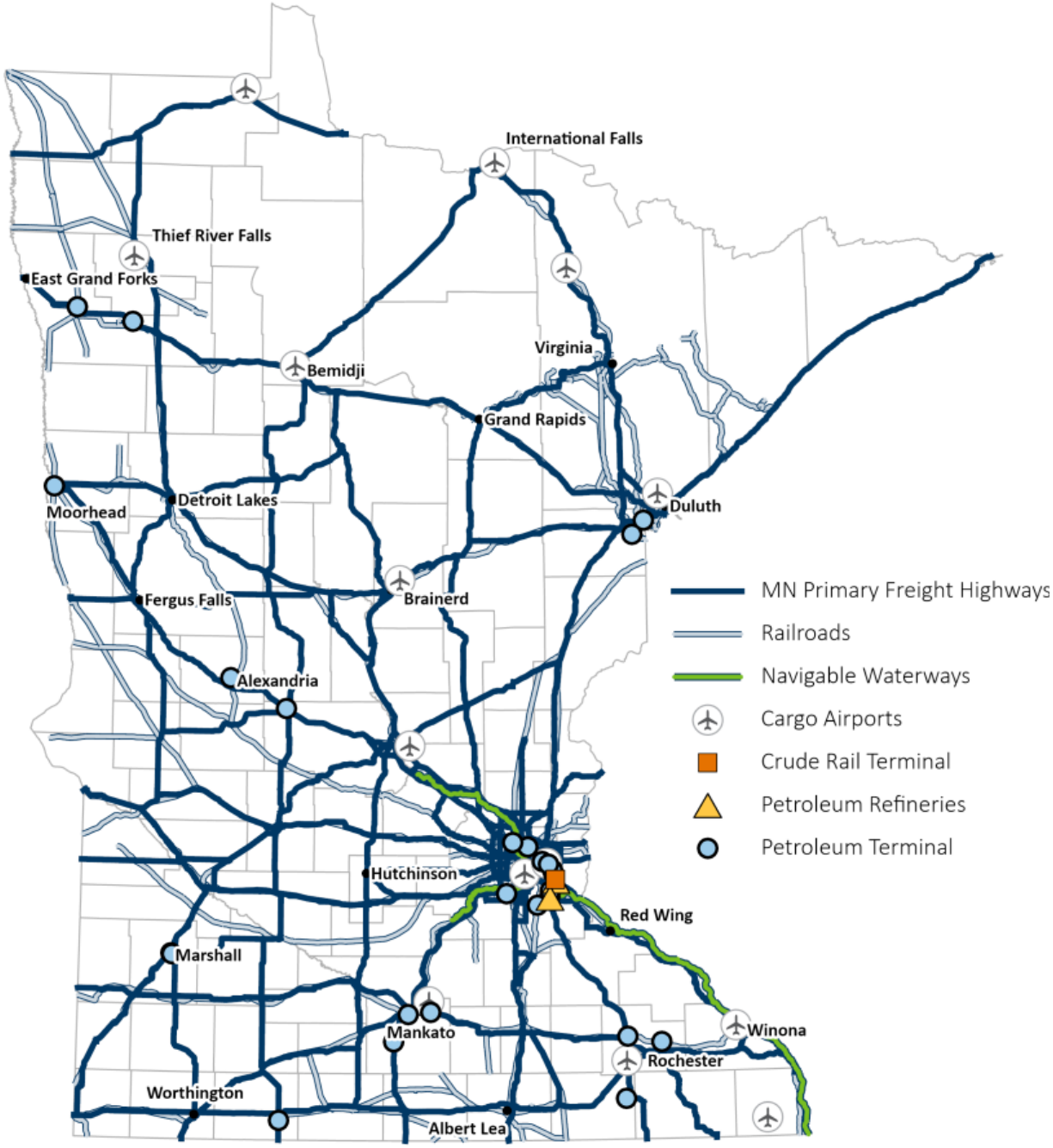
14

Cargo-handling Airports

20,000+

Miles of Interstate Pipelines

Figure 3-1: Minnesota Multimodal Freight System



HIGHWAY NETWORK

Compared to other freight modes, the highway freight network requires the largest footprint but provides the most direct means of access to the freight system for most homes and businesses. In Minnesota, nearly two-thirds of all freight is carried by truck and trucks play a crucial role in connecting shippers with other transportation modes, often carrying smaller volumes of goods compared to rail and pipelines. While road networks have low barriers to entry, they also come with high operations maintenance costs, including pavement repair, snow plowing and other upkeep.

National Primary Highway Freight System: **812 miles**	Critical Urban Freight Corridors: **91.44 miles designated**	State Primary Freight System (NHS): **3,888 miles**	Strategic Highway Network (STRAHNET): **3,180 miles**
Other Interstate Highways: **219 miles**	Critical Rural Freight Corridors: **177.6 miles designated**	National Network: **18,947 miles**	I-694 in the Twin Cities Metro has the highest average daily truck volumes at: **12,913**

Top 3 Commodities by Tonnage:	**Cereal Grains:** 87 million tons	**Gravel:** 65 million tons	**Agricultural Products:** 39 million tons
Top 3 Commodities by Value:	Machinery: $27 billion	**Electronics:** $23 billion	**Motorized Vehicles:** $22 billion

Minnesota has three major interstate highways: I-35, I-94 and I-90 and the 4th largest pubic road system in the nation. I-35 is a significant north-south route that extends from Duluth to the US-Mexico border. It serves as a heavily used freight corridor for trucks, making it an essential part of the interconnected freight network. I-35W experiences the highest truck traffic in the Twin Cities. It provides a link to Duluth-Superior. I-94 is an important east-west corridor that stretches from Port Huron, Michigan, to its western terminus in Billings, Montana. The route travels through Minneapolis and intersects with major routes, including I-35E, I-35W and I-90, which experience high levels of traffic. I-94 continues west through Sherburne and Stearns counties, which account for 17% of all traffic and serve as a major corridor for retail-trade businesses. Finally, it connects Fergus Falls and Alexandria, with significant concentrations of critical agriculture, construction and manufacturing sectors. I-90 is a crucial east-west route that spans over 3,000 miles from Boston to Seattle, WA. The route starts at the border of Wisconsin and ends in South Dakota. The eastern portion of the state has two major junctions: US 52 and I-35. I-35 has the largest truck parking supply in the state. This interstate passes through several communities and provides access to agricultural and industrial areas.

Why does so much freight move by truck and not other modes?

A common question from State Freight Plan engagement efforts was, "Why can't more freight be moved by rail or other modes?" The simple answer is that no other mode can compete with trucking in terms of accessibility and simplicity of shipping. Especially for distances less than 500 miles, the logistics of transporting goods via rail, water, air, or other modes can be costly and inefficient. Nearly all homes and businesses in Minnesota have a direct connection to the freight roadway network, meaning that even if other modes are used, most freight trips start and end with truck delivery.

KEY DESIGNATED FREIGHT NETWORKS IN MINNESOTA

A number of roadways in Minnesota are included on designated federal and state freight networks. A brief description of these networks is provided below:

- **Primary Highway Freight System (PHFS):** The PHFS is the primary component of the National Highway Freight Network (NHFN). This network, established by the FAST Act, helps strategically direct resources toward improved system performance for efficient freight movement on highways. Based on an FHWA assessment of average daily heavy commercial traffic volumes, the PHFS is a network of highways identified as the most critical highway portions of the U.S. freight transportation system. Minnesota's highway network includes 913 centerline miles of Interstate highways, of which 590 miles is designated as PHFS. Notable segments of the Interstate highways in Minnesota include I-35 from the Iowa border to the confluence of I-35W and I-35E, I-35/I- 35W south of I-494, a portion of I-35W south of I-694, I-694 between connections with I-94, I-494 between I-94 and the MSP Airport, the entirety of I-94 from North Dakota to Wisconsin (except for the segment from I-394 to I-694) and I-90 from the South Dakota border to I-35 in Freeborn County.
- **Other Interstate non on the PHFS:** All Interstate highways not included in the PHFS in Minnesota are also considered to be part of the NHFN. These highways, known as Non-PHFS routes, are essential for ensuring continuity and access to freight transportation facilities.
- **National Highway System (NHS):** This network of roadways has been identified for their importance to the nation's economy, defense and mobility and includes Interstate highways and other Principal Arterials that provide access between population centers and notable transportation features such as airports, water ports and other intermodal transportation facilities. Notably for Minnesota, the extents of the NHS have been used to designate the State's Primary Freight Network.

A strong truck network allows a company to reduce shipping costs and enhance service levels with minimal disruption to operations. However, traffic congestion on highways and at major intersections can lead to delays in truck movement, resulting in delivery delays. Heavy Commercial Annualized Average Daily Traffic (HCAADT) provides insight into daily truck traffic volume and identifies areas with the highest levels of truck traffic. The Twin Cities sees the highest level of traffic. I-694 has the highest average value of 12,913 trucks per day with a range between 5,577 and 18,838. The highest truck volumes are experienced on I-35W, north of Highway 62.

Other high truck volume segments include I-35W south of I-94, I-35 south of I-494, I-94 west of I-694 and I-694 in the north metro. (Figure 3-3). Outside of the Twin Cities, I-94 sees high levels of truck traffic near Monticello and St. Cloud, with over 20,000 trucks per day. Additionally, at the North Dakota border entering Fargo, there are nearly 12,000 trucks per day. Along I-90, the interchange at I-90 and US Highway 52 has upwards of 9,000 trucks per day. Finally, I-35 experiences steady truck traffic from the Iowa border to the Twin Cities.

HCAADT AND TRUCK BOTTLENECKS

The heavy commercial annual average daily traffic count (HCAADT), commonly referred to as daily truck volumes, for the state of Minnesota are shown in Figure 3-4. The highest concentration of daily truck activity is on the Interstate system, particularly on I-94, I-694, I-494, I-35E and I-35W in the Metro District. The highest recorded daily truck volume in the state is on I-35W in Minneapolis north of Diamond Lake Road. This roadway segment

experiences approximately 31,000 trucks per day. Other high truck volume roadways in Greater Minnesota include US 169, US 52, US 14 in southeast Minnesota, US 10 east of Fargo and US 53 north of Duluth.

In compliance with federal requirements, MnDOT routinely measures and reports on the locations of truck bottlenecks, defined as two or more contiguous segments of roadway, each of which meets the minimum threshold of 4 hours of truck delay per day per mile for at least one of three time periods: morning peak, midday peak, evening peak. The truck bottlenecks identified in the 2023 report are summarized in Table 3-1 and shown in Figure 3-2 below.

Table 3-1: List of Minnesota 2023 Truck Bottlenecks

Interstate Bottlenecks	Non-Interstate Bottlenecks
1. I-694: TH 47 to Jct. I-94 WB	12. US-52: Lafayette Bridge to Jct. I-94 NB
2. I-694: Jct. I-94 to Central Ave EB	13. TH 55:Lone Oak R. to S. Jct. of Dodd Rd. EB & WB
3. I-394: Jct. I-94 to Jct. TH 100 WB	14. TH 65:Jct. TH 10 to 99th Ave NE NB
4. I-394: Penn Ave Jct. I-94 EB	• TH 15/TH23/CSAH 75: 10th Ave. N to 33rd Ave S EB
5. I-94: N 7th St. to Lowry Tunnel EB	15. TH 15/TH23/CSAH 75: Washington Memorial Dr. to 10 Ave. N WB
6. I-94: Cedar Ave. to Jct. I-394 WB	16. TH 13: TH 13 to CSAH 5 EB
7. I-35W: Lake St. to Franklin Ave NB	17. TH 101: Jct. I-94 to 141st Ave. N NB
8. I-35W: 82nd St. to Jct. I-494 NB	18. TH 101: 141st Ave. N to Jct. I-94 SB
9. I-494: Bush Lake Rd. to Penn Ave. S EB	19. CSAH 42: Plymouth Ave. to Nicollet Ave. WB
10. I-494: Lyndale Ave. S to Penn Ave. S WB	20. CSAH 42: Buck Hill R. to Nicollet Ave. EB
11. I-494/694: Jct. I-94 SB	21. US-2: Jct. TH 38 to W Jct. TH 169 EB

Figure 3-2: List of Minnesota 2023 Truck Bottlenecks

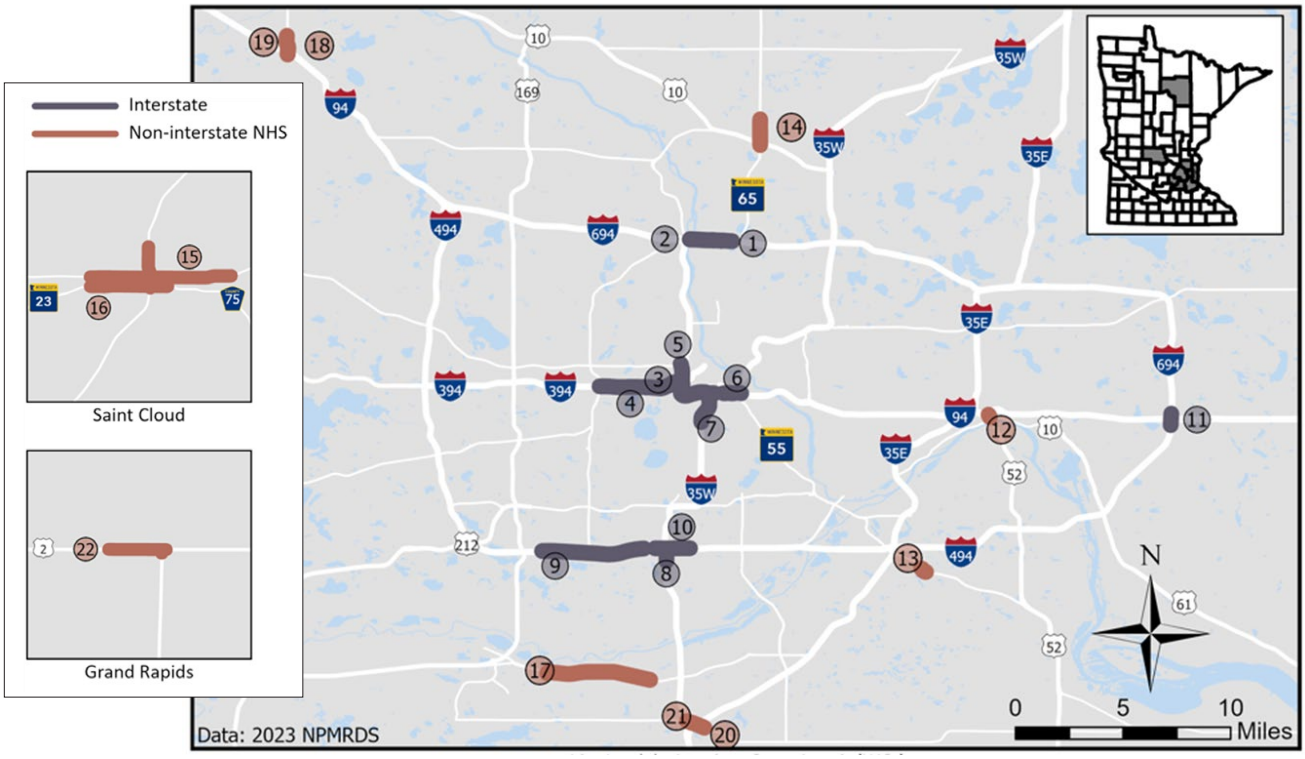


Figure 3-3: Heavy Commercial Annual Average Daily Traffic

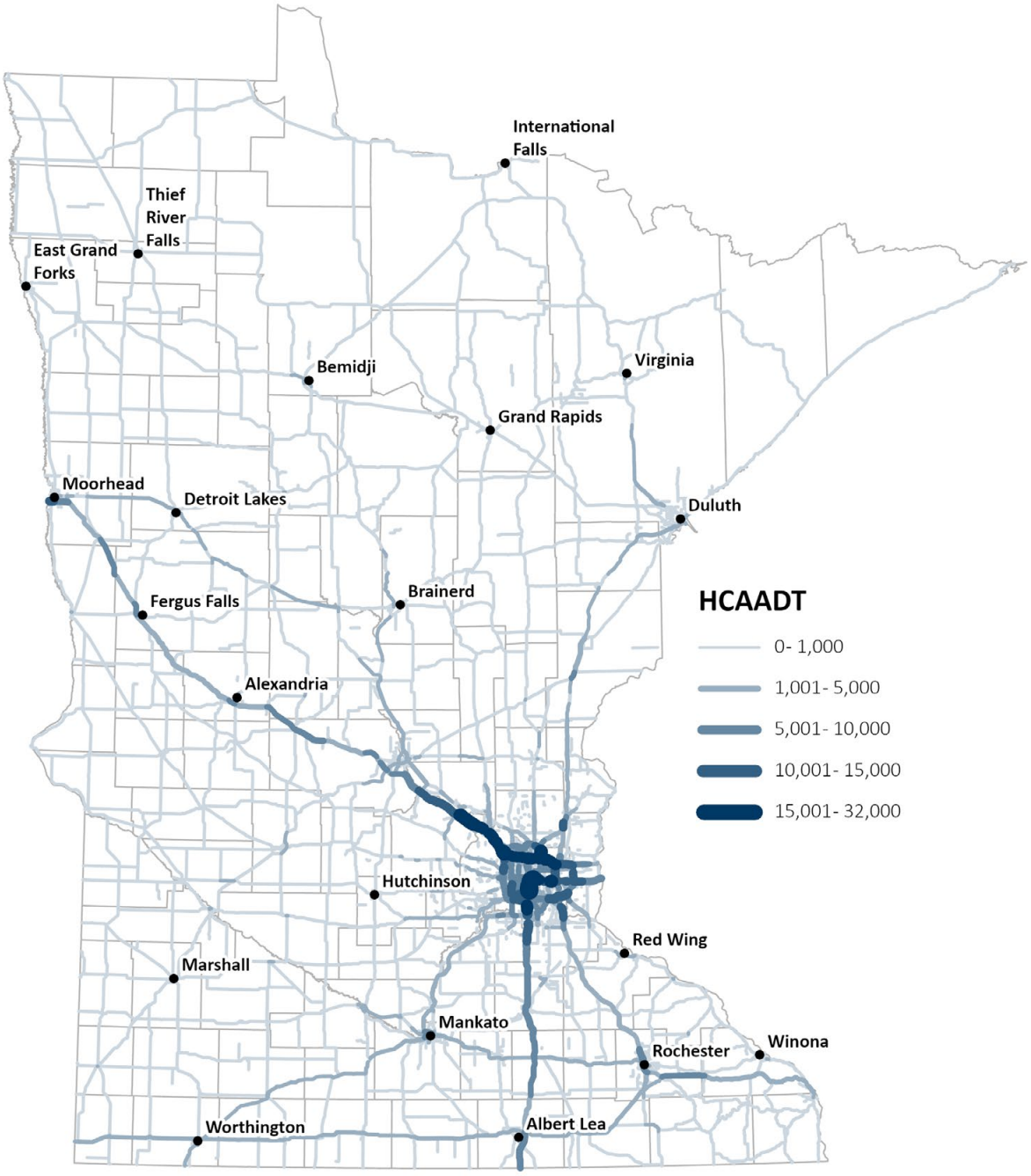
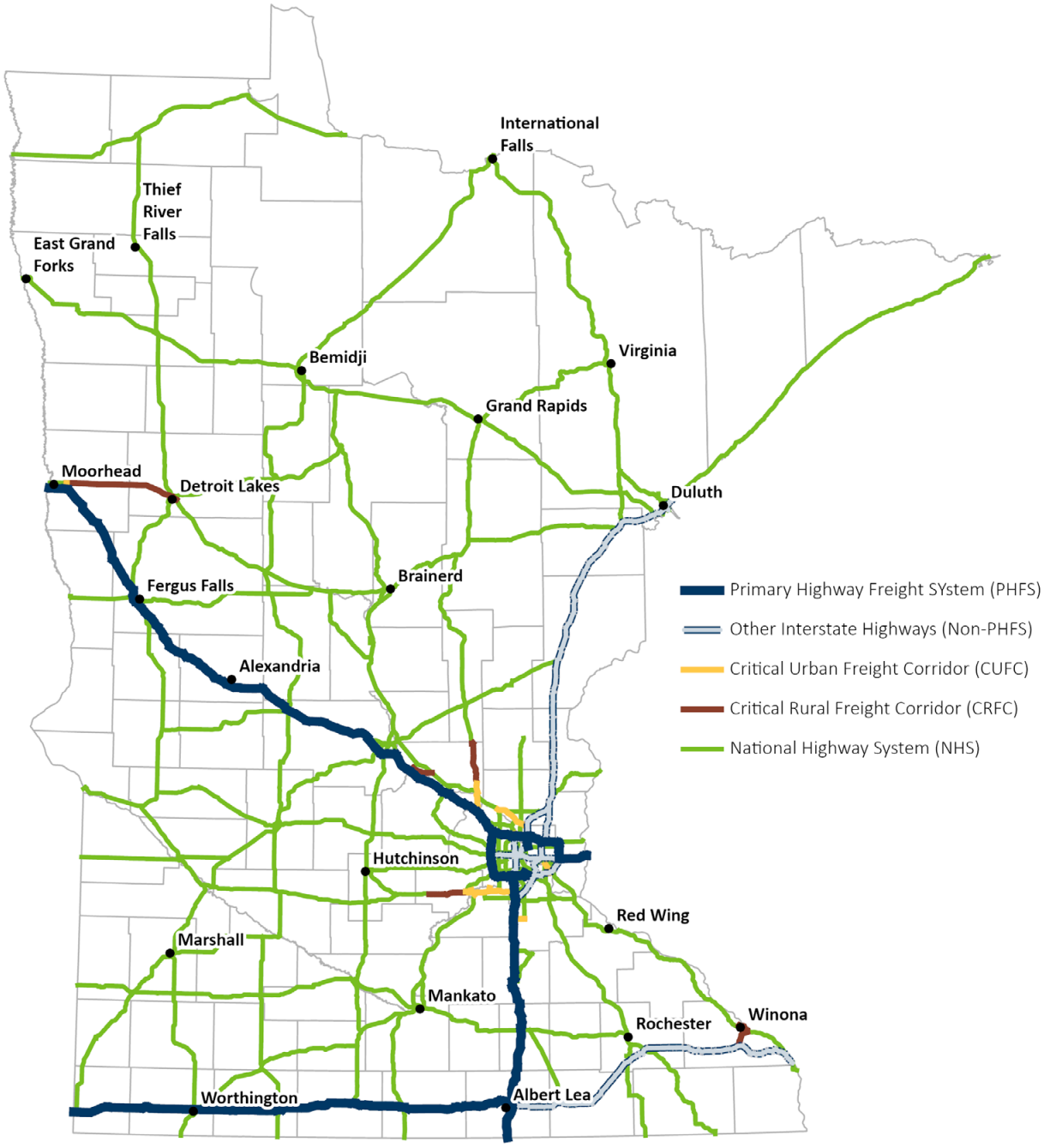


Figure 3-4: Designated Highway Freight Networks in Minnesota



RELIABILITY

The smooth and predictable movement of freight on the highway system is crucial for ensuring on-time deliveries and reduction of congestion. In addition to traditional congestion measures, one of the ways that MnDOT measures reliability is through the Truck Travel Time Reliability Index (TTTRI). This is a federally defined measure calculated as the ratio between the slowest truck travel times (95th percentile) and the average truck travel times (50th percentile). A TTTRI ratio of 1.0 indicates that the travel time on the roadway is very reliable and never deviates from the average time. A TTTRI ratio of 2.0 indicates that the truck travel time during the slowest conditions is twice as slow as during the average conditions. TTTRI hotspots in Minnesota are largely concentrated in the Twin Cities metro, particularly on portions of I-94, I-694 and I-494.

PAVEMENT CONDITION

Pavement that is maintained in good condition has a variety of benefits including improved safety, reduced wear and tear on vehicles and cargo and reduced roadway congestion. MnDOT has many different measures for assessing the evaluating pavement data. One of these is the Pavement Quality Index (PQI) which is calculated as a composite measure of both ride quality and overall surface condition. The resulting PQI measure is a number between 0 and 5. A PQI of 2.8 and above indicates "good" pavement condition while a PQI less than 1.8 is considered to be "poor" pavement condition. A PQI between 1.9 and 2.7 is considered to be in "fair" condition. The vast majority (93.7%) of Minnesota's trunk highway system is considered to be in good condition while only 0.1% of the system is considered to be in poor condition. The longest stretch of pavement in poor condition is MN 65 in northern Minnesota. This single stretch of road accounts for nearly 90% of the roads in poor condition. Other locations of roadways in poor condition are typically shorter segments spread throughout the state.

Figure 3-5: Truck Travel Time Reliability

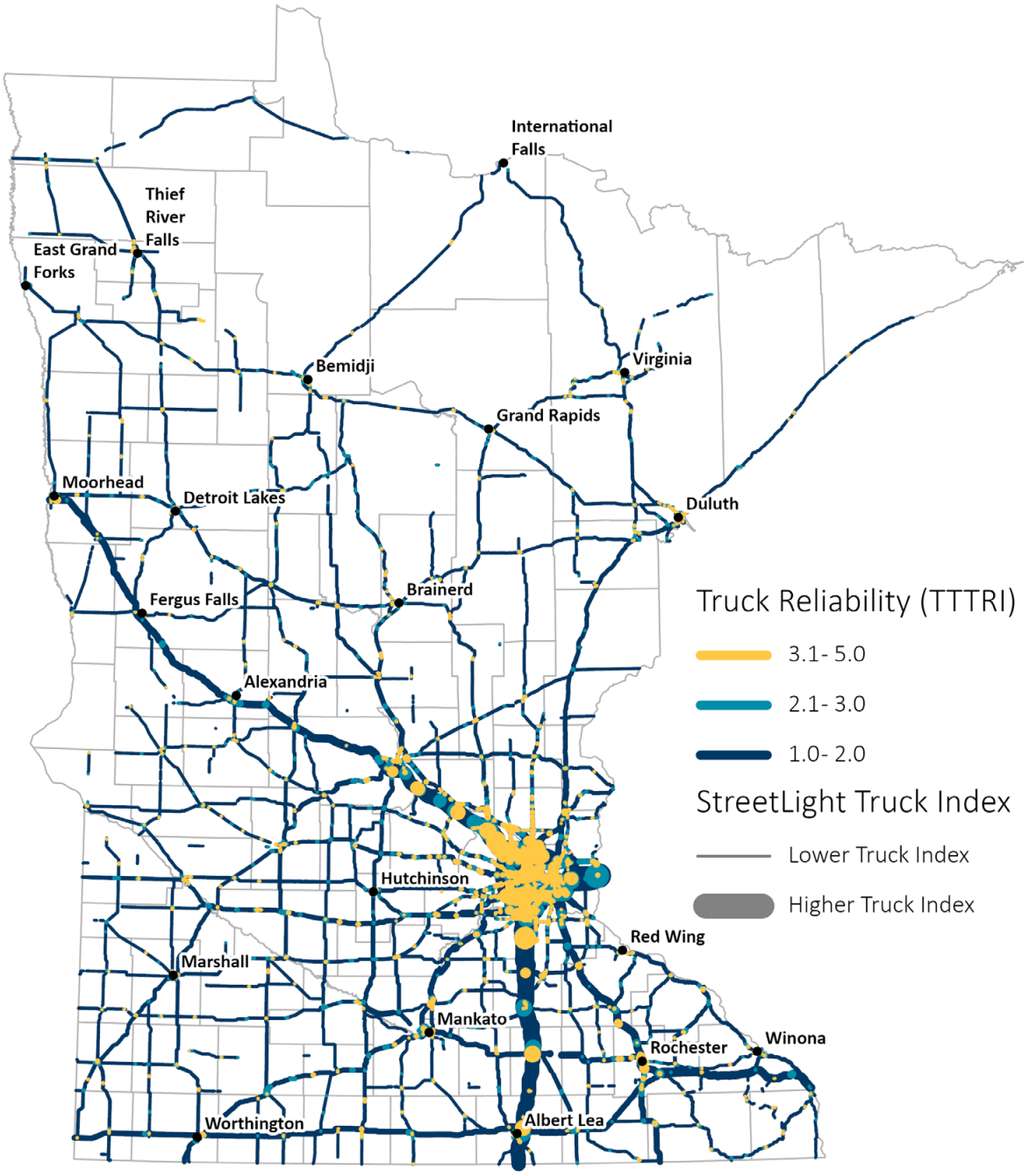
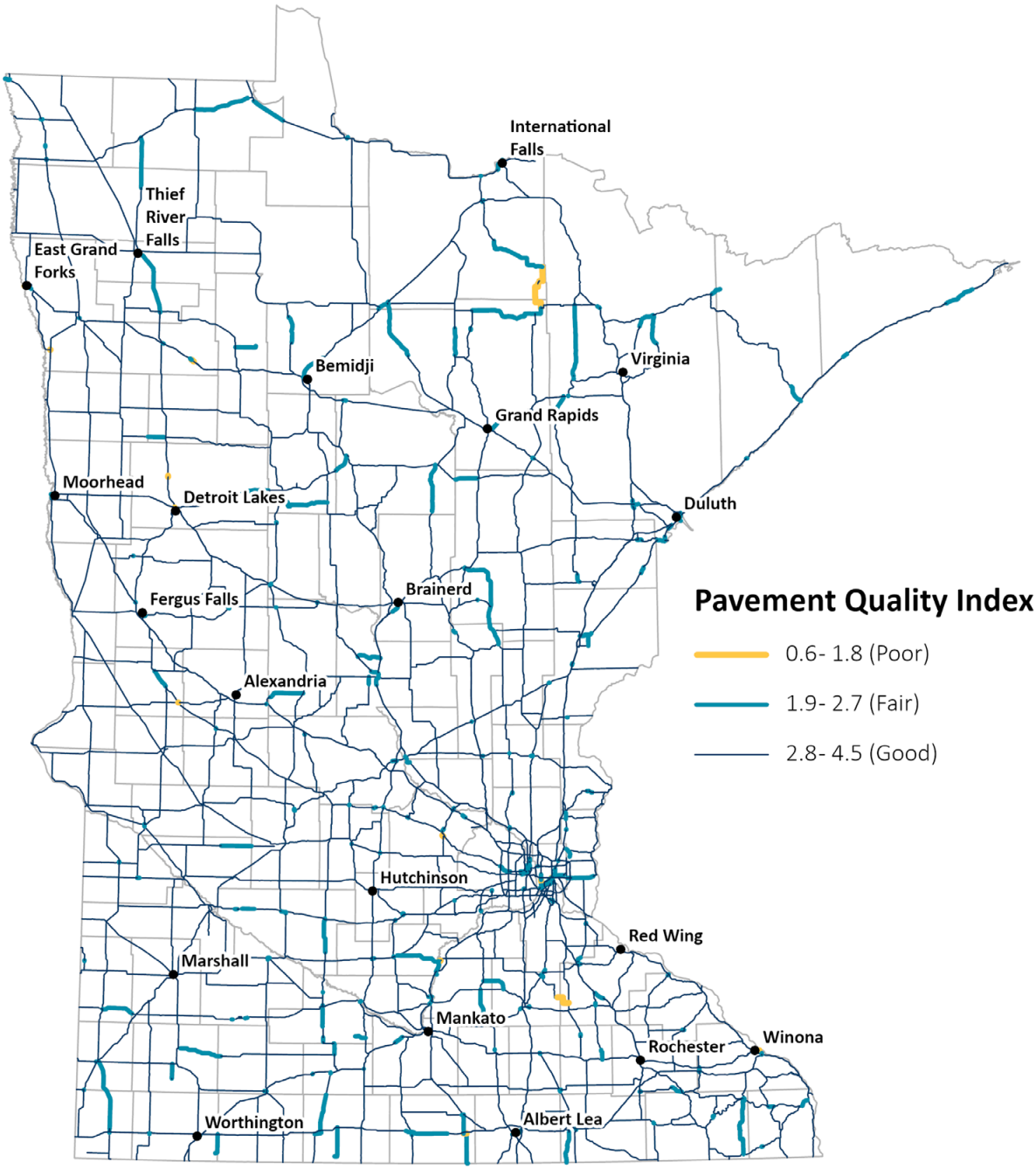


Figure 3-6: Pavement Condition (2022)



TRUCK PARKING

Trucks are responsible for moving more than 73% of the nation's goods by value and the amount of freight moved by truck is expected to continue to increase over the next 25 years. The lack of available truck parking is one of the primary concerns for truck drivers. More readily available parking can help drivers avoid violations related to federal hours of service regulations but is also important for ensuring driver safety.

212
parking facilities

49
public parking facilities

163
private parking spaces

4,266
total parking spaces

665
total public truck parking spaces

4,169
total private truck parking spaces

85%
is private truck parking

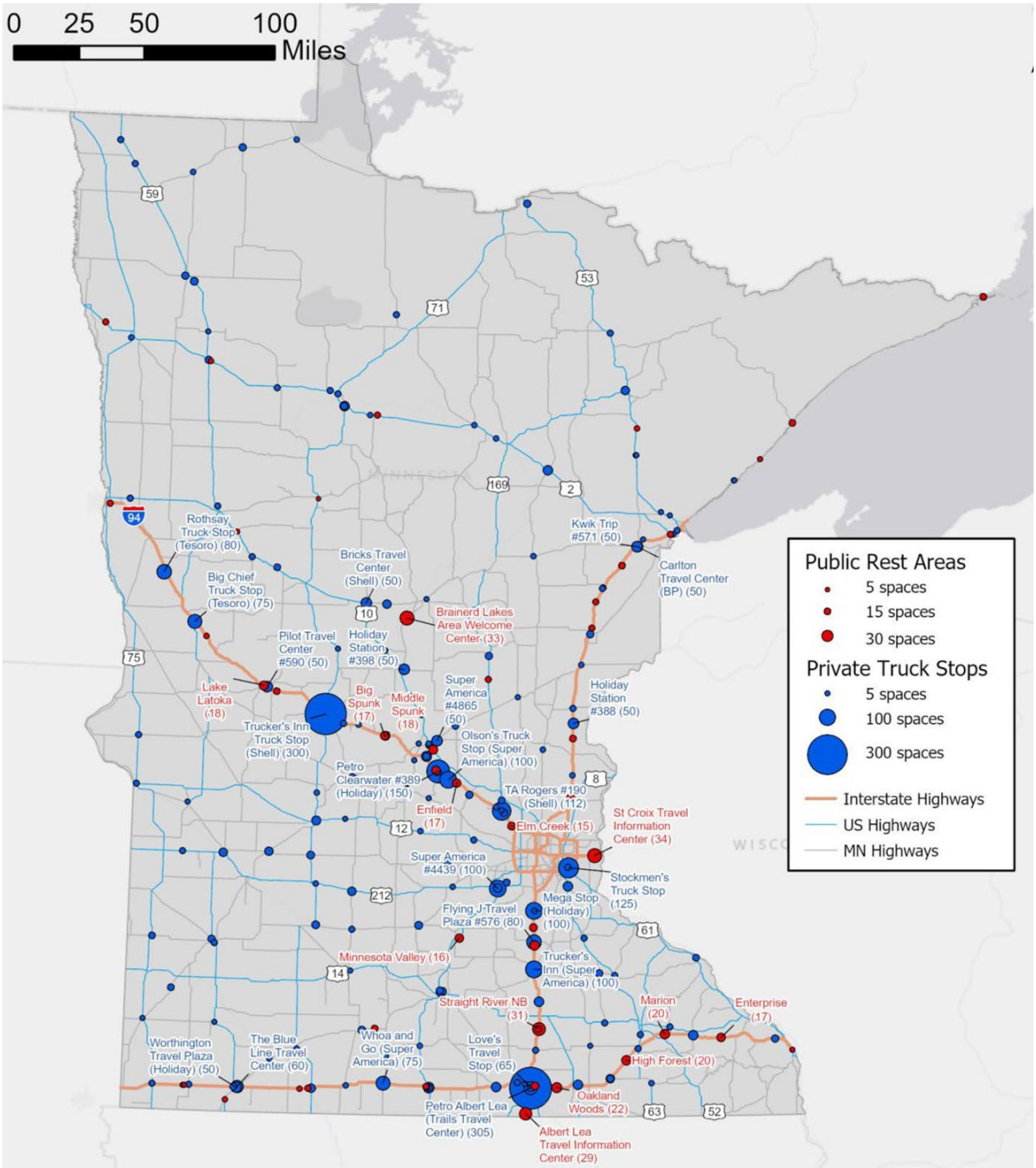
98%
of truck drivers struggle to find safe and sufficient parking

Minnesota conducted a Statewide Truck Parking Study in 2019. This study found that there are a total of 212 parking facilities, with 49 being public rest areas and 163 being private truck stops. These facilities offer approximately 4,834 parking spaces for trucks, with 665 of these spaces located at public facilities and 4,169 at private truck stops. The study calculated estimated truck parking demand using truck probe data from the American Transportation Research Institute (ATRI) and using the StreetLight Insight platform. The study found that many parking facilities in the state routinely meet or exceed their truck parking capacity. This can result in unsafe behavior such as truck parking on freeway on and off ramps or in otherwise unsafe locations. Many cities in the Twin Cities metro have also enacted bans for on-street truck parking, which is compounding the truck parking availability issue.

TRUCK PARKING TECHNOLOGIES

The Truck Parking Information Management System (TPIMS) program is an initiative to provide real- time truck parking information to drivers through dynamic message signs (DMS) located at strategic points across the eight-state Mid America Association of State Transportation Officials (MAASTO) region. A survey of truck drivers conducted for the Statewide Truck Parking Study revealed that over half of the respondents found the TPIMS signs on I-94 helpful in locating truck parking in Minnesota. Currently, TPIMS signs are installed on I-94 northwest of the Twin Cities metro area and on I-35 south of the Metro area. Additionally, MnDOT plans to improve truck parking in Minnesota by collaborating with local governments and land use authorities to emphasize the significance of truck parking for local and regional economies.

Figure 3-7: Truck Parking Facilities and Capacity



2019 Truck Parking study

RAILROAD

Heavy industries such as agriculture, mining and construction products are traditionally associated with rail transport systems for moving large amounts of cargo over large distances. This mode of transportation can be cost-effective and, in some cases, comparable in speed to truck shipping, with reliable schedules. Rail transport is also environmentally friendly, emitting fewer greenhouse gases than trucks. Rail cargo accounts for 19% of the freight tonnage moved to, from, or within Minnesota and accounts for 20% of freight value. In the past 10 years, the amount of freight shipped via traditional rail shipments has steadily declined but has been replaced by containerized intermodal service which allows for easier transport between other modes.

4,534
Total Miles of Track

4
Class I railroads

4
Intermodal Rail Terminals

6,278
At-grade crossings
1,633 Active Warning Devices
2,390 Passive Signage

Top 3 Commodities by Tonnage:	**Cereal Grains:** 21.2 million tons	**Metallic Ores:** 17.8 million tons	**Coal:** 11.9 million tons
Top 3 Commodities by Value:	**Cereal Grains:** $3.3 billion	**Crude Petroleum:** $1.9 billion	**Other Foodstuffs:** $1.4 billion

In the US, railroads are divided into three classes based on their annual revenue and geographic reach. The first class, known as Class I carriers, are those whose revenue exceeds a gross operating revenue of $447,600,000. Numbers for track miles operated in the state are sourced from the Association of American Railroads State Freight Rail Snapshot.

- BNSF Railway is responsible for maintaining the largest rail mileage in the state with 1,712 miles. BNSF's railway extends from the western part of the state and connects to the Bakken energy fields and relies on the BNSF railway to transport its products to refineries in Minnesota. It also serves as a connection point on the BNSF northern transcon route moving freight between Seattle and Chicago.
- CPKC operates the second highest rail miles in Minnesota, with 1,701 total rail miles and plays a crucial role in transporting agricultural products within the state, particularly along the Detroit Lakes subdivision, with access to 5 grain terminals in the MnDOT district and connects to the Shoreham Facility in northeast Minneapolis.
- Union Pacific (UP) operates 644 miles in the southeastern MN and Twin Cities area. The predominant commodities shipped by UP include grain, oils, biofuels, sweeteners and intermodal wholesale.
- Canadian National (CN) is the Class I railroad with the smallest amount of track operated in the state at 378 miles located primarily in the northeaster part of the state. This line is part of the major intermodal route between the Port of Prince Rupert in British Columbia and CN's major intermodal hub in Chicago, IL.

Class II and Class III carriers are regional and short line railroads, collectively operating the third largest rail mileage in the state with 984 total rail miles, providing "first mile/last mile" freight services.

The BNSF Staples Subdivision, which connects the Twin Cities Metro with Fargo, ND and beyond is the rail corridor with both the highest volumes and the highest maximum train speeds in the state with approximately 30 trains per day at a maximum

speed of 70 mph. As such, much of MnDOT's grade crossing improvement program has focused on the implementation of safety treatments at crossings in this corridor. Other key corridors include the CPKC River Subdivision along the Mississippi River (20 trains per day up to 75 mph) and the CPKC Paynesville Subdivision connecting Detroit Lakes to the Twin Cities (20 trains per day up to 60 mph).

INTERMODAL TERMINALS

Minnesota businesses have access to four intermodal rail terminals, where goods are transferred between rail and other modes of transportation. These include the BNSF Midway Yard located in the St. Paul Midway neighborhood, the CPKC Shoreham Yard located in northeast Minneapolis, the Union Pacific Twin Cities Intermodal Terminal and the CN Intermodal Ramp located at the Port of Duluth. The CN facilities were established in 2017 as part of a partnership with Duluth Cargo Connect. The UP facility originally opened as a pop-up ramp facility in 2021 and has seen continued investment by UP for additional turnouts, track and other yard improvements to streamline operations.

CRUDE BY RAIL

During the previous State Freight Plan update, one of the key topic areas was mitigation of potential impacts by shipments of crude oil by rail. In the years leading up to that plan, the volume of crude by rail shipments had peaked at their highest levels ever recorded, largely due to the development of oil fields in North Dakota and Canada using hydraulic fracturing processes to obtain what was previously considered to be unproductive areas. Existing pipeline infrastructure was not able to handle this sudden influx of crude oil and rail freight absorbed much of this volume. However, this led to many concerns for public safety due to a string of high-profile crude-by-rail derailments and explosions throughout north America. These events left to deaths and the destruction of property. MnDOT developed a number of strategies to address these concerns, including the installation of additional safety measures along rail corridors with higher volumes of crude-by-rail. However, since the release of the previous plan, the volume of crude oil being shipped by rail has dropped substantially, in large part due to the completion of many regional pipeline projects. While the risks inherent in crude-by-rail shipments have not gone away entirely, it is considered to be much less of an imminent risk.

HIGHWAY-RAIL GRADE CROSSING SAFETY

Over the last 40 years, the U.S. has made significant progress in reducing the total number of crashes at highway-rail grade crossings. There are a total of 6,278 at-grade crossings, with 4,070 being public crossings and 2,208 being private crossings. The number of public crossings has decreased from 6,700 to just over 4,000, which has led to a substantial reduction in the total number of accidents and incidents over the same period. Recently, MnDOT completed a Railroad Crossing Safety Action Plan, which includes evaluating methods for supplementing MnDOT's risk scoring approach, identifying pedestrian and bicycle safety issues at highway-rail grade crossings and continuing to replace outdated warning devices at these crossings.

Figure 3-8: Crude-By-Rail Volumes

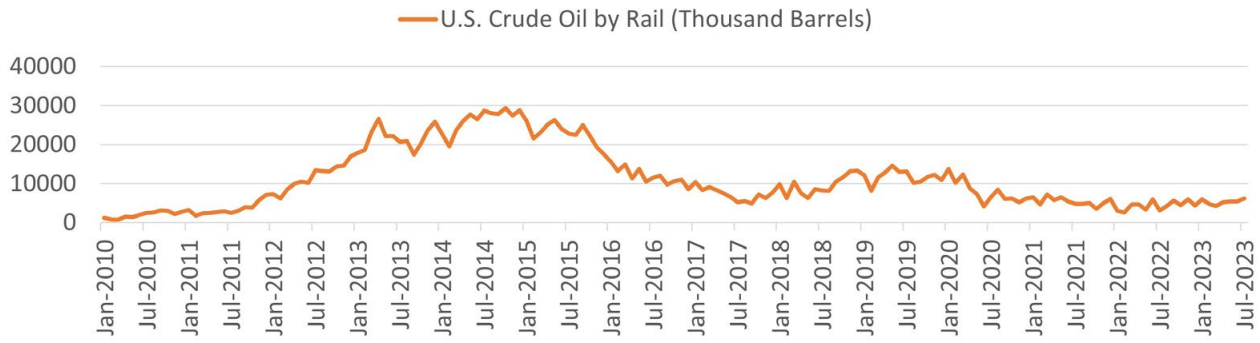


Figure 3-9: Minnesota Freight Railroads

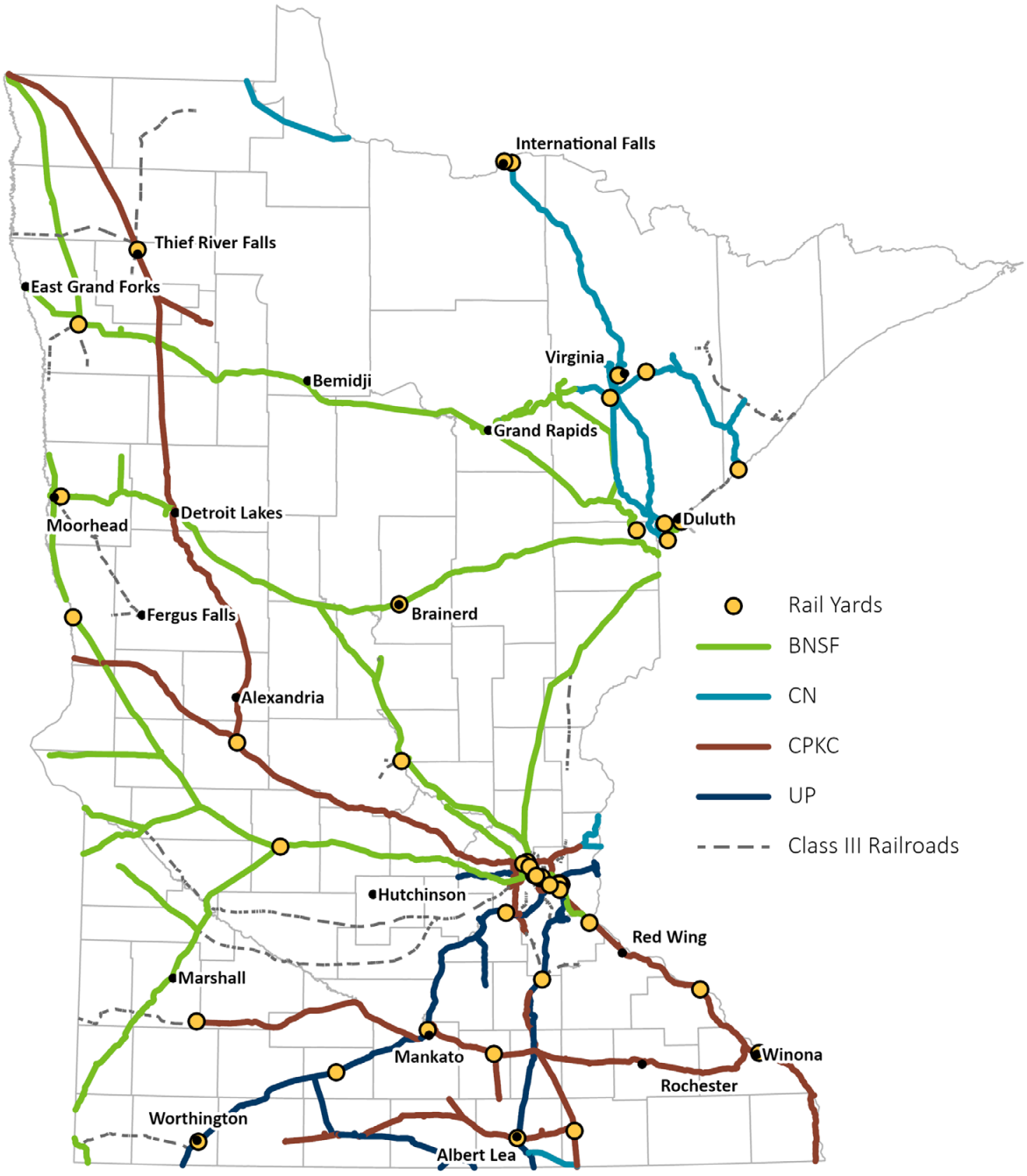
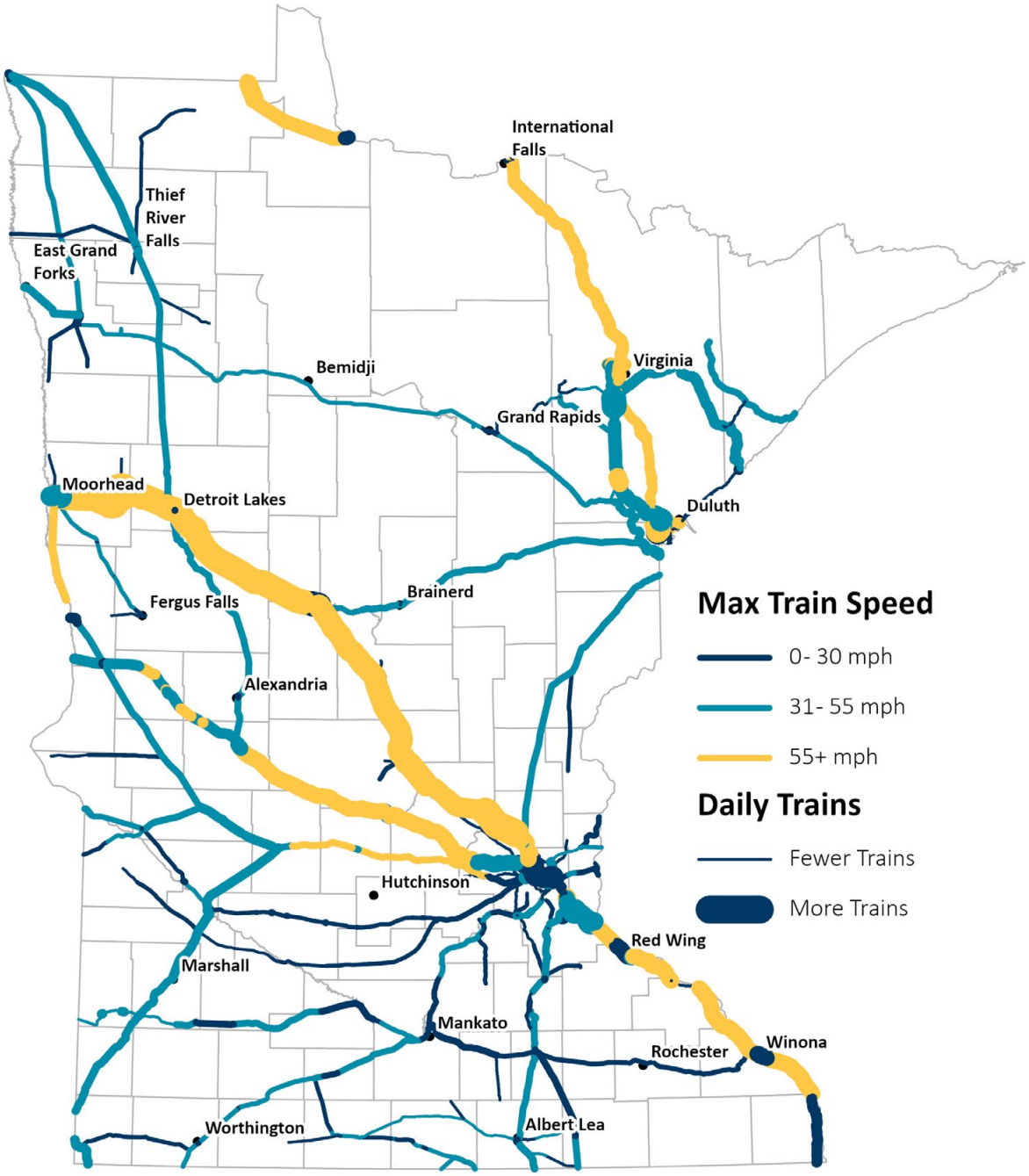


Figure 3-10: Railroad Volumes and Speeds



WATERWAY

Maritime transportation, particularly the barge and laker ship types most commonly found in Minnesota, is associated with heavy industries like steel and grain and is best suited for moving large volumes of cargo in bulk. This method is suitable for lower-cost commodities that are not time-sensitive. With containerization, cargo can be transferred between ships, trains and trucks without the need for unloading. However, maritime transportation does have high terminal costs and requires significant capital investment for maintenance and operation. Maritime cargo accounts for 2.3% of the freight tonnage moved to, from, or within Minnesota and accounts for 0.2% of freight value. Note the values for tonnage and freight value summarized below are sourced from the FHWA's Freight Analysis Framework (FAF) dataset and may be undercounting the amount of water freight transported to and from Minnesota.

3
Great Lakes Commercial Ports

4
Mississippi River Commercial Ports

17
million tons of freight handled annually

Top 3 Commodities by Tonnage:	**Metallic Ores:** 5 million tons	**Gravel:** 3 million tons	**Cereal Grains:** 2.7 million tons
Top 3 Commodities by Value:	**Cereal Grains:** $312 million	**Metallic Ores:** $310 million	**Other Ag. Products:** $164 million

Minnesota benefits from access to two commercially navigable water systems, providing connections to both domestic and international markets. The state has almost 260 miles of navigable waterways, ranking 27th in the nation. The top commodities by value include cereal grain, metallic ore and agricultural products, while the top commodities by weight include food and food products and chemical fertilizers. Three ports on Lake Superior transport over 50 million tons of freight per year and four ports on the Mississippi River System transport an additional 14 million tons of freight per year.

The Duluth-Superior Port is the largest freshwater port in the United States. The port possesses 49 miles of harbor frontage; services three Class I railroads; has NHS intermodal connectors that lead to major intermodal terminals like ports, rail and truck terminals and airports; and there are three surface streets linking I-535 to the Port of Duluth's Claire Public Terminal. The Clure Public Marine Terminal is home to CN's Duluth Intermodal Terminal, a joint effort between CN and Duluth Cargo Connect. This intermodal terminal is a land-based hub for containers that provides on-dock rail connections and offers access to CN's mainlines that connect to crucial markets such as New Orleans, Montreal, Vancouver, Mobile and Halifax.

Table 3-2: Minnesota's Commercial Waterway Ports

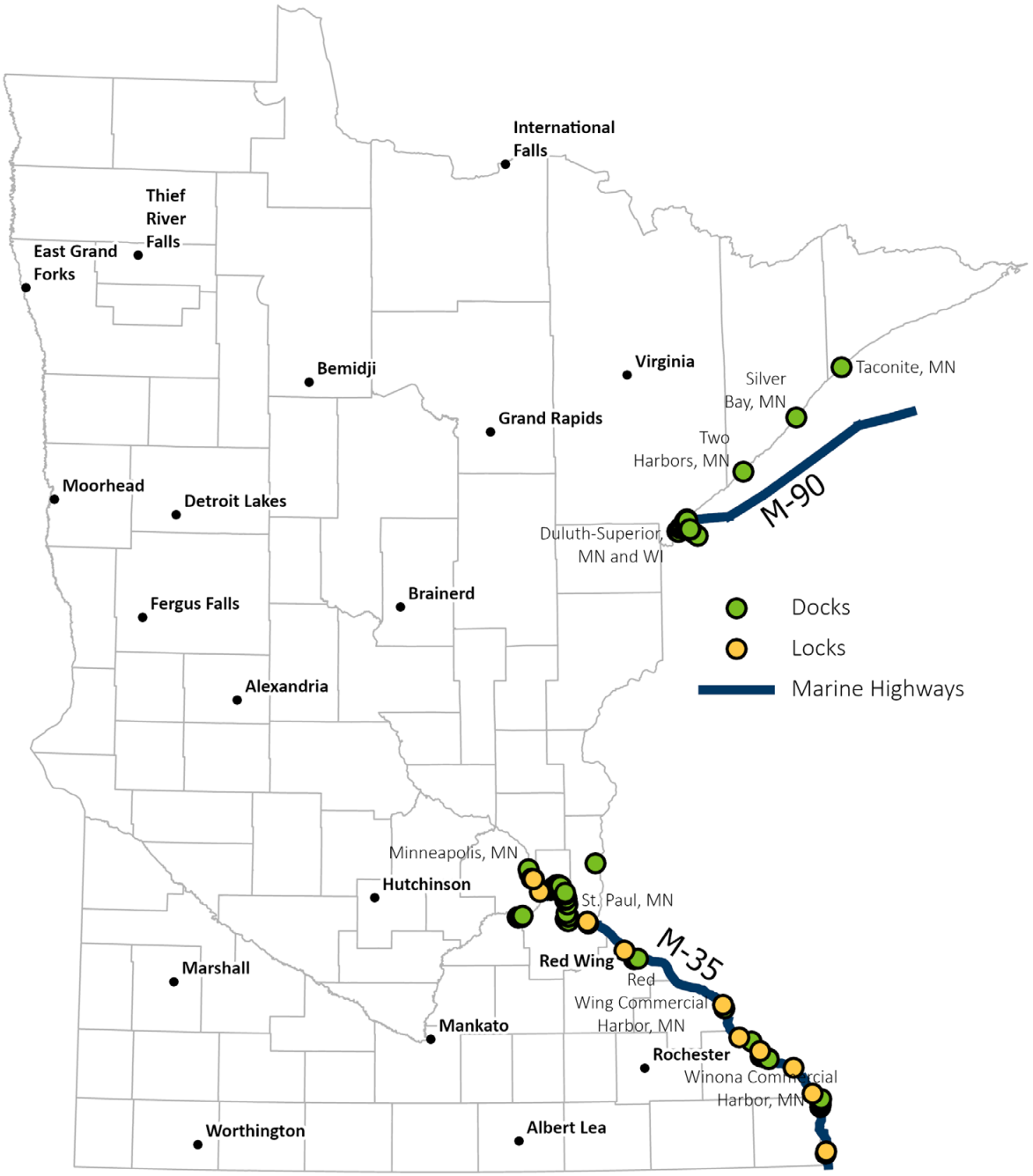
Great Lakes Ports	River Ports
Port of Duluth-Superior	Port of St. Paul
Port of Two Harbors	Port of Savage
Port of Silver Bay	Port of Red Wing
	Port of Winona

The United States Marine Highway is a network of navigable waterways established in 2007. It aims to reduce congestion on land-side infrastructure, decrease the number of trucks on the road and lessen the carbon footprint from trucking. The segment of the Mississippi River between the Twin Cities Metro area and southeastern Minnesota is designated as M-35 of the Marine Highway System. It extends from Minneapolis to the junction where the Mississippi and Illinois Rivers meet in Grafton, Illinois. This connects the Illinois River to the Mississippi river via Chicago and then leads to The Port of New Orleans, which handled 2.4 million short tons in 2021 and has access to global markets. Finally, along this stretch of the Mississippi in Minnesota, there are three port authorities which include the St. Paul Port Authority, the Redwing Port Authority and Winona Port Authority. The last two ports are part of the Northern Corn Belt Ports, which is part of a larger five-state area. This area is one of the largest grain-producing and exporting regions and is connected by the I-90 crossing of the Upper Mississippi River.

The majority of the operational locks and dams, 80%, on the Mississippi River system were built during the 1930s. Many received major rehabilitation work in the 1980s and 1990s. The most recent operational lock and dam facility, Lower St. Anthony Falls in Minneapolis, was constructed in 1959, while the oldest lock and dam, Lock and Dam 1 in St. Paul, opened in 1917. Dock walls on the system are particularly vulnerable, with some being more than 70 years old, far exceeding the typical 50-year asset life for such structures and are in need of major reconstruction.

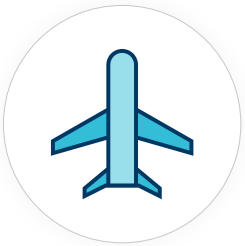
To address the issues of aging infrastructure, the US Army Corps of Engineers is exploring the disposition of the three locks and dams located within the city of Minneapolis. In 2021, Barge Terminal Two (BT2) was awarded a $4.14 million grant from the Port Infrastructure Development Program. This funding will be used to enhance and repair a 1,316-foot dock wall that was not up to current standards and has not been updated since the 1960s.

Figure 3-11: Waterway Cargo Facilities



AIR

Air cargo transportation has become an increasingly important mode for national and global logistics. It enables the fast movement of high-value, time-sensitive goods over long distances. However, air transportation is expensive and has lower volume capacity compared to other modes of transport that can handle larger cargo volumes. Air cargo accounts for less than one-tenth of one percent of the freight tonnage moved to, from, or within Minnesota but accounts for 4.5% of freight value.



14
Cargo-Handling Airports

MSP Accounts for
95% of State Air Cargo

Primary connecting location for inbound and outbound freight is Memphis, TN (25% of all inbound/freight)

Top 3 Commodities by Tonnage:	Precision Instruments	Electronics	Basic Chemicals
Top 3 Commodities by Value:	Precision Instruments	Electronics	Machinery

Statewide, Minnesota has 133 public use airports. Of these, only 14 have provided any amount of cargo handling between 2019 and 2023 through the movement of freight or mail parcels. Air cargo handling is dominated by the Minneapolis-St. Paul International Airport (MSP) which handled approximately 95% of all Minnesota Air Cargo. The most heavily used connecting airports for air cargo are Memphis, TN, Louisville, KY and Indianapolis, IN. Memphis is the site of FedEx's "Global Superhub," while Indianapolis is used as a FedEx regional hub. Louisville is the site of UPS's primary hub. Currently, the air cargo facilities at MSP cover around 523,000 square feet and four areas are designated for handling and processing freight. Amazon has doubled its volume and in response to the increasing cargo volume, MSP is planning to expand its capacity. A 2021 air cargo study completed by MSP found that Amazon was the fastest growing air cargo operator at MSP. All other cargo operators at the airport are projected to have adequate facilities to handle operations through 2040.

Rochester International (RST) follows with over 4% of the total tonnage. The Mayo Clinic receives most of the cargo deliveries, accounting for one-third of all cargo from this airport. This includes tissue samples, which are packaged together, resulting in a higher total volume but lower weight. The majority of the cargo is transported from FedEx Express's air cargo hub in Memphis, while medical devices are flown to Rochester from Minneapolis-St. Paul and Fort Wayne.

Figure 3-12: Average Air Cargo Annual Tonnage (2019-2023)

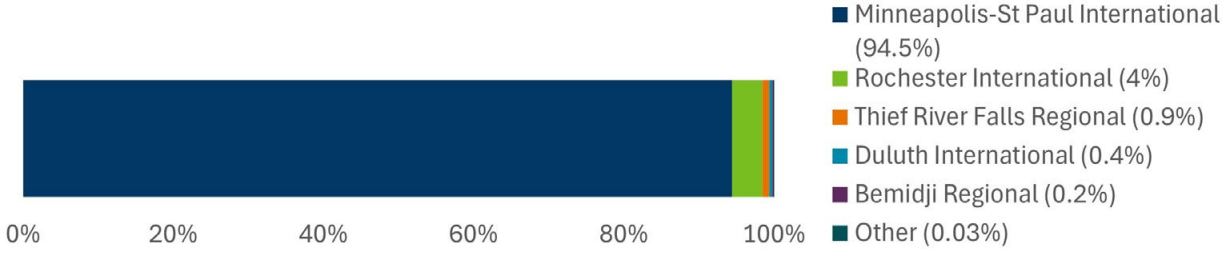
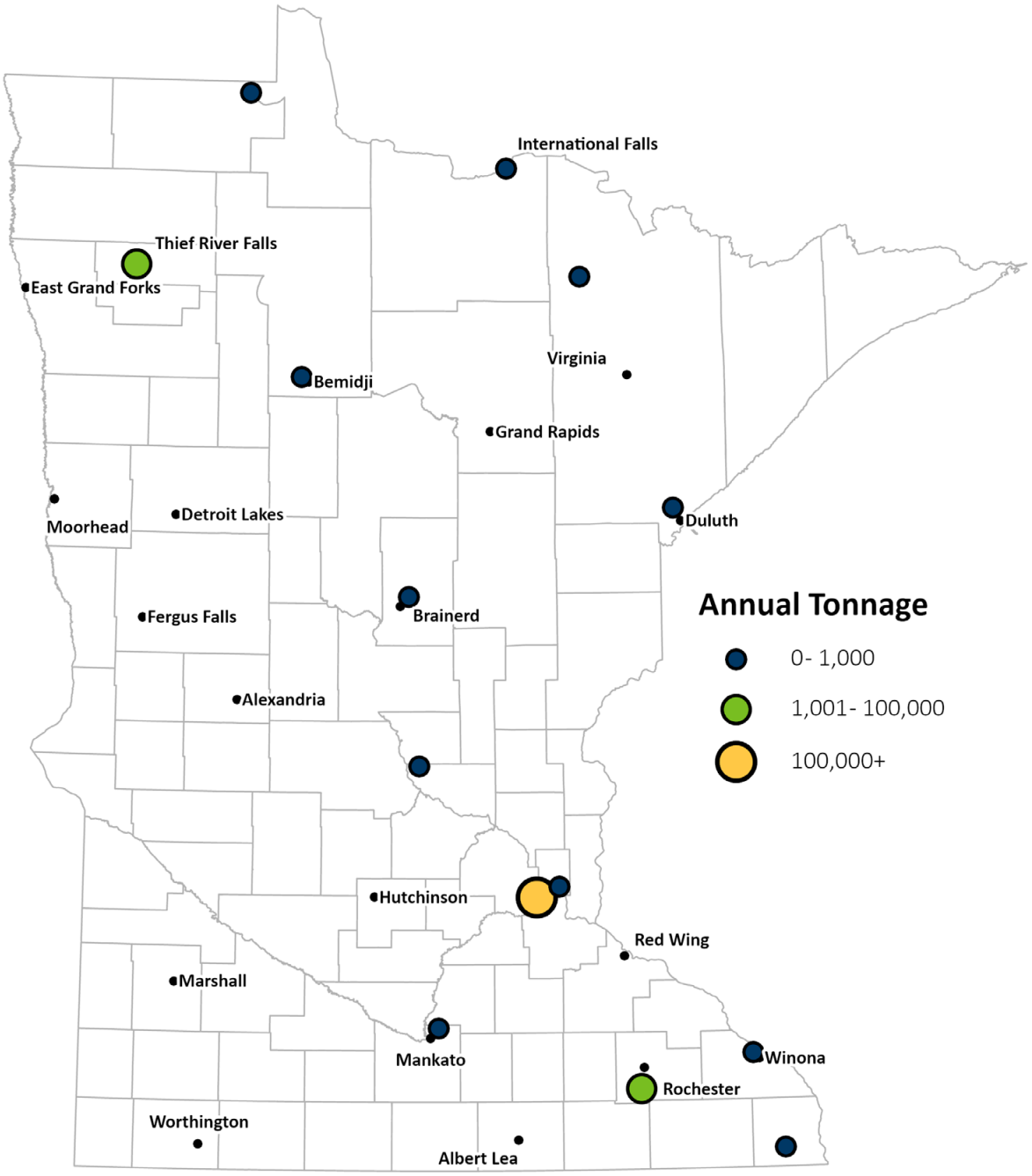


Figure 3-13: Cargo Airports



The Bemidji , Duluth and Thief River Falls regions have airports that handle a significant amount of air cargo. These airports are essential for providing air cargo services to smaller markets in District 1 and 2, allowing businesses to access national and international markets for shipping goods and obtaining materials and finished products. Thief River Falls Regional (TVF) is particularly notable, handling over 1% of the total tonnage. DigiKey Electronics, a major distributor of electronic components, is the fourth-largest supplier in the United States with an annual revenue in excess of $5 billion. Recently, DigiKey Electronics proposed constructing a larger air cargo hangar at the Thief River Falls Regional Airport. This expansion would increase the airport's capacity, enabling it to handle higher volumes and improve the supply chain.

PIPELINE

Pipeline transportation is a cost-effective method for moving liquids and gases to specific locations for consumption and over long distances. Pipeline terminals are crucial as they connect to refineries and harbors. While pipelines are generally safer than transporting liquids by rail, their installation and operation are not without controversy and there are several environmental and social issues associated with them. These include potential for spills and leaks, which can contaminate water supplies and ecosystems, as well as intersecting with Tribal lands.

20,000+ miles
of pipelines

12th and 62nd
largest refineries in the country

440,000 barrels
of crude oil processed daily

Natural gas and other fossil products:
99 million tons, $19 billion

Crude petroleum:
36 million tons, $10 billion

Gasoline:
2 million tons, 0.9 billion

Minnesota relies on imports for all petroleum and natural gas as it does not have its own fossil fuel resources. Pipelines transport 19% of total freight tonnage and 17% of total freight value into, out of and within the state. Precise pipeline mileage is difficult to measure. However, it is estimated that there are more than 20,000 miles of interstate pipeline in Minnesota, plus many more miles of smaller distribution pipelines. Approximately 30% of crude oil in the United States flows through Minnesota via pipelines, moving between refineries near St. Paul, Mandan, ND and Superior, WI. The state's proximity to the Bakken oil fields in North Dakota and Saskatchewan results in a significant amount of crude oil flowing through to refineries. The two refineries in Minnesota are located in St. Paul and St. Paul Park. The Pine Bend facility produces 335,000 barrels per day, ranking 12th in the nation. The refined crude oil is transported via a dedicated pipeline to the Minneapolis-St. Paul International Airport for aircraft fuel and to the Wisconsin Pipeline for further distribution.

Figure 3-14: Pipelines, Pipeline Terminals and Refineries

The St. Paul Park refinery produces 105,000 barrels per year and is ranked 62nd in the US. Both refineries have petroleum product terminals from which products are transferred by truck or rail.

The Enbridge Line 3 carries 760,000 barrels of crude oil per day, connecting the Canadian oil sands to oil depots in Superior, Wisconsin. The construction of the new Enbridge Line 3 pipeline began in 2021 and was completed in 2023. The new pipeline follows the same path as the previous one from North Dakota to the Clearbrook Terminal in Clearwater County, Minnesota. However, from the Clearbrook Terminal to Superior, Wisconsin, the pipeline was built in a new right-of-way, south of the existing Line 3 and ends at an existing terminal in Superior, Wisconsin.

Natural gas is transported from various production areas such as Western Canada, North Dakota, Wyoming, Montana, Kansas, Oklahoma, Texas and New Mexico. Minnesota consumes 450 billion cubic feet of natural gas annually, with two out of every three homes in the state using natural gas for heating. The state's ethanol industry also relies on natural gas for power. Industries in Minnesota that use significant quantities of natural gas include food manufacturing, petroleum refineries, iron and steel mills and fabricated metals production.

Minnesota is home to the 12th largest oil refinery in the country in terms of barrels produced per day.

Between the Flint Hill Resources Pine Bend Refiner and the Marathon St. Paul Park Refinery, Minnesota produces 440,000 barrels of crude oil per day, approximately 2.4% of national oil production.

MILITARY FREIGHT

Two federally designated freight networks were created with the express purpose of providing defense access, continuity and movement capabilities during times of emergency. These include the Strategic Highway Network (STRAHNET) and the Strategic Rail Corridor Network (STRACNET). The locations of these networks and the location of the Camp Ripley National Guard facility are shown in Figure 3-15.

- Minnesota Joint Forces Headquarters, St. Paul
- 34th Infantry Division and subordinate units, Arden Hills
- 133rd Airlift Wing, St. Paul
- 148th Fighter Wing, Duluth

Other units include:

- 88th Readiness Division (US Army Reserve), Fort Snelling
- 934th Airlift Wing (US Air Force Reserve), Minneapolis

One Army installation, Camp Ripley, is located in Minnesota. This training and readiness center, managed by the Minnesota National Guard, is located just north of Little Falls and provides support and services for training all branches of the U.S. Armed Forces. There are no active duty military units in Minnesota. Although the state includes 19,000 military personnel, approximately 97% are members of Reserve Forces. Regardless, logistics support is necessary to support training and maintain operational readiness. Frequent transportation movement of supplies, to include ammunition, fuel, food, equipment, maintenance items and numerous other needs requires a resilient supply chain network to support military units in Minnesota.

The conditions and performance of the freight system designated to support military operations in Minnesota is analogous to the status of Minnesota's multimodal freight system. There are no current issues that impedes military units and installations in Minnesota from performing their assigned roles and missions. The designated system of roadways, rail lines and aviation infrastructure to support military transportation needs are efficient, reliable and safe.

Figure 3-15: Military Freight Facilities

CHAPTER 4

FREIGHT FORECASTS

Utilizing the data to determine the direction of freight movements by mode, whether they be within, through, into or out of Minnesota is critical to understanding the supply chain of key industries in the state. How these flows will likely change by commodity and year, is equally critical for the freight plan to be better able to understand the actions needed in order to maintain and support infrastructure to enhance efficient supply chains for Minnesota's industries and businesses.

By analyzing future freight flow patterns actions can further be tailored to not just the current needs of Minnesota's business driven economy now, but well into the future.

CHAPTER CONTENTS

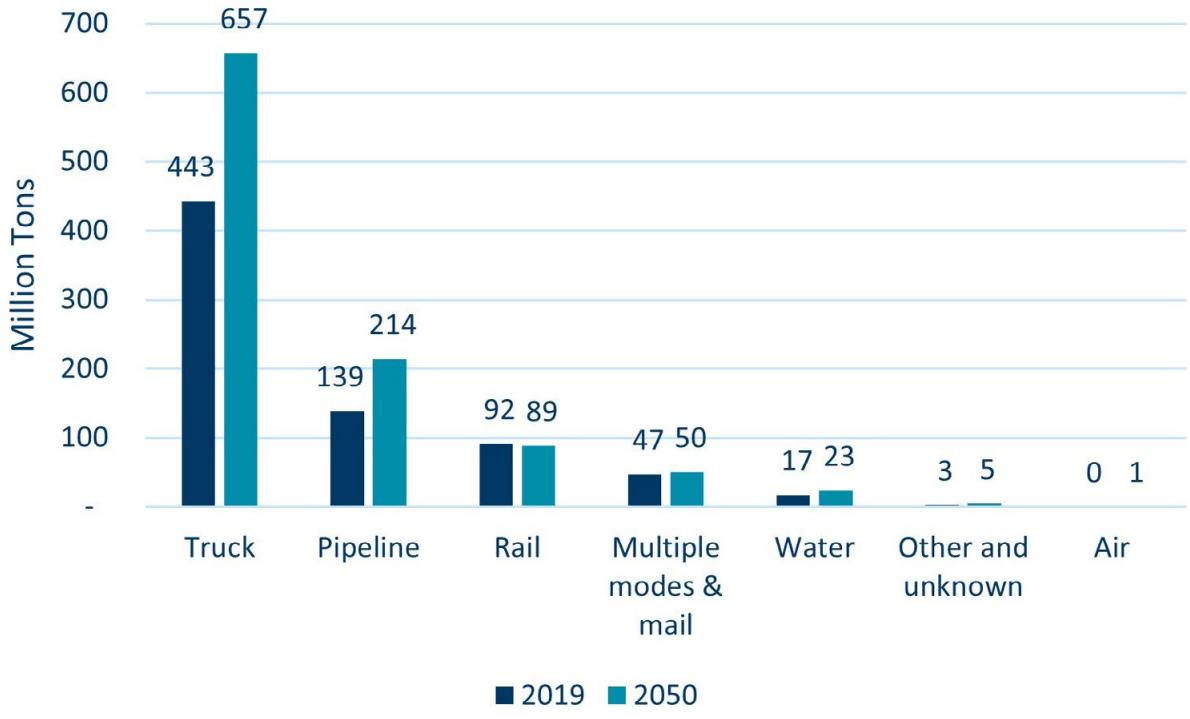
FREIGHT ANALYSIS FRAMEWORK

The Freight forecast for this freight plan is based on Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF). The Bureau of Transportation Statistics (BTS) with the support of the FHWA produce the FAF every five years, which provides estimates of tonnage, value and ton-miles moved by origin-destination pair, commodity type and transportation mode. The most recent version, FAF5, provides data for the base year (2017), recent years (2018-22) and forecasts up to 2050. FAF 5 data is used to estimate the freight tonnage and value by mode in Minnesota by 2050 and is the primary data utilized for the freight forecasts in this plan.

Figure 4-1 and Figure 4-2 illustrate the modal split in 2019 and 2050 forecast by tonnage and value of freight respectively. Total freight flows to, from and within Minnesota are projected to increase from 740 million tons in 2019 to 1.04 billion tons in 2050, growing at a 1.1% rate per year.

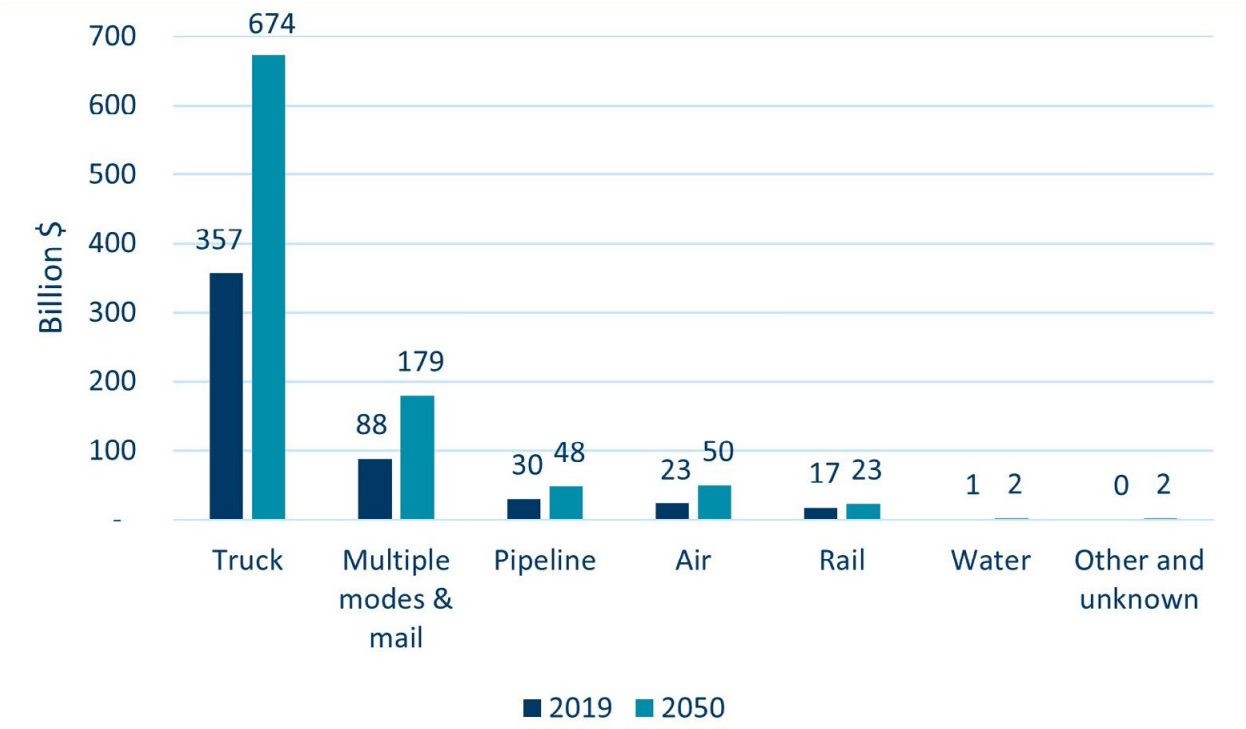
The modal shares are not expected to change dramatically with Truck having the highest share of 63%, followed by Pipeline with 21% share and Rail with 9%. Air cargo flows are estimated to increase the most by 2050 at a 3% rate annually while Rail is expected to remain at the same levels with minor losses of -0.1% per year.

Figure 4-1: Minnesota Freight Tonnage, Base Year and 2050 Forecast



The value of freight moving to, from and within the State is projected to increase 2.1% annually by 2050 from $517 billion to $978 billion. Truck cargo and multiple modes and mail value will account for 87% of the total freight value in Minnesota by 2050, growing at 2.1 and 2.3% per year.

Figure 4-2: Minnesota Freight Value, Base Year and 2050 Forecast



Of the 1.04 billion tons of freight in 2050, 92% or 945 million tons will be domestic flows to and from other states and within Minnesota, while 5% will be imports and 2% exports.

Similarly, 90% of freight value is attributed to domestic cargo, 6% in imports and 4% in exports — as shown in Table 4-1.

Table 4-1: Minnesota Forecast Freight Tonnage and Value by Trade Type

Trade Type	Million Tons (2050)	Billion USD (2050)
Domestic	945	868
Export	26	42
Import	68	68

The proximity to Canada and the various ports of entry in the Canadian-Minnesotan border make Canada the number one foreign trading partner with 74% of import and export tonnage and 33% of value in 2050. Eastern Asia follows as the second most significant trading partner with 13% of import and export tonnage and 32% of the value; Mexico is the third with 7% of import and export tonnage and 10% of value as illustrated in Figure 4-3.

Figure 4-3: Estimated Tonnage Share of International Trade Partners by 2050

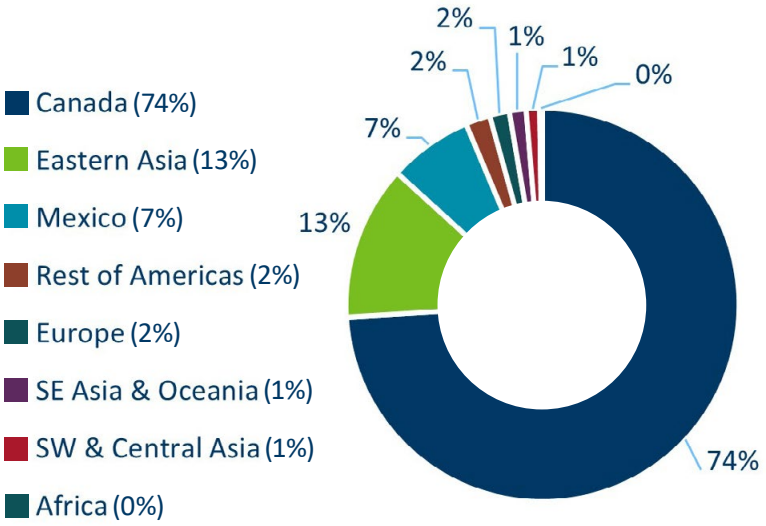
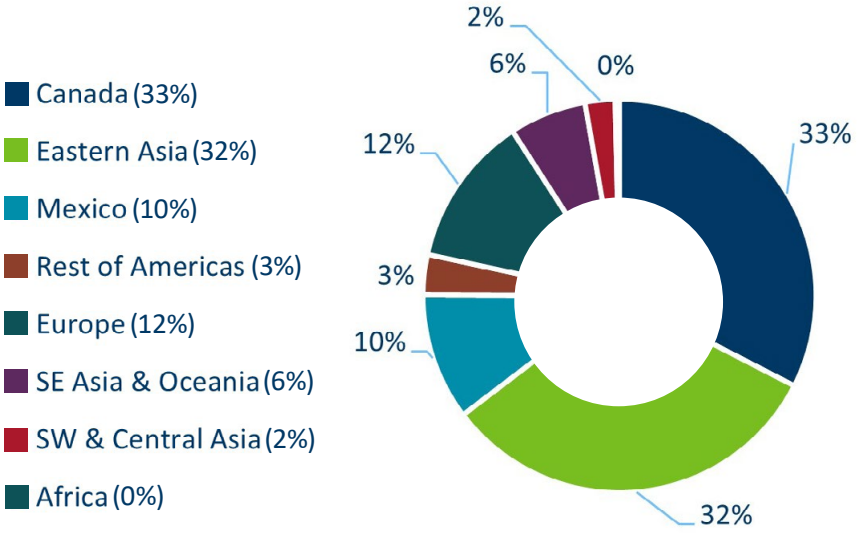


Figure 4-4: Estimated Value Share of International Trade Partners by 2050



Domestic trade in 2050 is also affected by proximity to neighboring states such as Iowa, Wisconsin, North and South Dakota. This will continue to account for most of freight flows in 2050 by tonnage (62%). However, in terms of value these states account only for 32% of 2050 freight value—as shown in Figure 4-5.

Figure 4-5: Estimated Tonnage Share of Domestic Trade Partners by 2050

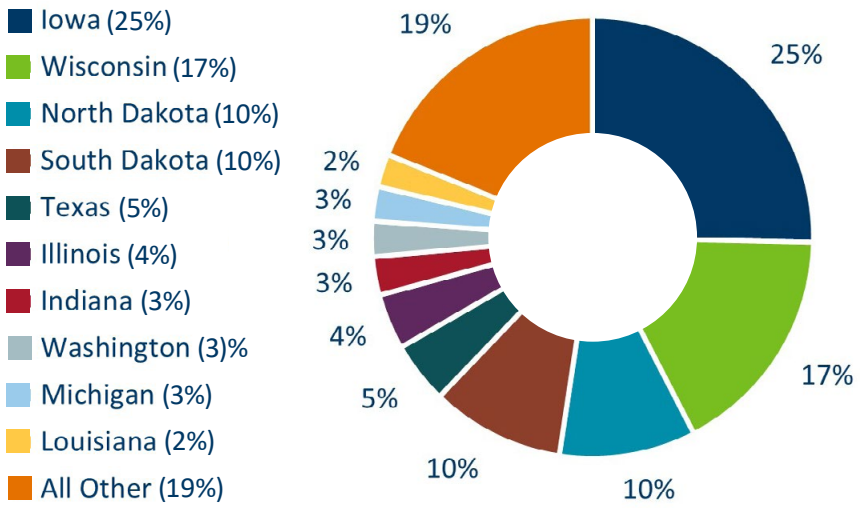
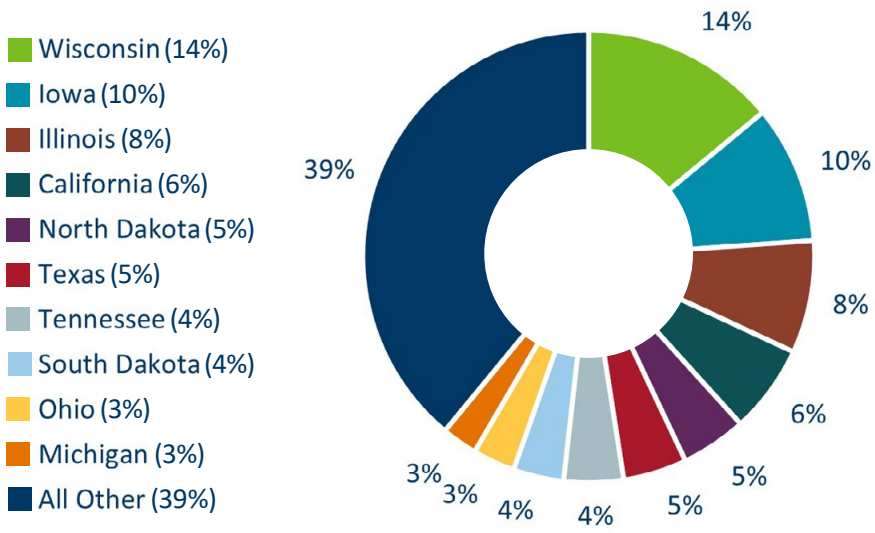


Figure 4-6: Estimated Value Share of Domestic Trade Partners by 2050



TRUCK

Truck tons will total 657 million in 2050, of which 639 million will be domestic, 11.7 million exports and 6.7 million imports. The same commodities will be at the top four in 2050 as in 2019 (cereal grains, gravel, agricultural products and nonmetal mineral products) growing at 1% annually. About 70% to 75% of these commodity truck flows will be flows within Minnesota, which are in line with the 63% truck flows within Minnesota overall. Live animals, mainly from Minnesota to neighboring states, are projected to have the highest truck growth by 2050, growing by 210%. Gasoline is expected to be the only commodity in the top ten that will decrease in 2050, decreasing by 28%, as shown in Table 4-2.

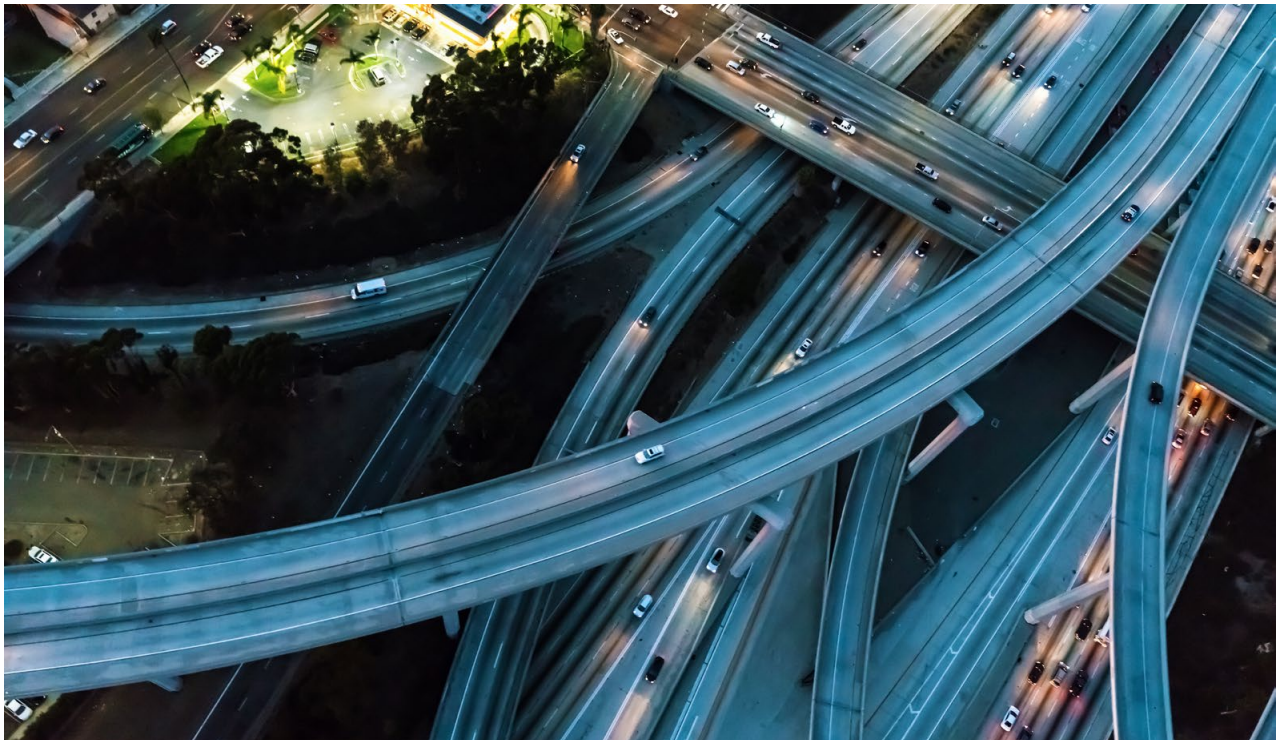
Table 4-2: Major Highway Commodities Tonnage, 2050

Commodity	Thousand Tons (2050)	Highway Tonnage Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Cereal grains	104,773	16%	-	21%	1%
Gravel	100,144	15%	-	53%	1%
Other ag prods.	55,052	8%	-	40%	1%
Nonmetal min. prods.	49,336	8%	-	51%	1%
Animal feed	43,509	7%	+1	92%	2%
Other foodstuffs	31,739	5%	+1	55%	1%
Mixed freight	23,122	4%	+2	93%	2%
Live animals/fish	21,363	3%	+8	210%	4%
Gasoline	20,356	3%	-4	-28%	-1%
Nonmetallic minerals	17,811	3%	+1	65%	2%

Mixed freight shipments are expected to be the number one truck commodity by value in 2050 as shown in Table 4-2 growing by 93% from 2019. Pharmaceuticals' value is projected to grow 207%, the highest increase of the top ten commodities by value, making it the commodity with the second highest value. Live fish, chemical products and plastics will also have a significant increase in terms of value of freight shipped by truck in Minnesota, as shown in Table 4-3.

Table 4-3: Major Highway Commodities Value, 2050

Commodity	Million USD (2050)	Highway Value Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Mixed freight	72,662	11%	-	93%	2%
Pharmaceuticals	53,564	8%	+5	207%	4%
Machinery	47,272	7%	-1	77%	2%
Plastics/rubber	44,309	7%	+2	141%	3%
Electronics	42,459	6%	-2	86%	2%
Motorized vehicles	38,716	6%	-2	75%	2%
Misc. mfg. prods.	35,584	5%	+1	148%	3%
Other foodstuffs	29,170	4%	-3	55%	1%
Live animals/fish	26,896	4%	+9	205%	4%
Chemical prods.	25,802	4%	+6	170%	3%



RAIL

Rail flows in FAF 5 include only carload shipments as intermodal traffic is reported under the multiple modes and mail category. As presented in Table 4-4 the two commodities with the highest tonnage in 2050 will be cereal grains and metallic ores, similarly to 2019, with cereal grains increasing 33% and metallic ores decreasing by 34%. Almost 30% of the cereal grains and 90% of the metallic ores shipped by rail will be internal Minnesota flows, while 9.8 million tons of cereal grains will be shipped to Washington State (35% of total cereal rail flows) for export to Asian countries. Animal feed and fertilizers are projected to have the highest tonnage increase, increasing by 138% and 187%. The highest decrease in railroad carload flows will be for coal following the general coal decline as energy shifts to cleaner alternatives.

Table 4-4: Major Rail Commodities Tonnage, 2050

Commodity	Thousand Tons (2050)	Rail Tonnage Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Cereal grains	28,287	32%	-	33%	1%
Metallic ores	11,782	13%	-	-34%	-1%
Natural sands	6,088	7%	+2	-6%	0%
Animal feed	5,793	7%	+5	138%	3%
Fertilizers	5,540	6%	+7	187%	3%
Other ag prods.	4,884	6%	+1	44%	1%
Nonmetallic minerals	4,838	5%	+1	74%	2%
Other foodstuffs	3,486	4%	+2	54%	1%
Fuel oils	3,001	3%	-3	-38%	-2%
Coal	2,798	3%	-7	-77%	-5%

The composition of rail flows in terms of value in 2050 will be somewhat different from that of tonnage, shown in Table 4-5. Miscellaneous manufactured products from Eastern Asia which are mainly imported through ports in California, Georgia and Washington are projected to increase 203% from 2019 for a total of $2.2 billion, accounting for 10% of rail value. Other commodities with significant gains from 2019 are fertilizers imported from Canada, plastics, animal feed exported to Canada and Mexico, gasoline and furniture.

Table 4-5: Major Rail Commodities Value, 2050

Commodity	Million USD (2050)	Retail Value Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Cereal grains	4,400	19%	-	33%	1%
Misc. mfg. prods.	2,234	10%	+5	203%	4%
Other foodstuffs	2,145	9%	-	53%	1%
Other ag prods.	1,613	7%	-	43%	1%
Fertilizers	1,222	5%	+4	82%	2%
Plastics/rubber	1,131	5%	+4	96%	2%
Animal feed	902	4%	+6	102%	2%
Gasoline	893	4%	+3	59%	2%
Furniture	817	4%	+8	210%	4%
Metallic ores	750	3%	-5	-30%	-1%

WATER

Water cargo in Minnesota is estimated to grow from 17 million tons in 2019 to 23 million in 2050, a 36% increase. Over 99% of water flows is from the ten commodities shown in Table 4-6. Lower value, bulk materials, such as agricultural products and construction material are usually shipped via water as a more economical alternative. Cereal grains are projected to increase 77% by 2050, being the commodity with the highest share accounting for 4.9 million tons, followed by gravel with 4.4 million tons, a 46% increase from 2019. Metallic ores shipped by water are projected to decrease 33% by 2050, accounting for 14% of the total water share.

Table 4-6: Major Water Commodities Tonnage, 2050

Commodity	Thousand Tons (2050)	Water Tonnage Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Cereal grains	4,859	21%	+2	77%	2%
Gravel	4,426	19%	-	46%	1%
Nonmetallic minerals	4,128	18%	+2	60%	2%
Natural sands	3,618	15%	-	37%	1%
Metallic ores	3,343	14%	-4	-33%	-1%
Other ag prods.	1,217	5%	-	113%	2%
Animal feed	1,079	5%	-	124%	3%
Natural gas and other fossil products	273	1%	+5	6272%	14%
Fertilizers	213	1%	-1	152%	3%
Other foodstuffs	167	1%	+18	97110%	25%

Cereal grains, worth of $583 million, will also be the number one commodity in terms of value for water flows in Minnesota. The value of other agricultural products and animal feed is projected to grow 3 and 2% annually for a total worth of $576 million. Other significant commodities by value include metallic ores, gravel, natural sands, fertilizers, machinery as shown in Table 4-7. The tenth commodity by value in 2050 will be other prepared foodstuffs which will increase from $1.2 million in 2019 to $61 million in 2050. Almost 90% of the value will be food from Minnesota to Louisiana for exports to the Rest of Americas.

Table 4-7: Major Water Commodities Value, 2050

Commodity	Million USD (2050)	Water Value Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Cereal grains	583	27%	-	87%	2%
Other ag prods.	361	17%	+1	120%	3%
Animal feed	216	10%	+1	93%	2%
Metallic ores	207	10%	-2	-33%	-1%
Gravel	79	4%	-	45%	1%
Natural sands	72	3%	-	37%	1%
Fertilizers	71	3%	+2	153%	3%
Machinery	70	3%	-	135%	3%
Nonmetallic minerals	70	3%	-2	68%	2%
Other foodstuffs	61	3%	+15	5067%	14%

AIR

Time sensitive, high value cargo is typically transported by air which has the highest transportation costs. Air is the mode with the lowest tonnage flows in Minnesota in 2019 and 2050. Commodities transported by air are typically light but high in value. In 2050 air cargo moved in Minnesota is projected to have a value of $82 thousand per ton, 13% lower than the $95 thousand per ton in 2019.

Air freight tonnage is projected to grow from 240 thousand tons in 2019 to 599 thousand in 2050, representing an average annual growth rate of 3%. The commodity with the highest tonnage share, 35% and 210 thousand tons in 2050, will be precision instruments (similar to 2019) as shown in Table 4-8. Other commodities shipped by air include plastics, electronics, textiles and machinery which will account for 34% of total air cargo and 50 thousand tons. It is worth mentioning newsprint and milled grain products will be among the top ten highest commodities by tonnage moved via air by 2050.

Table 4-8: Major Air Commodities Tonnage, 2050

Commodity	Thousand Tons (2050)	Air Tonnage Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Precision instruments	210	35%	-	158%	3%
Plastics/rubber	71	12%	+2	336%	5%
Electronics	52	9%	-1	106%	2%
Textiles/leather	47	8%	+5	775%	7%
Machinery	31	5%	-	98%	2%
Chemical prods.	23	4%	+1	153%	3%
Newsprint/paper	22	4%	+11	1160%	9%
Nonmetal min. prods.	21	3%	-	215%	4%
Milled grain prods.	18	3%	+19	2014%	10%
Other ag prods.	12	2%	-	136%	3%

The composition of air freight by value in Minnesota in 2050 is shown in Table 4-9. A major change in the top ten commodities by value is not expected. Precision instruments are projected to grow 3% annually and account for 60% of the total air freight value. Electronics and pharmaceuticals are projected to grow 2 and 3% annually, while the commodities with the highest annual growth are expected to be plastics and textiles at 4% each.

Table 4-9: Major Air Commodities Value, 2050

Commodity	Million USD (2050)	Air Value Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Precision instruments	29,808	60%	-	130%	3%
Electronics	8,708	18%	-	81%	2%
Pharmaceuticals	2,773	6%	+1	132%	3%
Machinery	2,068	4%	-1	72%	2%
Plastics/rubber	1,682	3%	-	200%	4%
Misc. mfg. prods.	804	2%	-	114%	2%
Chemical prods.	749	2%	-	118%	3%
Textiles/leather	679	1%	+2	256%	4%
Transport equip.	452	1%	-1	32%	1%
Motorized vehicles	303	1%	+2	137%	3%

PIPELINE

There is a limited number of commodities that are shipped in pipelines while access to privately owned pipeline system data is very limited. Based on FAF 5 estimates there are eight commodities moved through pipeline in Minnesota. By 2050, the total tonnage of pipeline cargo will increase by 55% and the value will increase by 62%. As seen in Table 4-10, the number one commodity will be natural gas and other fossil products which will account for 72% of pipeline tonnage and 59% of value. Crude petroleum, which is estimated to increase by 64% by tonnage, will be the second highest commodity with 28% share. It is also projected to increase by 90% in total (2% annually) and have 39% of total value pipeline share as shown in Table 4-11.

Table 4-10: Major Pipeline Commodities Tonnage, 2050

Commodity	Thousand Tons (2050)	Pipeline Tonnage Share (Percent)	Rank Change (2019-2050)	Total Change 2019-2050	Annual Change 2019-2050
Natural gas and other fossil products	153,334	72%	0	54%	1%
Crude petroleum	59,325	28%	-	64%	2%
Gasoline	1,100	1%	-	-46%	-2%
Fuel oils	456	0%	-	-33%	-1%
Fertilizers	98	0%	+1	150%	3%
Nonmetallic minerals	68	0%	-1	49%	1%
Nonmetal min. prods.	29	0%	-	59%	2%
Basic chemicals	15	0%	-	284%	4%

Approximately 76% of pipeline crude petroleum in Minnesota in 2050 will be imported from Canada. However, natural gas and other products imports from Canada will account for just 2% of pipeline flows, as 27% (41 million tons) will be natural gas from Minnesota to Iowa and 22% (34 million tons) internal Minnesota flows. South and North Dakota will be the top two origin states for natural gas pipeline flows for a total of 48 million tons. Table 4-11 show the value of the top ten commodities moved by pipeline.

Table 4-11: Major Pipeline Commodities Value, 2050

Commodity	Million USD (2050)	Percent	Rank Change (2019-2050)	Total Change	Change 2019-2050
Natural gas and other fossil products	28.540	59%	-	53%	1%
Crude petroleum	19,040	39%	-	90%	2%
Gasoline	493	1%	-	-47%	-2%
Fuel oils	212	0%	-	-34%	-1%
Fertilizers	31	0%	-	144%	3%
Nonmetallic minerals	8	0%	-	49%	1%
Nonmetal min. prods.	3	0%	-	59%	2%
Basic chemicals	0.5	0%	-	284%	4%

COMPARISON WITH THE PREVIOUS FREIGHT PLAN

The freight flows in the 2018 Minnesota Statewide Freight System and Investment Plan were estimated with FAF 3.5 which utilized a 2007 base year with synthesized 2012 values and a 2040 forecast. Additionally, rail flows were estimated from the STB 2012 Confidential Carload Waybill Sample. Since FAF 3.5 and STB 2012 Confidential Carload Waybill Sample are no longer available, this chapter compares base 2012 FAF 4 flows which utilized a 2012 base year with FAF 5 2019 and 2050 forecast.

As seen in Table 4-12, Minnesota freight flows have increased 16% between FAF 4 2012 data and FAF 5 2019. However, a shift in the modal split is evident as rail is no longer the mode with the second highest tonnage in 2019 as it dropped 33% and pipeline, with a 26% increase, has surpassed it. This rail drop is attributed to three main commodities. Metallic ores tonnage has declined 23 million tons or -57%, coal 11.5 million tons and -49% and cereal grains 9.6 million tons and -31%. Pipeline, on the other hand, has increased mainly because of natural gas and other fossil products that increased by 30 million tons and 43%.

Table 4-12: FAF 4 - FAF 5 Tonnage Modal Split

Description	Million Tons 2012	Million Tons 2019	Million Tons 2050
Truck	349	443	657
Rail	137	92	89
Pipeline	110	139	214
Multiple modes & mail	26	47	50
Water	19	17	23
Air (include truck-air)	0	0	1
Other and unknown	0	3	5
Sum	**641**	**741**	**1,039**

In terms of value of freight moving within Minnesota, the modal split has not changed between FAF 4 and FAF 5 as seen in Table 4-13. The total value of freight in Minnesota grew 3% with air growing 50% with the highest increase in the value of precision instruments ($6 billion), truck grew 10% with highest increase in pharmaceuticals ($11.3 billion) and mixed freight ($8.5 billion) and multiple modes and mail increased 8% because of precision instruments ($1.4 billion) and motor vehicles ($2 billion). Pipeline dropped 28% mainly because of crude which had a 51% decline in the per ton value, rail dropped 54% with highest drop in cereal grains ($4.8 billion) and water dropped 63% which declined for most commodities.

Table 4-13: FAF 4 - FAF 5 Value Modal Split

Description	Billion USD 2012	Billion USD 2019	Billion USD 2050
Truck	324	357	674
Multiple modes & mail	82	88	179
Pipeline	42	30	48
Rail	37	17	23
Air (include truck-air)	15	23	50
Water	3	1	2
Other and unknown	0	0	2
Sum	**504**	**517**	**978**

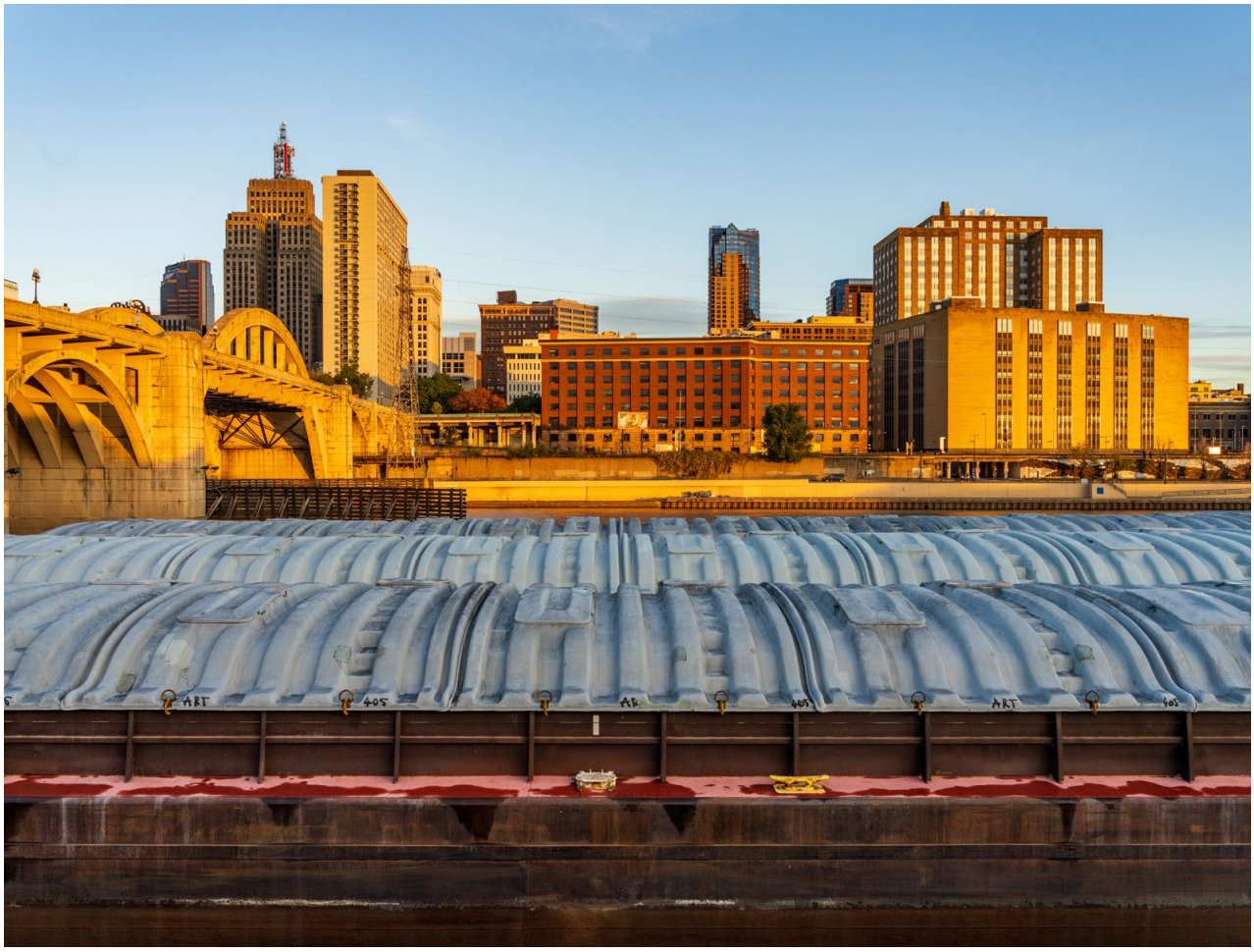


Table 4-14 illustrates the top 10 commodities in Minnesota in FAF 4 2012 base data and the change in FAF 5 2019 and 2050 findings by tonnage. Coal and metallic ores have dropped 49 and 27% respectively. On the other hand, natural gas and crude petroleum, both commodities moving primarily via pipeline in Minnesota, have the second highest increase (41%), after gravel which increased 57%.

Table 4-14: FAF 4 - FAF 5 Top 10 Commodities by Tonnage

Commodity	Thousand Tons 2012	Thousand Tons 2019	Thousand Tons 2050	Change 2012-2019	Change 2019-2050
Cereal grains	105,987	114,142	141,860	8%	24%
Natural gas and other fossil products	83,679	117,956	169,525	41%	44%
Metallic ores	61,577	44,969	33,124	-27%	-26%
Gravel	44,262	69,500	106,464	57%	53%
Other ag prods.	41,596	44,144	62,194	6%	41%
Nonmetal min. prods.	38,540	34,460	51,521	-11%	50%
Crude petroleum	31,100	43,787	59,655	41%	36%
Other foodstuffs	29,815	25,035	38,629	-16%	54%
Coal	23,606	11,973	2,829	-49%	-76%
Animal feed	21,295	27,688	54,187	30%	96%
All Other	**159,943**	**206,851**	**319,351**	**29%**	**54%**

Electronics was the highest commodity by value moved in Minnesota both in 2012 and 2019 but will be overpassed by mixed freight and precision instruments by 2050 as seen in Table 4-15. The highest decrease was in cereal grains value, dropping 37% from 2012 to 2019, followed by other foodstuffs at -16% and natural gas which despite its tonnage increase has dropped 1% because of its lower per ton value in 2019 ($208 versus $296 in 2012).

Table 4-15: FAF 4 - FAF 5 Top 10 Commodities by Value

Commodity	Million USD 2012	Million USD 2019	Million USD 2050	Change 2012-2019	Change 2019-2050
Electronics	41,114	43,794	79,259	7%	81%
Mixed freight	32,331	41,556	81,037	29%	95%
Machinery	30,268	34,485	60,682	14%	76%
Other foodstuffs	25,765	21,639	33,510	-16%	55%
Natural gas and other fossil products	24,761	24,495	33,730	-1%	38%
Motorized vehicles	24,724	30,210	51,639	22%	71%
Precision Instruments	23,091	32,088	80,313	39%	150%
Cereal grains	22,685	14,380	18,050	-37%	26%
Misc. mfg. prods.	21,752	24,579	63,011	13%	156%
Plastics/rubber	18,399	22,602	54,171	23%	140%
All Other	**238,758**	**226,886**	**422,900**	**-5%**	**86%**

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CHAPTER 5

FREIGHT POLICIES AND STRATEGIES

The freight policies and strategies MnDOT and freight partners will use to implement the State Freight Plan Goals cover a wide range of focus areas and activities. These strategies link to both the National Multimodal Freight Policy goals as well as the Statewide Multimodal Transportation Plan goals and objectives. Strategies come in the various forms of policies, programs and projects and will be prioritized predicated on how soon the strategy is needed and the resources allotted to the implement the strategy. Successful implementation of these goals will require a joint effort by many different stakeholders and partners.

CHAPTER CONTENTS

MINNESOTA'S FREIGHT ACTION AGENDA

The Freight Action Agenda is a set of actions created by MnDOT in partnership with the Minnesota Freight Advisory Committee (MFAC) to implement the State Freight Plan. The Action Agenda provides guidance in how to improve the freight network statewide in Minnesota along with opportunities to collaborate on how to better maximize the health of the economy, people and environment.

THE ROLE OF THE MINNESOTA FREIGHT ADVISORY COMMITTEE

Partnerships were key to developing this plan, and they will also be key to implementing and maintaining it. The Freight Action Agenda is not intended to be a static document, but modified as stakeholder needs change. As such, continuous outreach and communication with public and private sector freight stakeholders will be critical to implementation. The MFAC will monitor and report on the implementation and development of the Freight Action Agenda. The MFAC will work with MnDOT to ensure the Agenda is continuously revised and updated on regular and timely basis. MnDOT, the MFAC, and other public and private partners will collaborate towards fulfilling the Freight Action Agenda, helping ensure the well-being and success of Minnesota's freight network, and its economy, environment and communities.

ID	Action Description	Roles	Timeframe	Objective(s)
	GOAL 1: FREIGHT SYSTEM STEWARDSHIP			
1	**Encourage and Support Partnerships:** Engage and partner with Minnesota's public agencies and with producers, shippers/receivers, carriers, and other private sector freight stakeholders to address Minnesota's freight issues together. This includes convening an ongoing freight forum. Engage and partner with neighboring states to address regional freight issues together.	**Lead:** MnDOT **Partners:** The Center for Transportation Studies at the University of Minnesota and members of the MFAC, REV Midwest Coalition	Short-term	✓ Support and Grow Minnesota's Freight Industries ✓ Fair & Transparent Freight Planning and Funding Decisions
2	**Freight Education and Advocacy:** Public and private freight stakeholders advocate together for a safe, equitable and sustainable freight transportation by advancing critical freight partnerships, strategies, investments, and continued funding for freight investments, and educate the public on the critical role freight plays in the economy and everyday life of Minnesotans.	**Lead:** MnDOT **Partners:** Public and private sector freight stakeholders	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Fair & Transparent Freight Planning and Funding Decisions
3	**Improved Data Collection:** Improve freight-related data collection (e.g., truck counts) and use innovative sources to help make data-driven decisions. Increase public visibility of freight data.	**Lead:** MnDOT	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Fair & Transparent Freight Planning and Funding Decisions
4	**Freight Investment Plan:** Develop a freight investment plan that aligns key freight projects and available sources of funding so they can be implemented.	**Lead:** MnDOT **Partners:** Public and private freight stakeholders, system owners and operators	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Strategically Invest in New Freight Infrastructure ✓ Fair & Transparent Freight Planning and Funding Decisions ✓ Consider All Freight Modes in Planning and Design
5	**Prioritize Maintenance of the National Multimodal Freight Network:** Prioritize bridge/pavement maintenance on these shared routes to ensure ability to handle freight rail, truck and passenger traffic.	**Lead:** MnDOT	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure
6	**Integrate Freight into All Planning Projects:** Consider freight in overall project planning across modes (highway, rail, water, and air). Regularly engage the private sector and communities impacted by freight to consider their perspectives during freight system planning.	**Lead:** MnDOT **Partners:** State, regional and local planning agencies	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Consider All Freight Modes in Planning and Design
7	**Preserve Key Rail Corridors:** Preserve and maintain key railroad corridors by actively managing the State Rail Bank and coordinating with railroad partners on future connections across the state.	**Lead:** MnDOT **Partners:** State, regional and local planning agencies	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Increase Freight System Resiliency
8	**Maintain MnDOT Superload Corridors:** Maintain critical oversize and overweight routes to ensure access across the state for key freight movements and work with peer state partners to identify ways to harmonize size and weight limits.	**Lead:** MnDOT, state and local departments of public safety and enforcement **Partners:** Local permitting agencies	Short-term	✓ Preserve and Improve Minnesota's Freight Infrastructure
9	**Targeted Freight System Investments:** Utilize freight system performance measures to monitor and report system condition and identify investment needs.	**Lead:** MnDOT, public and private sector freight system owners and operator	Mid-term	✓ Preserve and Improve Minnesota's Freight Infrastructure ✓ Strategically Invest in New Freight Infrastructure

ID	Action Description	Roles	Timeframe	Objective(s)
	GOAL 2: IMPROVING FREIGHT SAFETY			
10	**Incident Management and Emergency Response Plans:** Develop emergency plans to ensure critical supply chain connectivity and proactively route hazardous materials	**Lead:** Minnesota Office of Public Safety **Partners:** MnDOT, public and private sector freight stakeholders	Short-term	✓ Improve Freight System Safety ✓ Improve Freight Mobility, Velocity, and Reliability in Minnesota
11	**Design for Freight Safety:** Design and implement geometric features that improve freight safety across modes including on roadways, across railroads, ports, and other facilities.	**Lead:** MnDOT	Short-term	✓ Improve Freight System Safety
12	**Address Truck Parking and Charging Needs:** Address the statewide truck parking shortage and electric truck charging by working with public and private sector partners to identify truck parking needs, invest in new and existing sites and maintain truck parking availability information systems.	**Lead:** MnDOT **Partners:** Public and private sector freight stakeholders, neighboring states, REV Midwest	Short-term	✓ Strategically Invest in New Freight Infrastructure
13	**Improve Freight Rail System Safety:** Building on the work of the State Rail Plan and the Railroad At Grade Crossing Safety Action Plan, implement the key findings from each focusing on rail safety improvement projects through the Minnesota Railroad Service Improvement Program, the At Grade Crossing Safety Program, the Antiquated Equipment Program, and others.	**Lead:** MnDOT **Partners:** Public and private sector freight stakeholders, Minnesota Department of Public Safety	Short-term	✓ Improve Freight System Safety
14	**Invest in New Freight Technology:** Support the implementation and advancement of connected and automated electric vehicles, truck parking information management systems, work zone in cab safety messaging and others.	**Lead:** MnDOT **Partners:** FHWA	Short-term	✓ Strategically Invest in New Freight Infrastructure
	GOAL 3: CONNECT MINNESOTANS AND BUSINESSES			
15	**Improve First- and Last-Mile Connections:** Encourage the development of first and last mile connecting infrastructure and operational programs, such as highway access and rail spurs to local businesses	**Lead:** MnDOT **Partners:** Various state, regional and local planning and economic development agencies	Mid-term	✓ Improve Freight Mobility, Velocity, and Reliability in Minnesota ✓ Support and Grow Minnesota's Freight Industries
16	**Support Freight Modal Balance:** Encourage modal balance and redundancy within key trade corridors so that businesses have access to a variety of cost-effective and competitive freight modes to ship their goods.	**Lead:** MnDOT **Partners:** Public and private sector freight stakeholders	Mid-term	✓ Improve Freight Mobility, Velocity, and Reliability in Minnesota

ID	Action Description	Roles	Timeframe	Objective(s)
17	**Support Multimodal Freight Options and Expansions:** Incentivize intermodal and multimodal facility development to allow goods to shift between modes to promote more competitive shipping rates, efficient use of vehicles, and minimize potential conflicts between freight and passenger modes.	**Lead:** MnDOT **Partners:** DEED, railroads in Minnesota, regional and local planning and economic development agencies where a new facility may be cited	Mid-term	✓ Improve Freight Mobility, Velocity, and Reliability in Minnesota ✓ Reduce Freight's Impact on the Environment ✓ Support and Grow Minnesota's Freight Industries
	GOAL 4: SAFEGUARD MINNESOTA'S HEALTH AND ENVIRONMENT			
18	**Explore Urban Goods Movement Programs:** Research, identify and trial urban freight delivery programs and projects to improve delivery safety and timing, reduce truck congestion, consolidate parcel deliveries, reduce freight conflict with passenger modes, decrease vehicle miles traveled and promote traffic safety.	**Lead:** MnDOT, various state, regional and local planning agencies	Mid-term	✓ Reduce Freight's Impact on the Environment ✓ Minimize Disparate Freight Impacts to Underserved or Overburdened Communities ✓ Consider All Freight Modes in Planning and Design
19	**Implement Sustainable Freight Efforts:** Actively lead on transition to low and zero emission freight vehicles, incentives for fleet replacement and coordinate with key public and private sector partners on electric, hydrogen and other motive power systems.	**Lead:** MnDOT **Partners:** REV Midwest Coalition	Mid-term	✓ Reduce Freight's Impact on the Environment ✓ Minimize Disparate Freight Impacts to Underserved or Overburdened Communities
20	**Mitigate Impacts on Environmental Justice Populations:** Identify and mitigate freight impacts which relate to environmental justice issues such as air quality and flooding on underrepresented, underserved, and overburdened communities in future infrastructure projects.	**Lead:** MnDOT **Partners:** Various state, regional, and local planning agencies, freight stakeholders	Long-term	✓ Minimize Disparate Freight Impacts to Underserved or Overburdened Communities
21	**Integrate Freight into Land Use Planning and Policies:** Implement land use planning and policies to ensure freight development areas are designated and preserved and that development occurs adjacent to existing infrastructure in ways that do not negatively impact vulnerable populations while improving first and last mile connections.	**Lead:** Various state, regional and local planning agencies **Partners:** MnDOT, DEED	Long-term	✓ Minimize Disparate Freight Impacts to Underserved or Overburdened Communities ✓ Consider All Freight Modes in Planning and Design
22	**Mitigate and reduce local air pollution, flooding, stormwater runoff and wildlife habitat loss impacts caused by the freight system in Minnesota:** Support policies and programs that reduce freight transportation emissions, minimize the impacts of freight on the natural environment.	**Lead:** MnDOT	Long-term	✓ Reduce Freight's Impact on the Environment
	GOAL 5: SUPPORT MINNESOTA'S ECONOMY			
23	**Improve and Expand Freight Industry Workforce Development:** Develop programs in cooperation with community colleges and the private sector to ensure workforce is available for industry needs.	**Lead:** DEED, Minnesota Trucking Association	Mid-term	✓ Support and Grow Minnesota's Freight Industries

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CHAPTER 6

SUSTAINABLE TRUCK TRENDS AND STRATEGIES

This chapter provides a summary of the trends related to the reduction of environmental impacts by medium and heavy duty (MHD) vehicles, specifically related to the reduction of greenhouse gas emissions. This includes an overview of MHD vehicle activity and emissions in Minnesota, an overview of the many available vehicle emission reduction strategies and a summary of considerations that should be taken into account when considering the different strategies. This paper also includes a review of recent Regional and national regulations, plans and studies relevant to MHD vehicle emissions reduction. Finally, the paper concludes with a listing of proposed goals and strategies for MnDOT to consider as part of the broader State Freight Plan development process.

CHAPTER CONTENTS

OVERVIEW

Greenhouse gases (GHG) are gases that absorb and emit infrared radiation emitted by the earth. They include CO2, Methane, Nitrous Oxide and Flurorinated gases. Their increased presence in the atmosphere is a leading contributor to global warming and climate change. In 2021, the transportation sector accounted for an estimated 28% of total U.S. greenhouse gas emissions. In response to this growing issue the U.S. Department of Transportation (U.S. DOT) has set multiple climate and sustainability goals, including a substantial reduction in greenhouse gas emissions and transportation-related pollution. The bipartisan 2007 Next Generation Energy Act set statutory benchmarks to reduce GHG emissions 15% from 2005 levels by 2015, 30% by 2025 and 80% by 2050. The U.S. DOT FY 2022-2026 Strategic Plan includes goals to achieve net-zero emissions from all operations by 2050.

Minnesota has also set statewide goals to reduce collective greenhouse gas (GHG) emissions. In 2022, Minnesota's Climate Action Framework updated goals to reduce emissions 50% by 2030 and achieve net-zero emissions by 2050. Minnesota's overall GHG emissions decreased 23% between 2005 and 2020.

Medium and heavy-duty (MHD) vehicles are the second largest source of GHG emissions in the transportation sector, despite these vehicles making up a relatively small proportion of the overall vehicle population. Vehicles are classified according to their gross vehicle weight rating (GVWR), with different weight ratings grouped into vehicle classes and categories as shown in Figure 1. MHD vehicles are those vehicles with a gross vehicle weight greater than 8,500 pounds.

MHD vehicles are vital to the Minnesota economy. As the above figure illustrates, there are many different users of MHD vehicles. Farmers and contractors using heavier model pick-ups; school buses and transit bus operators employing a variety of models to transport people to work, school and leisure activities; delivery companies using vans and small trucks to deliver packages; food and beverage companies employing straight trucks and tractor trailers delivering goods to stores; farmers, fuel

Figure 6-1: FHWA Vehicle Classifications

Vehicle Class	Gross Vehicle Weight Rating	Category	Vehicle Examples			
Class 1	< 6,000 lbs	Light Duty	SEDAN	SUV		
Class 2a	6,001- 8,500 lbs		SUV	PICKUP		
Class 2b	8,501-10,000 lbs	Medium Duty	MINIVAN	CARGO VAN	FULL-SIZE PICKUP	STEP VAN
Class 3	10,001-14,000 lbs		WALK-IN	BOX TRUCK	CITY DELIVERY	HEAVY-DUTY PICKUP
Class 4	14,001-16,000 lbs	Heavy Duty	LARGE WALK-IN	BOX TRUCK	CITY DELIVERY	
Class 5	16,001-19,500 lbs		BUCKET TRUCK	LARGE WALK-IN	CITY DELIVERY	
Class 6	19,501-26,000 lbs		BEVERAGE TRUCK	SINGLE-AXLE	SCHOOL BUS	RACK TRUCK
Class 7	26,001-33,000 lbs		REFUSE	FURNITURE	CITY TRANSIT BUS	TRUCK TRACTOR
Class 8	≥ 33,001 lbs		CEMENT TRUCK	TRUCK TRACTOR	DUMP TRUCK	

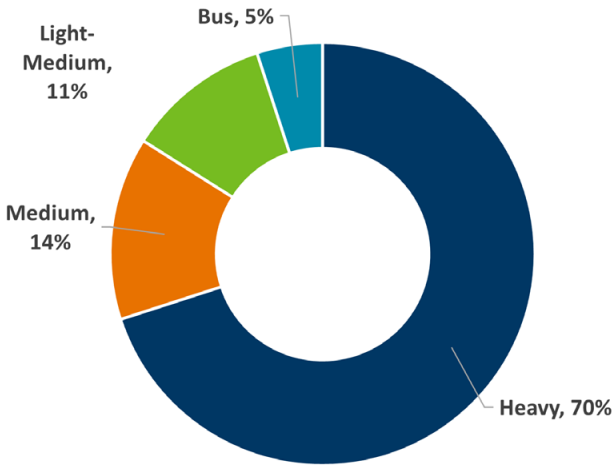
distributors and mineral companies using trucks to move bulk products from production sites to onward distribution facilities; and, Class 8 tractor-trailers operating long distance routes to bring products and consumables to the state. These uses all differ in terms of the type of vehicle they use, the distance traveled, routes taken, where vehicles are based, vehicle ownership models and crucially for many MHD vehicle operators, the financial and business metrics that drive their operations.

MHD VEHICLE EMISSIONS IN MINNESOTA

Transportation remains the largest source of GHG emission in Minnesota accounting for approximately 25% of the state's total GHG emissions. However, since 2005, these emissions have been trending downward with an 18% reduction in GHG emissions between 2005 and 2020. This compares to a reduction of 54% for electricity generation and increases of 14% each for residential and industrial sources over this same time period.

In terms of the national emissions inventory, transportation accounts 35% of total U.S. CO_2 emissions. Within the transportation sector, passenger vehicles, light-duty trucks (including SUVs) and medium to heavy-duty trucks produce more than 70% of emissions. Light-duty trucks accounted for 13.2 million tons of emissions in Minnesota (CO_2 equivalent) and heavy-duty trucks 6.9 million CO_2 e-Tons in 2020. Heavy-duty vehicles are the largest source of mobile NOx and the second largest source of GHG emissions in the transportation sector. According to EPA, heavy-duty vehicles would contribute 32% of the mobile source NOx emissions and 89% of on-road NOx emissions, in calendar year 2045. GHG emissions from transportation have decreased by about 18% since 2005. Key factors include reduced travel during the COVID-19 pandemic and more stringent emissions standards associated with federal regulations reducing vehicle emissions. The proportion of national MHD vehicle emissions categorized by vehicle use and length of journey is illustrated in Figure 6-2.

Figure 6-2: Transportation Sources of GHG Emissions



Source: NREL report Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis (nrel.gov)

CONNECTIONS TO REGIONAL AND NATIONAL REGULATIONS, PLANS AND STUDIES

Multiple plans exist at both the regional national level that have established standards, guidance and recommendations for the adoption of emissions reduction strategies.

MINNESOTA NEXT GENERATION ENERGY ACT

The Next Generation Energy Act establishes a statewide goal "to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15% below 2005 levels by 2015, to a level at least 30% below 2005 levels by 2025 and to a level at least 80% below 2005 levels by 2050."

CLEAN CARS MINNESOTA RULE

In 2021, the MPCA adopted the Clean Car Minnesota rule that requires automobile manufacturers to deliver for sale in Minnesota only passenger cars, light-duty trucks, medium-duty vehicles and medium-duty passenger vehicles that are certified by California as meeting the low-emission vehicle (LEV) standard.

The low-emission vehicle standard sets tailpipe pollution limits and requires manufacturers to produce new light and medium-duty vehicles with lower emissions.

STATEWIDE MULTIMODAL TRANSPORTATION PLAN

As the highest policy plan for transportation in Minnesota, the Statewide Multimodal Transportation Plan (SMTP) provides objectives, performance measures, strategies and actions to move Minnesota's transportation system forward. These collectively make up the policy direction that answers, "How are we going to achieve a multimodal transportation system that maximizes the health of people, the environment and our economy?"

The SMTP established a target to reduce annual GHG emissions from the transportation sector by 80% from 2005 levels by 2040, along with interim targets.

MINNESOTA CARBON REDUCTION STRATEGY

In February 2024, MnDOT received approval of the Minnesota's Carbon Reduction Strategy (CRS) from the Federal Highway Administration. The strategy informs how federal Carbon Reduction Program funds will be spent and identifies priorities for advancing transportation investments to reduce carbon emissions from:

- On-road transportation sources, which include cars, trucks, buses and other vehicles used by people and for movement of goods on our transportation network.
- Development and maintenance of the transportation system, including infrastructure construction, repair and energy used in transportation facilities and operations.

MINNESOTA ELECTRIC VEHICLE INFRASTRUCTURE PLAN

Minnesota will receive $68 million in federal funds from the National Electric Vehicle Infrastructure (NEVI) Formula Program over five years. This initially targets the deployment of DCFCs on the state's Alternative Fuel Corridors (AFCs) which includes I-35 and I-94, every 50 miles and providing at least four 150kW chargers. The plan is focused on the light duty vehicle sector, but NEVI funded fast chargers could be used by MHD vehicles, especially those in lower weight vehicle classes. Larger vehicles, however, may have difficulty accessing the chargers if the sites hosting the chargers are not designed to accommodate larger vehicles.

MINNESOTA CLEAN TRANSPORTATION STANDARD

The 2023 legislature established the Clean Transportation Standard Work Group to prepare recommendations for implementing a Clean Transportation Standard (CTS), including development of performance-based incentives to reduce carbon pollution from all transportation fuels including gasoline, diesel, biofuels and electricity.

The goal of a CTS is to significantly reduce transportation emissions, create new jobs, attract new investments and reduce air and water pollution in Minnesota. The work group will make recommendations on fuel pathways and determine impacts to jobs, fuel prices, rural and agricultural economic development and environmental justice for legislation in the 2024 legislative session to reduce the carbon intensity (CI) of all fuels used in transportation.

NATIONAL ALTERNATIVE FUEL CORRIDORS

The Fixing America's Surface Transportation Act of 2015 required the U.S. Department of Transportation (DOT) to designate national alternative fueling corridors (Title 23, United States Code, Section 151). The Bipartisan Infrastructure Law (BIL), enacted as the Infrastructure Investment and Jobs Act, amended Section 151 to update the requirements related to the designation of national alternative fueling corridors. The BIL, in Section §151(d), requires that DOT establish a recurring process to regularly update and redesignate the corridors. In accordance with 23 U.S.C. 151(a), corridor designations must identify near- and long-term needs for and location of, EV charging, hydrogen, propane and natural gas fueling infrastructure at strategic locations along major national highways.

CONSIDERATIONS IN REDUCING VEHICLE EMISSIONS

A ZEV powered by 100% sustainable fuels, would be the most appropriate vehicle to use from a GHG reduction perspective. This chapter of the report identifies several challenges and considerations in adopting cleaner vehicles, both ZEV and those vehicles suing fuels with reduced carbon intensity. It recognizes that the cost of equipment, such as trucks and supporting fuel infrastructure and fuel, are a vital consideration in the transition to cleaner and greener forms of transportation, in a competitive market, where cost of transportation services is one of the most significant factors in decision making. Identifying these challenges is key to the development of climate change initiatives and strategies and realize those opportunities to make significant progress in addressing climate change associated with activities

VEHICLE DUTY CYCLE

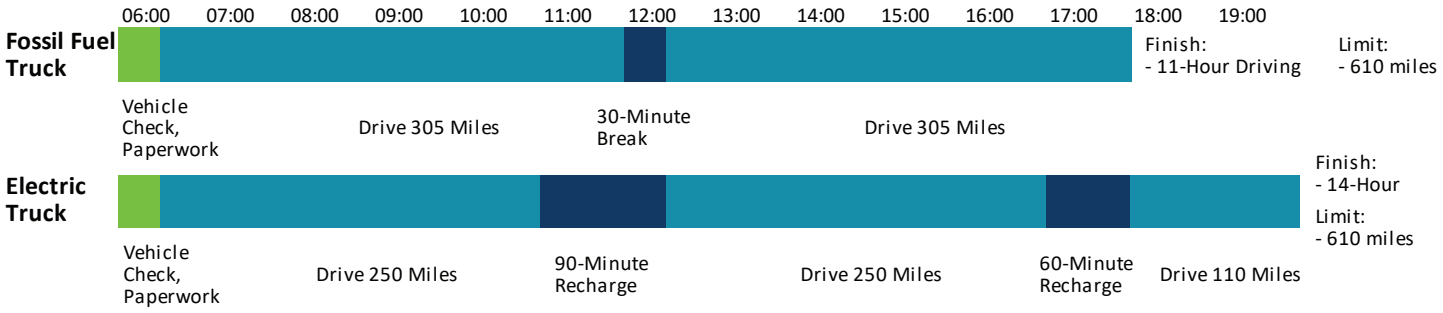
Successful deployments of low or zero emission MHD vehicles are when the vehicle duty cycle meshes with the capabilities of the technology. Distance traveled, elevation, driving conditions, payload and how long the vehicle is on the road and in the depot, will influence what routes can be transitioned to alternative fuel technologies and the type of charging or fueling infrastructure that is most applicable and cost effective.

RANGE

Range is a key consideration when comparing alternative fuel vehicles with traditional diesel. A Class 8 tractor trailer equipped with a 120-gallon tank could travel around 600 miles, while a truck equipped with two 150-gallon tanks could travel up to 1,500 miles. Alternative liquid fueled vehicle may have similar ranges to their diesel counterparts, but availability of the right type of fuel also influences distance and routes traveled. The median range of battery electric trucks available in the US marketplace is approximately 160 miles.

This range suggests most day trips, such as those associated with regional and local distribution of food and beverages, package deliveries, some waste collection rounds, some drayage trips from intermodal yards, some school bus and transit routes, would have routes that are suitable for battery electric trucks. Long-haul trucking with routes averaging 400-600 miles per day, would be challenging to adopt with today's class 8 battery electric trucks, as most of them will require multiple charges in one day. This is illustrated in Figure 6-3 below which compares the operating timelines associated with a fossil fuel-powered truck and an electric truck with a range of 250 miles.

Figure 6-3: Example MHD Duty Cycles



These trips assume an average traveling speed of 55 miles per hour. After 250 miles, the electric truck driver would recharge, taking 90 minutes, followed by another 250 miles. Another recharge time of 60 minutes is followed by a final 110 miles of driving. After having travelled 610 miles, the electric truck driver must stop driving at 8pm because they are at the limit of both their 14-hour duty limit and 11-hour driving limit. The fossil fuel-powered truck, however, has also driven 610 miles and must stop due to the 11-hour driving limit. It is recognized this is a simplistic overview of a variety of factors, but it does demonstrate the impact of current Class 8 electric trucks on the long-distance trucking sector.

Even though longer range battery electric trucks (such as Tesla) have been introduced, the numbers are small. Furthermore, adding range to battery MHD vehicles requires heavier batteries, which despite the additional 2,000 pound weight allowance for battery and natural gas vehicles (bringing the overall gross vehicle weight for a class 8 truck to 82,000 pounds), would impact the revenue payload that can be transported. Further technological innovation is required to produce batteries capable of powering trucks over longer ranges but minimizing increase in battery weight; and for batteries to accept a very high charging rate to reduce charging time and for those chargers to be widely available.

Reducing the charging time is also a key factor for those trucks that require charging during a journey and to maximize the throughput of trucks that can be charged at a charging facility. To meet future needs, such as enroute charging, charging facilities will need to charge at speeds of greater than one megawatt. The Megawatt Charging System (MCS), capable of peak charging power of 3.75 megawatts (equivalent to an average power demand of 3,200 homes) was launched in 2022 and is designed to be a global standard, including the standardized location of the vehicle charging port on the left-hand side of the vehicle.

FUEL AVAILABILITY AND CERTAINTY OF SUPPLY

MHD vehicle operators need certainty that their vehicles can be refueled or recharged, and the infrastructure is available to them when they need it. With diesel, that certainty is generally guaranteed due to the plentiful supply of the fuel, the established and robust distribution network supplying the fuel and the network of dispensing facilities. Alternative liquid fuel supply presents a different dynamic in that the facilities are not necessarily as widespread, or available as traditional diesel. Some alternative fuels can share the same infrastructure (pipes and storage tanks as traditional fuels) while others cannot. Fuel availability will influence the types of routes and distribution networks operators choose to implement cleaner vehicles on. For some fuels, such as B100 biodiesel, some elements of the fuel distribution infrastructure including production, exist with the state. According to the 2017 report, Economic Impact of the Minnesota Biodiesel Industry, 96% of Minnesota's biodiesel consumption of 74 million gallons was produced within the state. For fleets domiciled in the state and whose routes are based on returning back to a depot after every shift, such as waste collection, MNDOT fleet and other government agencies who may have on site fuel storage and dispensing facilities, alternative fuels such as RNG and biodiesel may be more cost effective short and mid-term solutions to reduce emissions from fleet activity.

In terms of charging electric MHD vehicles and especially those engaged in timed deliveries and delivery rounds, the use of publicly accessible chargers does not give the certainty fleet operators require. Driver's salary and benefits account for the largest costs associated with operating a truck and so keeping them productive is key to an efficient operation. Waiting in a queue and the time taken to recharge a vehicle, outside of a mandatory break, would not be cost effective and could jeopardize delivery windows and fulfilling the number of deliveries and collection in the delivery round. To have this guaranteed charging ability, fleet operators will therefore install charging infrastructure in their depots, garages or fleet bases and make use of the downtime associated with the vehicles that return to base every day and can be charged, typically overnight, until the next delivery round. One way around the certainty challenge is for EV charging providers to provide access to publicly accessible charging facilities on a reserved basis, using online booking/reservation systems. Another factor in this decision making is whether the fleet operator owns their fleet depot or garage. If the site is leased, the site owner would need to be involved and if the site doesn't have a long lease, it may not be economically viable for the operator to invest in the infrastructure necessary for charging vehicles.

A significant proportion of the MHD fleet is made of vehicles in the lower weight classes of Class 2b and 3 and includes larger pickup trucks and vans. Operators of these vehicles may be independent contractors who do not have a fleet or depot base. They could install charging equipment at home, but this may be complicated if they live in a multi-occupancy building or where home-based charging is not possible. Publicly accessible chargers that will be used to charge autos can support these users.

To support FCEV, hydrogen must be readily available and cost effective. Reducing production and distribution costs are key as is producing greater volumes of green hydrogen. According to the Alternative Fuels data Center, there are no publicly available hydrogen fueling facilities in Minnesota.

COST OF ZERO EMISSION VEHICLES AND CHARGING INFRASTRUCTURE

Zero emission vehicles are expensive when comparing initial capital costs with traditional fueled vehicles. A diesel-fueled school bus costs circa $100,000, but its battery equivalent with charging infrastructure is about $420,000 and heavy-duty BEVs can be between two to four times more expensive than their equivalent diesel counterparts. However, ZEVs typically have lower fuel and maintenance costs. Despite a closing gap in total cost of ownership (TCO) between MHD conventional fueled vehicles and ZEVs, the current higher capital cost of ZEVs represents a barrier to adoption associated with certain operations within the MHD sector. One challenge is access to finance. Companies across the MHD spectrum, but especially smaller companies and owner operators, may be challenged to access funding at affordable rates or finding sufficient funding or down payments to invest in new, higher cost ZEVs. The lack of an extensive used after market for MHD ZEVs means that for companies who typically purchase used, but cheaper vehicles, that option is not readily available.

Charging infrastructure also requires financing and some indicative costs are estimated below:

- Residential chargers may cost $500, plus installation.
- Level 2 commercial chargers may cost $20,000.
- Approximately $100,000 to install a 50kW DCFC (but costs are declining)

The user typically pays for the charging infrastructure and other construction as necessary to install the chargers such as cabling and conduits. If any electricity distribution system upgrades are required, the costs associated may also be passed to the electricity consumer. However, make ready programs, which can be used to support the financial costs of grid upgrades may be offered by the consumer's electricity provider and Charging as a Service (CaaS) business models, where a third party procures, installs and operates the charging infrastructure and the fleet operator pays a fee to the CaaS operator, would help alleviate the upfront capital costs related to charging infrastructure. CaaS could be deployed as follows:

- A fleet operator has CaaS deployed in their depot/garage on an exclusive basis.
- A CaaS operator is installed in a depot, but unused capacity is used to supply other fleet operators.
- A CaaS supplier has their own facility and offers charging services to multiple operators.

Examples of commercial medium and heavy-duty charging business models include:

- **Greenlanes:** In April, 2023, Daimler Truck North America announced a $650 million joint venture with NextEra Energy and Blackrock Alternatives to develop and operate a network of charging facilities followed by hydrogen facilities on freight routes on the west and east coast and also in Texas, using existing infrastructure and amenities and adding greenfield sites.
- **Volvo and Pilot Company:** In November 2022, Pilot and Volvo Group plans to create a network of chargers for medium and heavy-duty trucks at select Pilot and Flying J truck stop locations across the country. There are 6 Pilot and Flying J facilities in Minnesota.

- **WattEV:** In May 2023, WattEV opened the largest public truck charging station in the nation, with 26 charging bays at the Port of Long Beach. It is also aiming to open three other charging facilities in California as well as other locations across the nation.

Another business model is Truck-as -a-Service (TaaS). This one stop shop service is where a driver or company pays a fee for the use of an electric truck, typically by the mile or by a route. The charge paid by the driver or company includes use of the vehicle, cost of charging and maintenance. A driver collects the vehicle, operates the truck and returns to the fleet location where the TaaS operator charges that truck ready for its next trip. The usage fee is typically higher than if the driver or company were to own and operate its vehicle and pay for charging infrastructure, but it would avoid high upfront vehicle and charger acquisition costs.

ELECTRIC GRID SYSTEM, UTILITIES AND COST

The electric grid system generates, transmits and distributes electricity from where it is sourced to where it is consumed. New electricity loads, such as those associated with charging MHD vehicles requires planning and liaison with the supplying utility to ensure capacity within the electrical grid system is available. During the early phases of EV adoption, it is expected that the distribution part of the grid system (the infrastructure that connects transmission lines to the consumer's facility) is likely to experience most requirements for upgrades.

Grid upgrades require time and are likely to be dependent upon existing utility workload and availability of components such as transformers. New rights of way may also be required and new components such as transformers may be required. Some or all of the upgrade costs maybe passed to the consumer. How much of this cost and in what format it could be reimbursed back to the utility, will depend upon each utility and its regulating authority. Some utilities have make-ready programs which assist consumers with the upfront costs of bringing additional power to their location.

However, fleets are unlikely to transition all their vehicles to electric at one time, the transition is expected to be gradual and in line with fleet renewal programs. A fleet could therefore add a number of electric vehicles to their fleet each year, potentially requiring incremental grid upgrades to facilitate the increased electrical loads.

FUNDING

While the total cost of ownership of alternative fueled vehicles may be closing with their fossil fuel counterparts, the upfront capital costs of vehicles, especially battery and FCEV trucks and associated charging and fueling infrastructure remains a barrier to widespread adoption. Some companies may be prepared to deploy these more expensive vehicles in their fleet to satisfy sustainability goals, while others cannot afford the additional expense. To help bridge the financial gap, grant funding can be used. However, it is recognized that many grant funding is limited and programs oversubscribed. Ensuring Minnesota can attract as much grant funding as possible will be a key factor in accelerating the transition to more sustainable fleet operations.

POTENTIAL GOALS AND STRATEGIES

There are multiple ways to reduce GHG emissions associated with the MHD vehicle sector in Minnesota, including the increased use of lower carbon fuels and zero emission vehicles. This section outlines potential short- and long-term goals and strategies that could be pursued by MnDOT and other partners.

Short-term goals and strategies are intended to be implemented over the next four years, between 2024 and 2028 and focus on strategies that are more achievable in the given timeframe. Many of the recommendations focus on local and regional MHD operations. Long-term goals are intended for implementation between 2029 and 2025 and generally focus on strategies that require higher levels of funding and coordination with other partners and stakeholders. Where possible, the goals have also been developed to be in alignment with the 2022 SMTP goals and strategies. Specifically, many of the goals and strategies outlined in this working paper address the Healthy Equitable Communities and Climate Action objectives noted in the SMTP.

POTENTIAL CONSIDERATIONS FOR 2024-2028

ISSUES AND TRENDS

- Fuels such as biodiesel, renewable diesel, ethanol, natural gas, renewable natural gas and propane represent other pathways to reduced emissions, but do not achieve the same emission benefits as zero emission vehicles powered by renewable electrical energy and green hydrogen. Some of these fuels could be sourced and processed within Minnesota. The technology exists today and could have a role to play in reducing emissions from certain fleets based and operating within Minnesota e.g., municipal and government agency fleets and fleets solely operating and returning to a single depot location.

- Capital costs of heavier battery electric vehicles such as Class 7-8, are likely to remain more expensive than diesel, but the cost differential is likely to reduce over time.
- EPA Phase 3 emissions standards for model year 2027 are currently being proposed and are estimated to result in a reduction in emissions of CO2 by 1.8 billion metric tons from 2027 through 2055.
- Battery electrification in the MHD sector is likely to be focused in local and regional delivery and distribution fleets, where the total cost of ownership begins to align with fossil fueled vehicles. Long distance electrification is likely to remain challenging due to a combination of factors including vehicle range, slower charging speeds, vehicles costs and challenges in construction of charging facilities.
- Fuel cell trucks will be commercially produced, but supply of hydrogen to the transportation sector, at a comparative cost with diesel, is likely to remain challenging.

GOALS

- Target the most polluting vehicles for removal from the statewide MHD inventory and replacing them with cleaner trucks.
- Secure as much funding for sustainable truck initiatives as possible.
- Facilitate and support the introduction of electrified vehicles in the regional and local distribution fleets based in the Twin Cities area, especially those located in and adjacent to areas of environmental justice and adverse air quality.
- Improve the environmental performance of Minnesota's public sector fleet.

STRATEGIES

REMOVE OR REPLACE OLDER MHD VEHICLES FROM SERVICE

Accelerate the reduction in older vehicles (pre-2010) in the Minnesota vehicle inventory by funding Diesel Retrofit/Replacement Programs. Potential mechanisms and supporting strategies include:

- Implement incentive, retrofit, or replacement programs. Schemes such as New York City's Clean Truck Program, Houston's Heavy-Duty Diesel replacement program and Minnesota's Volkswagen settlement, provide rebates for scrapping an older, program eligible vehicle and replacing it with a newer truck and cleaner technology including rebate incentive funding for all-electric, or EPA emission compliant alternative fueled (compressed natural gas, diesel-electric hybrid, plug-in diesel-electric hybrid) and diesel replacement trucks varies from $12,000 to $185,000 in NYC. Houston's program provides 50% of the incremental cost of diesel-powered equipment and 75% alternative fueled equipment such as LNG, CNG, electric etc.
- Programs should be reserved for replacing pre-2010 vehicles only, to ensure the most polluting vehicles are removed from use.
- Programs could also be prioritized at fleets based in environmental justice areas, overburdened communities, communities of color and health sensitive communities, or operating predominantly in these communities. An enabling strategy would be to map existing freight corridors, freight related vehicle generators such as warehousing, distribution centers and intermodal rail yards and sensitive land uses to help inform decision making related to the prioritization of funding and where to target limited resources. Reducing the number of older, most polluting MHD vehicles based or operating in these communities should be a key priority.

- Programs should also require grant recipients who receive diesel vehicles to commit to other efficiency measures including anti-idling and driver training.
- Many grant programs are oversubscribed. Securing as much funding as possible and "stretching" the available funding, such as funding cheaper level 2 chargers, rather than more expensive fast chargers.
- Support early adoption of electric vehicles. The Agricultural Growth, Research and Innovation (AGRI) Biofuels Infrastructure Grant is an example, but this grant is focused on equipment to dispense biofuels to the public. A biofuels grant to support the acquisition and or conversion of existing vehicles using biodiesel, ethanol or RNG could support the introduction of these alternative fueled vehicles into Minnesota's truck fleet.

DEVELOP A ZERO EMISSION AND CLEANER MHD VEHICLE TRANSITION PLAN FOR PUBLIC FLEETS.

One example is the Metro Transit Zero-Emission Bus Transition plan which required the Metropolitan Council to develop an electric vehicle transition plan and revise the plan every five years. A public fleet vehicle transition plan would identify the vehicle duty cycles that could be electrified or use other lower carbon intensity fuels for those vehicle duty cycles that are difficult to electrify, as well as considerations for provision of electrical capacity, charging infrastructure, availability and cost of vehicles and sourcing of alternative fuels. This could also include an inventory of pre-2010 trucks operated by state, local and other partner agencies and identify the replacement program for these vehicles. The plan would also consider how public sector contracts would include requirements for zero emission or cleaner fuels such as Minnesota produced biodiesel, to ensure public sector supply chains are reducing their GHG emissions.

SUPPORT A CHARGE AS A SERVICE FACILITY OPERATING BY 2028 IN THE TWIN CITIES METROPOLITAN AREA.

To support the early adoption phase of electric vehicles in the MHD sector, a Charge as a Service (CaaS) facility should be developed and operated within the Twin Cities Metro area located in, or in close proximity to, areas where fleets that are suitable for electrification (operating local and regional distribution routes returning to the same location at the end of the delivery round) are located, such as Egan and Mid City Industrial. The CaaS facility provides charging for multiple fleet users and allows fleet operators who are trialing electric vehicles in their operations to avoid upfront capital costs and support fleets with a desire to use electric trucks who might have utility connection challenges until the challenges are resolved. The introduction of a CaaS operation will require public sector support and funding, as well as close coordination with utilities. MNDOT could issue a Request for Information (RFI) to assess the viability and market potential for a private CaaS operator in the Twin Cities region and then assess funding requirements and methods to select a private company that would develop and operate the facility.

DEVELOP A SUSTAINABLE TRUCK COORDINATION/WORKING GROUP.

Bringing various stakeholders such as utilities, other alternative fuel providers, truck dealerships and fleet operators, Minnesota government departments such as the Minnesota Pollution Control Agency together can help direct funding, identify barriers and solutions, share successes and case studies and support the transition to more sustainable truck operations. This group could be modelled on the Minnesota Freight Advisory Committee (MFAC) or be part of the MFAC with a Sustainable Truck Sub-committee. This group would also have the potential to be proactive and identify recipients for grant funding and assist with the grant funding application.

SUPPORT IMPROVED DATA COLLECTION

Work with departments such as DPS to develop methods to analyze state databases to assess the age, vehicle class (FHWA or National Highway Traffic Safety Administration (NHTSA) classification), engine/fuel type of trucks registered and operated in the state, including ZEV

COORDINATE WITH UTILITY COMPANIES

Utility companies are a key component in facilitating the transition to electric trucks. Recognizing that this transition will present challenges to both utilities and fleet operators there are a number of actions that could be adopted to help streamline the adoption process, reduce costs and time for deploying charging private, depot-based charging infrastructure. These include:

- Establishing a point of contact within utilities for MHD fleets
- Develop guidance documents to help MHD operators understand and navigate the various processes to plan, design, install and operate charging infrastructure.
- Develop EV-specific rate designs, including time of use programs.
- Access to charging infrastructure make ready programs.
- Proactively engaging with MHD fleets to assess and uptake of MHD vehicles and to help prepare the grid for increasing fleet electrification.

CHAPTER 7

FREIGHT INVESTMENT PLAN AND IMPLEMENTATION

Funding for freight projects originates from federal and state government sources and are both formulaic and discretionary. Each funding program, including the National Highway Freight Program (NHFP), has requirements for funding eligibility. Projects selected for investment for federal funding must meet specified criteria established in the IIJA.

There are several federal discretionary programs by which all states compete for limited funding. Minnesota must submit grant applications specified timeframes, which articulate the business case and substantiated need for each project. The process by which projects are identified, selected and prioritized for funding investment in Minnesota are discussed in this chapter.

CHAPTER CONTENTS

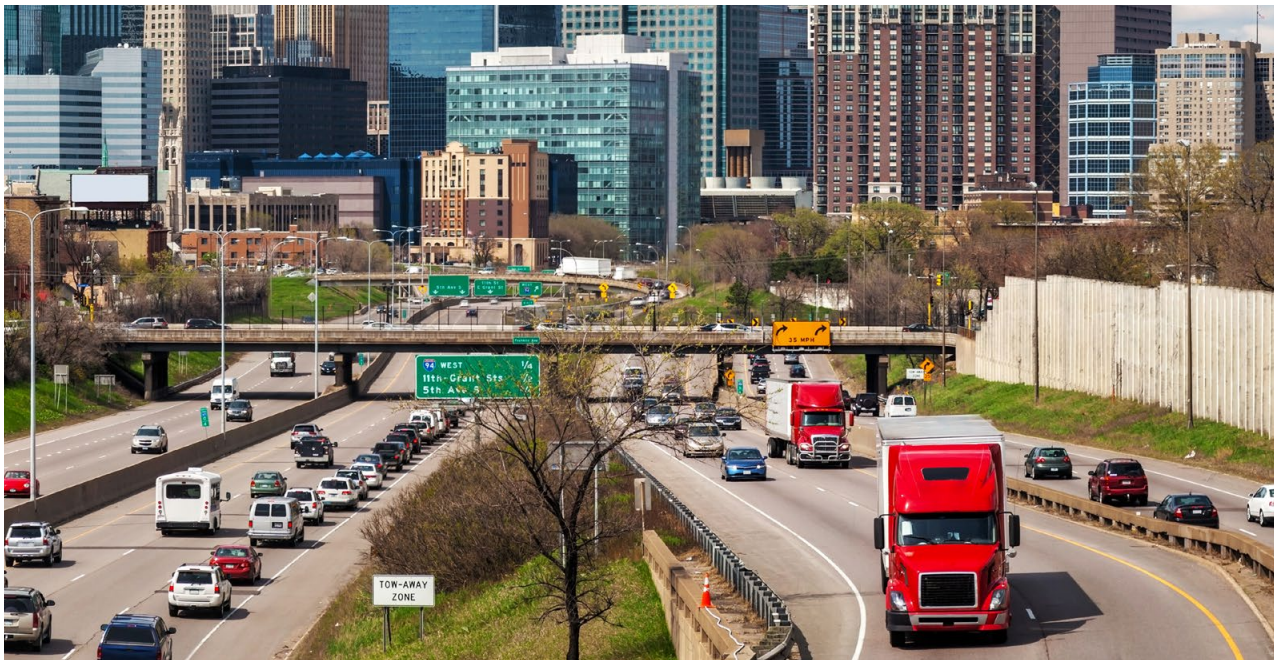
OVERVIEW

The Freight Investment Plan identifies public freight investments in Minnesota funded through the National Highway Freight Program (NHFP) and other capital programs that will support MnDOT's Minnesota GO Vision, the goals of the Statewide Multimodal Transportation Plan (SMTP), the goals of the Minnesota State Freight Plan and work towards implementing the Freight Action Agenda. The purpose of the Freight Investment Plan is to provide an overview of these investments; describe MnDOT's approach to identifying projects to invest in; and coordinate federal, state and local investments on the freight network over the next ten years. This Freight Investment Plan builds on existing statewide policy and was developed to provide a consistent programmatic approach for the Minnesota Highway Freight Program (MHFP).

The MHFP was developed to allocate federal formula funds appropriated to the state through the NHFP. The NHFP was first created by the Fixing America's Surface Transportation (FAST) Act and was continued in the Infrastructure Investment and Jobs Act (IIJA). In accordance with federal law (49 U.S.C. 70202), the Freight Investment Plan is required for the state to obligate funds from the NHFP to projects identified for funding by the state. The plan complies with federal law by listing projects funded with federal money for five state fiscal years under the FAST Act (state fiscal years 2016-2020) and eight state fiscal years under the IIJA (state fiscal years 2021-2028). Table 7-1 shows how much NHFP funding was, and is, available under the MHFP.

Table 7-1: 2023-2024 National Highway Freight Program Funds in Millions each state fiscal year

2023	2024	2025	2026	2027	2028	2029	2030
$14.6	$22.2	$22.2	$21.6	$21.6	$21.6	$22.6	$22.6



STATEWIDE FREIGHT SYSTEM NEEDS

Following the adoption of the 2018 Minnesota State Freight Plan, the Minnesota Department of Transportation (MnDOT) began the task of completing district-level freight plans for each of the eight MnDOT districts. The overall process for each of the district plans is summarized in Figure 7-1. Potential freight needs were identified through a review of safety, mobility and condition issues, as well as through the use of detailed stakeholder interviews and feedback. The needs were ranked to determine the most critical freight system investments prior to making final recommendations. These recommendations were reviewed with MnDOT OFCVO and District staff prior to making final plan recommendations and advancing the top scoring freight system investments.

MANUFACTURERS' PERSPECTIVES STUDIES

Each of the District Freight Plans relied on previous local and regional studies to identify issues and needs identified by freight stakeholders. The predominant source of these stakeholder-identified issues was the Manufacturers' Perspectives Studies. These district-based studies were started in 2014 with the express goal of better understanding the needs and issues of local manufacturers and to forge strong, ongoing relationships between MnDOT and local business communities. District 8 was the first district to complete one of the studies. The project team conducted 125 one-on-one interviews with manufacturers in District 8 using a standard questionnaire and interview process. The results of these interviews were geospatially coded and included descriptions of various needs and issues identified by the businesses.

- Metro District / Urban Freight Perspectives Study (Phase 2) - 2020-2021
- District 3 / Central Minnesota (PDF) - 2019-2020
- District 7 / South Central Minnesota (PDF) - 2018-2019
- Metro District / Greater Twin Cities (Phase 1) (PDF) - 2018-2019
- District 6 / Southeast Minnesota (PDF) - 2018
- District 1 / Northeast Minnesota (PDF) - 2017
- District 2 / Northwest Minnesota(PDF) - 2016
- District 4 / West Central Minnesota (PDF) - 2015
- District 8 / Southwest Minnesota (PDF) - 2014

All of the District Freight Plans were scheduled such that the Manufacturers' Perspectives Studies has been recently completed prior to the start of the plan development. This timing ensured that each plan could rely on a solid framework of stakeholder engagement and issue identification to compare and contrast to the data-driven assessments noted previously.

Figure 7-1: District Freight Planning Process

FREIGHT NEED SCORING PROCESS

Freight needs in each district were identified using the three categories of safety, mobility and condition as well as through stakeholder outreach. A combined score was then calculated to account for any overlap between these issues. Finally, a truck volume score was applied to calculate the final adjusted score and apply a need rank. An example of the process from District 2 is shown in Table 7-3 below. The top ranked issue is based purely on a high safety score bolstered by an equally high truck volume score. Other highly ranked projects (D17, D3, S1) include scores for both safety and mobility. Note that while each district was allowed some degree of leeway in determining scoring thresholds and other factors that would influence the overall need scores and rankings, all districts largely following the overall scoring approach using scoring categories of safety, mobility, condition, truck volume and stakeholder identification.

ESTIMATING TOTAL STATEWIDE FREIGHT NEEDS

An estimate of the total value of freight needs in the state was developed using a combination of the freight needs identified during the District Freight Plans and average unit costs for construction of the improvement identified to address those needs. Table 7-2 provides a summary of the assumptions and the basic calculations used to develop the final estimate. After carrying through these calculations, the total estimated costs of implementing the needs are $255 million. It is assumed that these needs represent a snapshot in time that estimates the potential freight needs over a five-year outlook period. Therefore, to expand these costs to a 20-year forecast total, the estimated costs were multiplied by four to achieve a 20-year forecast freight needs estimate. Some of the key assumptions that are inherent in this estimate are:

- No consideration for inflation or other time discounts of money.
- The assumption that additional freight needs will develop over time based on normal wear and tear on the roadways and greater need to handle expanded freight traffic.

Table 7-2: Final Freight Need Cost Estimate Summary (5-year outlook)

Need Type	Total Statewide Needs	Point Count or Segment Miles	Percent Assumed for Implementation	Unit Cost	Total Cost
Safety: Point	393	393	8.4%1	$705k (Lump Sum)	$23,273,460
Safety: Segment	254	1,399	7.9%1	$439k (Per Mile)	$48,518,719
Mobility: Point	148	148	6.1%1	$10.9M (Lump Sum)	$98,405,200
Mobility: Segment	302	1,422	5.0%2	$562k (Per Mile)	$39,958,200
Condition: Point	109	109	5.0%2	$6.4M (Lump Sum)	$34,880,000
Condition: Segment	61	274	5.0%2	$0.7M (Per Mile)	$9,590,000
TOTAL (5-Year)	**1,267**	-	-	-	**$254,625,579**
TOTAL (20-year)					**$1,018,502,316**

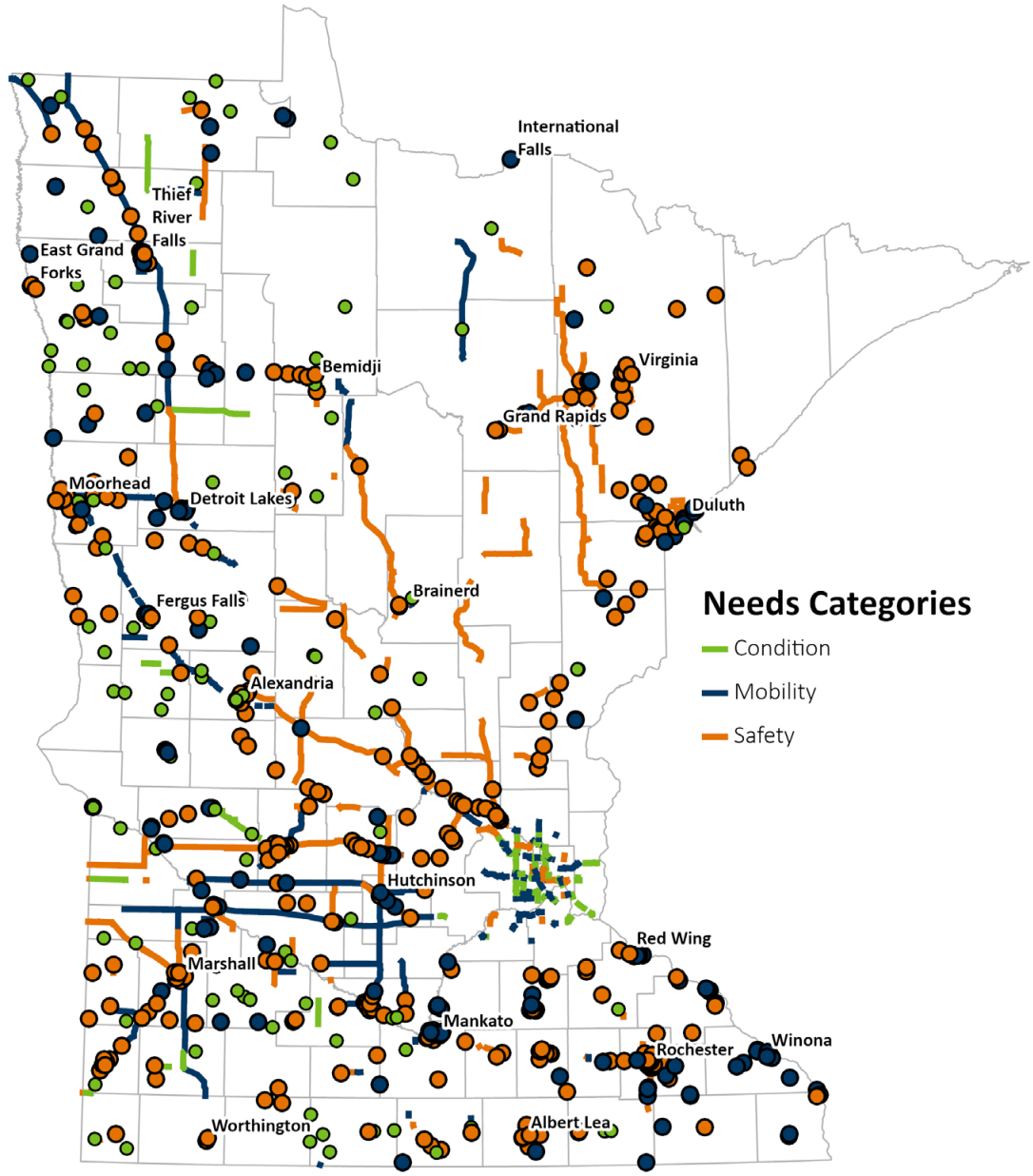
[1] - Based on proportions selected for concept development

[2] - Based on minimum assumed proportion

Table 7-3: Example Scoring Result, District 2 Freight Plan

Issue	Truck Volume		Safety		Mobility		Condition		Total		Adjusted Total	
ID	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
D12	100%	1	100%	1	NA	NA	NA	NA	100%	1	100%	1
D14	90%	2	100%	2	NA	NA	NA	NA	93%	2	93%	2
D17	80%	3	100%	7	40%	59	NA	NA	75%	3	75%	3
D3	60%	9	100%	6	60%	44	NA	NA	70%	4	70%	4
S1	50%	14	20%	51	80%	22	NA	NA	50%	21	67%	5

Figure 7-2: Identified Statewide Freight Needs



MINNESOTA HIGHWAY FREIGHT PROGRAM DEVELOPMENT

The FAST Act and the NHFP provide flexibility to the states in determining how each state will spend NHFP funding. MnDOT developed a centralized competitive solicitation, the MHFP, to solicit projects from a wide variety of state and local partners.

The MHFP was developed at the recommendation of local stakeholders on the Statewide Freight Investment Committee and through input received from other groups, such as the Minnesota Freight Advisory Committee, Minnesota-based Metropolitan Planning Organizations (MPOs) and Regional Development Organizations (RDOs). MnDOT, with input from these stakeholders, designed the application evaluation process to prioritize investments that align with the Minnesota GO Vision, the SMTP, the goals and objectives of the State Freight Plan and its Freight Action Agenda.

Applications are evaluated according to scoring criteria. MnDOT and freight stakeholders worked to develop criteria that support the Minnesota GO Vision, the objectives of the SMTP, the goals and objectives of the Minnesota State Freight Plan and work towards implementing the Freight Action Agenda. Mobility is a key theme across these plans—moving goods and services to people effectively and efficiently is key to the success of the state across economic, social and environmental dimensions.

MHFP criteria score projects based on mobility through performance measures such as Heavy Commercial Average Annual Daily Traffic (HCAADT) counts, Truck Travel Time Reliability and if the project removes a barrier or upgrades a roadway to 10-ton standards. Safety is also a necessary theme to the success of the state freight and state transportation systems. MHFP criteria score project safety by looking at crash rate reductions, addressing sustained crash locations and addressing safety issues identified in safety plans. Unique to the MHFP, MnDOT also evaluates proposed projects on environmental justice impacts. Within the most recent round of the MHFP solicitation, MnDOT added a new Sustainability and Emissions scoring criterion and increased available points for the Environmental Justice criterion. An increased importance on these criteria contributes to the State Freight Plan's goal of protecting the environment and communities and aligns with the Minnesota GO Vision and SMTP. MnDOT's Office of Freight and Commercial Vehicle Operations (OFCVO), which facilitates the solicitation, coordinated with MnDOT's Office of Sustainability and Public Health (OSPH) and MnDOT leadership to develop questions for those criteria and how answers should be scored.

Since 2017 there have been three formal MHFP solicitation rounds. This Freight Investment Plan discusses development of the third MHFP solicitation (state fiscal years 2026-2028) and its resulting investments.

MnDOT developed a centralized competitive solicitation, the MHFP, to solicit projects from a wide variety of state and local partners.

STATEWIDE FREIGHT INVESTMENT COMMITTEE

The MHFP was designed via recommendations from the Statewide Freight Investment Committee. The Statewide Freight Investment Committee acts as a review and oversight body; represents a wide array of interests; discusses freight investment strategies, policies and program operation; and recommends decisions to MnDOT leadership for approval. These investment recommendations include investments funded through the MHFP. The Committee's membership includes MnDOT planning, programming, policy, state aid and functional area staff, as well as representatives from Metropolitan Planning Organizations (MPOs), Regional Development Organizations (RDOs), counties, cities, the Federal Highway Administration (FHWA) and the Chair of the Minnesota Freight Advisory Committee (MFAC). The variety of organizations represented by the Committee is reflective of the breadth of goals and objectives of the State Freight Plan.

For the third round of the MHFP, MnDOT met with the Freight Investment Committee six times, as well as internal MnDOT committees, to develop this round's solicitation and recommend selected draft awards.

APPROACH PRIOR TO THE THIRD ROUND OF MHFP

The FAST Act was signed into law in December 2015, making the NHFP funding immediately available to Minnesota for state fiscal years 2016 through 2020. Since December 2015 was already halfway through state fiscal year 2016, MnDOT chose to initially allocate some of the funding quickly, applying it to known high priority freight-specific projects. During this time OFCVO convened groups of stakeholders including re-creating the Freight Investment Committee to provide input into how the NHFP funds should be invested as shown in Table 7-4. Based on local stakeholder input a desire to provide flexible funds across the state and provide opportunities for investment on local networks was the desired outcome. From this sequential approach the Minnesota Highway Freight Program was created.

In 2017, MnDOT then held the first round of MHFP solicitation for projects in state fiscal years 2019-2022. In 2020, MnDOT held the second round of MHFP solicitation for projects in state fiscal years 2022-2025.

Table 7-4: Membership of the Statewide Freight Investment Committee

Name	Organization	Representing
Aaron Tag	MnDOT Metro District	Twin Cities MnDOT District
Ashley Jacobson	MnDOT Bridge Office	Bridge Program Planning
Andy Hubley	Arrowhead Regional Development Commission	RDOs
Brad Utecht	MnDOT Office of Transportation System Management (OTSM)	Statewide Investment Planning
Brian Gage	MnDOT OTSM	Statewide Capital Programming
Brian Sorenson	MnDOT Office of Traffic Engineering (OTE), Safety and Technology (OTST)	Traffic Engineering
Brianne Nelsen	Upper Minnesota Valley Regional Development Commission	RDOs
Bryan Anderson	MnDOT District 1	Greater MN MnDOT District Planners
David Burns	Metropolitan Council	Twin Cities MPO
Deb Deluca	Duluth Port Authority	Chair of the MFAC
Derek Leuer	MnDOT OTSTOTE	Traffic Engineering
Jason Craig	MFAC	Vice Chair of the MFAC
Jennifer Wiltgen	MnDOT Metro District Office of Advancing Equity	Twin Cities MnDOT District
Jon Huseby	MnDOT District 8 Engineer	Greater MN MnDOT Districts
Jon Solberg	MnDOT Sustainability, Planning and Program Management (SPPM) Division	Division and Agency Leadership
Kenneth Johnson	MnDOT OTSTOTE	Traffic Engineering
Lisa Freese	Scott County	Twin Cities Counties
Mike Wenholz	Arrowhead Regional Development Commission	RDOs
Nick Klisch	Cottonwood County	Greater Minnesota Counties
Nicki Bartelt	MnDOT Bridge Office	Bridge Program Planning
Paige Melius	ARDC	RDOs
Patrick Wiedemann	MnDOT OTSM	Statewide Capital Programming
Peter Dahlberg	MnDOT OFCVO	MnDOT Freight Office
Philip Schaffner	MnDOT OTSM	MnDOT OTSM Leadership
Ron Chicka	Duluth-Superior Metro Interstate Council	Greater Minnesota MPO
Scott Mareck	Federal Highway Administration (FHWA)	Technical Services Team Leader, FHWA Minnesota Division
Shaker Rabban	MnDOT OTSM	Statewide Asset Management Planning
Shelly Meyer	MnDOT OFCVO	Freight Office Leadership
Shiloh Wahl	MnDOT District 4 Engineer	Greater MN MnDOT Districts
Siri Simons	MnDOT Office of Sustainability and Public Health (OSPH)	Sustainability and Emissions
Steve Bot	City of St. Michael	Minnesota Cities and City Engineers

Table 7-4: Membership of the Statewide Freight Investment Committee, continued

Name	Organization	Representing
Steve Elmer	Metropolitan Council	Twin Cities MPO
Steve Peterson	Metropolitan Council	Twin Cities MPO
Susan Wimberly	FHWA	Deputy Division Administrator, FHWA Minnesota Division
Tad Erickson	Region Five Development Commission	RDOs
Ted Schoenecker	MnDOT State Aid	State Aid Leadership
Tim Sexton	MnDOT SSPM Division	Division and Agency Leadership
Torey Hunkus	MnDOT OFCVO	MnDOT Freight Office

THIRD ROUND OF THE MHFP SOLICITATION

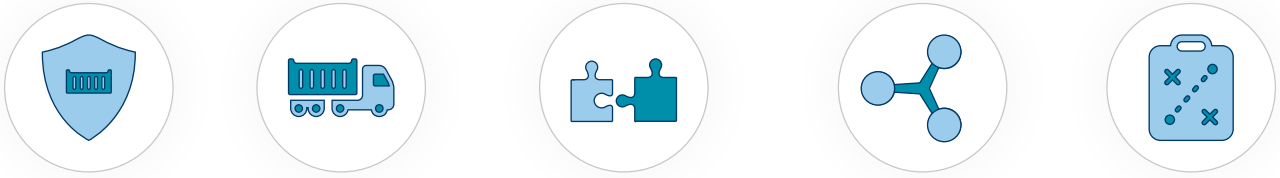
In 2023, MnDOT held the third round of MHFP solicitation for projects in state fiscal years 2026-2028. Awards were announced in early 2024. About $63 million was available in this solicitation. MnDOT planned approximately $21.6 million per state fiscal year, plus $5 million per year from matching state funds. The minimum project cost threshold was $500,000 and the maximum award to a project was one half the total amount available in any one fiscal year.

MnDOT made some changes for the third round MHFP due to NHFP changes that resulted from IIJA being signed into law. States can now use up to 30% of NHFP funding on freight intermodal or freight rail projects (subject to certain restrictions). Additionally eligible for NHFP funding are projects for the modernization/rehabilitation of a lock and dam or a marine highway corridor, connector or crossing that are functionally connected to the National Highway Freight Network (NHFN) and likely to reduce on-road mobile source emissions.

Such eligible projects would fall under the intermodal category of the MHFP application. Lastly, IIJA allowed more miles to be designated as Critical Rural Freight Corridors (CRFCs) and Critical Urban Freight Corridors (CUFCs) (see Critical Urban and Rural Freight Corridors section).

ELIGIBILITY OF APPLICANTS

MHFP is open to applicants from MnDOT districts, cities, counties, Tribal governments, railroads, airports, ports and other federal aid eligible entities or partnerships. Applicants select a specific investment category for their project to compete in one of the following major categories:



FREIGHT SAFETY | **FREIGHT MOBILITY** | **FIRST/LAST MILE CONNECTIONS** | **INTERMODAL CONNECTIONS** | **PLANNING**

These categories were identified through feedback from the Statewide Freight Investment Committee, the Minnesota Freight Advisory Committee and internal MnDOT committees.

Eligible projects include new construction and add-ons or up-scopes to existing projects, given the applying project provides a clear freight benefit. Specific to MnDOT's implementation preliminary engineering and right of way costs (project planning, engineering design and related work preparatory to the advancement of a project to physical construction) are not eligible. Based on stakeholder's recommendations, certain types of projects are also not eligible, (even though the law allowed for them) including acquisition of equipment, highway ramp metering and diesel retrofitting. The MHFP may provide funding up to 80% of the eligible project cost. Projects on the Interstate may receive up to 90% of the eligible project cost. . The Minnesota Highway Freight Program website has the most recent MHFP application, which includes more details on project eligibility for the third round of MHFP solicitation.

MnDOT has programmed some funding specifically for freight planning and freight data collection to ensure future updates of the State Freight Plan and other related efforts comply with federal requirements. These projects are included below in Table 7-5.

Table 7-5: MnDOT Freight Planning and Freight Data Collection Projects Funded Through MHFP

State Fiscal Year	Project	Amount	Project Category
2026	Statewide Trucking Parking Study Update	$300,000	Planning
2026	Statewide Truck Parking Information Management Systems Replacement Project	$550,000	Safety
2027	State Freight Plan Update	$600,000	Planning

INVESTMENT APPROACH

For each round of the MHFP solicitation, MnDOT, with input from the Statewide Freight Investment Committee, adopts an investment direction with targets for the distribution of funding across project categories and geographic areas. The project categories are freight mobility, freight safety, first/ last mile connections, intermodal/freight rail and planning and data collection. These category targets ensure that freight investments funded through MHFP will contribute to the State Freight Plan goals that address freight needs in Minnesota. Projects in the intermodal and freight rail category were awarded first and the remaining funding was awarded to the remaining projects based on the categorical and geographical investment targets.

Investment targets for projects located in the Twin Cities Metropolitan Area or Greater Minnesota (Minnesota outside of the Twin Cities) were adopted to ensure geographic balance of funding and projects. This split is based on DEED data comparing the percentage of people employed and gross domestic product of the Twin Cities Metro region with Greater Minnesota.

The targets are soft targets and are not mandated. If enough projects are not submitted in one region the remaining funds will be used entirely in any one program year. These geographic targets will ensure freight investments funded through MHFP provide benefits throughout the state of Minnesota.

Figure 7-3: Proposed Project Category Investment Targets for the Third Round of MHFP

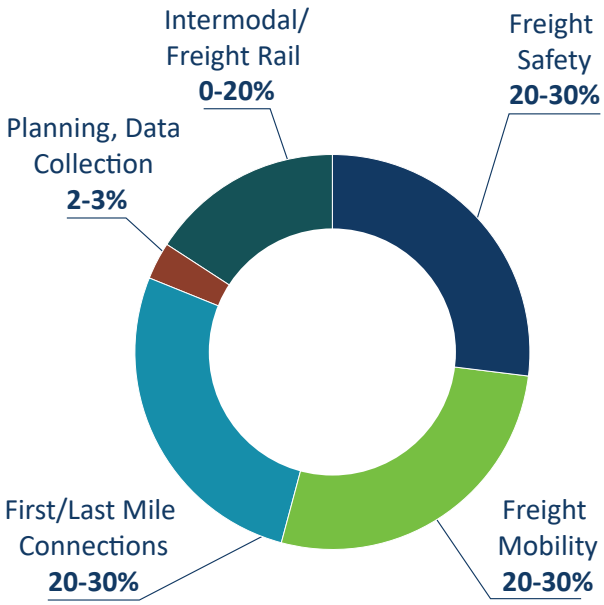


Table 7-6: Proposed Geographic Targets for the Third Round of MHFP

Geographic Area	Funding Target	Percentage Target
Metro District	$48,900,000	60%
Greater Minnesota	$32,600,000	40%

Targets include state match targets provided by OTSM for MnDOT District projects

PROJECT SELECTION AND AWARDS

During the third round of the MHFP, MnDOT received 25 total project applications. Applications included one intermodal project, ten mobility projects, eight first/last mile connection projects and six safety projects. In total, applicants requested $158.1 million in funding. Split geographically, nine of the projects were located in the Twin Cities Metropolitan area, requesting $97.4 million in total and 16 of the projects were located in Greater Minnesota requesting $60.7 million in total. MHFP received applications covering a variety of project types:

- 7 Freight Road Mobility projects
- 6 Road Reconstruction/Realignments
- 3 Interchanges
- 2 Roundabouts
- 2 Truck Parking Improvement Projects
- 1 Highway Railway Grade Separation
- 1 Snow fence project
- 1 Intermodal Access Road
- 1 Bridge
- 1 Shoulder Widening

Based on the adopted investment direction, OFCVO first selected the intermodal project as a draft award. OFCVO then ranked the remaining projects based on score and assigned them to them into Twin Cities and Greater Minnesota projects. OFCVO then selected the top projects in each geographic category, selecting the appropriate number of projects in each geographic category to best meet the geographic balance funding targets.

In December 2023, MnDOT presented the draft MHFP awards to the Statewide Freight Investment Committee and requested and received its approval of the draft awards. The deliberation process with the Committee involved ensuring project selections were balanced across categories and geographically. The freight mobility category received the most applications and makes up the largest amount of draft funding awarded. The freight mobility category includes a wide range of project types and so MnDOT and the Statewide Freight Investment Committee were comfortable with expanding that category beyond the target. Additionally, only receiving one intermodal project increased the funding share available to other categories. Figure 7-4 compares the category investment targets to the draft award distribution and Table 7-7 compares the geographical investment targets to the draft award distribution.

In February 2024, following the Committee's approval, OFCVO shared the draft awards with MnDOT's Transportation Program Investment Committee, who approved them. OFCVO then requested and received approval from the Commissioner of MnDOT. Table 7-8 shows the list of draft awarded projects.

Figure 7-4: Comparison of Third Round Project Category Investment Targets and Draft Awards

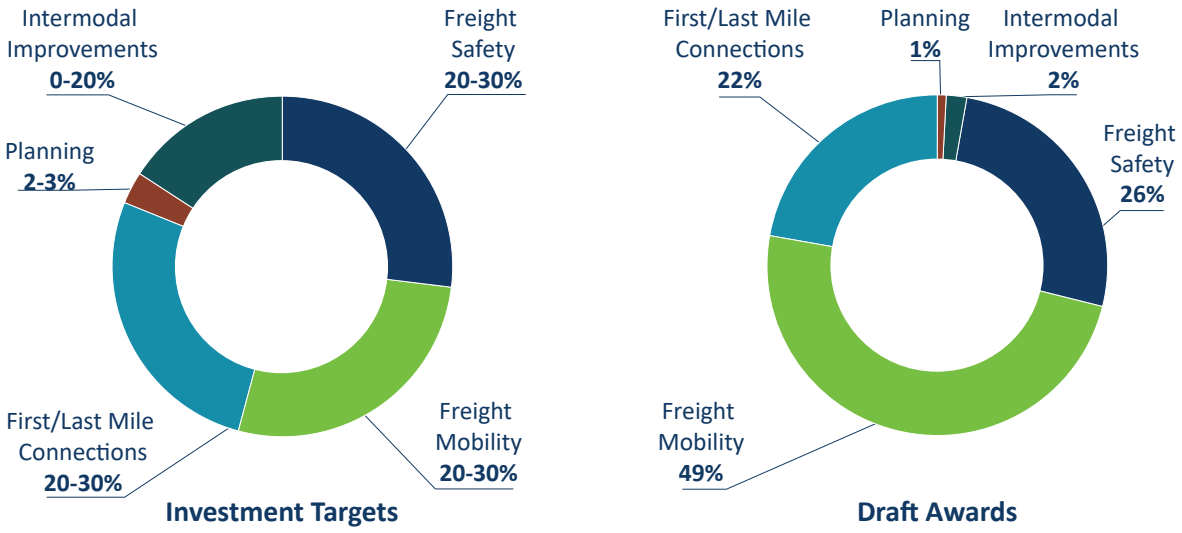


Table 7-7: Comparison of Geographic Investment Targets and Results

Geographic Area	Funding Target	Funding Target Percentage	Funding Awarded	Funding Awarded Percentage
Metro District	$48,900,000	60%	$38,125,000	47%
Greater Minnesota	$32,600,000	40%	$43,375,000	53%

Targets include state match targets provided by OTSM for MnDOT District project

Table 7-8: Draft Awarded Projects for the Third Round of MHFP

State Fiscal Year	Project	Amount	Project Category
2026	Statewide Trucking Parking Study Update	$300,000	Planning
2026	Statewide Truck Parking Information Management Systems Replacement Project	$550,000	Safety
2026	MnDOT Rest Area Program – I-94 Enfield Rest Area Truck Parking Expansion	$2,700,000	Safety
2026	MnDOT District 4 – Snow Fence on I-94 near Rothsay	$2,250,000	Mobility
2026	MnDOT Rest Area Program - I-94 Big Spunk Lake Truck Parking Expansion	$3,400,000	Safety
2026	City of Cottage Grove - 100 St SW Arterial Roadway Project	$5,000,000	First/Last Mile
2026	Sherburne County - US169 and CR4 Rural Safety and Mobility Project	$10,800,000	Mobility
2027	State Freight Plan Update	$600,000	Planning
2027	Carver County - MN5 Arboretum Area Safety Project	$10,800,000	Safety
2027	Scott County - MN13 River, Rails and Highway Freight Improvement Project	$10,800,000	Mobility
2027	City of Coon Rapids - US610 East River Road Interchange	$10,800,000	First/Last Mile
2027	Bridgewater Township - Comus Industrial Park Intermodal Facility Access Road	$1,600,000	Intermodal
2028	MnDOT District 7 - US169 Mankato Area Revitalization Project	$10,800,000	Mobility
2028	City of Clearwater - I-94 and MN24 Improvements	$5,000,000	Mobility
2028	City of Mankato - Veterans Memorial Bridge Rehabilitation	$6,100,000	First/Last Mile
	Total:	$81,500,000	

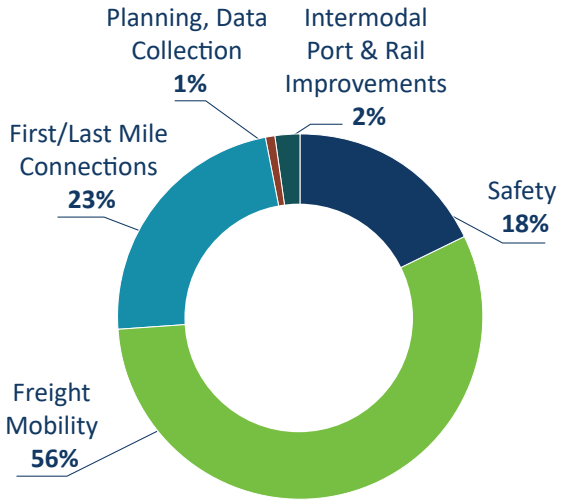
Note: Projects have been programmed with STBG and local federal aid funding until after the State Freight Plan is approved. These projects will be funded with NHFP funding once the State Freight Plan is approved.

SUMMARY OF MHFP INVESTMENTS

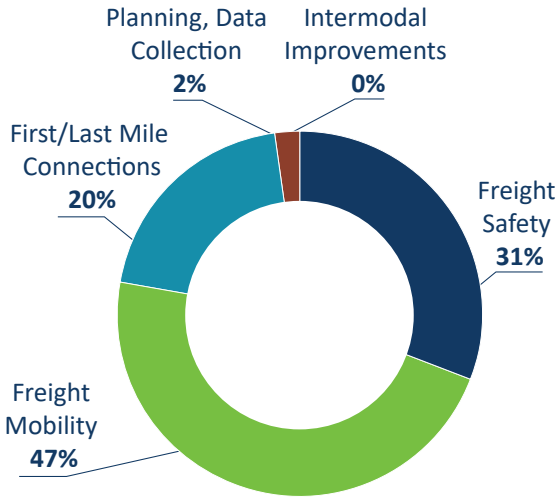
Figure 7-5 below compares the distribution of investments across the different project categories over the three rounds of the MHFP. Project categories have received roughly similar proportions of MHFP funds each round, with the freight mobility category receiving the largest proportion of investment. The freight mobility category can include a range of project types, which contribute to decreasing congestion and increasing efficiency.

Increasing freight mobility is a goal of the State Freight Plan and decreasing congestion and increasing efficiency also contribute to attaining various other State Freight Plan goals such as improving freight safety, supporting the economy and protecting Minnesota's environment and communities.

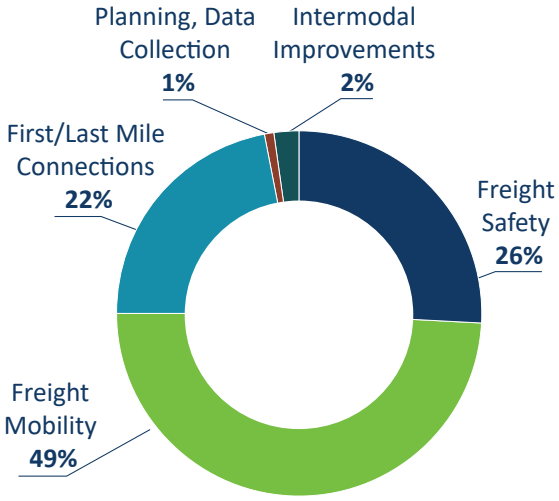
Figure 7-5: Historical Project Category Investment Summary



First Round Awards



Second Round Awards



Third Round Draft Awards

Overall, MnDOT strives to be geographically balanced in its distribution of NHFP funds through the MHFP. This ensures that freight investments funded through MHFP provide benefit throughout the state of Minnesota.

Table 7-9 below demonstrates the summation of all uses of NHFP funding balances close to proposed geographic balance targets of 60% for the Twin Cities Metro and 40% for Greater Minnesota.

Table 7-9: Historical Geographic Balance Investment Summary

Funding Round	Fiscal Years	Twin Cities Metro	Greater Minnesota	Total
Pre-MHFP	2016-2018	$25,300,000	$25,000,000	$50,300,000
Round 1	2019-2022	$82,000,000	$18,000,000	$100,000,000
Round 2	2023-2025	$44,325,900	$23,864,100	$68,190,000
Geographic Distribution of Funding Prior to Round 3	**2016-2025**	69%	31%	100%
Round 3	2026-2028	$38,125,000	$43,375,000	$81,500,000
Total Geographic Distribution of Funding	**2016-2026**	63%	37%	100%
Total	-	$189,750,900	$110,239,100	$299,990,000

CRITICAL URBAN AND RURAL FREIGHT CORRIDORS

The FAST Act required the FHWA to establish a National Highway Freight Network (NHFN). As part of this, NHFP funding must go to projects located on the NHFN. NHFN includes four subsystems, two of which are the Critical Urban Freight Corridors (CUFC) and Critical Rural Freight Corridors (CRFC). CUFCs and CRFCs are designated by states and MPOs (which meet population requirements). Each state is allotted a certain number of CUFCs and CRFC miles based on federal law.

MnDOT used a project-first approach to designate CUFCs and CRFCs from the third round of the MHFP (and has done so for prior rounds). This means that MnDOT designated the stretch of road projects are located on as either a CUFC or CRFC after it awarded projects. MnDOT then used remaining CUFC and CRFC mileage to connect projects from the third round that were located off of the existing NHFN in the state to the NHFN. MnDOT did not use a hierarchal approach to corridor designations. Corridors designated may be undesignated as projects are completed and mileage is needed to continue allocating NHFP funds on a flexible basis for future projects. MnDOT continues to connect these corridors in alignment with the National Multimodal Freight Network and the National Strategic Freight Plan. MnDOT discussed and received support from the Statewide Freight Investment Committee on this approach. These corridors are listed in Appendix A: Critical Urban and Rural Freight Corridors.

INVESTMENT PLAN AND PROGRAM IMPLEMENTATION

Moving forward into implementation, MnDOT will work with local partners to develop projects selected as part of the Minnesota Highway Freight Program and Intermodal Program.

MnDOT intends to continue the Minnesota Highway Freight Program competitive solicitation for additional freight investments in the future. This will appear as a two-year cycle on a revolving basis based on the availability of ongoing federal formula freight funds appropriated by Congress to the NHFP. Through regional District Freight Plans completed in each region of the state, freight needs will continue to be explored with local and regional stakeholders to help support a pipeline of high priority projects to future MHFP solicitations. OFCVO will continue to look for ways to better integrate freight into future construction projects, create further connections between freight related efforts and coordinate across different offices in MnDOT.

Future efforts will be focused on the incorporation of these improvements into statewide programming processes as well as linking to and carrying out the Freight Action Agenda, the goals and objectives of the State Freight Plan, the objectives of the SMTP and the Minnesota GO Vision. As noted in the prior chapter MnDOT has connected the State Freight Plan with the Minnesota Statewide Highway Investment Plan for the first time by identifying the universe of unmet freight needs. With this new resource, MnDOT has a clearer picture of how freight investments can be prioritized among all investment needs and asset categories.

MnDOT is supporting new practices that help align investments in areas of ongoing research such as freight in complete streets, freight and goods movement in urban areas, freight sustainability and zero emission investments, freight impacts to sensitive communities and environmental justice benefits of federal investments. MnDOT freight planning staff will continue to meet with the Statewide Freight Investment Committee, the Minnesota Freight Advisory Committee, other government partners and freight industry stakeholders to address future freight needs, issues, investments, policies or concerns.

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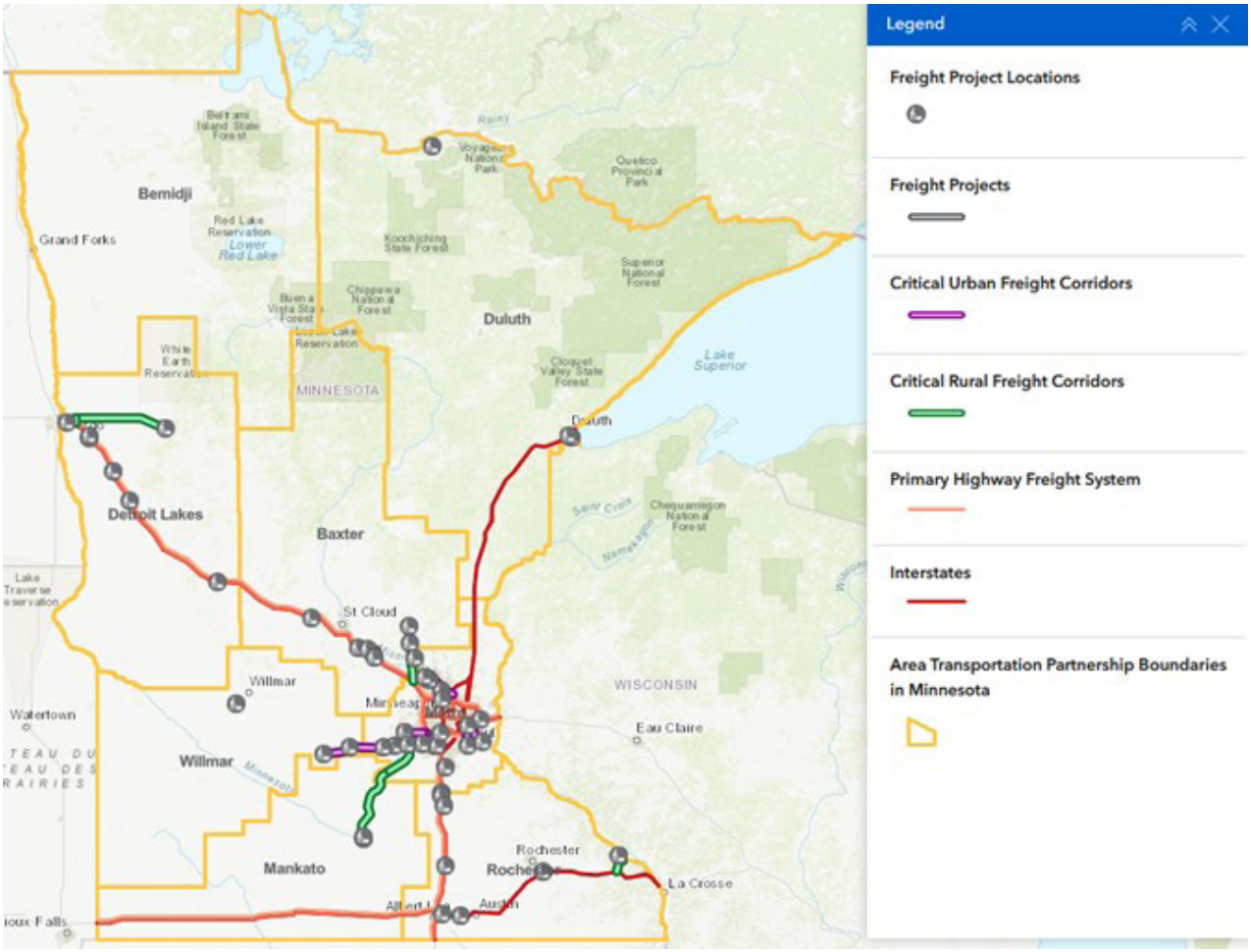
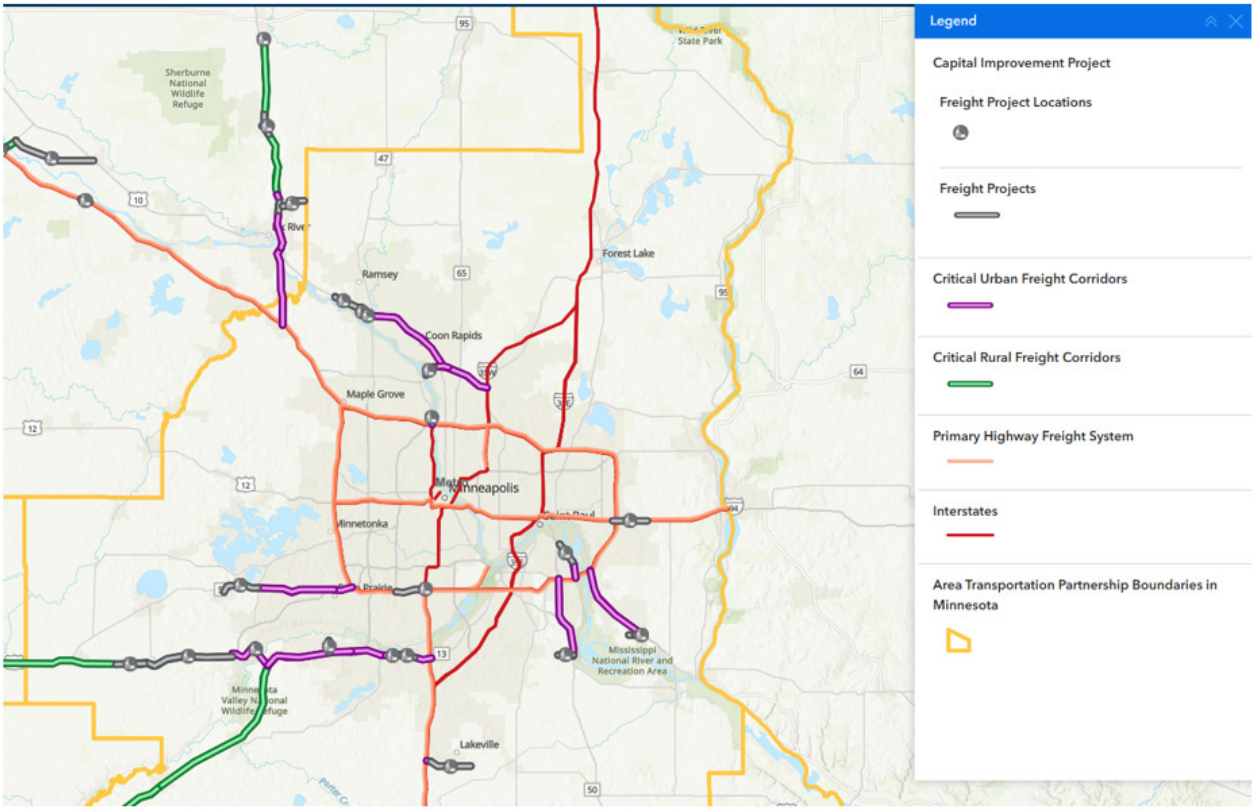
APPENDIX A: CRITICAL URBAN AND RURAL FREIGHT CORRIDORS

Figure A-1: 2024 National Highway Freight Network in Minnesota



An interactive map is available at:
https://experience.arcgis.com/experience/68fd0a0359ea4f9e9424de0ae9ab8b45

Figure A-2: 2024 CUFC/CRFC Corridor Designations, Twin Cities Metro Area



CRITICAL URBAN FREIGHT CORRIDORS

Road Authority	Route	From	To	Length (miles)	CRFC ID
MnDOT Metro District	US 61	CSAH 61 (Chaska Boulevard)	CSAH 11 (Jonathan Carver Parkway)	2.48	K
Carver County	CSAH 11 (Jon. Carver Pkwy)	CSAH 61 (Chaska Boulevard)	US 212	0.20	K
MnDOT Metro District	MN 41	US 61	US 169	2.00	K
MnDOT Metro District	US 169	130th Street NW in Shakopee	MN 13 Junction	8.70	J
MnDOT Metro District	MN 13	US 169	I-35	11.60	J
Dakota County	CSAH 70	I-35	MN 3	4.00	J
MnDOT Metro District	MN 252	I-694	70th Avenue N	0.90	K
Scott County	CSAH 83 (Canterbury Road)	US 169	4th Avenue E	1.05	J
MnDOT Metro District	CSAH 56/MN 156 (Concord Avenue)	I-494	Annapolis Street E	3.45	J
MnDOT Metro District	US 10	I-35W	Armstrong Boulevard NW	16.80	K
MnDOT Metro District	US 52	I-494	117th Street E in Inver Grove Heights	7.50	K
City of Inver Grove Heights	117th Street E	CSAH 71 (Rich Valley Boulevard)	US 52	1.20	J
Sherburne County	CSAH 33	Auburn Street	CSAH 13/CR 34/Twin Lake Road NW	1.70	K
MnDOT Metro District	MN 101	I-94	US 169	6.90	K
MnDOT Metro District	US 169	MN 101	213th Avenue NW in Elk River	4.70	K
MnDOT Metro District	US 61	I-494	Innovation Road S/Keats Avenue	7.49	K
Washington County	CR 19A (Innovation Road S)	100th Street S	US 61	0.12	J
City of Cottage Grove	Miller Road/ 100th Street S	CR 19A (Innovation Road)	Jamaica Avenue S	1.11	J
MnDOT Metro District	MN 5	I-494 in Eden Prairie	80th Street in Victoria	11.69	J
MnDOT Metro District	US 610	Mississippi River Bridge	800 ft E of CSAH 1 (E. River Road)	2.45	K
-	-	-	**Total Mileage**	**96.04**	-

CRITICAL RURAL FREIGHT CORRIDORS

Road Authority	Route	From	To	Length (miles)	CRFC ID
MnDOT District 3	US 169	213th Avenue NW near Elk River	CSAH 45/South Rum River Drive at US 169 in Princeton	13.90	F
Sherburne County	County Road 45	CSAH 45/South Rum River Drive	125th Street / 9th Avenue Circle	0.20	F
MnDOT District 4	US 10	MN 336	Randolph Road in Detroit Lakes	40.20	C
City of Detroit Lakes	Kris Street	US 10	Randolph Road	0.10	G
City of Detroit Lakes	Randolph Road	US 10	Highland Drive	1.10	G
MnDOT District 6	MN 43	I-90	W 4th Street in Winona	9.30	D
City of Winona	West 4th Street	MN 43	Huff Street	0.07	D
City of Winona	Huff Street	W 4th Street	Riverview Drive	0.10	D
City of Winona	Riverview Drive	Huff Street	Theurer Boulevard	2.25	D
MnDOT District 3	MN 24	I-94 near Clearwater	CSAH 8	1.74	F
Sherburne County	CSAH 8	MN 24	MN 25 / US 10	7.20	G
MnDOT Metro District/ District 8	US 212	Jonathan Carver Parkway / County Road 11	MN 15	37.6	F
Carver County	Jonathan Carver Parkway / County Road 11	County Road 61	US 212	0.20	F
MnDOT District 8	US 212	0.25 miles west of Morningside Drive	0.25 miles east of Morningside Drive	0.50	G
City of Glencoe	Morningside Drive	0.1 miles north of US 212	0.1 miles south of US 213	0.20	G
Rice County	CSAH 59	0.1 miles north of Intersection with TH 19	0.1 miles south of Intersection with TH 19	0.20	G
MnDOT District 6	MN 19	I-35 Interchange	Albany Avenue	0.28	G
MnDOT District 1	US 53	0.1 miles north of JCT with CSAH 332	0.1 miles south of JCT with CSAH 333	0.2	G
Koochiching County	CSAH 332	0.1 miles west of JCT with US 53	0.1 miles east of JCT with US 53	0.2	G
MnDOT District 8	MN 23	At County Road 1 / 75th Avenue SW	75th Avenue SW	0.2	G
MnDOT District 8	MN 15	0.1 north of JCT with US 212	0.1 south of JCT with US 212	0.2	F

CRITICAL RURAL FREIGHT CORRIDORS, CONTINUED

Road Authority	Route	From	To	Length (miles)	CRFC ID
MnDOT District 6	US 52	0.19 miles north of JCT with I-90	0.19 miles south of JCT with I-90	0.38	C
Sherburne County	County Road 4	2nd Street W	120th Street	0.85	G
Rice County	County Road 1	I-35 at Millersburg Boulevard / County Road 1	County Road 76 / Baseline Road	3.26	H
Rice County	County Road 76	County Road 76 / Baseline Road	140th Street	0.61	H
Town of Bridgewater	140th Street	County Road 76	West of Faribault Boulevard / County Road 3	1.61	D
City of Clearwater	MN 24	I94 in City of Clearwater	River Road SE	1.75	F
MnDOT Metro District / District 7	US 169	130th Street W in Shakopee	Belgrade Township Road 193	48.5	G
-	-	-	**Total Mileage**	**172.90**	-

MINNESOTA NATIONAL HIGHWAY FREIGHT NETWORK MILEAGE SUMMARY

Mileage Category	Mileage
MnDOT Designated Critical Urban Freight Corridors	9.93
Metro Council MPO Designated Critical Urban Freight Corridors	96.04
Total Minnesota Urban Mileage Designated	**105.97**
MnDOT Designated Critical Rural Freight Corridors	172.90
USDOT Designated Mileage Interstate and PHFS	589.54

APPENDIX B: FREIGHT PERFORMANCE MEASURES

Minnesota State Freight Plan

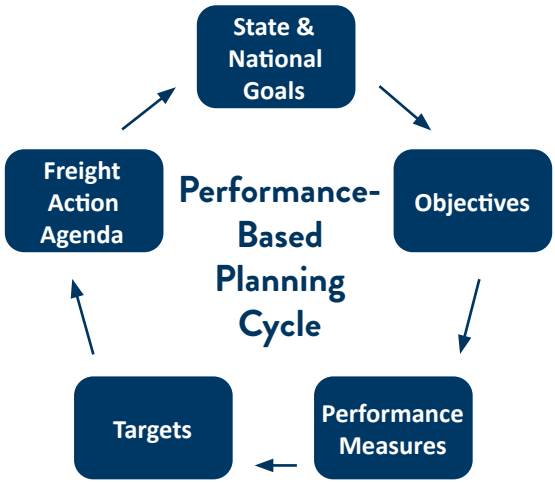
FREIGHT PERFORMANCE MEASURES SUMMARY

MINNESOTA GO

The Minnesota State Freight Plan uses a performance-based planning approach. It includes a review of national freight plan guidance, national freight plan goals, and a review of peer state efforts at developing goals and performance measures.

Components of Performance-Based Planning

- **GOALS:** A goal is a broad statement that describes a desired result or end state. Goals are typically supported by specific objectives.
- **OBJECTIVES:** The result to be achieved. Objectives are more specific than goals and there are often multiple objectives for each goal.
- **PERFORMANCE MEASURES:** A way to quantify progress towards goals.



Multimodal Transportation Goals and Objectives

The State Freight Plan supports the goals identified in the Minnesota Statewide Multimodal Transportation Plan (SMTP). The SMTP is Minnesota's highest level policy plan for transportation. It is a 20-year plan based on the Minnesota GO Vision for a transportation system that maximizes the health of people, the environment, and economy.

State Freight Plan Objectives

- Improve Freight System Safety
- Reduce Freight's Impact on the Environment
- Minimize Disparate Freight Impacts to Underserved or Overburdened Communities
- Preserve and Improve Minnesota's Freight Infrastructure
- Improve Freight Mobility, Velocity, and Reliability
- Consideration of All Freight Modes in Planning and Design
- Increase Freight System Resiliency
- Strategically Invest in New Freight Infrastructure
- Support and Grow Minnesota's Freight Industries

Freight Performance Measurement

The practice of consistently evaluating performance is vital to achieving Minnesota's identified goals. MnDOT staff regularly measure outcomes and results, which generates reliable data on the effectiveness and efficiency of investments, policies, and programs. By doing this, MnDOT staff maintain an effective methodology for quantifying goals and objectives and communicating progress toward their attainment.

How are Freight Performance Measures Used?

- **Description**. Describe the effect of an investment, program, or policy.
- **Evaluation**. Assess progress and determine problems or barriers.
- **Accountability**. Set targets for specific staff or programs and measure performance.
- **Decision-support**. Support the most sustainable outcomes.
- **Communication**. Explain to partners what was achieved.

State Freight Plan Performance Measures

SMTP Objectives/ Focus Areas	State Freight Plan Objectives	Performance Measures	Actors
Safety / Transportation Safety 	Improve Freight System Safety	Combined Freight-Involved Fatalities	MnDOT / NTSB
		Fatal Truck Crashes	MnDOT / NTSB
		Fatal Truck Crash Rate	MnDOT / NTSB
		Serious Truck Injury Crashes	MnDOT / NTSB
		Serious Injury Truck Crash Rate	MnDOT / NTSB
		Severe Crashes Involving Trucks	MnDOT / NTSB
		RR Crossing Fatalities	MnDOT / NTSB / FRA
		RR Crossing Serious Injuries	MnDOT / NTSB / FRA
		Annual Rail Derailments	MnDOT / NTSB / FRA
		RR Trespassing Incidents	MnDOT / Private Sector / FRA / RR's
		Rail Grade Crossing Risk	MnDOT / Private Sector / FRA
Aging Infrastructure / System Stewardship 	Preserve and Improve Minnesota's Freight Infrastructure	NHS Pavement in Good Condition	MnDOT
		Trunk Highway in Good Condition	MnDOT
		NHS Bridge Condition	MnDOT
		Trunk Highway Bridge Condition	MnDOT
		NHS Culvert Condition	MnDOT
		Airport Pavement Condition	MnDOT / Private Sector
		Ports, Locks, Dams Service Life	MnDOT / USACE
	Strategically Invest in New Freight Infrastructure	Funding Allocated to New or Expanded Freight Infrastructure	MnDOT
Climate / Climate Action 	Reduce Freight's Impact on the Environment	Age of Registered MN Trucks	MnDOT/ Private Sector / MN DPS
		Age of MN Truck Fleet	MnDOT/ Private Sector
		Zero Emission Medium/Heavy Duty Vehicles	MnDOT / Private Sector
		HCAADT Vehicle-Mile Proximity to Alternative Fuel Stations	MnDOT
		Wildlife Habitat Loss	MnDOT / Local Municipalities
		Mode Shift	TBD
		Dwell Time	TBD
	Increase Freight System Resiliency	Freight Resiliency to Severe Weather Events	MnDOT
Economy and Employment 	Support and Grow Minnesota's Freight Industries	Freight Employment by Industry	MnDOT / MnDEED / Private Sector
		Freight Tonnage by Mode	MnDOT / FHWA
		Freight Value by Mode	MnDOT / FHWA
		Proximity to Freight Facilities	MnDOT
		Intermodal Container Lifts	MnDOT
		Cost of Transportation	TBD / Private Sector
		Empty/Deadhead Truck Miles	TBD
Critical Connections 	Improve Freight Mobility, Velocity, and Reliability	Truck Travel Time Reliability	MnDOT
		Roadway Truck Bottlenecks	MnDOT
		Hours of Delay	MnDOT
		Truck Speed	MnDOT
		OSOW Barriers Removed	MnDOT
		Truck Ton Miles	MnDOT
Equity / Healthy Equitable Communities 	Minimize Disparate Freight Impacts to Underserved or Overburdened Communities	Population in Designated Food Deserts	MnDOT / State Demographer / MN Federal Reserve
		Workforce Participation Rate	MnDOT / MnDEED
		Freight Investment in Justice40 Areas	MnDOT
		Freight GHG Emissions Impacts	MnDOT / MN GHG Emissions Impact Mitigation Working Group
		Freight Workforce Demographics	MnDOT / MnDEED
Transportation Options 	Consideration of All Freight Modes in Planning and Design	TBD	MnDOT / Local Municipalities

APPENDIX C: IIJA STATE FREIGHT PLAN REQUIREMENTS

The Minnesota State Freight Plan has been meticulously developed to align with federal requirements outlined in the Infrastructure Investment and Jobs Act (IIJA). Under IIJA, a number of new state freight plan requirements were added to the requirements detailed in the previous funding and authorization bill, the Fixing America's Surface Transportation (FAST) Act. A summary of the IIJA State Freight Plan Requirements and details on which sections of the Plan addresses these requirements is provided in the following table.

IIJA State Freight Plan Requirement	Location in the State Freight Plan
(1) an identification of significant freight system trends, needs, and issues with respect to the State;	**Chapter 2. Current and Future Freight Trends and Issues** describes dynamic freight trends affecting freight movement in Minnesota that must be considered when developing policies, programs and projects to address freight needs and issues. These include global trade and supply chain disruptions like COVID as well as demographic and workforce changes, changing market dynamics, climate change and equity impacts, truck parking challenges, and innovative or emerging freight technologies.
(2) a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;	**Chapter 5. Freight Policies and Strategies** provides a detailed summary of MnDOT's freight policies and strategies. **Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** describes the performance of Minnesota's multimodal freight network and **Chapter 7. Freight Investment Plan and Implementation** details the freight system investments MnDOT has programmed through the Minnesota Highway Freight Program. The chapter also describes the overall approach and performance measures used to score program applications.
(3) when applicable, a listing of: (A) multimodal critical rural freight facilities and corridors designated within the State under section 70103 of this title; and (B) critical rural and urban freight corridors designated within the State under section 167 of title 23;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** describes Minnesota's multimodal designated freight network, including critical rural and urban freight corridor segments within the State. These segments are also illustrated in **Appendix A**.

IIJA State Freight Plan Requirement	Location in the State Freight Plan
(4) a description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in section 70101(b) of this title and the national highway freight program goals described in section 167 of title 23;	The **Introduction** describes how the Minnesota State Freight Plan aligns closely with the six objectives of the Minnesota Statewide Multimodal Transportation Plan and also directly support the national multimodal freight policy and national highway fright program goals.
(5) a description of how innovative technologies and operational strategies, including intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered;	**Chapter 2. Current and Future Freight Trends and Issues** describes a variety of innovative freight technologies and operational strategies that MnDOT considered to best prepare for adoption and implementation of new systems or experiences.
(6) in the case of routes on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of roadways, a description of improvements that may be required to reduce or impede the deterioration;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** provides detail on the multimodal freight routes handling heavy industrial cargo in Minnesota.
(7) an inventory of facilities with freight mobility issues, such as truck bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address those freight mobility issues;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** includes a description of the State's freight mobility issues and a list of Minnesota's top truck bottlenecks. **Chapter 5. Freight Policies and Strategies** describes the set of goals, policies and detailed strategies that MnDOT and its freight partners will use to address freight mobility issues in the State.
(8) consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion and delay;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** includes an evaluation of freight congestion and delay in Minnesota, specifically travel time reliability and vehicle hours of delay. **Chapter 5. Freight Policies and Strategies** includes a summary of the Freight Action Agenda with specific key actors to implement strategies to mitigate freight congestion and delay.
(9) a freight investment plan that, subject to subsection (c)(2), includes a list of priority projects and describes how funds made available to carry out section 167 of title 23 would be invested and matched;	**Chapter 7. Freight Investment Plan and Implementation** describes the prioritization process and overall approach used to score applications to the Minnesota Highway Freight Program and details MnDOT's programmatic freight system investments.

IIJA State Freight Plan Requirement	Location in the State Freight Plan
(10) the most recent commercial motor vehicle parking facilities assessment conducted by the State under subsection (f); (A) the capability of the State, together with the private sector in the State, to provide adequate parking facilities and rest facilities for commercial motor vehicles engaged in interstate transportation; (B) the volume of commercial motor vehicle traffic in the State; (C) whether there exist any areas within the State with a shortage of adequate commercial motor vehicle parking facilities, including an analysis of the underlying causes of such a shortage;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** provides detail on the State's evaluation of statewide truck parking availability, describes the highest concentrations of daily truck volumes in the State and areas that routinely meet or exceed their truck parking capacity.
(11) the most recent supply chain cargo flows in the State, expressed by mode of transportation;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** summarizes multimodal freight flows by tonnage and value. **Chapter 4. Freight Forecasts** summarizes future multimodal freight flows by tonnage and value.
(12) an inventory of commercial ports in the State;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** provides an inventory of commercial ports in Minnesota.
(13) if applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party under section 70204;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** includes a description of the Truck Parking Information Management System, a multi-state effort to support truck parking.
(14) the impacts of e-commerce on freight infrastructure in the State;	**Chapter 1. Importance of Freight to Minnesota** summarizes the impacts of the dramatic increase e-commerce across the state. **Chapter 2. Current and Future Freight Trends and Issues** also describes a variety of e-commerce impacts and market outcomes.
(15) considerations of military freight;	**Chapter 3. Minnesota's Freight System Assets, Conditions and Performance** includes a description of the conditions and performance of the freight system designated to support military operations in Minnesota.
(16) strategies and goals to decrease: (A) the severity of impacts of extreme weather and natural disasters on freight mobility; (B) the impacts of freight movement on local air pollution; (C) the impacts of freight movement on flooding and stormwater runoff; and (D) the impacts of freight movement on wildlife habitat loss; and	**Chapter 5. Freight Policies and Strategies** includes a summary of the Freight Action Agenda with specific strategies to mitigate extreme disaster impacts on freight mobility as well as unintended freight impacts on local air pollution, the environment or vulnerable populations.
(17) consultation with the State freight advisory committee, if applicable.	**Chapter 5. Freight Policies and Strategies** includes a summary of the continuous outreach and communication with the Minnesota Freight Advisory Committee.