Freight North Texas 2022

A FREIGHT Mobility Plan

August 2022

FREIGHT
NORTH TEXAS

A Product of the Transportation Department Freight Team

North Central Texas
Council of Governments

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What is NCTCOG?

The North Central Texas Council of Governments is a voluntary association of cities, counties, school districts, and special districts which was established in January 1966 to assist local governments in **planning** for common needs, **cooperating** for mutual benefit, and **coordinating** for sound regional development.

It serves a 16-county metropolitan region centered around the two urban centers of Dallas and Fort Worth. Currently the Council has **236 members**, including 16 counties, 168 cities, 24 independent school districts, and 28 special districts. The area of the region is approximately **12,800 square miles**, which is larger than nine states, and the population of the region is about **7 million** which is larger than 38 states.

NCTCOG's structure is relatively simple; each member government appoints a voting representative from the governing body. These voting representatives make up the **General Assembly** which annually elects a 17-member Executive Board. The **Executive Board** is supported by policy development, technical advisory, and study committees, as well as a professional staff of 350.

NCTCOG's offices are located in Arlington in the Centerpoint Two Building at 616 Six Flags Drive (approximately one-half mile south of the main entrance to Six Flags Over Texas).

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NCTCOG's Department of Transportation

Since 1974 NCTCOG has served as the Metropolitan Planning Organization (MPO) for transportation for the Dallas-Fort Worth area. NCTCOG's Department of Transportation is responsible for the regional planning process for all modes of transportation. The department provides technical support and staff assistance to the Regional Transportation Council and its technical committees, which compose the MPO policy-making structure. In addition, the department provides technical assistance to the local governments of North Central Texas in planning, coordinating, and implementing transportation decisions.

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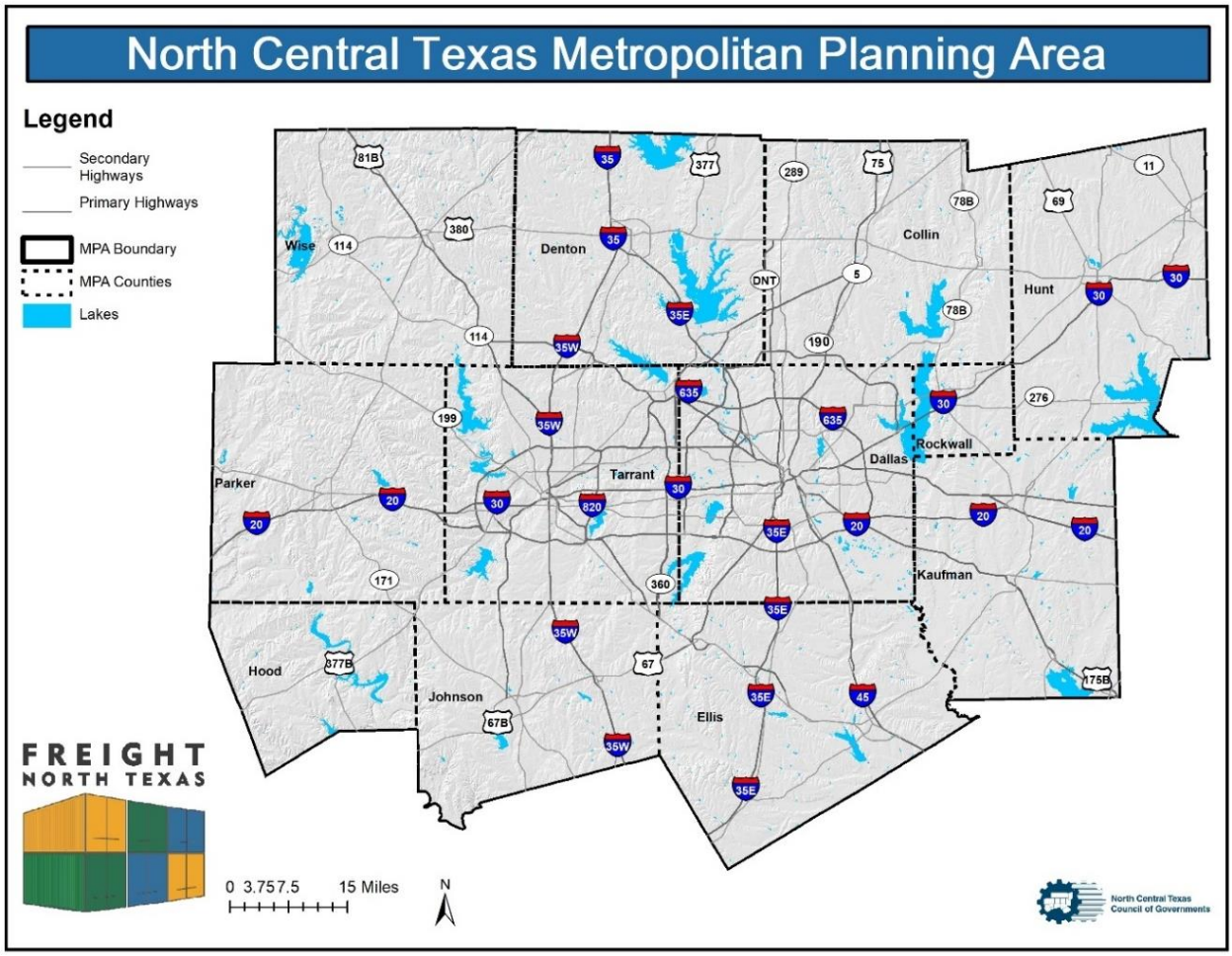
1.0 Introduction to Freight North Texas

Freight and goods movement are essential to our daily lives. Without freight movement, manufacturers would not be able to operate, homes could not be built, fuel could not be delivered, and even hospitals could not function. Each American requires goods the freight network moves every day. Freight movement is critical to our national, state, and regional economies.

1.1 Freight Planning in North Central Texas

The North Central Texas region is a national leader and innovator in transportation policy, projects, and programs. North Central Texas Council of Governments (NCTCOG) staff oversees freight system planning in the NCTCOG 12-county Metropolitan Planning Area, shown in **Figure 1.1.** This 12-county region covers approximately 10,000 square miles and over 170 municipalities.

Figure 1.1: NCTCOG Metropolitan Planning Area



The North Central Texas region is located centrally within the United States allowing it to be a major freight hub for the country. This is assisted by the major Interstates that crisscross through the region, three Class I railroads that operate in the region, and major air cargo facilities, including Dallas Fort Worth International Airport, that give access to the region. All these features, along with major

manufacturing operations, and a robust and growing population, make the region an international freight hub or Inland Port.

The goal of the Freight North Texas Program is to enhance the safety, mobility, efficiency, and air quality associated with freight movements within the Dallas-Fort Worth area.

NCTCOG developed the Freight Planning Program, which is associated with freight movement throughout the Dallas-Fort Worth region. The primary objectives of the program are to:

- Provide short- and long-range freight transportation plans and studies
- Foster regional economic activity through safe, efficient freight movement
- Educate elected officials and the public regarding freight's role in the regional economy and impact on everyday life
- Support Regional Transportation Council activities

To achieve these objectives, NCTCOG has set the following regional freight planning goals:

- Seek freight community participation in the planning process
- Monitor freight traffic through the region to identify potential bottlenecks
- Improve freight movement efficiency to, from, and within the region
- Promote safety, mobility, and accessibility
- Reduce the air quality impacts of freight movements
- Incorporate freight considerations in transportation projects
- Develop and use a sustainable and reliable funding source for freight programs and projects
- Develop a regional freight database
- Improve railroad safety and reliability

To accomplish these objectives and goals, the Freight Planning Program focuses on the following areas of work:

- Freight projects and funding sources
- Data collection
- Regional Freight Mobility Plan development
- Follow-up studies identified in the Freight Mobility Plan

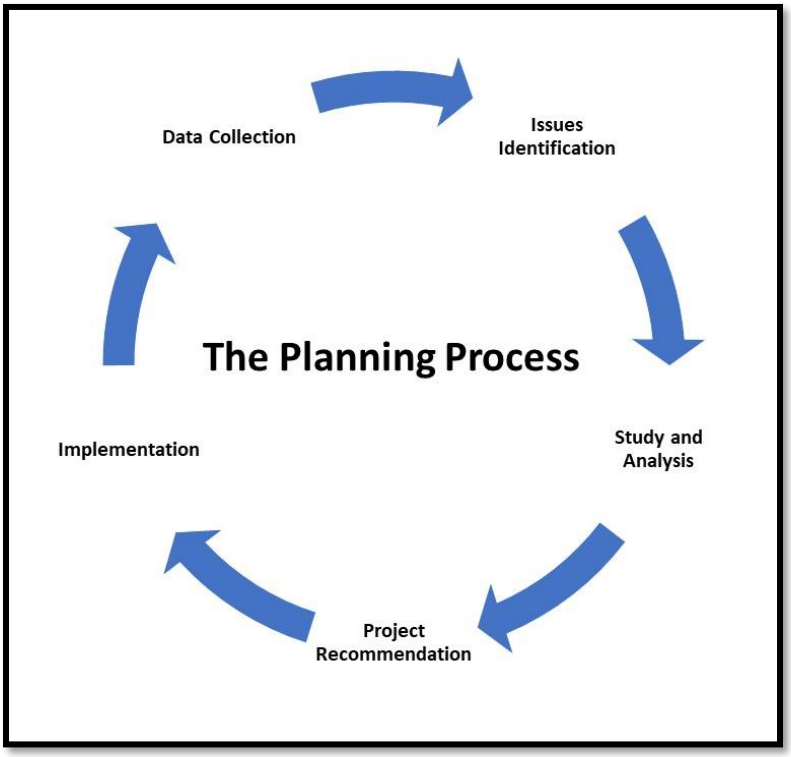
Together, these Freight Program objectives, goals, and focus areas improve quality of life for regional residents by supporting a robust, dynamic transportation system and development of the economy.

Metropolitan Transportation Plan – Mobility 2045 Update and Goods Movement Planning

The Freight North Texas Program is key in defining successful regional planning processes outlined in the Metropolitan Transportation Plan (MTP). This plan, known as the Mobility 2045 Update, is the guide to transportation planning in the North Central Texas region. Goods, services, and people movement planning involves an array of programs, which defines the Freight North Texas Program. Policies, programs, and projects have been developed to assess, understand, and improve upon regional freight movements to, through, and within the region. The Freight section, in the Mobility Options chapter of the MTP, includes the region's goals, policies, and programs as they pertain to goods movement and freight planning. It also provides an overview of regional freight planning and the role it plays in the everyday lives of North Texas residents.

The goals, policies, programs, and projects outlined in the MTP form a strong basis to guide goods movement in planning. *Freight North Texas* is the plan of how those goals and policies are used in the continuous planning process. This approach to planning is shown in **Figure 1.2**. As goals and policies are adopted, work needs to be done to move forward and support them – this is the planning process. It includes data collection, identification of issues, studies, analysis, project selection, review of what was implemented, and the impact it has, or data collected from the implementation. The Freight Planning Program uses this continual cycle of planning throughout *Freight North Texas*.

Figure 1.2: The Planning Process



1.2 Freight North Texas 2013

In 2013, NCTCOG completed *Freight North Texas: The North Central Texas Regional Freight System Inventory.* This was the first effort in creating a regional freight plan. This report assessed freight network capacity, concerns, and opportunities, as well as the need for future programs and studies. Completion of this inventory was the first step in a continuous planning process. This effort continues and grows. As more data is collected and additional studies are conducted, the Freight North Texas Program continues to develop and improve the North Central Texas transportation system. The key elements of *Freight North Texas (2013)* included:

Overview of Freight in North Central Texas: This section identifies the elements that create the freight system. This includes freight modes (trucks, rail, pipelines, air cargo, and intermodal), the importance of freight to the region, foreign trade zones, and key infrastructure issues.

The Regional Freight System: Outlined in this section are the Regional Freight Network; freight system concerns; freight facility locations; city, county, and regional economic information; regional rail and

truck initiatives; truck routes; key infrastructure points; key freight groups; air quality mitigation strategies; and environmental justice concerns.

Current System Issues: This section reviews the freight system challenges related to land use, truck traffic and volume, infrastructure strategies for the future regional freight system, future federal and regional policies impacting freight, and performance measures.

Follow-Up Studies: *Freight North Texas (2013)* outlined a series of follow-up studies that would be the focus of freight planning efforts for following years. These included:

- **Freight Congestion and Delay Study:** The Freight Congestion and Delay Study focused on roadway movements, utilizing data from various sources to identify specific causes of congestion and delay. This report was completed in 2016.
- **Economic Impact of Freight on the Region/Freight Project Evaluation System:** The economic impact of freight was combined into one report which focuses on the economic value and impact of a project from a freight-driven perspective. This report includes a tool that allows for evaluation of a project for the freight industry. This was completed in 2021.
- **Freight and Environmental Justice Report:** This analysis was completed along with the Land Use Analysis. This report reviews the relationship between freight and environmental justice communities throughout the region. This was completed in 2022.
- **Truck Parking Study:** The study was conducted to determine the locations and adequacy of both short-term and long-term truck parking in the North Central Texas region. This study also identified corridors of concern in the region for additional truck parking needs. This was completed in 2018.
- **Land Use Analysis:** The Land Use Analysis contains a land-use evaluation for all freight facilities within the region. An inventory of the facilities within or adjacent to non-compatible land uses was created, and a detailed definition of compatible and non-compatible land uses was developed. Freight infrastructure is in danger of disappearing, in need of preservation, and strategies to maintain it were developed. This analysis was completed in 2022.

These studies and reports deal with the goods movement system and issues in the North Texas region. These follow-up studies are discussed in depth in the appropriate portions of **Section 3**, which deals with specific issues of the freight system in the region.

1.3 Freight North Texas 2022

This document, *Freight North Texas 2022*, is the freight plan for the North Central Texas region and outlines the goods movement planning efforts in the region. It outlines the goals, policies, and programs laid out for goods movement in the MTP and how they are being used in the region. The plan lays out freight resources and assets, as well as discusses issues and elements of the freight system in the region. Finally, it concludes with recommendations for policies, programs, projects, and studies to help improve freight movement in the region.

1.3.1 Key Terms

Key terms provide details to help understand important concepts within *Freight North Texas*.

Brownfield: Real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Double Stack: The process of stacking two or more containers in a well rail car.

Environmental Justice: The Environmental Protection Agency defines environmental justice as, "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

First/Last Mile: Highway connections to ports and rail yards that are key to the efficiency of the freight system.

Foreign Trade Zone: An area within the US at or near an airport under US Customs control where goods are held duty-free, pending customs clearance.

Freight: The goods transported by rail, truck, air, or water.

Freight-Intense Land Use: An area with one or more continuously operating freight-oriented business.

Freight-Oriented Development: An area where manufacturing, warehousing, distribution, and freight forwarding operations are consolidated with ready access to a multimodal transportation network.

Good Neighbor Strategies: Operational or physical characteristics that aim to integrate freight facilities into their surrounding land uses, with a focus on preventing or remediating land use conflicts.

Inland Port: An inland site operating in a similar capacity to that of a seaport.

Just-in-Time: An inventory control system that controls the flow of shipments to arrive just in time for use.

Lift: The process of moving a container or trailer to and/or from a rail car.

Long-Haul Trucks: Trucks travelling more than 500 miles between their origin and destination.

Nonattainment Area: A designation given by the Environmental Protection Agency applied to areas that do not meet national air quality standards.

Transuranic Waste: The highest level of hazardous waste transported in the US and a more cautious transport than other types of hazardous waste.

1.3.2 Freight North Texas Sections

Freight North Texas 2022 is structured in a simple and straight-forward manner. It is organized into four sections. These include 1) this section (Introduction), 2) Freight in North Central Texas, 3) Freight Planning in North Central Texas, and 4) Recommendations for North Central Texas. The following is a breakdown of the three main sections of the plan.

Freight in North Central Texas: This section outlines the current status of freight at the regional, state, and national level. It looks at the different elements of the freight system as they are currently aligned in the region. The different elements are outlined below:

- ***The Importance of Freight:*** The portion of this section demonstrates the importance of freight to the Nation, state, and region. It includes facts and figures about freight movements and different times of freight activity in the region.
- ***The Different Modes of Freight:*** This part of the section addresses the different types of freight movement that exist in the region. These include truck, rail, pipeline, air cargo, intermodal, and inland ports. Each of these have an important role to play in the movement of goods through the region.
  - **Truck:** Trucks are the most utilized mode of transportation for most of the goods moving into, through, and out of the region. The extensive regional roadway network allows trucks to access the region from many directions, saving time and money for both truck operators and consumers.
  - **Rail:** The regional railroad system is extensive. Three Class I railroads (BNSF Railway, Kansas City Southern Railway, and Union Pacific Railroad) and two regional railroads (Dallas, Garland and Northeastern Railroad and the Fort Worth and Western Railroad) operate within the region. The regional railroads interchange with the Class I railroads to deliver key commodities into and within the region.
  - **Pipeline:** Pipelines and pipeline facilities in the region transport petroleum, natural gas, and other hazardous materials. The oil and natural gas industry is an integral component of the regional economy. The Barnett Shale formation, located in the region, is an onshore natural gas field stretching from the city of Dallas to the west and south. The Barnett Shale covers 5,000 square miles and 8 of the 12 Metropolitan Planning Area counties.
  - **Air Cargo:** Air cargo is the movement of freight by air. This mode typically consists of high value and/or high priority items, including electronics and pharmaceuticals. This represents only a small share of the total tonnage shipped annually in the US. In 2018, air transportation generated 16 billion-ton miles.
  - **Intermodal:** Intermodal transportation is a critical feature of freight transportation in the North Central Texas region. An intermodal facility is when a transportation mode (truck, rail, air, or ship) brings goods to and from a facility, then passes the goods to another transportation mode. Intermodal transport refers to the movement of containers of freight between modes.
  - **Inland Ports and Freight-Oriented Developments:** While the North Central Texas region does not have direct access to a seaport, the region is the largest inland port in the nation. Since the Dallas-Fort Worth region is a major logistical hub, there are many freight-oriented developments within the region. A freight-oriented development is defined as an area where manufacturing, warehousing, distribution, and freight forwarding operations are consolidated with ready access to a multimodal transportation network.
- ***Freight Scans:*** This section includes information that demonstrates the current freight trends on a national, state, and, most importantly, regional level. For example, topics cover trading partners, local freight-oriented developments, inland ports, regional intermodal hubs, and at-grade railroad

crossings. For more information regarding the four core urban counties within the Metropolitan Planning Area, please see the freight scan fact sheets in **Appendix A.**

Freight Planning in North Central Texas: As the largest section in the plan, it outlines analysis done by NCTCOG regarding different freight-related transportation issues throughout the region. This section includes NCTCOG freight initiatives, and policies related to freight on a national, state, and regional level. Performance measures related to these policies are also included. The majority of the section is devoted to discussing and analyzing the region's freight systems elements.

These include:

- Freight and the Environment
- Freight and Equity
- Truck Parking
- Freight Congestion and Delay
- Freight and Land Use
- The Economics of Infrastructure Projects and Freight
- North Texas Multimodal Operations, Velocity, Efficiency, and Safety Program – Freight and Railroads in North Texas
- Critical Urban Freight Corridors
- Hazardous Material Routing
- Freight and Technology
- Corridor Studies
- Freight and Safety

The discussion of these different elements includes the different kinds of studies and analyses that have been done over the last few years for the region, including the follow-up studies to the *Freight North Texas (2013)* documents.

The final portion of Section 3 examines freight connectivity, and how the region interacts with the rest of the State of Texas, surrounding states, and Mexico. This is to better understand the relationship between these areas and the North Central Texas region in the context of freight. The countries, cities, and states include:

Countries:

- Mexico

States:

- Louisiana
- Oklahoma
- New Mexico

Cities:

- Houston
- San Antonio
- Austin

- El Paso
- Corpus Christi

Insight on what commodities are moving to and from these different locations – and the mode they use to get there – is vital to understanding the impact of freight on this region.

Recommendations for North Central Texas: This section discusses results of data collection and analysis done within the Freight North Texas Program and comes in the form of recommendations for policies, programs, and projects. These recommendations will be evaluated for inclusion in the next MTP at the appropriate time. It is important to note that any new policy, program, or project recommendations will be in line with the current MTP at the time of publication.

This section also outlines new studies and analysis that will be done as a follow-up for this plan, along with studies that will be updated that were completed as part of *Freight North Texas (2013)*. Following is a breakdown of the studies and analysis to be done.

New Follow-Up Studies:

- Truck Bottleneck Study
- Rail Pathing Study
- Air Cargo Analysis
- Truck Routing Study
- Rail Crossing Analysis
- Truck Safety Analysis
- Commodity Flow Model
- First-and-Last-Mile Improvement Study

Updates to Completed Studies:

- Truck Parking Study Update
- Freight Congestion and Delay Update
- Freight Land Use Analysis Update

1.4 Summary

The region's freight plan, *Freight North Texas*, is key to NCTCOG's goods movement planning effort in the region. The plan demonstrates the importance and role of freight in the region and its economic impact. This plan explains the robust freight infrastructure of the region, including the different modes that make it up. The plan shows the different analyses NCTCOG has completed over the last few years and the impact different elements of freight movement have on the region.

Freight North Texas is a guide to how the region approaches planning for freight movement and the follow-up studies and updates will be a large part of what NCTCOG focuses on when it comes to goods movements over the next few years. *Freight North Texas* will operate as a blueprint for better integration of goods movement into the larger planning efforts for the North Central Texas region.

2.0 Freight in North Texas

As the population grows in the North Texas region, freight movement will continue to increase as demand for goods grows. It is important for freight to continually move around the region, as well as other parts of Texas, the United States, and countries. This section includes information that demonstrates the current freight trends on national, state, and, most importantly, regional levels.

2.1 National and Texas Freight Movements

Freight is vital to the US, not only to the transportation industry, but to all facets of industry and the economy. In 2018, an average of 51 million tons of freight, worth $51.8 billion, was moved along the US transportation system every day.[1] The Freight Analysis Framework estimates tonnage will increase about 1.2 percent per year between 2018 and 2045.[2]

Freight movement within the nation is not only vital to the US economy, but also to the world economy. The top 15 US trading partners in 2021 are listed in **Table 2.1**. This list includes the countries, exports, imports, total trade, and percent of total trade. The top 15 countries make up 75 percent of the total trade on a national level.[3]

Most of the freight moved within the US is moved by truck. Long-haul freight truck traffic in the United States is concentrated on major routes connecting population centers, ports, border crossings, and other major activity hubs (see **Figure 2.1**).[4]

Table 2.1: Top 15 US Trading Partners in 2021

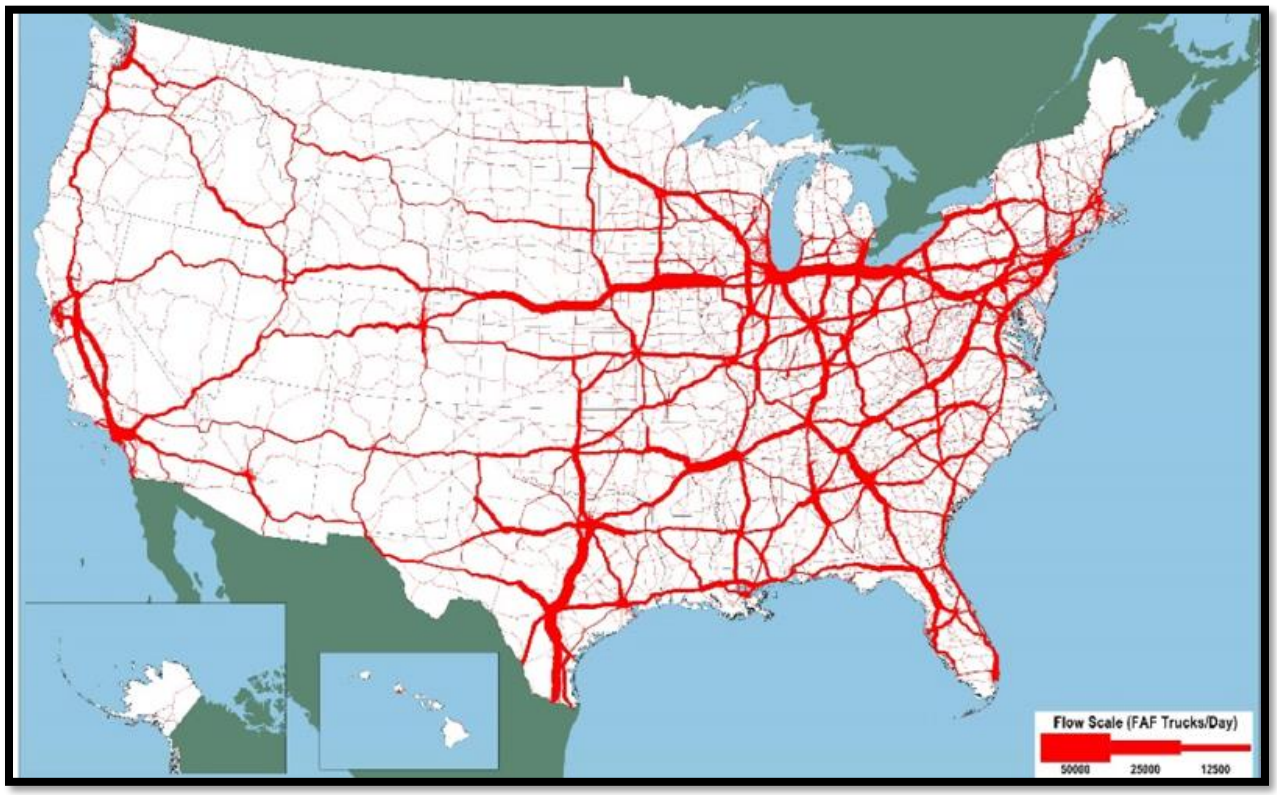
Rank	Country	Exports	Imports	Total Trade	Percent of Total Trade
1	Mexico	47.4	65.8	113.2	14.50%
2	China	23.1	90.1	113.2	14.50%
3	Canada	49.8	63.1	112.9	14.50%
4	Japan	12.7	23.3	36	4.60%
5	Germany	10.6	19.6	30.1	3.90%
6	South Korea	10.5	17.1	27.5	3.50%
7	India	7.7	12.6	20.3	2.60%
8	Taiwan	6.2	13.8	20	2.60%
9	Vietnam	1.6	18.1	19.7	2.50%
10	United Kingdom	10.9	8.1	18.9	2.40%
11	Ireland	2.6	12.5	15.1	1.90%
12	Netherlands	9.5	5	14.5	1.90%
13	France	6.5	7.8	14.3	1.80%
14	Italy	4.2	9.4	13.6	1.70%
15	Switzerland	3.8	9.1	12.9	1.70%

Source: US Census Bureau 2021

[1] Federal Highway Administration Freight Facts and Figures 2019
[2] Federal Highway Administration Freight Facts and Figures 2019
[3] United States Census Bureau, 2021
[4] Federal Highway Administration Freight Facts and Figures 2021

US freight truck traffic is projected to increase by the year 2045, when long-haul truck travel is forecast to be 662 million miles per day (see **Figure 2.2**).[5] Figures 2.1 and 2.2 show the volume of freight moving through the country now and in the future. This shows the impact of freight movements to the country's transportation network on a daily basis. It demonstrates the importance of planning for these movements and the impact freight has on the daily lives of everyone.

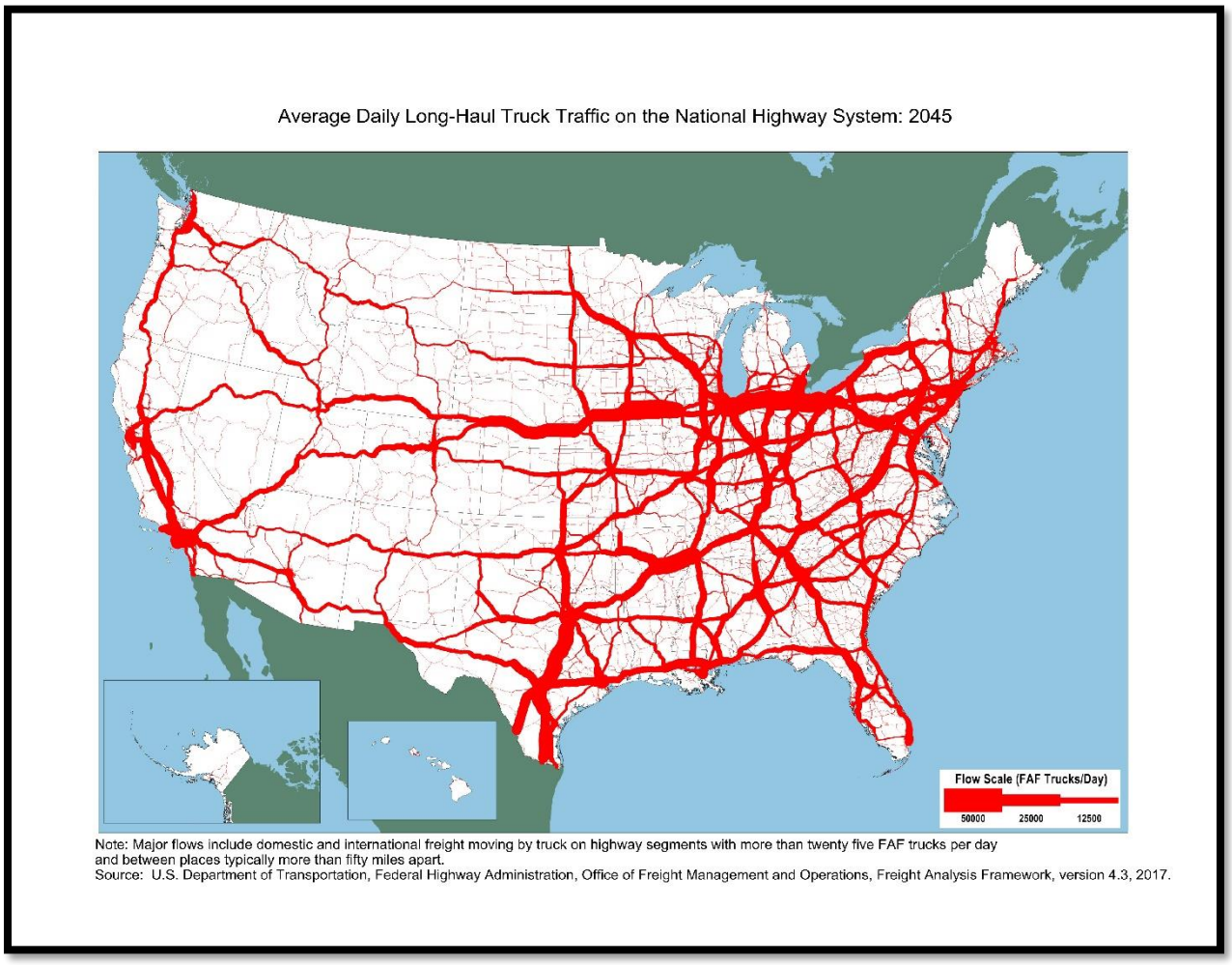
Figure 2.1: Estimated Average Freight Analysis Framework Daily Volumes for Trucks on National Highway System, 2017



Source: Federal Highway Administration

[5] Federal Highway Administration Freight Facts and Figures 2017

Figure 2.2: Average Daily Long-Haul Freight Traffic on the National Highway System, 2045



Source: Federal Highway Administration

United States-Mexico-Canada Agreement

The United States-Mexico-Canada Agreement (USMCA) is an agreement replacing the North American Free Trade Agreement. This agreement was established on July 1, 2020 by the governments of Canada, Mexico, and the United States, creating a trilateral trade bloc in North America.

Transporting freight is a key component of USMCA. Commodity agreements play a key role between the USMCA partners of Canada, Mexico, and the US. The United States exports dairy, poultry, and eggs to Canada and, therefore, provides new access to Canada for dairy, peanuts, processed peanut products, and a limited amount of sugar and sugar-containing products. Under a modernized agreement, all other tariffs on agricultural products traded between the United States and Mexico will remain at zero.[6] This new agreement supports Texas farmers and other agricultural industries within the North Central Texas region, thus increasing the Texas economy and the movement of necessary goods.

[6] Office of The United States Trade Representative

Texas has an important relationship with the two countries as part of USMCA, which results in $270 billion in trade annually.[7] The agreement also increases jobs and other work opportunities for the State of Texas. This agreement encourages businesses to locate in Texas to move products into Mexico faster and more efficiently. The North Central Texas region is located at the crossroads of four major Interstate Highways: IH 20, IH 30, IH 35 (which includes both IH 35E and IH 35W), and IH 45. Additionally, the region is a national railroad crossroads, as well as a national and international air cargo hub, making it a natural logistics hub, thus making it a key location for freight movements benefitting from USMCA.

Texas and Freight

Goods movement is imperative to the Texas economy and serves as a vital link that connects the rural and urban areas of Texas. Texas maintains its leadership position in the economy because of how efficient its freight mobility is and continues to be. This productivity provides access to new jobs and markets, as well as the timely delivery of goods. Freight transportation supports 1 in every 16 jobs in the state. This means that in Texas, there are 2.2 million full-time jobs related to the freight industry.[8] The freight industry in Texas also supports other important industries like agriculture, energy, defense, manufacturing, and construction. Without freight movement, these industries would not be able to function and, therefore, not be able to support the Texas economy and community.

On average, 1,000 people are moving to Texas daily. This means the freight industry will only continue to grow.[9] As this growth continues, the demand for moving goods will persist. To help guide the freight transportation needs of the state, the Texas Department of Transportation has developed the Texas Freight Mobility Plan. This document lays out a plan for freight and goods movement that is federally approved as a guide for the whole state to follow. For more information on this plan, please see Texas Freight Mobility Plan (txdot.gov).

2.2 Importance of Freight in North Texas

With approximately 7.7 million residents, the North Central Texas region is the fourth-largest metropolitan area in the US and one of the nation's largest destination markets.[10] Located amidst a central crossroads of North America and having access to major domestic and international trade routes allows the region to be accessed by multiple transportation modes, including truck, rail, and air.

2.2.1 Overview of Freight in North Texas

North Central Texas is North America's distribution hub. The region can be accessed by six Interstate Highways, three Class I railroads, two regional railroads, and three airports with extensive cargo operations. Below is an overview of the region's freight transportation assets. These modes utilize regional infrastructure linking nearly every major population center throughout the US, Mexico, and Canada directly to the region.

[7] Dallas Innovates
[8] Texas Freight Mobility Plan (txdot.gov)
[9] Texas Freight Mobility Plan (txdot.gov)
[10] 2020 US Census Bureau

Regional Freight Transportation Assets:

Interstates:

- IH 20
- IH 30
- IH 35
- IH 45/US 75
- IH 635
- IH 820

Class I Railroads:

- Union Pacific Railroad
- BNSF Railway
- Kansas City Southern Railway

Short Line Railroads:

- Dallas, Garland and Northeastern Railroad
- Fort Worth and Western Railroad

Airports:

- Dallas Fort Worth International Airport
- Dallas Love Field
- Fort Worth Alliance Airport

Within the US, logistics operations move in two key ways:

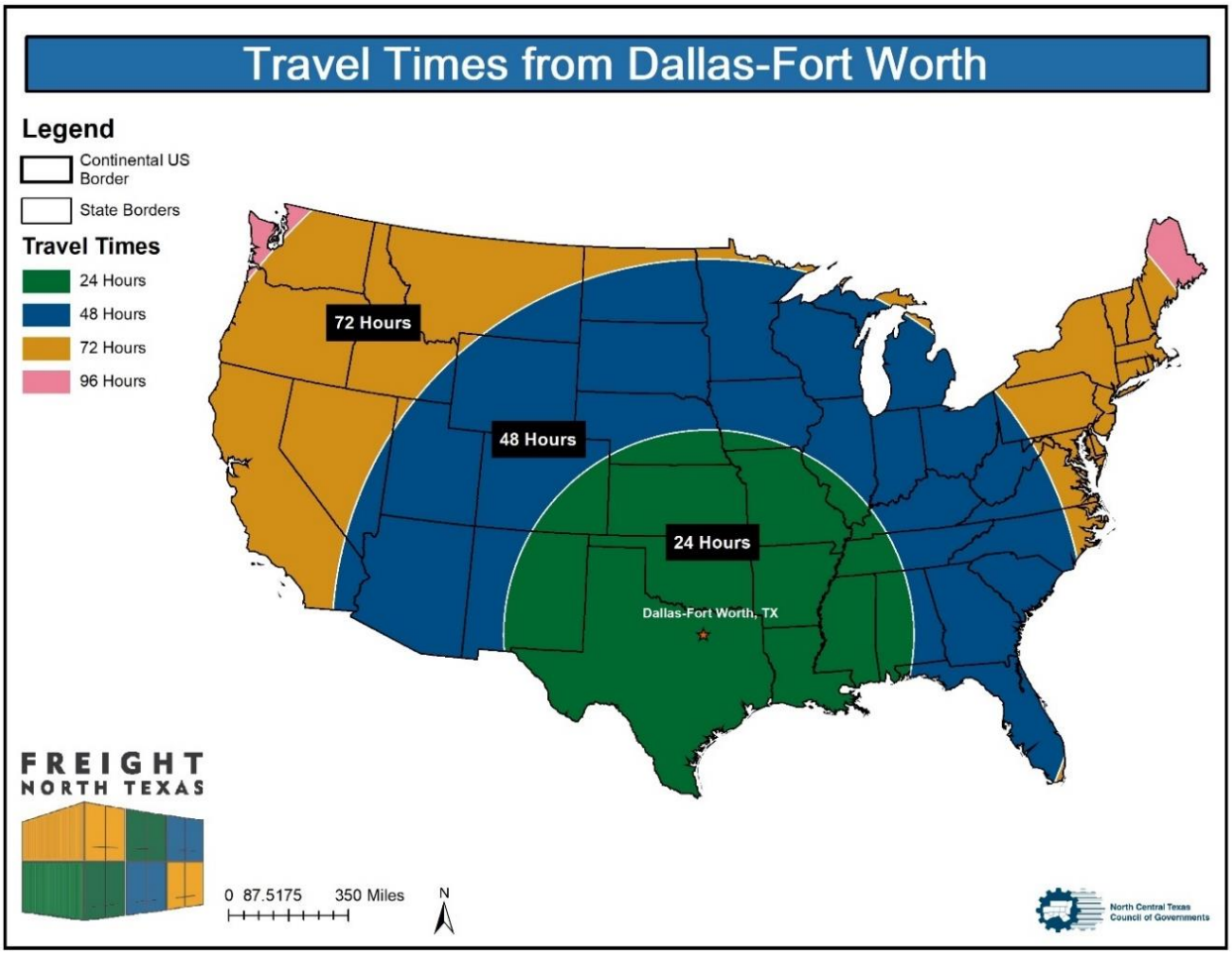
- From production center to export center, as is the case of agricultural products from the Midwest.
- From ports along the coast to distribution centers throughout the country, as is the case with containers arriving from Asia, through the ports of Los Angeles and Long Beach (LA/Long Beach).

A majority of US imports arrive through the ports of LA/Long Beach which, combined, are the two busiest seaports in the nation.[11] Most freight entering through the ports of LA/Long Beach travels through the North Central Texas region via truck or train on its way to markets in the eastern US.

North Central Texas is centrally located within the lower 48 states, which allows the region to serve as a primary distribution center, or inland port, for the southwestern US and the nation. Trucks leaving the region can reach much of the country within 72 hours (see **Figure 2.3**).

[11] Bureau of Transportation Statistics; *America's Container Ports: Linking Markets at Home and Abroad*

Figure 2.3: Travel Times from Dallas-Fort Worth



The region is also at a crossroads of the east-west rail from the ports of LA/Long Beach to the eastern US and the north-south rail lines from Mexico and the Port of Houston to the Upper Midwest. The region is also a large air cargo hub and a major distribution center.

The freight industry is vital to both the regional and state economies. The manufacturing, transportation, and warehousing industries in North Central Texas make a combined 84 billion in gross domestic product (GDP).[12] In 2020, the North Central Texas region accounted for about 30 percent of Texas' GDP.[13] Additionally, the region is home to four foreign trade zones (FTZ). FTZs benefit the region as many of the tariffs and fees associated with the goods-importing process are waived. This benefit encourages employers to keep manufacturing jobs in the region instead of outsourcing, and the tariff savings help to offset the cost savings of using foreign workers. With four FTZs, companies can ship products to the region directly from other countries.

This process bypasses long processing times at major US points of entry. An FTZ not only saves money for companies utilizing them, but also benefits the region through job creation, ensuring goods arrive

[12] North Texas Commission, 2022
[13] Bureau of Economic Analysis, 2021

more quickly, and reducing product cost**. Table 2.2** lists the region's FTZs and national ranking among the 195 US foreign trade zones.

Table 2.2: Regional Foreign Trade Zones 2020

FTZ ID	FTZ Name	Goods Processed (Millions)	Employees	Warehouse/Distribution (Millions)
196	Alliance Texas	$5,000-10,000	2,001-2,500	$1,000-$5,000
113	Ellis County Trade Zone Corporation	$0	0	$0
39	Dallas Fort Worth International Airport	$5,000-10,000	4,001-5,000	$5,000-$10,000
168	Metroplex International Trade Development Corporation	$10,000-25,000	751-1,000	$750-1,000

Source: Annual Report of Foreign Trade Zone, 2020

Economic Importance of Freight

The economic importance of freight in the North Central Texas region is immense. Freight's economic importance is evidenced by the devastation that would take place if the flow of freight into the region were to stop completely. The Federal Highway Administration estimates:

- Within 6 to 12 hours, assembly lines would come to a stop.
- Within 24 hours, hospitals would begin to run out of essential supplies.
- Within 48 hours, service stations would begin to run out of gas.
- Within 72 hours, grocery stores would begin to run out of perishable items.[14]

With the increased reliance on just-in-time shipping, the need for large warehousing spaces is removed, making timely deliveries critical. The freight industry not only ensures the timely delivery of goods to the region, but also provides employment opportunities. Over 377 million workers are employed in the transportation and material-moving industry, with a median income of $42,890.[15] Freight sector employment for the 10-year period from 2010 to 2020 can be seen in **Table 2.3**.

Table 2.3: Regional Freight Employment

Regional Freight Employment, 2010-2020						
Year	Freight Employment Sectors			Total Employment in Freight Sectors	Total Employment	Freight Percentage
	Manufacturing	Wholesale Trade	Transportation and Warehousing			
2010	284,193.00	90,297.00	129,298.00	503,788.00	2,184,748.00	23.1%
2011	290,039.00	86,374.00	129,980.00	506,393.00	2,253,680.00	22.5%
2012	289,414.00	85,112.00	133,365.00	507,891.00	2,305,216.00	22.0%
2013	286,685.00	85,072.00	131,466.00	503,223.00	2,345,331.00	21.5%
2014	290,773.00	85,708.00	134,228.00	510,709.00	2,390,596.00	21.4%
2015	292,122.00	90,051.00	137,898.00	520,071.00	2,463,442.00	21.1%
2016	289,669.00	93,995.00	144,426.00	528,090.00	2,529,447.00	20.9%

[14] *Keeping the Supply Chain Moving*, Federal Highway Administration
[15] US Bureau of Labor Statistics, 2021

Regional Freight Employment, 2010-2020						
Year	Freight Employment Sectors			Total Employment in Freight Sectors	Total Employment	Freight Percentage
	Manufacturing	Wholesale Trade	Transportation and Warehousing			
2017	289,690.00	98,583.00	149,584.00	537,857.00	2,613,448.00	20.6%
2018	292,304.00	99,474.00	160,769.00	552,547.00	2,701,884.00	20.5%
2019	292,406.00	100,201.00	171,686.00	564,293.00	2,772,299.00	20.4%
2020	297,327.00	100,971.00	181,399.00	579,697.00	2,844,377.00	20.4%

Source: US Census Data, American Community Survey 5-Year Estimates

Without a well-functioning freight system, goods could not be produced, shipped, or purchased. Ensuring the region's freight system is functioning properly is key to ensuring the success of the region's economy. In 2020, congestion cost freight shippers an estimated $101 billion in the US. In the North Central Texas region, truck congestion cost freight shippers an estimated $330 million annually, the sixth highest US metropolitan regional cost.[16] Freight bottlenecks cost approximately $200 billion, or 1.6 percent, of the US GDP each year.[17]

In 2020, approximately 464 million tons of goods were shipped from the region.[18] The Bureau of Transportation Statistics estimates the value of a ton of goods shipped ranges from $430 for bulk commodities to $18,000 for electronic and electrical equipment. As freight continues to grow, the economic impact of freight from both the jobs created and value of goods shipped will play a significant role in regional growth.

Regional Growth

The 12-county NCTCOG Metropolitan Planning Area population is approximately 7.9 million. NCTCOG's demographic estimates indicate increases to nearly 11 million people with 7.1 million jobs in the region by the year 2045. The Federal Highway Administration estimates freight shipment tonnage will increase between 2015 and 2045 by 40 percent nationally.[19] This statistic mirrors the projected regional population growth of 61 percent between 2010 and 2040. This estimated growth further illustrates the region's reliance on and need for an efficient freight network to ensure regional economic growth.

Freight Businesses and Operations in North Central Texas

As the North Central Texas region continues to grow, many freight businesses have moved to the region. Large freight truck facilities include the FedEx Ground Dallas Hub in Dallas and the Union Pacific Railroad intermodal terminals, which are located in Mesquite and Wilmer. These businesses are particularly important and necessary to move and deliver goods into the region. Key freight businesses and operations in North Central Texas include:

- BNSF Railway Intermodal and Carload Transportation Center at Alliance
- Kansas City Southern Wylie Intermodal Terminal in Wylie
- Union Pacific Railroad Dallas Intermodal Terminal in Wilmer

[16] Texas Transportation Institute
[17] Building Americas Future
[18] Freight Analysis Framework 5, Federal Highway Administration
[19] US Department of Transportation

- Union Pacific Railroad Mesquite Intermodal Terminal in Mesquite
- Dallas Fort Worth International Airport
- Alliance Airport Air Cargo Terminals
- Peterbilt Motors Company Manufacturing in Denton
- FedEx Ground Dallas Hub in Dallas
- United Parcel Service in Dallas
- Coca-Cola Bottling and Distribution in Fort Worth
- Pepsi-Cola Bottling and Distribution in Mesquite
- Miller Distributing of Fort Worth
- Alcon Medical Company in Fort Worth

These businesses move substantial amounts of necessary freight into the region. As the region grows, more businesses will locate and participate in more freight movements. For example, the city of Lancaster will host two large Walmart distribution facilities, each over one million square feet, that will provide necessary goods into the region with plans to expand with other freight facilities.

2.3 North Texas Freight Components

A variety of modes are used to transport freight in the North Central Texas region. Freight is not a transportation mode; rather freight consists of the goods transported by rail, truck, air, or water.

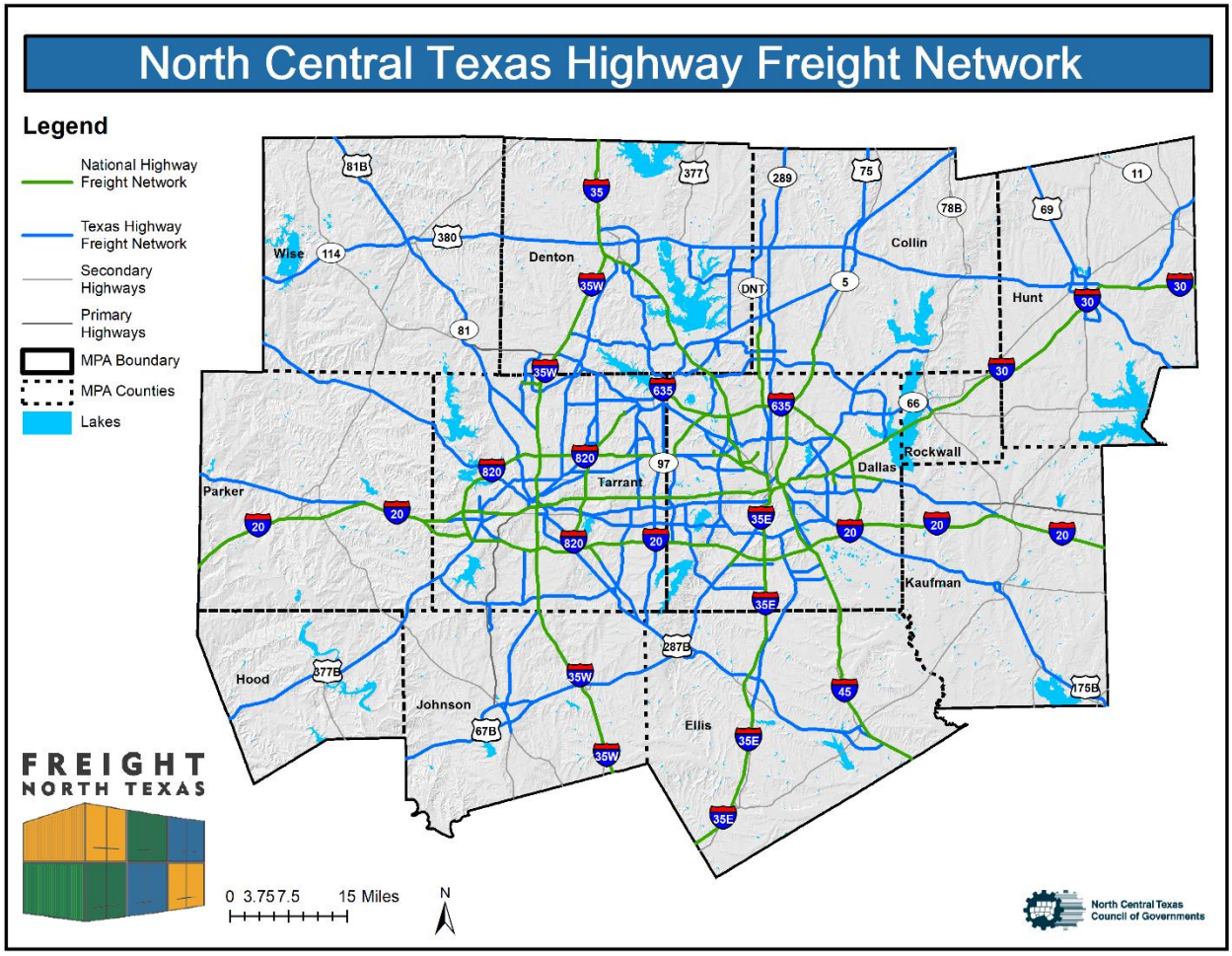
2.3.1 Trucks

Trucks are the most utilized mode of transportation for most of the goods moving into, through, and out of the region. The extensive regional roadway network allows trucks to access the region from many directions, saving time and money for both the truck operators and consumers.

Regional Freight Networks

A regional roadway network review identified the region's National Highway Freight Network (NHFN) and Texas Highway Freight Network (THFN). The NHFN corridors are used by the majority of freight shippers moving through the region. The THFN corridors are primarily used by intraregional traffic. The NHFN and THFN facilities are shown in **Figure 2.4**. These corridors also provide access and egress points into and out of the North Central Texas region.

Figure 2.4: National and State Highway Freight Network



Regional Truck Routes

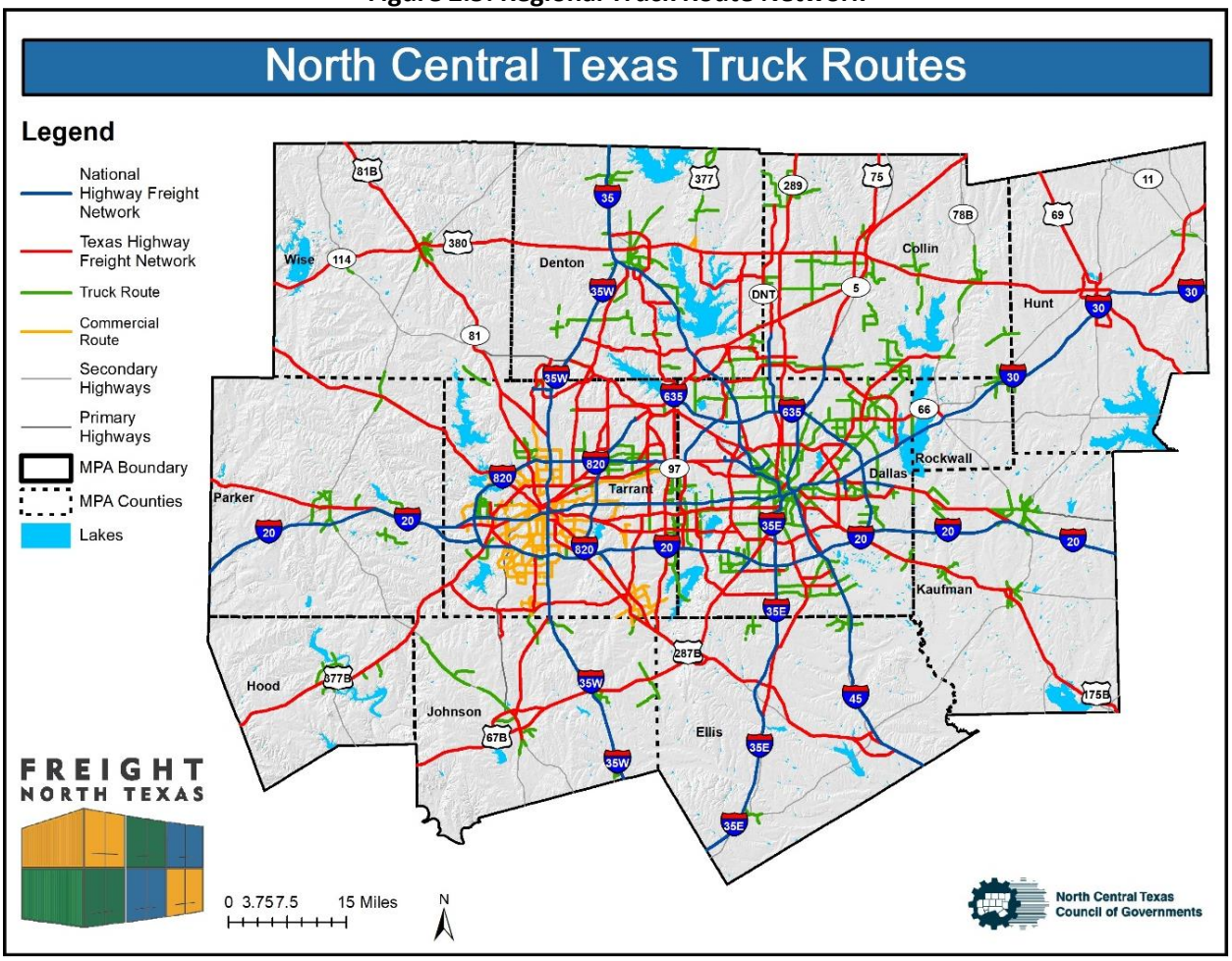
Dedicated truck routes are an important regional freight system component. Federal, state, and local governments can establish truck routes as a way to direct freight traffic to alleviate congestion for both passenger and freight vehicles. Truck routes also provide designated routes to key freight facilities. Within the North Central Texas region, 96 municipalities have some form of truck route designated by ordinance. The different roadway classifications and the level of government with the authority to regulate traffic on each roadway type are shown in **Table 2.4**.

Table 2.4: Roadway Functional Classes

Roadway Type	Regulation Authority	Regional Examples
Interstate Highways (IH) United State Highways (US)	Federal Government	IH 30 US 377 US 75
State Highways (SH) Farm-to-Market Roads (FM)	State Government	SH 183 FM 157
Local Arterials	Municipal/Local Government	Coit Road Randol Mill Road

The locations of these routes are shown in **Figure 2.5.** While a majority of the regional truck routes are located on local streets, several segments are located on THFN corridors and, to a lesser degree, on NHFN corridors.

Figure 2.5: Regional Truck Route Network



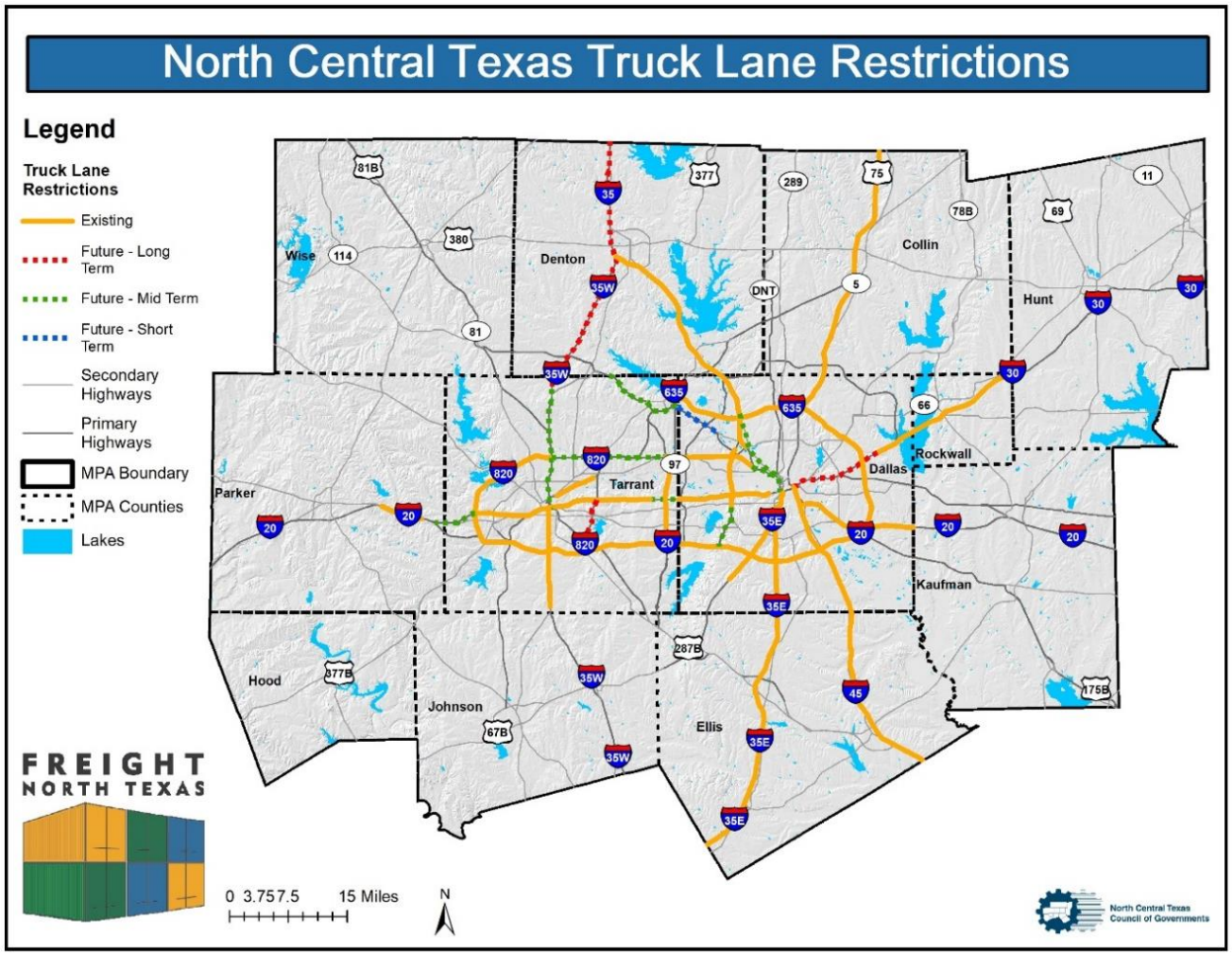
Truck Lane Restrictions

The Truck Lane Pilot Study was completed in 2006. Based on traffic studies, truck lane restrictions have been shown to improve mobility, safety, and air quality. For a corridor to be considered for truck lane restrictions, there must be three or more traffic lanes (excluding frontage roads) in each direction and there cannot be left exits. In these corridor sections, trucks with three or more axles are prohibited from using the inside left lane, except when passing traffic.

The truck lane restrictions proposed in the 2006 Truck Lane Pilot Study and 2009 Truck Lane Restriction Expansion Study are operational along sections of highway segments in Collin, Dallas, Ellis, Parker, Rockwall, and Tarrant counties. These were further expanded in 2013. Then in 2019 and 2022, NCTCOG and the Texas Department of Transportation Dallas District worked together on an expansion of the region's truck lane restrictions, including those across the eastern side of the region. **Figure 2.6** illustrates these sections. As portrayed, the majority of the operational truck lane restrictions are in

Dallas and Tarrant counties. The figure also shows plans for future truck lane restrictions, which will complete corridors in Denton County. Combined, these truck lane restrictions are expected to improve highway safety and mobility and the region's air quality. The implementation of these additional truck lane restrictions will help to ease congestion for passenger vehicles and increase safety in the proposed corridors

Figure 2.6: Regional Truck Lane Restrictions



Trucks are an attractive option for shippers as they have access to nearly every major metropolitan area in North America. The flexibility offered by trucks is one attribute that sets it apart from other modes. Approximately 84.6 percent of all goods being shipped to and from the region are transported on trucks. The region relies heavily on trucks to deliver the following commodities:

- Gasoline
- Fuel oils
- Nonmetal mineral products

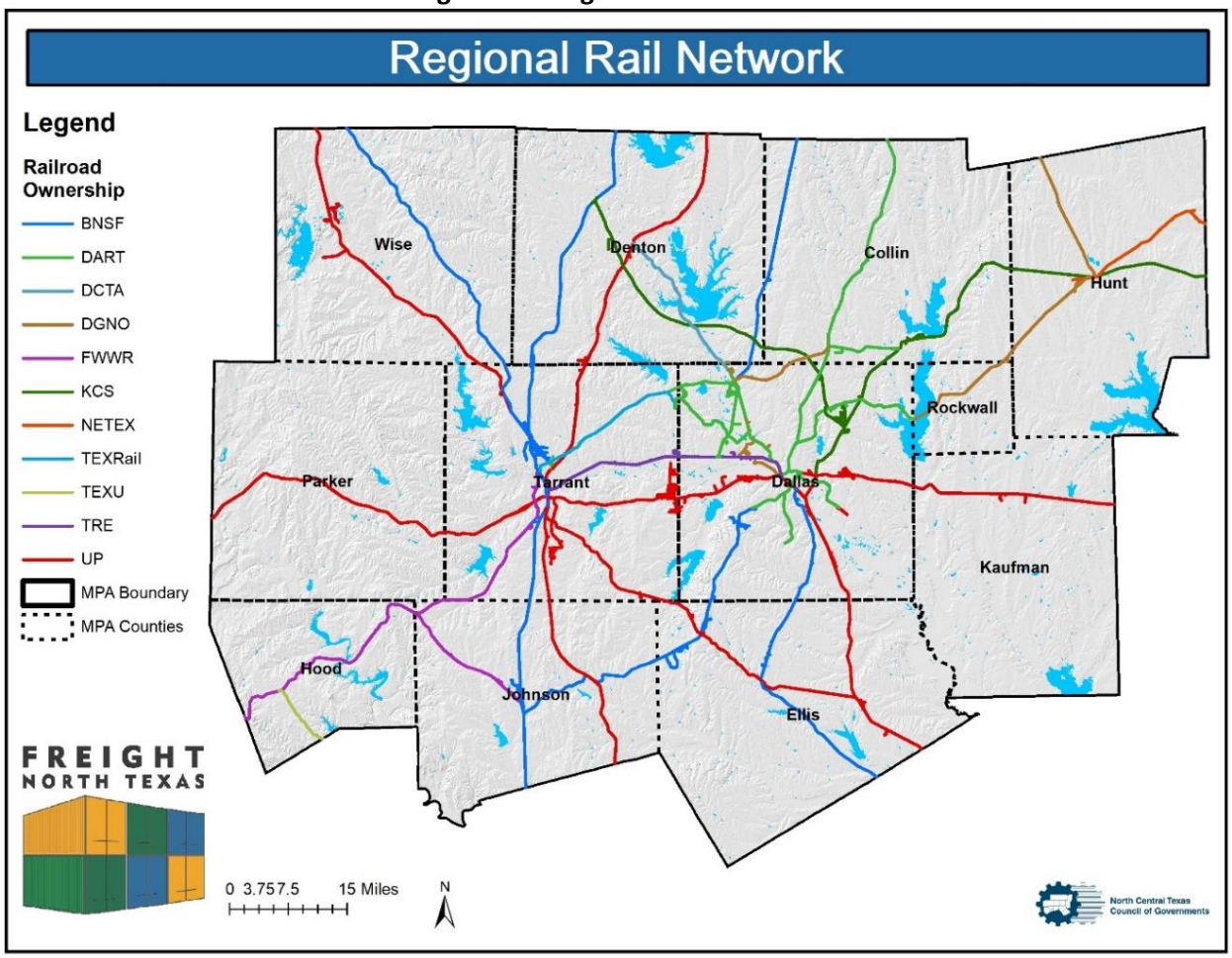
- Natural sands
- Coal[20]

There are several hundred national and local trucking companies operating within the region. Truck shipments are the region's economic lifeblood, carrying products during the supply chain's critical first and last miles. Everything used on a daily basis travels by truck at some point on its journey.

2.3.2 Rail

The regional railroad system is extensive, as seen in **Figure 2.7.** Three Class I railroads (BNSF Railway, Kansas City Southern Railway, and Union Pacific Railroad) and two regional railroads (Dallas, Garland and Northeastern Railroad and the Fort Worth and Western Railroad) operate within the region. The regional railroads interchange with the Class I railroads (railroads with annual operating revenues of $505 million or more) to deliver key commodities into and within the region.[21]

Figure 2.7: Regional Rail Network



[20] Freight Analysis Framework 5, Federal Highway Administration
[21] Class I Railroads (USA): Definition, Revenue, Size (american-rails.com)

In addition to the two regional railroads headquartered within the region, BNSF Railway's corporate headquarters is located in Fort Worth.

Rail shipments utilize a rail network covering more than 2,300 miles. The rail network provides the link between the region and major international and domestic freight routes in North America.

Rail is often utilized for items shipped in large quantities that are heavy (such as coal and grain), with a low value per unit (such as gravel) or shipped at a distance over 500 miles.

The region relies heavily on rail to deliver the following commodities:

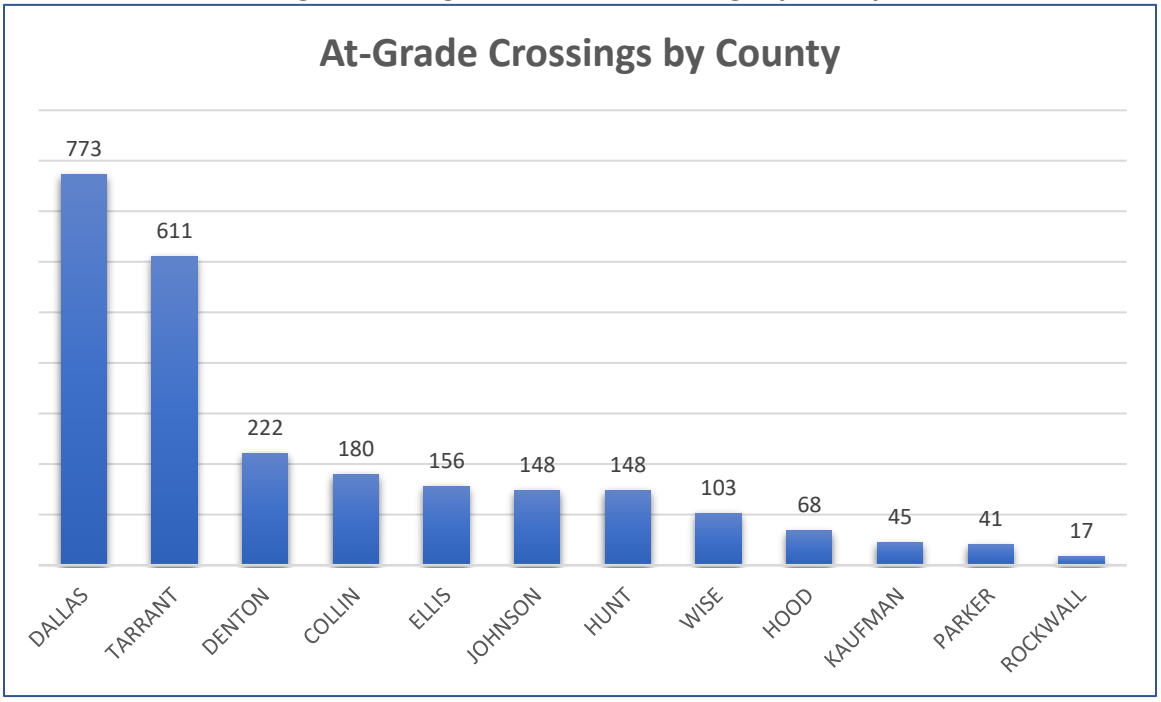
- Plastics/rubber
- Gasoline
- Fuel oils
- Basic chemicals
- Cereal grains[22]

Source: NCTCOG

There are 2,442 at-grade railroad-highway crossings within the 12-county region. A breakdown by county is shown in **Figure 2.8.** In the region, Dallas County has 773 at-grade crossings, which is the highest number in the region. Tarrant County has 611 and Denton County has 222 at-grade crossings. A majority of rail-related injuries and fatalities occur at at-grade crossings. It is important to know and understand the significant role rail crossings play in the transportation network.

[22] Freight Analysis Framework 5, Federal Highway Administration

Figure 2.8: Regional At-Grade Crossings by County



The importance of safety at rail crossings cannot be understated. There always needs to be a better understanding of the power of trains and the impact of proper behavior at rail crossings. To help understand this better, below are facts about trains and what it takes for one to stop and the impact it can have:

- The average train weighs 12 million pounds.
- A train traveling 50 mph and pulling 100 cars takes one mile to stop.
- The weight ratio of a train to a car is the same as a car to an aluminum can.
- Many vehicle-train collisions occur when trains are traveling at less than 35 mph. Nearly two-thirds of all collisions occur during daylight hours.[23]

2.3.3 Pipeline

Pipelines and pipeline facilities in the region transport petroleum, natural gas, and other hazardous materials. The oil and natural gas industry is an integral component of the regional economy. The Barnett Shale formation, located in the region, is an onshore natural gas field stretching from the city of Dallas to the west and south. The Barnett Shale covers 5,000 square miles and 8 of the 12 Metropolitan Planning Area counties, including:

- Dallas County
- Denton County
- Ellis County
- Hood County
- Johnson County
- Parker County

[23] Texas Department of Insurance

- Tarrant County
- Wise County

Throughout the region, pipelines are used to transport commodities associated with the oil and gas industry, including:

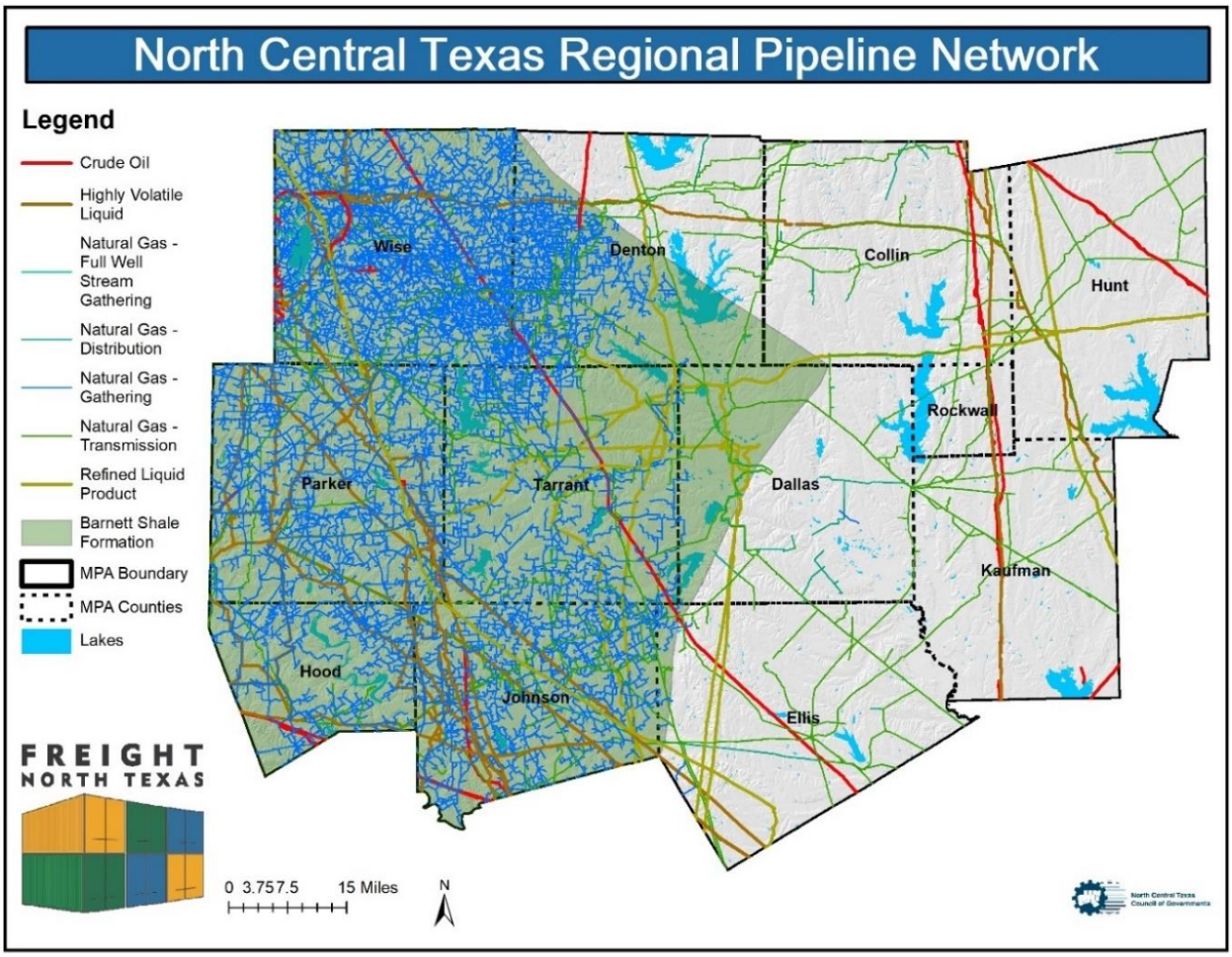
- Gasoline
- Natural gas
- Water
- Other fuel oils[24]

The recent Barnett Shale exploration for natural gas resources has led to an increase in regional pipelines. Pipelines are considered the safest and most efficient way to move oil and gas products.

Due to the size of the Barnett Shale and the oil industry in North Central Texas, the region's pipeline network is large, as seen in **Figure 2.9.** Regional commercial pipelines total approximately 16,000 miles, roughly the same distance as three roundtrip flights between Los Angeles and New York City. This extensive network, which operates mainly below ground, transports approximately 29.3 million tons annually in North Central Texas, second only to trucks in tonnage transported.[25]

[24] Freight Analysis Framework 5, Federal Highway Administration
[25] Freight Analysis Framework 5, Federal Highway Administration

Figure 2.9: North Central Texas Pipeline Network



2.3.4 Air Cargo

Air cargo is the movement of freight by air. This mode, typically consisting of high value and/or high priority items, represents only a small share of the total tonnage shipped annually in the US. In 2018, air transportation carried 16 billion-ton miles. This equates to 0.3 percent of the total cargo movement activity by weight within the US.[26] Some of the top commodities transported by air for the North Central Texas region are:

- Electronics
- Transportation equipment machinery
- Miscellaneous manufacturing products

[26] Bureau of Transportation Statistics

Within the region, all scheduled regional air cargo is handled at one of three airports:

- Dallas Fort Worth International Airport (DFW)
- Dallas Love Field (DAL)
- Fort Worth Alliance Airport (AFW)

DFW and AFW lead the region in transportation of cargo. **Figures 2.10** and **2.11** show the air cargo tonnage at DFW and AFW from 1995 to 2021. In general, air cargo is handled at the same airports with scheduled commercial passenger service. These diverse air transportation modes coexist due to the population and industrial base, as well as the extensive airport facilities, infrastructure, and services that are already present in and around the passenger airports.

Source: NCTCOG

Both DFW and AFW saw a significant increase in cargo transported from 2020 to 2021. DFW saw a 5 percent increase in cargo transported and AFW saw a 4 percent increase. This increase can be contributed to changes in buying habits, increased online shopping, and supply chain disruptions and COVID-19.

Figure 2.10: Dallas Fort Worth International Airport Air Cargo Tonnage

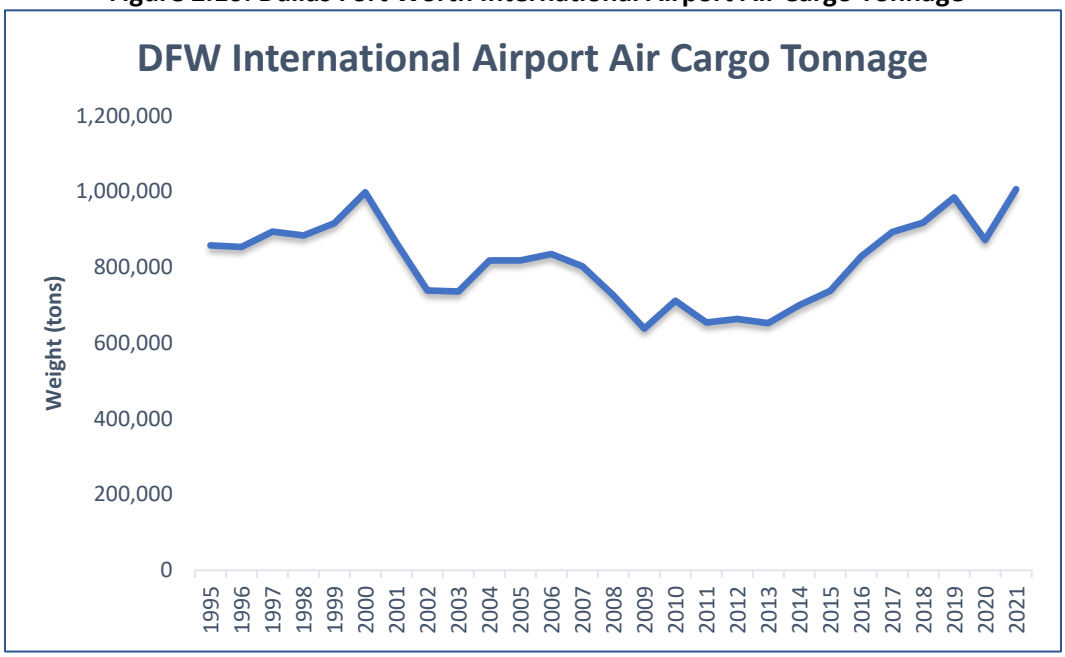
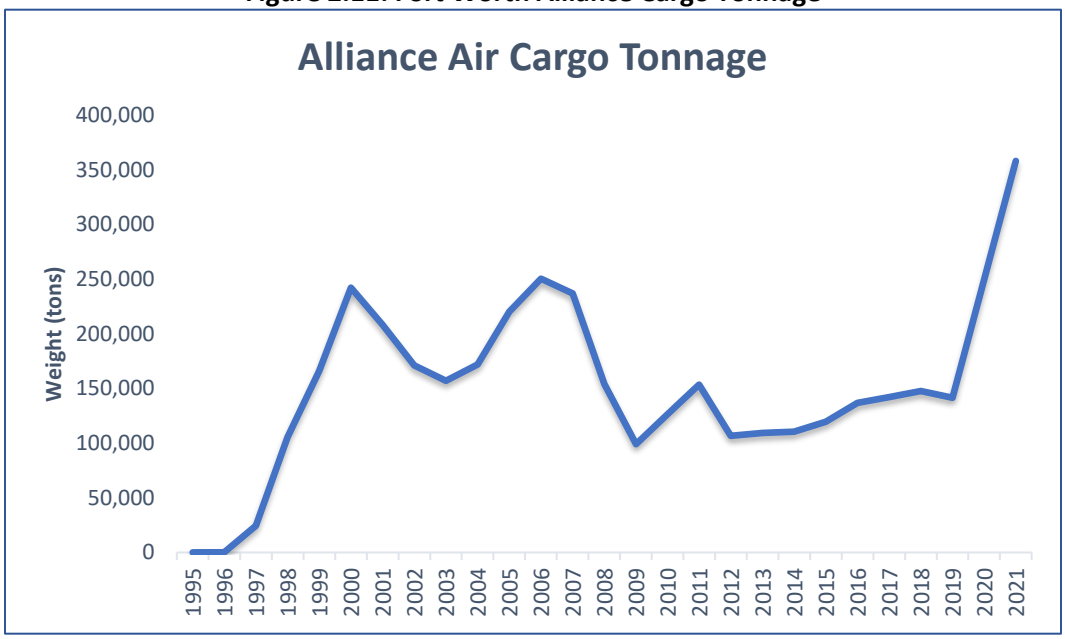


Figure 2.11: Fort Worth Alliance Cargo Tonnage



2.3.5 Intermodal

Intermodal transportation is a critical feature of freight transportation in the North Central Texas region. An intermodal facility is when a transportation mode (truck, rail, air, or ship) brings goods to and from a facility, then passes the goods to another transportation mode. Intermodal transport refers to the movement of containers of freight between modes, including:

- Between rail and truck
- Between ship and truck
- Between air and truck

The region has numerous intermodal facilities that move goods throughout the region. Within the area, intermodal refers to the transfer between truck, rail, and air modes. In addition to the freight-focused airports discussed in **Section 2.3.4**, below are the region's four major intermodal rail yards:

- BNSF Railway's Alliance Texas Facility in Fort Worth
- Union Pacific Railroad's Dallas Intermodal Terminal in Wilmer/Hutchins
- Union Pacific Railroad's Mesquite Intermodal Terminal in Mesquite
- Kansas City Southern Railway Wylie Intermodal Facility

Union Pacific Railroad has intermodal operations in two locations in the southeast portion of the region with the Dallas Intermodal Facility located off IH 45 near IH 20 and the Mesquite Intermodal Facility located off US 80 near IH 635. BNSF Railway also has an intermodal yard in the northwest part of the region located off IH 35W and SH 170 in Alliance. Kansas City Southern Railway recently opened an intermodal yard in Wylie in the northeast portion of the region off SH 78.

Intermodal facility operations are significant to roadway freight movements due to the truck trips they create. Since the domestic and international freight demand continues to grow, it is important to recognize the importance of these large intermodal facilities that provide necessary goods to and from the region. Without these facilities, North Texans would not get the deliveries they want/need, and the efficiency of deliveries would plummet significantly. Combined, these facilities handle over one million intermodal transfers (also known as lifts) annually (see **Table 2.5**):

Table 2.5: Regional Intermodal Hubs

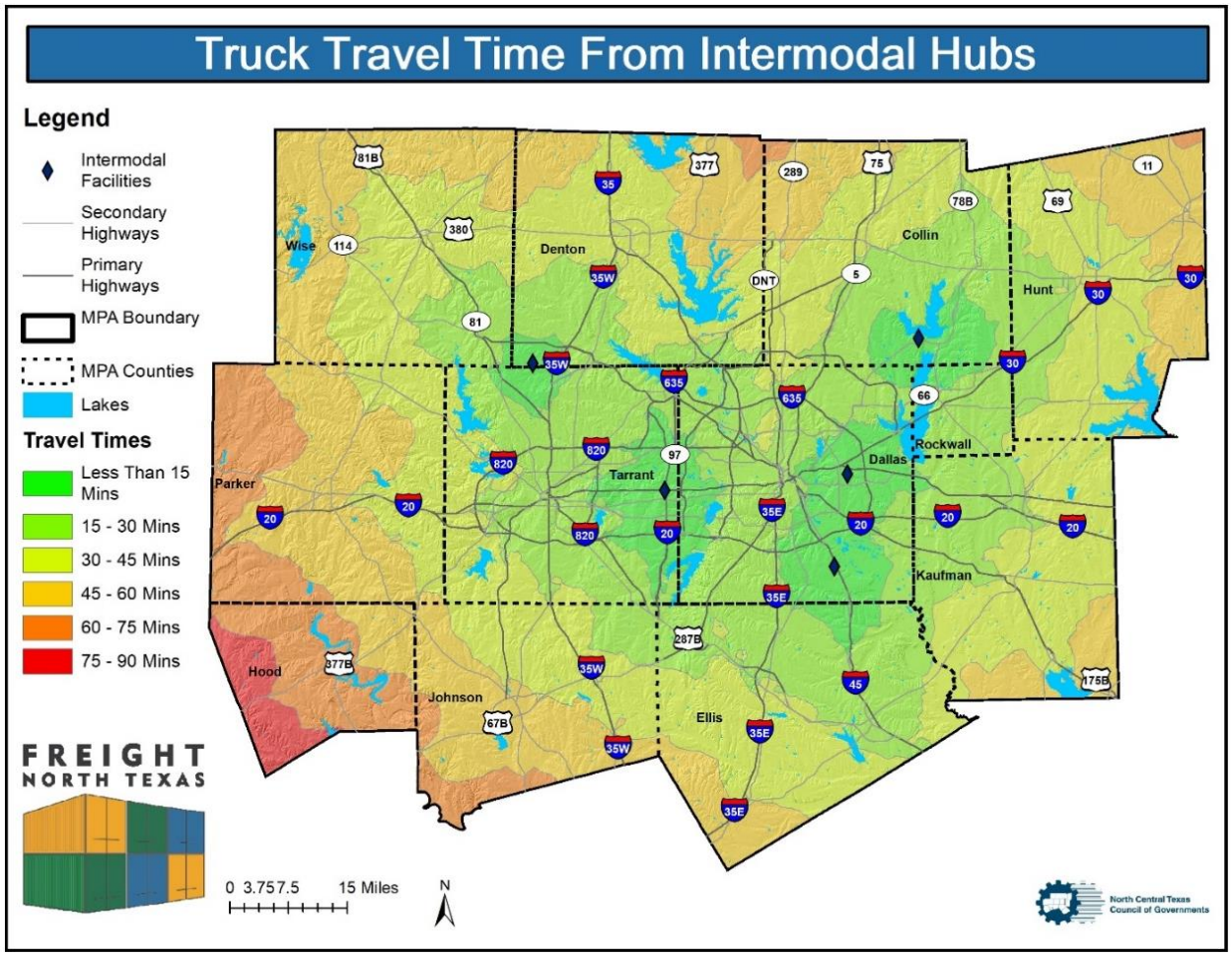
Name	City	Annual Lift Capacity
Alliance Intermodal Facility	Fort Worth	1,000,000
Dallas Intermodal Terminal	Wilmer/Hutchins	387,000
Mesquite Intermodal Terminal	Mesquite	225,000
Kansas City Southern Railway Wylie Intermodal Facility	Wylie	342,000

Intermodal freight has the highest growth rate of all freight conveyance methods. The region has benefitted from the influx of intermodal traffic due to direct rail access to the ports of LA/Long Beach. The region relies on intermodal freight to deliver the following commodities:

- Food products
- Consumer products (i.e., electronics, clothes, etc.)

The intermodal hubs/terminals are strategically located within the region. Almost all of the region can be accessed by truck from these hubs/terminals within 60 minutes. **Figure 2.12** illustrates the travel times for the major regional hubs/terminals.

Figure 2.12: Regional Intermodal Hub Travel Times



2.3.6 Inland Ports/Freight-Oriented Development

While the North Central Texas region does not have direct access to a seaport, the region is the largest inland port in the nation. Located 250 miles southwest of the region, the Port of Houston is a 25-mile-long complex of public and private facilities located near the Gulf of Mexico.[27] The port is ranked first in the US in foreign waterborne tonnage, first in US imports, first in US export tonnage, and third in the US in total tonnage.[28] The Port of Houston's connection to IH 45 is significant to the North Texas region due to the high amounts of freight movement passing on the highway.

Since the Dallas-Fort Worth region is a major logistical hub, there are many freight-oriented developments within the region. A freight-oriented development is defined as an area where manufacturing, warehousing, distribution, and freight forwarding operations are consolidated with ready access to a multimodal transportation network. **Table 2.6** shows the major freight-oriented developments within the region.

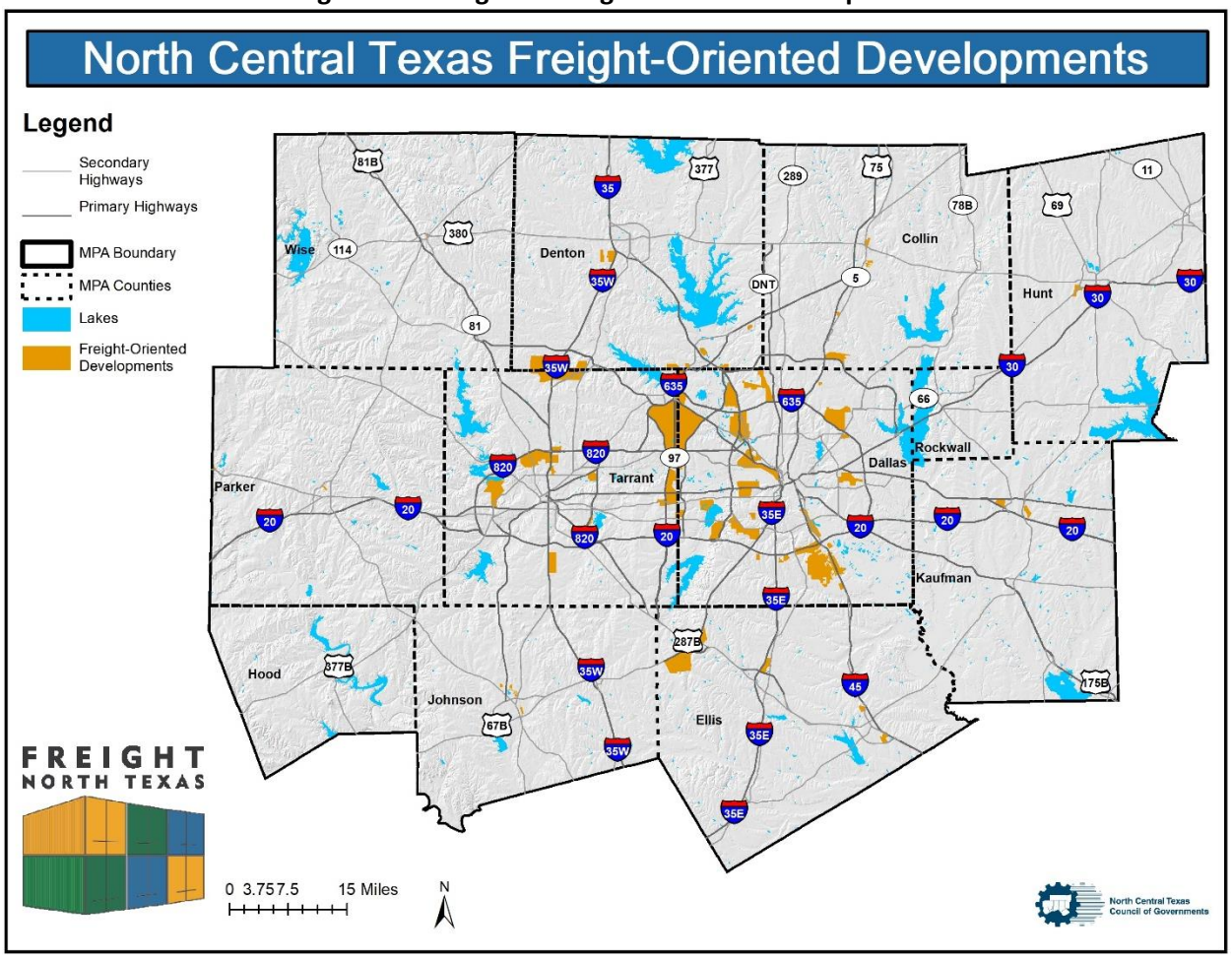
[27] Texas Ports Association
[28] Texas Ports Association

Table 2.6: Major Freight-Oriented Developments in the Dallas-Fort Worth Area

Major Freight-Oriented Developments in the Dallas-Fort Worth Area		
Name	**City Primary**	**County**
Alliance Area	Fort Worth	Denton
Meacham Area	Fort Worth	Tarrant
Joint Reserve Base	Fort Worth	Tarrant
Carter Industrial Park	Fort Worth	Tarrant
820 East/Lake Arlington	Fort Worth	Tarrant
Riverbend	Fort Worth	Tarrant
Centreport	Fort Worth	Tarrant
Midlothian Industries	Midlothian	Ellis
Dallas Ecopark	Dallas	Dallas
Dallas Southport	Dallas	Dallas
Dallas Eastpoint Business Center	Dallas	Dallas
Dallas Hensley Field	Dallas	Dallas
Dallas Mountain Creek Business Park	Dallas	Dallas
Dallas Pinnacle Park	Dallas	Dallas
Dallas Redbird Industrial Property	Dallas	Dallas
Dallas Santa Fe Industrial Park	Dallas	Dallas
Dallas Stoneridge	Dallas	Dallas
Great Southwest Industrial District	Grand Prairie	Tarrant
Northgate Business Park	Garland	Dallas
Valwood Business Park	Carrollton	Dallas
Turnpike Distribution Center	Dallas	Dallas
Skyline Industrial Park	Mesquite	Dallas
Sunridge Business Park	Wilmer	Dallas
North Dallas	Dallas	Dallas
Addison	Addison	Dallas
Southwest Dallas	Dallas	Dallas
Trinity Freight-Oriented Development	Dallas	Dallas
Northeast Dallas	Dallas	Collin
Mesquite Intermodal Facility	Dallas	Dallas
Trinity Mills Business Park	Carrollton	Denton
Santa Fe Industrial Park	Dallas	Dallas
Dallas County – Centerport	Irving	Dallas
Terrell Municipal Airport District	Terrell	Kaufman
North Dallas Fort Worth International Airport Area	Irving	Dallas
Casa Linda Industrial District	Dallas	Dallas
Trinity Mills Business Park	Carrollton	Dallas
Danieldale Road Lancaster	Lancaster	Dallas

Figure 2.13 shows all the freight-oriented developments in the region. As the figure shows, the majority of the freight-oriented developments are located near major transportation infrastructure, including freeways, airports, and rail intermodal facilities.

Figure 2.13: Regional Freight-Oriented Developments



2.4 Summary

This section shows the importance of freight movement around the region, as well as other parts of Texas, the United States, and other countries. The North Central Texas region, especially the four main counties, depends on the efficiency of goods moving. For more information regarding the four core urban counties within the Metropolitan Planning Area, see the freight scan fact sheets located in **Appendix A.** This section includes information that demonstrates the current freight trends on a national, state, and, most importantly, regional level. For example, topics cover trading partners, local freight-oriented developments, inland ports, regional intermodal hubs, and at-grade railroad crossings.

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3.0 Freight Planning in North Central Texas

The analysis and review of freight elements discussed in this section was to build upon what was learned from reviewing the regional conditions discussed in **Section 2**. This section deals with all elements of planning for freight in North Central Texas. The program's guiding goals and objectives, as well as the federal, state, and regional policies that help determine the priorities of the program, are discussed.

3.1 Freight Program Goals and Objectives

NCTCOG developed the Freight Planning Program to enhance the safety, mobility, efficiency, and air quality associated with freight movement throughout the Dallas-Fort Worth region. These are outlined in **Section 1.1** as part of the introduction to Freight Planning in North Central Texas. This section provides a more in-depth review of the goals, objectives, and focus areas.

The Freight Planning Program at NCTCOG was developed to recognize that goods movement has an impact on all facets of people's lives and, thus, encompasses many different areas of planning, including safety, mobility, efficiency, and the environment. These all need to be improved to ensure that freight is a positive aspect in the lives of everyone in North Central Texas. NCTCOG's overall goal on freight is:

> ***The goal of the Freight North Texas Program is to enhance the safety, mobility, efficiency, and air quality associated with freight movements within the Dallas-Fort Worth area.***

As stated earlier, NCTCOG developed the Freight Planning Program with goals associated with freight movement throughout the Dallas-Fort Worth region. The primary objectives of the program are to:

- **Provide short- and long-range freight transportation plans and studies:** These include many different reviews, studies, and an analysis that is done within the Freight North Texas Program. Many of the studies, both short- and long-term, are highlighted throughout **Section 3.** These studies, especially the short-term ones, can be the result of requests from cities or other regional partners. They can also be the result of a larger effort such as *Freight North Texas*.
- **Foster regional economic activity through safe, efficient freight movement:** As shown in **Section 2**, freight and goods movement have a huge impact on the national, state, and regional economy. Fostering the growth of this industry is important to the success of any region. Planning for improved movements of goods is key to the region's economic strength and is a top priority for NCTCOG.
- **Educate elected officials and the public regarding freight's role in the regional economy and impact on everyday life:** The Regional Transportation Council (RTC) is the governing body of the Metropolitan Planning Organization so key elements of *Freight North Texas* are to make sure members of the RTC and others see the positive impact it has on their daily lives and the region. As part of this, it is important for elected officials to understand the importance they play in improving goods movements throughout the region.
- **Support Regional Transportation Council activities:** This objective is one that all programs at NCTCOG share in common. As stated in **Section 1**, the entire *Freight North Texas* and the Freight Planning Program are in support of the region's MTP which supports the RTC's decisions for the region. *Freight North Texas* strives to be in line with the overall goals of the RTC.

To achieve these objectives, NCTCOG has set the following regional freight planning goals:

- Seek freight community participation in the planning process
- Monitor freight traffic through the region to identify potential bottlenecks
- Improve freight movement efficiency to, from, and within the region
- Promote safety, mobility, and accessibility
- Reduce the air quality impacts of freight movements
- Incorporate freight considerations in transportation projects
- Develop and use a sustainable and reliable funding source for freight programs and projects
- Develop a regional freight database
- Improve railroad safety and reliability

To accomplish these objectives and goals, the Freight Planning Program focuses on the following areas of work:

- **Freight projects and funding sources:** Key to the success of goods movement in the region is developing freight-specific projects, then identifying those projects. **Section 4** of this document outlines several freight-specific projects.
- **Data collection:** This focus area is straightforward; without data, it is very hard to do proper analysis. Data collection is the life blood of planning and the process within *Freight North Texas* is in line with that approach.
- **Regional Freight Mobility Plan development:** Everything that is done within goods movement planning is done with the objective of creating this freight mobility plan.
- **Follow-up studies identified in the Freight Mobility Plan:** Since *Freight North Texas* – the regional mobility plan – is the guiding document, it only makes sense that a large focus of the Freight Program is on the follow-up studies of the previous *Freight North Texas* and its current version.

Together, these Freight Program objectives, goals, and focus areas improve quality-of-life for regional residents by supporting a robust, dynamic transportation system and development of the economy.

3.2 Freight Initiatives

The NCTCOG Freight Planning Program focuses on several concrete initiatives to bring about desired outcomes in the focus areas outlined above. These initiatives produce data, analysis, and recommended courses of action for regional elected officials, city planners, transportation authorities, and freight industry stakeholders.

Regional Freight Mobility Plan (*Freight North Texas*)

A significant focus of the NCTCOG Freight Program is the development of a regional Freight System Plan for the purpose of guiding freight transportation infrastructure development and investment, and anticipating change in freight network conditions, as well as addressing weaknesses and opportunities within the current network. In 2013, NCTCOG published *Freight North Texas*, the first regional freight plan and inventory of freight network infrastructure in the region, which also serves as the basis for this updated plan. Additionally, *Freight North Texas* (*2013)* identified the need for the completion of several follow-up studies, including a Freight Land Use Analysis, a Freight Congestion and Delay Study, a Bottleneck Study, and a Truck Parking Study. The outcomes of these studies will be discussed throughout **Section 3.5** of this document. This plan is the result of this initiative.

Long- and Short-Term Planning Studies and Analysis

Completing studies and analysis are probably the biggest initiative within freight planning at NCTCOG. This is the major function of the program. This initiative provides the backbone of freight movements in both a very localized way (short-term) and regionwide (long-term). The studies help to educate and help everyone understand what needs to be done to help the movement of freight within and through the region.

Regional Freight Advisory Committee

This initiative draws on the experience and expertise of freight industry professionals with the goal of improving regional freight planning. As a part of this study, NCTCOG staff convened the Regional Freight Advisory Committee (RFAC), consisting of regional freight professionals, in September 2011. RFAC provides guidance to NCTCOG staff regarding freight activities, as well as strategic product and project review. *Freight North Texas* and RFAC will advise and guide NCTCOG staff in prioritizing and improving freight planning in the North Central Texas region. Biannual meetings are coordinated with freight industry partners to solicit feedback regarding the NCTCOG Freight Planning Program and share information about ongoing efforts. These meetings provide a venue for discussions on topics of interest to regional freight stakeholders and foster the development of a collaborative professional network.

In addition to the biannual meetings, staff prepares quarterly newsletters that are sent to RFAC to keep them up-to-date on the different projects, programs, and initiatives NCTCOG is working on that relate to freight.

Data Collection and Tracking

Data collection and tracking is used on a regular basis in freight planning. Staff require regular updates and maintenance to ensure successful data collection and tracking techniques. The projects listed below identify current data tracking tasks.

- **Freight Information System Maintenance:** A database of various freight data, updated quarterly
- **Air Cargo:** Tracks air cargo data from the various airports in the region, updated yearly
- **Foreign Trade Zone:** Tracks foreign trade zone information for the four regional zones and updates GIS if needed, updated yearly
- **Freight Facilities:** Tracks the various facilities in the region, including freight-oriented developments in GIS and a database, updated yearly
- **Hazardous Materials Incident:** Tracks hazardous materials incidents in the region in GIS, updated yearly
- **Quiet Zone:** Tracks the different rail quiet zones in GIS, updated yearly
- **Truck Routes Tracking:** Reviews all the truck routes in the region and tracks them in GIS and a database, updated yearly
- **Truck Volumes:** Obtains current model year truck volumes and maps in GIS when a new TransCAD roadway network model run is available
- **Rail Operators and Owners:** A GIS map and database of current owners and operators of rail lines in the region, updated yearly

- **At-Grade Crossing Incidents:** Tracks the incidents, including fatalities at crossings in the region, by county, updated yearly
- **Truck Parking:** Tracks different truck parking in the region in GIS, updated yearly

Grant Submissions

Securing federal funding in support of local and regional freight network improvement projects is a critical enabler for capital projects that preserve major infrastructure components and fund new expansion or improvement projects. US Department of Transportation discretionary grant programs such as the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) and the Infrastructure for Rebuilding America (INFRA) grants make funding available to support major maintenance and improvement projects in the multimodal goods movement system. NCTCOG has historically utilized these funding mechanisms to make possible large-scale projects using a diverse array of funding sources.

Freight Safety Initiatives

With the goal of creating a safer environment for pedestrians, cyclists, and roadway users in the North Central Texas region, the NCTCOG Freight Safety Initiative promotes awareness of safe practices in freight movement. Working with partners such as Operation: Lifesaver, activities surrounding this initiative involve the distribution of advertisements and outreach materials via social media, billboards, and radio.

3.3 Freight Policies

The NCTCOG Freight Planning Program both crafts and pursues policies for adoption by municipal, county, and regional transportation authorities for the purpose of better integrating freight considerations in transportation planning and securing funding for freight infrastructure projects. By researching and analyzing various elements of the multimodal network, the Freight Program produces recommendations and courses of action that local entities can incorporate into their own planning processes, as well as prioritize capital project listings that local officials can select from as funding becomes available or timelines allow. These freight policies support the program area objectives and the goals of the NCTCOG Regional Transportation Council.

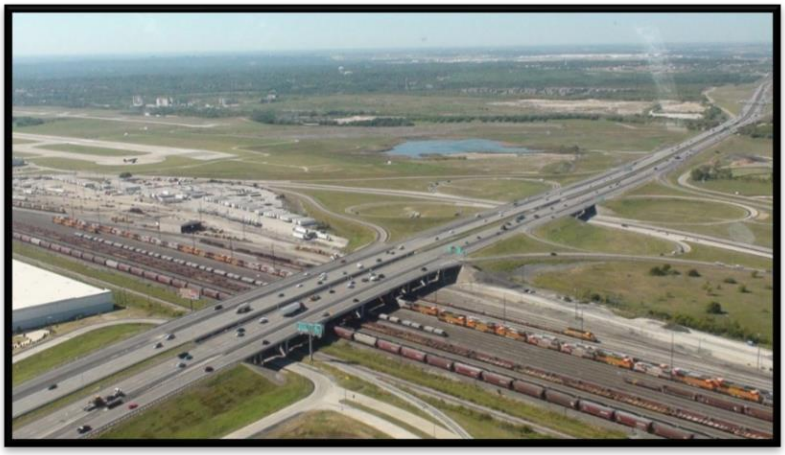
Although the Freight Program provides analysis and policy recommendations at the regional level, there are both state and federal government policies that guide the activities of the regional Freight Planning Program.

3.3.1 Federal Policies Impacting Freight

The two primary pieces of legislation at the federal level that impact freight are the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act, which were passed by Congress in 2012 and 2015, respectively. MAP-21 established the National Freight Network and identified national freight transportation policy, although it did not provide funding for capital projects or network improvement. The FAST Act, however, augmented national freight transportation policies and established dedicated funding for freight projects and research through the National Highway Freight Program (NHFP). The FAST Act also requires freight mobility plans at the state level to receive federal funding in support of their objectives.

In 2021, Congress passed the Infrastructure Investment and Jobs Act (IIJA), which continued funding for the NHFP, increased the number of miles that can be identified as Critical Urban Freight Corridors; increased the maximum on funding for multimodal projects to 30 percent; and broadened eligibility for lock, dam, and marine highway projects that are likely to reduce on-road emissions. Furthermore, IIJA represents a significant investment in freight and passenger intercity rail projects; the bill requires the US Department of Transportation to establish a Corridor Identification and Development Program that will produce a pipeline of freight and intercity rail projects. These policies will impact freight network development at both the state and regional level as improvements to the regional railroad and highway freight networks are contemplated.

IIJA continues the Consolidated Rail Infrastructure and Safety Improvement Grant Program, which funds capital improvement projects for both freight and passenger rail systems. The IIJA mandates the creation of a Railroad Crossing Elimination Program that targets crossings frequently blocked by trains and the impact of rail and freight movement on underserved communities.



Source: NCTCOG

Federal freight transportation infrastructure policy is enacted by the United States Department of Transportation (USDOT). This department and its subsidiary agencies collect and analyze data at the national level, set strategic transportation policy, and allocate funding according to priorities set by national elected officials. The most important policy document published by USDOT is the National Freight Strategic Plan (NFSP). In the NFSP, USDOT sets forth a vision and goals for the nation's multimodal freight infrastructure network. The NFSP identified the following vision:

> ***"The freight transportation system of the United States will strengthen our economic competitiveness with safe and reliable supply chains that efficiently and seamlessly connect producers, shippers, and consumers in domestic and foreign markets."***

This vision is supported by three overarching goals:

- **Safety:** Improve the safety, security, and resilience of the national freight system.
- **Infrastructure:** Modernize freight infrastructure and operations to grow the economy, increase competitiveness, and improve quality of life.
- **Innovation:** Prepare for the future by supporting the development of data, technologies, and workforce capabilities that improve freight system performance.

The NFSP further identifies multiple strategic objectives aimed at bringing about the plan's stated goals:

- Support the development and adoption of automation, connectivity, and other freight safety technologies
- Modernize safety oversight and security procedures
- Minimize the effects of fatigue and human error on freight safety
- Reduce conflicts between passenger and freight traffic
- Protect the freight system from natural and human-caused disasters and improve recovery speed
- Fund targeted investments in freight capacity
- Improve consideration of freight in transportation planning
- Prioritize projects that improve freight intermodal connectivity, and enhance freight flows on first- and last-mile connectors at major trade gateways
- Advance freight system management and operation practices
- Improve job growth and economic competitiveness in rural and urban communities
- Mitigate the impacts of freight movement on communities
- Support the development and adoption of automation and vehicle-to-everything
- Support the safe deployment of uncrewed aircraft systems technology
- Streamline regulations to improve governance, efficiency, and economic competitiveness
- Improve freight data, modeling, and analysis tools and resources
- Strengthen workforce professional capacity
- Invest in freight research
- Support regulatory frameworks that foster freight innovation

The activities of the NCTCOG Freight Planning Program, as well as the policies outlined in this plan, operate in support of the goals and objectives of the NFSP.

Federal transportation policy also sets the criteria upon which discretionary grant programs award funds to local and regional capital improvement projects. Some discretionary grant programs have specific applicability to freight projects; thus, the relevance of local freight network projects to federal performance measures affects competitiveness and eligibility for federal investment. Goals and objectives related to federal freight performance measures is discussed in **Section 3.4.1**.

USDOT operates several discretionary grant programs for which freight projects are eligible:

- Infrastructure for Rebuilding America
- Rebuilding American Infrastructure with Sustainability and Equity
- National Infrastructure Project Assistance
- Bridge Investment Program (new under IIJA)
- Rural Surface Transportation

Two are the focus of the NCTCOG Freight Program grant application efforts. The INFRA Grant Program (known statutorily as Nationally Significant Multimodal Freight and Highway Projects) awards competitive grants for multimodal freight and highway projects with the stated goal of improving safety, efficiency, and reliability of the movement of freight and people in and across rural and urban areas.[29] The RAISE Grant Program (which was preceded by the Better Utilizing Investment to Leverage Development Grant Program) invests in road, rail, transit, and port projects in support of national objectives.[30]

Freight transportation policy at the federal level is driven not only by the priorities of elected officials, but also by a growing body of research and data produced by the Transportation Research Board, a federally funded subsidiary of the National Academies of Sciences, Engineering, and Medicine. The National Cooperative Freight Research Program conducts research and produces reports on a wide range of freight transportation issues and is the primary freight transportation research initiative at the Transportation Research Board. These reports generate specific methodologies and identify successful project outcomes in cities across the nation. They also serve as manuals for use by state and local planning agencies to foster innovation and promote awareness of freight issues by transportation infrastructure authorities.

3.3.1 State Policies

The multimodal movement of goods is foundational for the economy of the State of Texas, which is the second largest state in the nation, and ninth largest in the world.[31] A diverse range of freight industry hubs, including maritime, ground, air, and pipeline facilities enables this economic productivity. State offices and planners have enacted several policies and programs in support of freight infrastructure and overall economic development.

Texas Connected Freight Corridors

This program represents collaboration between multiple transportation agencies and private sector businesses to produce – using advanced automated vehicle technologies – tangible safety benefits and improvements to freight network efficiency. By identifying suitable corridors where the deployment of automated vehicle technologies would most benefit the movement of goods, state and local agencies collaborate to gather data and implement technology solutions.

State Freight Plan

In accordance with regulations in the FAST Act (2015), in 2018, the Texas Department of Transportation (TxDOT) published an update to the Texas Freight Mobility Plan. This plan identified a blueprint for facilitating economic growth potential in Texas through a solid but flexible strategy for addressing freight transportation needs throughout the state. This plan enumerates several state-level goals:

- **Safety:** Improve Multimodal Transportation Safety.
- **Economic Competitiveness:** Improve the contribution of the Texas freight transportation system to economic competitiveness, productivity, and development.

[29] https://www.transportation.gov/grants/infra-grants-program
[30] https://www.transportation.gov/RAISEgrants/about
[31] Source: US Bureau of Economic Analysis

- **Asset Preservation and Utilization:** Maintain and preserve infrastructure assets using cost-beneficial treatment.
- **Mobility and Reliability:** Reduce congestion and improve system efficiency and performance.
- **Multimodal Connectivity:** Provide transportation choices and improve system connectivity for all freight modes.
- **Stewardship:** Manage environmental and TxDOT resources responsibly and be accountable in decision making.
- **Customer Service:** Understand and incorporate citizen feedback in decision-making processes and be transparent in all TxDOT communications.
- **Sustainable Funding:** Identify sustainable funding sources for all freight transportation modes.

The plan outlines courses of action at both the state and local levels that TxDOT will pursue to achieve these goals. TxDOT is developing a new state freight plan due to be published in early 2023.

3.3.2 NCTCOG Policies Impacting Freight

The region is guided by the federally mandated Metropolitan Transportation Plan. This acts as a blueprint to guide the spending of federal and state transportation funds in the region for the next 20 years and beyond. The current MTP for the North Central Texas region is the Mobility 2045 Update, approved by the RTC in 2022. This document lays out the policies, programs, and projects that will help create better travel and transportation movements within the region by 2045. More about this plan can be found on NCTCOG's MTP Webpage. The MTP contains policies for a wide variety of programs and topics, including freight. Freight planning in the region is guided by the policies established in the freight section of the plan. The MTP includes the following policies to guide attainment of freight goals discussed in **Section 3.1**:

- **FP3-001:** Foster regional economic activity through safe, efficient, reliable freight movement while educating elected officials and the public regarding freight's role in the Dallas-Fort Worth region's economy.
- **FP3-002:** Encourage the freight industry to participate in freight system planning and development to improve air quality and delivery time reliability.
- **FP3-003:** Identify and maintain regional freight networks to meet business and consumer demand benefiting everyday life.
- **FP3-004:** Enhance intermodal freight activity through innovation, facility development, and improved connections to the freight network by requiring local governments to create a dedicated and recurring funding source for projects that enhance freight mobility.
- **FP3-005:** Enhance freight-oriented land-use sustainability by requiring local governments to adopt compatible zoning requirements and address environmental justice pertaining to freight-oriented development land uses.
- **FP3-006:** Incorporate technological advancements into the freight system.
- **FP3-007:** Improve efficiency by promoting safety, mobility, and accessibility on the freight networks.
- **FP3-008:** Monitor freight traffic annually along major corridors and major freight facilities through the creation and maintenance of a regional freight database.
- **FP3-009:** Incorporate freight analysis and involve the freight community in the planning process of all transportation projects.

- **FP3-010:** Improve air quality related to freight through adopting local ordinances prohibiting truck engine idling.
- **FP3-011:** Improve railroad safety through public education, innovation, and partnering with local governments to address railroad crossing safety improvements.
- **FP3-012:** Incorporate technological advancements into the regional freight network.
- **FP3-013:** Encourage regional railroads to participate in rail system planning, identifying issues, and the development of integrated operations with local commuter rail agencies.

The freight policies and programs as they appear in the Mobility 2045 Update can be found in **Appendix B**.

3.4 Freight Performance Measures

NCTCOG tracks federal, state, and local performance measures and datasets every year to record important quantitative data. The datasets are used in many ways for studies, analysis, and whitepapers NCTCOG prepares each year. It also provides data that will be compared to previous years and makes predications for the future. The section below provides details on the specific performance measures tracked by NCTCOG and the State of Texas.

3.4.1 Federal Performance Measures

MAP-21 focused on safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. To help meet the goals set forth in MAP-21 and carried out under the FAST Act, Metropolitan Planning Organizations were required to establish and report on performance measures.

For freight movements, the MAP-21 performance measure is the Truck Travel Time Reliability Index. Truck Travel Time Reliability (TTTR) is a required federal performance measure. This assessment requires two- and four-year targets and is reported every two years. TTTR addresses how much time it should take truck drivers to get to their destination. If trucks get to their destination on time consistently, it shows how reliable the road network is for truck traffic.

Specifically, TTTR is an index that establishes the amount of time a truck driver needs to add to a median trip length to arrive on time. The lower the number, the better the travel time reliability. If the TTTR is 1.5 and the trip should take 60 minutes, it will take 90 minutes with this TTTR.

The observed TTTR has been increasing within the region. For example, in 2017, the TTTR for the region was 1.73, while in 2019, the TTTR was 1.82. Due to the pandemic, in 2020, the numbers improved to 1.60. In 2021 though, the TTTR increased back up to 1.76. The current TTTR goals for 2020 and 2022, which are based off the 2016-2019 trends, are **1.83** and **1.90**.

In order to achieve current TTTR targets, truck bottlenecks, Travel Demand Management, and truck parking need to be addressed within our region to move TTTR in a more positive direction. NCTCOG encourages educating elected officials and the public regarding freight's role in the Dallas-Fort Worth region. Staff also supports freight system planning among the freight industry to improve delivery time reliability.

3.4.2 State Performance Measures

While the Federal Highway Administration requires the monitoring of Truck Travel Time Reliability, additional targeted performance measures established during the Texas Freight Mobility Plan's development support the identification of deficiencies on the Texas Multimodal Freight Network and monitor freight system performance. Some measures include safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. Performance measures will enable TxDOT to track trends, focus on problem areas, and improve public communication and education related to freight. The performance measures serve three key functions:

1. **Plan Development:** Provide a method to quantify baseline system performance and the impacts of Texas Freight Mobility Plan options to support trade-off decisions and to communicate the anticipated impacts of different investment strategies.
2. **Plan Implementation:** Support the implementation of the Texas Freight Mobility Plan by emphasizing agency goals/objectives and integrating those into budgeting, program structure, project selection, and project/program implementation policies.
3. **Accountability:** Facilitate tracking and reporting on system performance relative to the goals and objectives of the Texas Freight Mobility Plan to support accountability for implementation and results (Federal Highway Administration).

3.4.3 NCTCOG Performance Measures and Data Collection

In addition to the federally required performance measures, NCTCOG also measures the **Regional Ratio of Truck Travel Time Index to Passenger Vehicle Travel Time Index.** This is to improve the availability of transportation options for people and goods. NCTCOG hopes this will help improve congestion issues that disproportionately impact freight movement.

In an effort to provide the best projections and to select projects with the most benefit for future freight activity, regional performance measures and associated data must be collected on a regular basis. It is often difficult to determine freight performance measures because many planners are unsure what data is useful and necessary. Freight-specific data are not typically collected by state and federal agencies and the data planning officials need to create a robust freight plan are privately held.

Locally defined freight performance measures are specific data sets collected by planning agencies to determine the effectiveness of various freight policies, programs, or projects. In general, freight performance measures are mode-specific, although some, such as the freight industry's economic impact, are multimodal in scope.

Additional regional freight performance dimensions to track progress include:

- Yearly vehicle classification counts
- Completed (commercial vehicle) freight travel model
- Updated freight transportation facility inventory
- Reduction in annual number of accidents between trucks and non-trucks
- Increased travel speeds for non-truck traffic
- Reduction in accidents/incidents at at-grade railroad crossings

- Reduction in the number of at-grade railroad crossings
- Increased number of truck parking locations
- Reduction of incidents involving hazardous materials
- Improved and increased relationships with the freight community
- Improved attendance at Regional Freight Advisory Committee meetings
- Improved compatible land uses near freight development

3.5 Freight System Elements

3.5.1 Freight and the Environment

As large amounts of goods move throughout the region, NCTCOG staff have made efforts to try and reduce emissions and improve air quality worldwide and for the community. As the region continues to grow, more resources will be used. It is important for NCTCOG to see the amounts of pollution in the air from freight movement and ways to reduce it. Listed below are more specific ways NCTCOG is improving air quality and the environment.

As the Metropolitan Planning Organization, NCTCOG conducts transportation-related air quality analyses for the nonattainment area, as seen in **Figure 3.1**. A nonattainment area is a designation given by the Environmental Protection Agency that is applied to areas that do not meet national air quality standards. Emphasis is placed on on-road mobile sources, including freight trucks. NCTCOG staff also administers numerous programs and projects to help reduce emissions from both on-road vehicles and non-road mobile sectors, such as locomotives, by incentivizing the use of newer, cleaner engines or encouraging more efficient operations.

Generally, trucks and trains use diesel fuel. Diesel engines are a major source of nitrogen oxides (NO_X), which is the primary precursor to ground-level ozone formation in the 10-county air quality nonattainment area. This area includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise counties. **Figure 3.2** illustrates the percentage of NO_X emissions produced by trucks (18-wheelers) in 2020. On-road mobile sources produced the most tons of NO_X per day. This is made up of cars (light-duty vehicles) and trucks (medium- and heavy-duty vehicles). Of the more than 88 tons per day of NO_X produced, trucks make up over half. This is despite trucks only being a small portion of the traffic. This shows the importance of focusing on truck emissions.

Figure 3.1: North Central Texas Nonattainment Areas

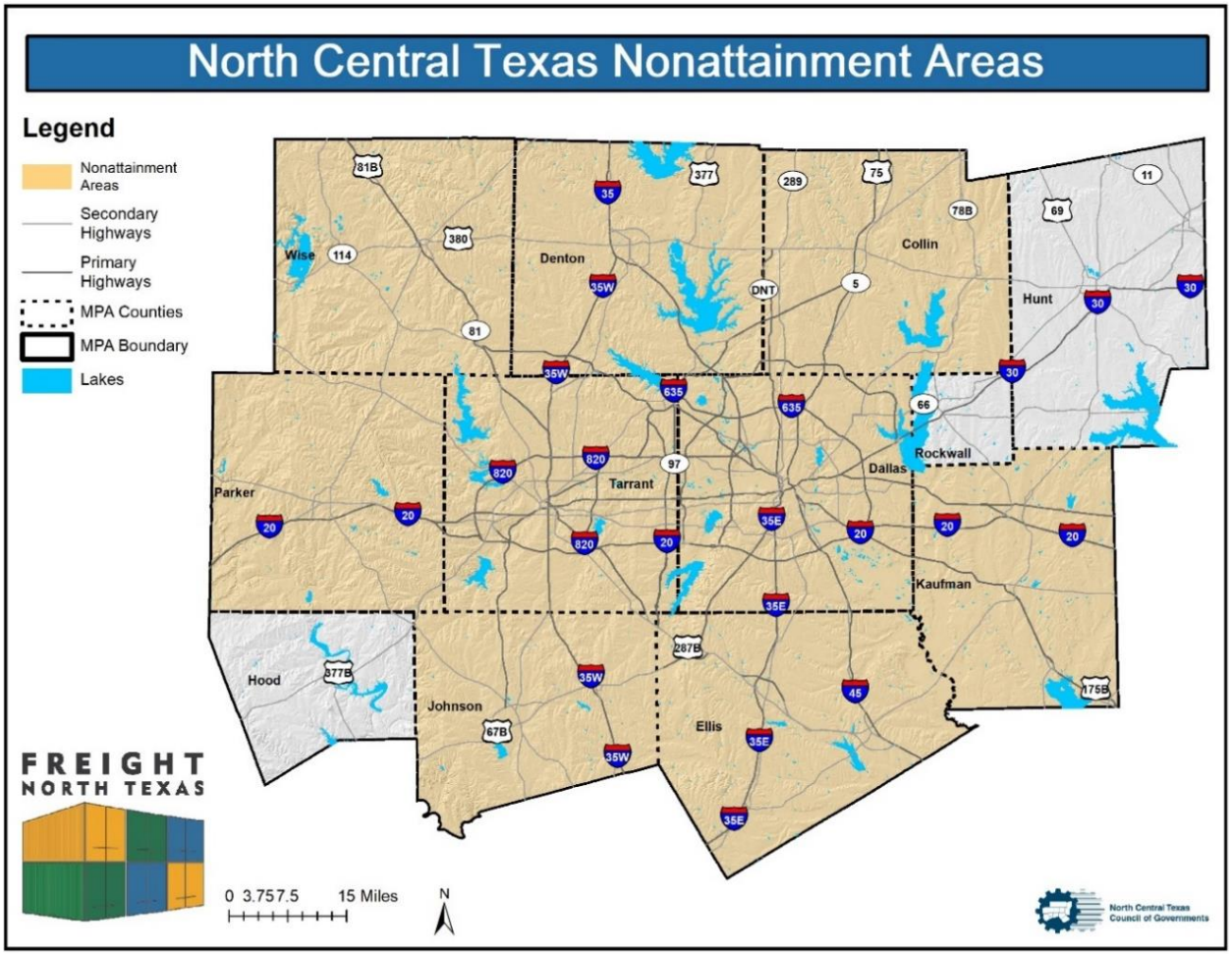
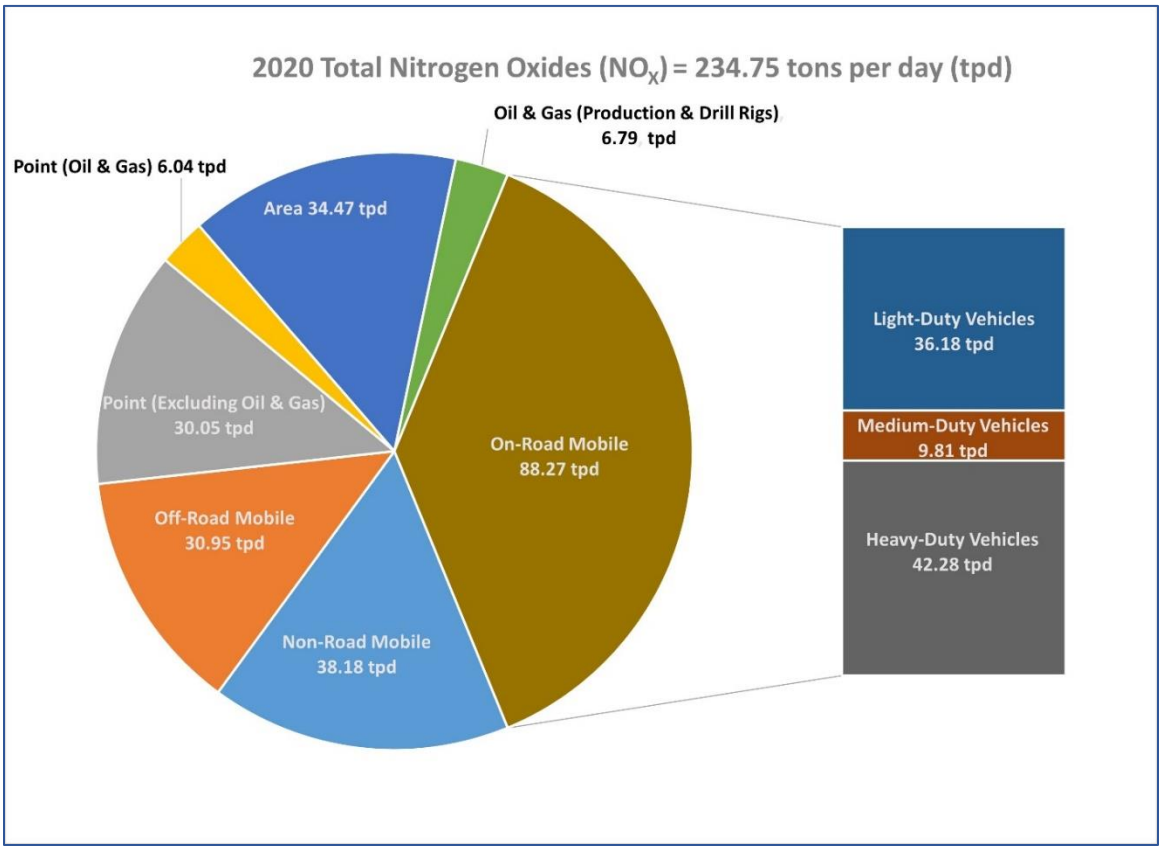


Figure 3.2: On-Road NO_X Emissions Inventory by Sector



Listed below are programs NCTCOG hosts to help with air quality and the overall environment within the region.

SMARTE

The Saving Money and Reducing Truck Emissions (SMARTE) Program aims to help truck owner/operators and small- to medium-sized fleet owners reach their sustainability goals through cost saving strategies. SMARTE connects our local trucking industry to local vendors that can provide Environmental Protection Agency SmartWay Verified Technology. SMARTE also can be used as a resource for information on different technologies or approaches that help reduce emissions, tools to help drivers make more informed decisions, and available funding opportunities. For more information, visit www.nctcog.org/smarte.

Engine Off North Texas

Engine Off North Texas aims to reduce unnecessary idling from heavy-duty diesel trucks by encouraging local governments and businesses to adopt and enforce idle reduction policies and install idle reduction infrastructure like electrified parking spaces. Engine Off North Texas offers guidance and educational materials like regulatory 'No Idling' signs free of charge. North Texans can also report excessive idling from heavy-duty diesel trucks to NCTCOG by calling 1-877-NTX-IDLE (1-877-689-4353), which will result in vehicle owners being notified. For more information, visit www.engineoffnorthtexas.org.

Dallas-Fort Worth Clean Cities

NCTCOG houses the Dallas-Fort Worth Clean Cities Coalition (DFWCC), which works with local fleets to promote practices and decisions to reduce transportation energy use and improve air quality. Some of these efforts include collaborating with vehicle fleets to increase use of alternative fuel vehicles, reducing idling, funding, annual fleet recognition, and the RTC approved Clean Fleet Policy. With heavy-duty gas and diesel making up only 7 percent of the vehicle miles traveled in the region, but contributing 48 percent of all NOx emissions for on-road sources, DFWCC is dedicated to expanding alternative fueling options for local and regional fleets. For more information about DFWCC, visit www.cleancities.org.

IH 45 Zero-Emission Vehicle Corridor

NCTCOG is developing a Zero-Emission Vehicle Corridor Plan along Interstate Highway 45 from Dallas to Houston. This plan will outline a strategy for building infrastructure for both electric and hydrogen fuel cell electric vehicles with an emphasis on medium- and heavy-duty trucks and buses. Workshops and stakeholder groups have been created to provide feedback and input for this initiative.

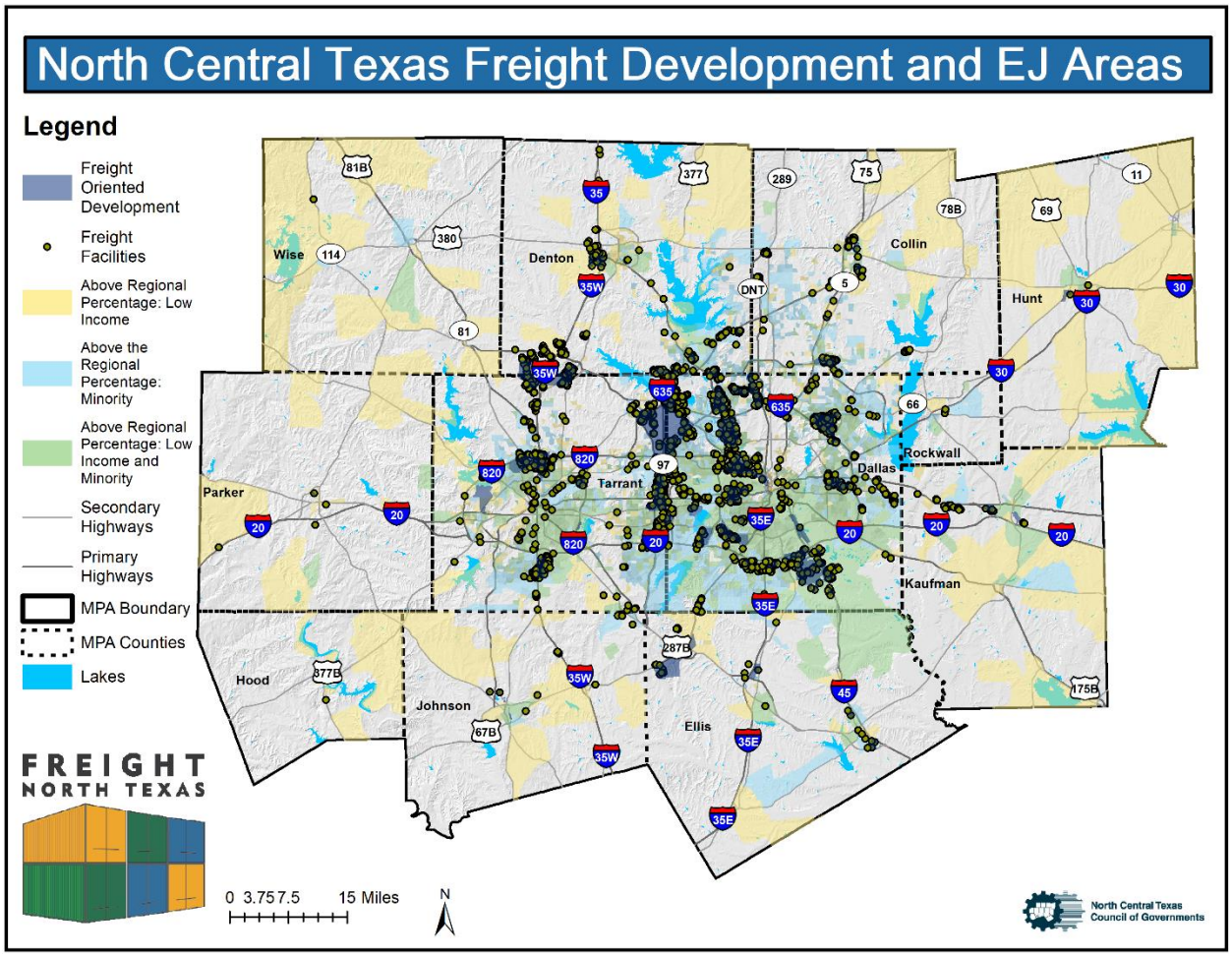
3.5.2 Freight and Equity

Equity within the freight industry is important to address within the region. **Figure 3.3** shows the freight developments within the environmental justice areas in the North Central Texas region. These areas are highlighted to show all the freight-oriented developments within the environmental justice areas in the region.

NCTCOG analyzed the environmental justice areas and freight-oriented developments within the region. Environmental justice (EJ) is defined by the Environmental Protection Agency as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[32] More specifically, the Federal Highway Administration describes environmental justice in the context of freight and land use as "The geographically equitable distribution of the benefits and burdens of government policies, programs, and investments, and to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process."[33] Freight land uses in the North Central Texas region are frequently collocated with low-income and minority populations.

[32] https://www.epa.gov/environmentaljustice
[33] *Freight and Land Use Handbook*, Federal Highway Administration, 2012, pg. 1-4

Figure 3.3: Freight Development and Environmental Justice Areas



The EJ analysis highlights some key aspects of the freight network in the North Central Texas region relative to EJ populations and examines the potential effects of proximity to industrial land and certain transportation network features. It is important that the potential effects of freight land use on EJ populations is examined for the purpose of mitigating any inequitable distribution of negative externalities. As a result of this analysis, NCTCOG will pursue infrastructure and policy solutions to address disparities and land use conflicts identified in this report.

North Central Texas is home to a host of historic resources, as well as a diverse array of cultures and ethnicities to which attention must be paid in the land use planning process. Towards that end, the report examines the following elements of freight network infrastructure:

- Prevalence of freight facilities in EJ areas
- Proximity of freight facilities to schools
- Presence of freight railroads in EJ areas
- Rail crossing grade separation efforts in EJ areas
- Spatial distribution of freight land use conflict sites in EJ areas
- Proximity of freight facilities to historical and cultural assets
- Proximity of freight facilities to sensitive ecological features

The location of freight facilities in EJ areas was studied for the purpose of determining prevalence and potential for impact on surrounding land uses. Prevalence was measured by performing a crosstabulation between freight facility location data and EJ population data, which identified that a significant majority (73.10 percent) of freight facilities in the North Central Texas Metropolitan Planning Area were located in an EJ area of any type, while 48.24 percent were located inside an area with both above regional percentage minority population and low-income population.

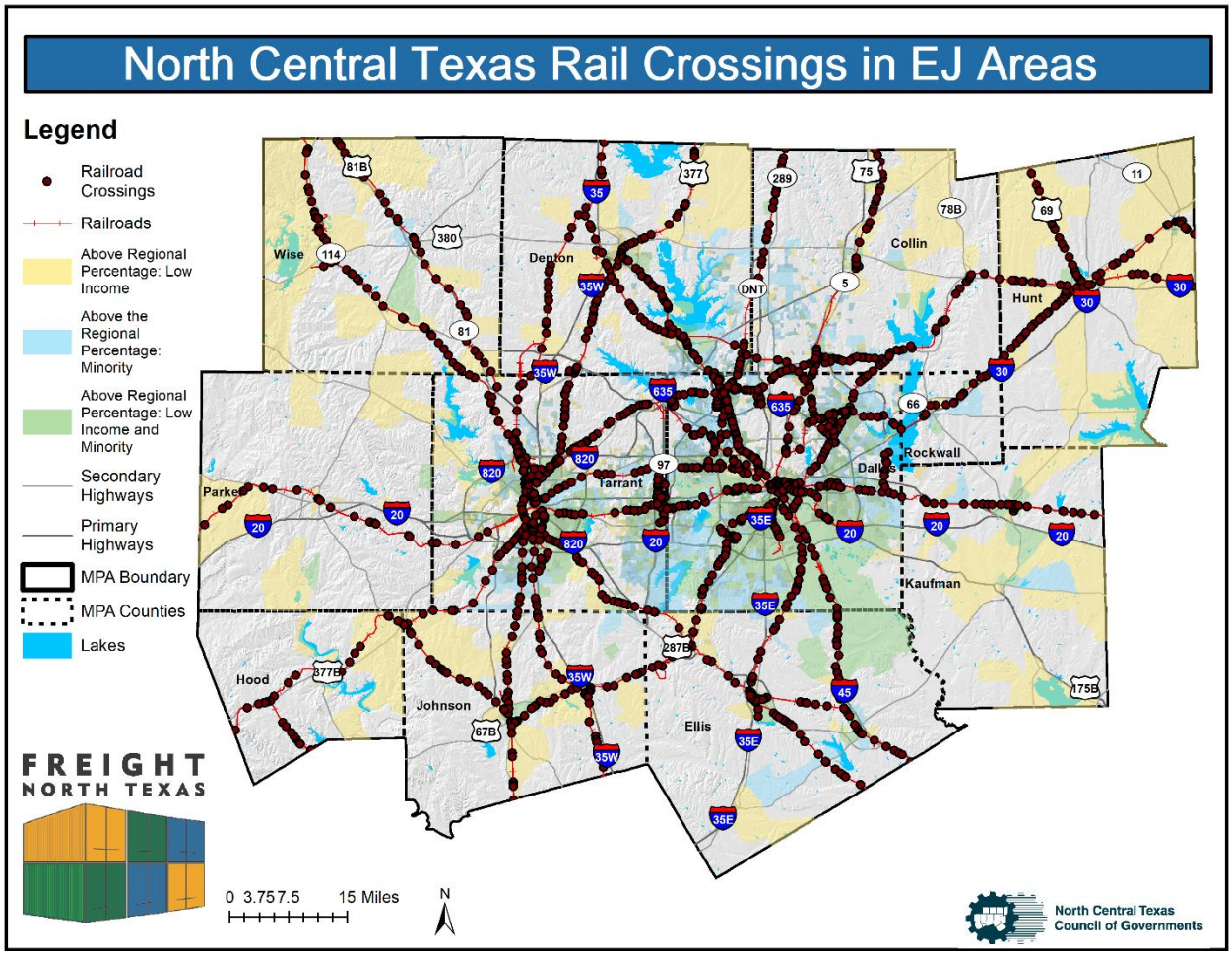
It should be noted that location selection criteria for schools and freight facilities overlap in some respects, including the need for access to major thoroughfares and relatively low cost of land. For schools, these roadway connections are an important part of servicing their educational district; even more so for larger secondary schools since they are fewer in number than elementary schools and serve multiple neighborhoods. Likewise, freight businesses rely on expeditious access to highways and business centers to reduce operating cost by minimizing transit time. Affordable land prices allow school districts to conserve resources and logistics sector businesses to maximize return on investment.

In similar fashion, in the freight facility location analysis, which precedes this section, freight railroads were analyzed for both prevalence and potential for impact. **Figure 3.4** shows the rail crossings in EJ areas within the region. The analysis found that although a majority of the regional freight rail network exists outside of EJ areas, freight railroads are frequently collocated with EJ populations. Furthermore, out of the seven intermodal facilities located in the North Central Texas Metropolitan Planning Area, four are in an EJ area of any type. Educational facilities in EJ areas tended to have 41.26 percent less distance from freight rail lines than did those in non-EJ areas, which would not be expected considering that less than half of all regional rail miles are located within EJ areas.

The analysis also discusses the environmental impacts on EJ areas being so close to freight-oriented areas. Overall, NCTCOG recommends the following areas of emphasis when considering EJ populations in freight infrastructure plans:

- School proximity to freight facilities and railroad infrastructure
- Freight infrastructure proximity to historical, social, and cultural assets
- Proximity and interaction with nearby ecological features

Figure 3.4: Rail Crossings in Environmental Justice Areas



3.5.3 Truck Parking

The trucking industry is vital to the movement of goods nationwide. In fact, of all goods transported to and from the North Central Texas region, 84.6 percent is moved by trucks, as noted in **Section 2**. The trucking industry is made up of thousands of freight motor carriers, with millions of drivers moving goods locally or on long hauls between cities and states. The importance of trucks in freight movements cannot be overstated. For the truck driver, high demand for goods movement and product delivery can mean driving long hours, pressure to meet deadlines, and maneuvering on congested routes, making it difficult to find or access available parking locations.

The hours-of-service (HOS) rules that commercial vehicle drivers are required to follow can make these demands even more difficult. HOS rules require mandatory breaks, both long and short. Drivers must find adequate parking to maintain compliance and, if no available parking location is nearby, the driver is placed in a difficult situation. Another added concern is related to the nature of today's logistics industry as "just in time" deliveries are popular with many shipping customers. Just in time deliveries move goods to a specific location just before it is needed and helps control inventory. These daily constraints make any time looking for parking critical. Delays caused by congested roadways can also

have a negative impact on a driver's ability to find parking. Drivers may not even be able to find adequate parking at state rest areas or commercial truck stops due to a lack of capacity. When this occurs, they often must park in undesignated or unsafe locations. These locations can cause many problems for drivers and can adversely affect the rest they should be receiving at these locations. They may also have to park on roadway shoulders and ramps, which creates an unsafe situation for the driver and other motorists, increasing the risk of accidents. Truck drivers need a reliable inventory of available parking spaces to remain in compliance with HOS restrictions and minimize fatigue. They should have access to resources and amenities and the assurance that if they need to stop to follow their HOS rules, there will be safe, adequate parking available. The importance of trucking to the freight industry, the demands placed on drivers, and the issues and concerns associated with finding parking facilities illustrate the importance of this study and others like it. Both national and regional freight movements are impacted greatly by truck parking and the needs of drivers at those facilities. It is a national, state, and regional issue that needs to be addressed to increase the number of adequate truck parking locations and enhance existing facilities.

Source: Getty Images

The Regional Truck Parking Study was conducted in 2018 due to the importance of this topic. The study defines the locations and adequacy of both short- and long-term truck parking within the region. The study also defines areas or corridors in which current parking needs are not being met and develops possible solutions to regional truck parking concerns. The study assesses the overnight and temporary truck parking needs in the North Central Texas region. The study includes review of existing information from previous truck parking studies, results of data collection, results of driver surveys, analysis of regional Corridors of Concern, and recommendations for possible solutions for the Dallas-Fort Worth area.

The study included the following elements:

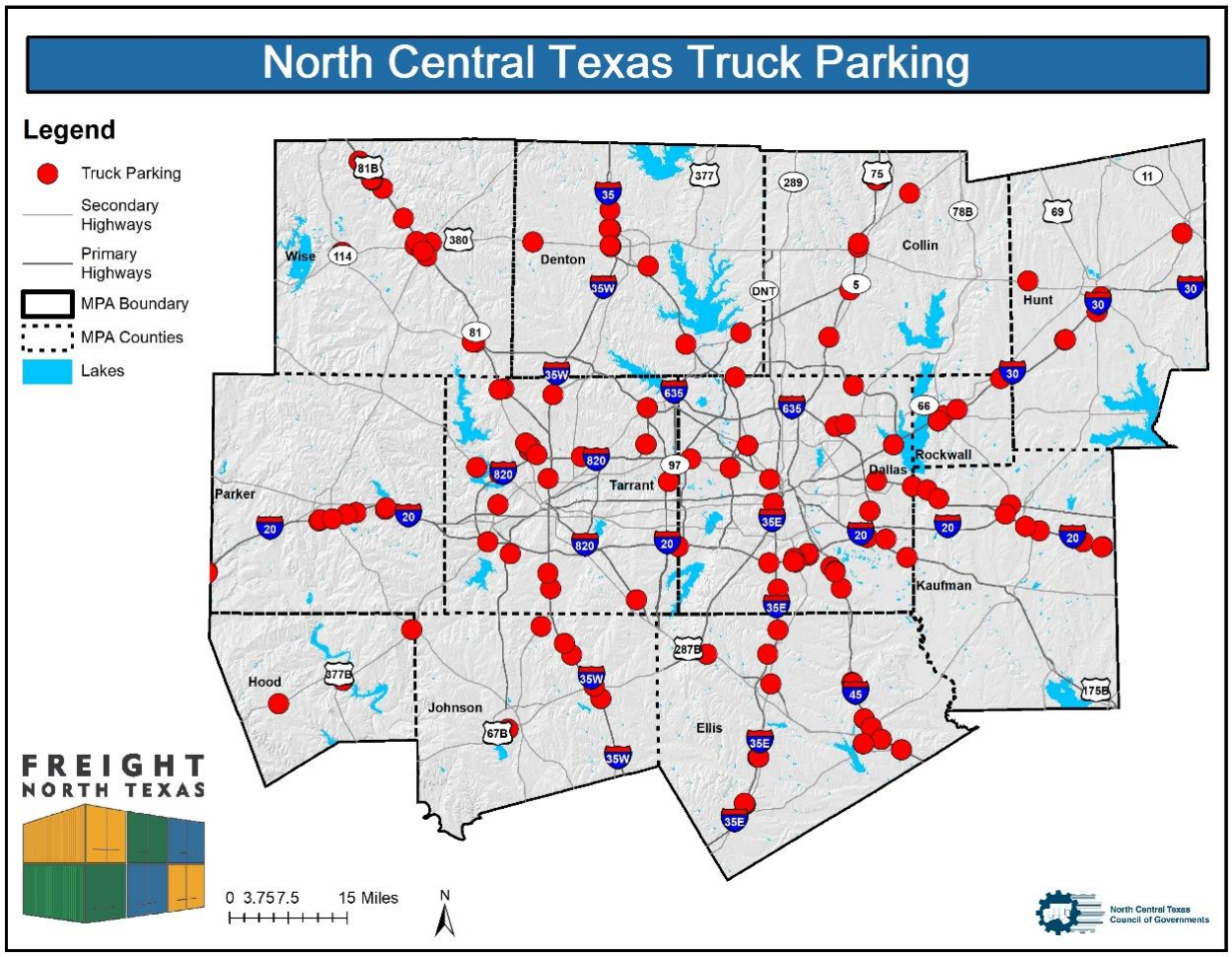
Data Collection

The following data sets were collected for the study:

- Regional Overview
- Literature Review
- Texas Safety Rest Areas
- Regional Truck Stops
- Local Truck Parking Ordinances
- Hours-of-Service
- In-Region Travel Times
- Heavily Traveled Freight Corridors
- Driver Survey and Stakeholder Outreach

Figure 3.5 shows regional truck parking and is an example of the data collected for this study. The data collected in this study is used in the planning process for relevant studies since 2018. For this reason, datasets, such as the one in **Figure 3.5**, are continually updated.

Figure 3.5: Regional Truck Parking



Analysis

The goal of the analysis phase in the study was to identify patterns in common areas or corridors where truck traffic is frequent and freight-oriented developments are in high concentrations to help identify locations where parking may be insufficient. Both short- and long-term parking needs were assessed. A commercial motor vehicle driver survey was conducted to gauge what amenities might be needed at existing and additional locations. The data was analyzed from the compiled driver surveys, assembled and mapped to demonstrate the locational aspects of the responses. All of the analyzed information was refined by cross-referencing the following criteria:

- Existing truck parking locations
- Freight-oriented developments and major freight facilities
- Local truck parking ordinances and land-use plans
- Travel times and hours-of-service
- Heavily traveled freight corridors
- Driver surveys and stakeholder outreach

From these criteria and analyzed data, high priority Corridors of Concern were identified. An example of the scoring matrix can be seen in **Table 3.1** The study does not identify specific locations, but general areas and corridors which could benefit from additional or improved truck parking availability and truck parking facilities. The high priority corridors and areas include:

- IH 30/SH 360 (Great Southwest area)
- South Dallas (IH 45 and IH 20)
- IH 35W (north of Downtown Fort Worth)
- North Dallas (IH 35E and IH 635)
- East Dallas County (IH 635)
- Parker County (IH 20/IH 30)

Table 3.1: Example of Corridors of Concern Matrix

Corridors	Matrix Score	Location Boundaries	Freight-Oriented Developments & Major Freight Facilities	Lack of Existing Truck Parking Locations	Local Truck Parking Ordinances & Lane Use Issues	Travel Times & Hours-of-Service Issues	Heavily Traveled Freight Corridors	Driver Surveys & Stakeholder Outreach
Great Southwest Area (IH 30 & SH 360)	**Yes – 6/6**	**East to West:** from SH 161 to IH 820 **North to South:** from SH 183 to SH 303	**Yes** DFW Airport, Great Southwest Industrial Park, GM Assembly Plant, & Other Freight-Oriented Developments	**Yes** Only one truck stop in corridor	**Yes** Significant residential development & parking ordinances	**Yes** Corridor centrally located so travel time across the region can be significant	**Yes** IH 30 was identified as heavily traveled	**Yes** Identified as an area needing both long- & short-term parking
South Dallas (IH 45 & IH 20)	**Yes – 5/6**	**East to West:** Trinity River to SH 342 **North to South:** Loop 12 to Belt Line Road in Wilmer	**Yes** Trinity Inland Port of Dallas & Union Pacific Intermodal Facility	**No** Seven major truck stops in corridor	**Yes** Significant residential development & parking ordinances	**Yes** Located on the southeast edge of the region so travel time across the region can be significant	**Yes** Both IH 20 & IH 45 were identified as heavily traveled	**Yes** Identified as an area needing both long- & short-term parking

These corridors and areas have specific challenges and opportunities associated with future advancement of truck parking solutions. Opportunities for increased truck parking availability, amenities tailored to commercial motor vehicle driver needs, and an enhanced network of truck parking locations which could be instituted in these areas are proposed in the following section.

Recommendations

The study recommendations consider ideas and strategies that other agencies and groups around the country are currently utilizing to provide solutions for truck parking concerns. Recommended strategies include:

State and Regional Strategic Partnerships: Truck parking facilities could be located on public land and serve as public rest areas. Funding agreements between the state and local/regional public agencies could be arranged for facility construction, maintenance, and operation.

Public-Private Partnerships: The public and private sectors could collaborate to develop more truck parking in specified areas through a mutually beneficial incentivized plan. Incentives and benefits may include roadway improvements, entrance/exit upgrades, curb cuts, utility work, beautification, maintenance, right-of-way acquisition, competitive leasing, special zoning districts, intelligent parking availability notification (advanced signage), electrified parking, security measures, and other driver amenities.

Technology Enhancements and Applications: Technologies may be implemented to promote a more cohesive relationship between actual truck parking availability or projected availability, notification of availability, and amenities specific to individual facilities.

Corridor Specific Recommendations: Specific recommendations for regional high priority corridors and Corridors of Concern identified in this report are outlined in the Recommendations Section of this report.

The Regional Truck Parking Study was conducted to determine the adequacy of both short- and long-term truck parking in locations or corridors where parking needs are not being met and to recommend viable solutions to help mitigate regional truck parking issues. For more information about the 2018 study, please visit the Truck Parking Study online.

Truck parking availability in the Dallas-Fort Worth area is inadequate, at best. As e-commerce projections continue to rise, there is little doubt that freight movements will rise accordingly. Actionable recommendations are included in this Truck Parking Study to provide local, regional, and state agencies, along with private entities, verifiable data and opportunities to improve truck parking infrastructure and enable the truck driver to comply with federally mandated regulations, to improve safety on our roadways, and enhance regional economic development.

NCTCOG is committed to improving truck parking options in the North Central Texas region. Following the 2018 study, the agency has been looking for opportunities and ways to apply and utilize the recommendations. This has included grant applications, working with the private sector, and working with TxDOT on finding long-term solutions. Truck parking in North Central Texas will be reevaluated as part of the Freight North Texas Program in the coming years.

3.5.4 Freight Congestion and Delay

The Freight Congestion and Delay Study analyzed rail and roadway conditions throughout the regional freight network to determine locations where congestion had the greatest impact on the movement of goods. Furthermore, the study identified the causes of congestion and delay, including roadway geometry, railroad capacity limitations, and freight facility design problems.

Completed in 2016, the initial data collection efforts centered on obtaining input through personal contact with freight industry professionals. The outreach effort was conducted to learn about and share best practices for avoiding or minimizing delay from the system user perspective. Nineteen meetings with private sector freight industry professionals were conducted. Results from this effort did not provide sufficient information for the study. As such, a revision in study methodology was warranted.

After soliciting input from RFAC on data collection efforts and study methodology, the study shifted focus from a broad regional analysis to four distinct freight-oriented focus areas. Traditional transportation analysis tools were employed, leading to recommendations for policies, programs, and projects designed to mitigate freight delays efficiently and effectively.

The study began from a regionwide perspective. A variety of factors related to freight-specific delay were investigated, including recurring, non-recurring, and non-transportation related delay. A variety of data sources were also reviewed, including:

- Truck volumes on regional facilities
- Regional truck congestion
- Traffic control delay
- Locations for reported truck-involved crashes

Additionally, the goal was to collect data on locations of delay specific to freight traffic from drivers and managers of freight facilities. While staff had RFAC support and assistance, this data collection effort did not produce the intended results. Using the information obtained and input from RFAC members, it was determined a regional approach was too large for the scope of this study and staff elected to analyze smaller focus areas.

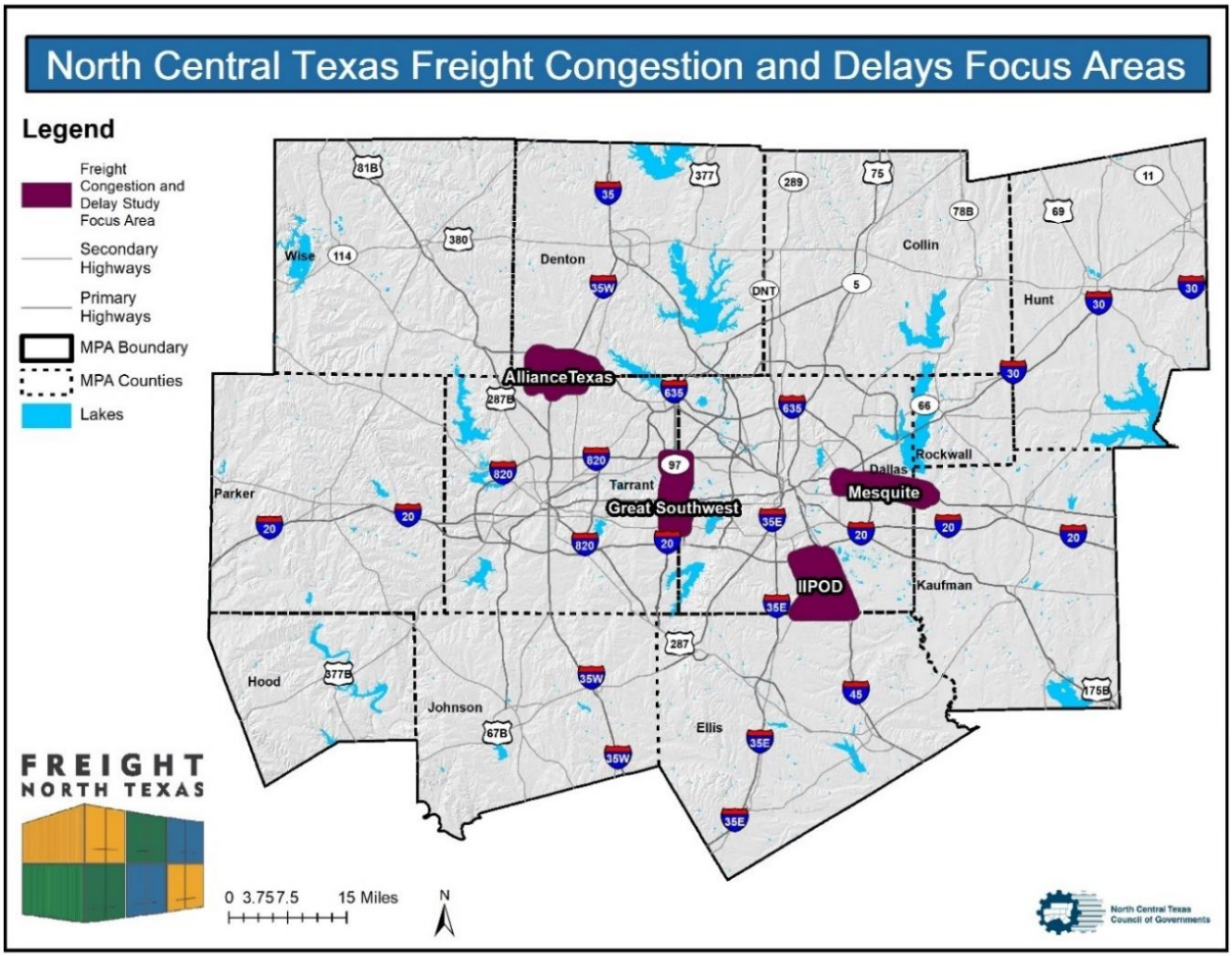
The following focus areas were selected; they are shown in **Figure 3.6**.

- Alliance Texas
- Great Southwest Industrial Park
- Intermodal Inland Port of Dallas
- Mesquite Intermodal Hub

The Freight Congestion and Delay Study focuses on roadway movements, utilizing data from various sources to identify specific causes of congestion and delay. The study examines the impacts of three types of delay on freight movement:

Recurring: Delays exhibiting predictable patterns typically caused by high traffic volume, traffic signals, speed limits, regularly occurring bottlenecks, or major construction projects. This delay can be described as generally occurring daily and in consistent locations. Recurring congestion and delay are typically created by transportation system deficiencies.

Figure 3.6: Freight Congestion and Delay Focus Areas



Non-Recurring: Delays due to unpredictable or highly variable sources such as traffic incidents, inclement weather, special events, or maintenance closures. This delay is best described as random. Non-recurring congestion is generally created by unforeseen circumstances and is typically not a product of transportation system deficiencies.

Non-Transportation: Delays stemming from sources unrelated to the transportation system, including wait times to load/unload, staffing levels, equipment maintenance, or documentation/regulatory compliance. This delay can be both recurring and non-recurring. Non-transportation congestion is generally produced by both private- and public-sector entities.

Each delay type requires a different approach to mitigate congestion and identify policies, programs, and projects intended to increase the efficiency of freight transportation. Recurring congestion is the easiest to identify and address proactively through long-term planning efforts. Non-recurring delay is, by definition, more difficult to address due to its random qualities. Strategies to reduce non-recurring delay include initiatives to increase incident responsiveness, encourage communication, and implementation of technological solutions. Non-transportation delay is the most difficult to address. Non-transportation

delay is included in the study to encourage partnerships designed to minimize these less visible sources of inefficiency and ineffectiveness.

The focus areas were evaluated based on the three congestion categories described above. In addition, the analysis incorporated the following components:

- Truck Traffic Forecasts
- Traffic Signal Assessment
- Truck-Involved Crashes
- Truck Route Assessment
- Roadway/Railroad Crossing Assessment

The results of the analysis led to recommendations for each focus area. Implementing the recommendations is intended to relieve regional congestion by alleviating congestion and delay causes within the "first/last" mile of a freight trip located within the focus areas.

> ***The methodology for assessing freight congestion and delay is designed in a way that this analysis can be conducted on different areas within the region to identify issues with congestion and delay.***

Recommendations were organized into policies, programs, and projects. Three policies were established to help reduce congestion and delay. **Table 3.2** shows the policies from the study and the issues they are to address. The programs from the report support the policies and project recommendations.

Table 3.2: Freight Congestion and Delay Policy Recommendations

Policy	Issues	Policy Description
Safety	Improve at-grade rail crossing safety. Minimize truck crashes.	Create safer truck routes and conditions for freight movement.
Efficiency	Improve at-grade rail crossing efficiency. Eliminate truck route discontinuity. Improve "first/last mile" network access.	Ensure continuous truck routes between municipalities, allowing freight to move efficiently to designated facilities. Improve access to the "first/last mile" using designated truck routes. Follow appropriate heavy truck design standards, including turning radius. Retime traffic signals to minimize delays.
Comprehensive	Ensure project continuity. Identify local freight network.	To be eligible for funding, the project must be on a freight network (Primary, Secondary, or Local).

The recommendations from this study have been followed, and one of the project recommendations was to optimize the signals in these areas for freight traffic. In 2022, NCTCOG is funding a pilot project called the Freight Signal Optimization Program. This project will assist cities in the region with high freight traffic to optimize their signals with software options. This study also recommends truck route network continuity. This would begin with a study or evaluation of the region's municipal truck routes and will, hopefully, lead to coordination with local municipalities to designate appropriate truck route facilities, allowing for efficient connected truck routes.

3.5.5 Freight and Land Use

The Freight and Land Use Analysis defines areas or corridors in which there are land use conflicts and includes possible solutions to mitigate these conflicts. It is very important the facilities that support goods movement be integrated into the urban environment. The results will help reduce land use conflicts and alleviate the locations that have these concerns in the North Central Texas region.

The timely and efficient movement of goods is vital to the national, state, and regional economy. According to Version 4 of the Freight Analysis Framework, the combined value of all freight moved across all modes in the United States was $18.8 trillion, **which represents 92 percent of the entire national Gross Domestic Product for that same year.**[34] Since the North Central Texas region is a major logistical nexus for the national and state freight systems, continued systematic efforts to maintain and improve critical freight assets are necessary for the public benefit.

As a major hub of logistics activities with national significance, the Dallas-Fort Worth metroplex and surrounding North Central Texas region contain a great diversity of freight land uses across the rail, air, pipeline, and highway modes. The region is a nexus for freight movement along the IH 35, IH 20, IH 30, and IH 45 corridors, and three Class I railroads operate in the area, along with several short-line railroads. NCTCOG estimates that by 2045, the Dallas-Fort Worth population of 7,548,400 will grow to 11,246,246, an increase of 49 percent. This, combined with an increase in e-commerce and overall consumer demand, assures growth in the freight sector. Due to this growth, intensifying strain will be placed on the region's freight transportation network. In order to retain the current level-of-service enjoyed by the region, freight land use patterns must be examined at the regional level, the result of which will enable a granular assessment of the region's freight network.

This study was conducted based on the recommendation of the Freight North Texas Inventory. Freight facilities vary greatly in the functions they perform and, when adjacent to incompatible land uses, can have negative effects on residences, businesses, schools, and parks. In order to prevent such conflicts from occurring, NCTCOG determined that defining, inventorying, analyzing, and mitigating these conflicts through thoughtful policy solutions at the municipal level was essential for economic growth and maintaining a high quality-of-life in the region.

The study includes a literature review, typology, data collection, analysis, recommendations, and summary.

For the literature review, multiple technical documents and guides were consulted which helped to form the foundation of this study. While a full enumeration of the documents reviewed may be found below, some of the materials that contributed most significantly to this study were:

- The *Freight and Land Use Handbook* produced by the Federal Highway Administration
- *Integrating Freight Facilities and Operations with Community Goals* produced by the Transportation Research Board

These documents were comprehensive in their approach and highlight key freight land use issues, as well as provide a wide range of case studies and best practices. Many strategies aimed at mitigating and/or preventing freight land use conflicts are presented, along with contexts in which they are most

[34] Current dollar US GDP in 2018 was $20.5 trillion according to the Bureau of Economic Analysis. More information about the Freight Analysis Framework can be found at https://ops.fhwa.dot.gov/freight/freight_analysis/faf/.

likely to be effective. The recommendations in this report are based on these, while being tailored specifically for the types of land uses and regulatory context most prevalent in North Central Texas.

For the data collection portion of the analysis, data was collected from site visits, literature review, local land use policies and ordinances, and internal and external outreach. The collected data will be used in the analysis to help determine any land use conflicts within the region.

The typology portion provides a breakdown of five different freight-related land uses that can be found in the North Central Texas region. These include 1) Warehousing and Distribution, 2) Freight Rail Transportation, 3) Air Cargo Transportation, 4) Pipelines and Public Works, and 5) Manufacturing and Processing. Notably included in these categories are land uses that do not specifically involve the commercial shipment and delivery of goods, namely Land Use Type 4 (Pipeline and Public Works). Public works facilities are included because of the operational and physical similarities they have to other freight-oriented developments; however, they are not the primary focus of this study. For this analysis, the categories and definitions utilized by the North American Industry Classification System were used as a guide to the typology.

Compatibility Concerns and Best Practices

Below is the discussion on compatibility concerns unique to each type of freight-oriented development, along with land use planning factors and tools for use in the mitigation and prevention of conflicts with respect to land use types.

Warehouse and distribution center collocation with residential and commercial land uses is relatively commonplace and tends to have the lightest impact on other land uses when compared to other industrial facilities. Much can be provided in the way of flexibility on the part of the freight operator, and many strategies – both in design and procedure – are available to lessen any negative impacts to adjacent properties. For example, noise emissions from distribution centers are usually limited to the sound of trucks entering or departing the property, as well as those that result from the activities that occur during loading and unloading (metal banging, backup signals, air brakes, etc.). Facilities with railroad access will produce sounds related to freight train operation, heavy crane operation, and possibly vibrations in the ground as well. Good Neighbor Strategies abound in this category, as sound walls, careful placement of vegetation, earthen berms, and high-quality fences do much in the way of bringing noise output down to tolerable levels for neighboring residential and commercial districts.

Truck traffic is a continuous concern. Trucks (and occasionally railcars) are constantly making their way in and out of facilities, usually during business hours. This can coincide with peak travel times of non-commercial traffic, resulting in severe delays for the freight operator, as well as contribute to congestion on already over-capacity streets. These factors result in a complicated obstacle that requires nuance on the part of both municipalities and businesses to successfully navigate. In some situations, the most readily available solution to this issue is the development of designated truck routes and driveway reconfiguration; these force trucks to enter and exit facilities via only approved avenues of approach and route commercial traffic away from private automobile traffic. A consequence of this method is that safety is improved since research has shown that segregating trucks from other types of traffic reduces

the severity of accidents when they occur.[35] This approach, however, requires collaboration with local governments to codify truck routes in local ordinances. Coordination of design and funding between cities and freight businesses must take place in order to emplace new roads, reconfigure facility entrances, and install additional and/or improved signage. Improved traffic flow reduces the negative effects that freight bottlenecks have on shippers.

Older Type 1 facilities may also present aesthetic challenges for communities. The presentation of a light industrial site has a significant impact on perception by community members in nearby neighborhoods and offices, which is especially relevant for freight facilities in a highly urbanized context.

Most challenges stemming from the development of freight rail infrastructure have to do with at-grade crossings, which affect safety, noise, and traffic flow. The most noticeable is the danger that locomotives pose to automobiles, bicyclists, and pedestrians at these crossings since trains have little, if any, ability to stop should an object or person occupy space on the railway during a crossing event. Because of these hazards, safety equipment such as gates, bells, alarms, and flashing lights are required to be installed on most urban at-grade crossings, in addition to the train whistles installed on every locomotive. These, in turn, affect nearby properties by generating large amounts of noise. Some low-cost strategies that can be undertaken to mitigate these effects include no-whistle zones (or "Quiet Zones"), sound wall construction, and the emplacement of urban forestation (which helps to absorb sound). The more permanent and ideal solution, however, is to grade separate a railroad crossing, which entails constructing either an underpass or bridge to isolate traffic, remediate crossing delays, and improve safety. Grade separating railroad crossings, however, can be prohibitively expensive and should be considered in very high-traffic corridors or crossings with a history of safety concerns. Grade separation projects should also be a part of transportation system planning to draw in outside investment and maximize both safety and public investment.

Source: NCTCOG

Another significant concern with freight rail transportation infrastructure is the movement of hazardous cargo through heavily populated and/or environmentally sensitive areas. Trains are frequently used to ship high volumes of substances such as chlorine, petroleum products, radioactive materials, and explosives. Although they are rare, it is important to consider the minimum safe distance from nearby

[35] https://mobility.tamu.edu/mip/strategies-pdfs/traffic-management/executive-summary/truck-lane-restrictions-1-pg.pdf

inhabited buildings in the event of a derailment or spill and ensure that rail planning efforts are underway to route hazardous cargo away from heavily populated areas. In the event this is not possible, placing extra distance between rail lines and residential or commercial development can somewhat mitigate the risks associated with hazardous cargo through routes while simultaneously addressing noise and vibration.

Freight rail spurs that are constructed to provide trains direct access to industrial facilities increase mobility and efficiency by removing the need for an intermodal connector to get products and goods to their recipient. However, high rates of turnover for businesses in some industrial parks and the loss of industrial land in urbanized districts causes many of these rail spurs to fall out of use, and eventually into disrepair. Once no longer active, rail siding inhibits redevelopment and poses a challenge to municipalities that cannot afford to remove the derelict track with public dollars since some degree of environmental mitigation is usually required. An increasingly popular and cost-effective method of remediation is what is known as the "Rails-to-Trails" initiative wherein abandoned railways are converted into nature preserves, and the tracks filled in or paved over to make them navigable by pedestrians and bicyclists, thereby adding community value to former industrial sites.

One of the most obvious land use impacts associated with any type of airplane operation is noise pollution. Aircraft engines produce large amounts of noise while in flight, especially during takeoff and landing. Because of the amount of space required for airport operations, there is usually a significant offset from other nearby land uses; however, this is seldom enough to completely obstruct airplane noise. This affects nearby development and can drive down the price of land; this, in consort with a high degree of freight network connectivity and generally low building heights, makes land adjacent to an airport a prime location for fright land development. Additional considerations include the quality and designation of the airspace above the airport, the height of surrounding structures, amount of air traffic congestion, and access to Interstate Highways or other corridors that connect to the same.

Manufacturing facilities, depending on the type, can affect nearby developments significantly due to their operational requirements. The intensity and frequency of truck traffic that will be induced onto nearby roadways should be considered during the permitting and zoning process. Much modern industrial development occurs in greenfield or exurban areas, so it is likely that trucks will need to traverse several low-capacity roads in their first/last mile movements. It is important to forecast how much truck traffic will increase and consider whether widening existing roads, making geometric improvements, or building new roads will be necessary. Safety and security concerns usually result in Type 5 (Manufacturing and Processing) facilities being well-lit at all hours, which can disturb nearby residences during non-business hours, as can the noise that comes from the operation of heavy machinery and vehicles. The type of manufacturing or processing is important for land use planners to consider prior to new facility development, as there may be other land use compatibility impacts unique to the facility (e.g., foul odor emissions, vibration emissions from heavy rail or machine operation, surface pollution, etc.).

Cities may consider the designation of *planned industrial districts* (PIDs),[36] which collocate industrial land uses and allow for deliberate planning efforts to segregate incompatible land uses and emplace the

[36] PIDs are more fully discussed in *Policy 2-6: Planned Industrial District Designation* under Section 4.0 of this report.

needed Good Neighbor Strategies along the periphery of the district or where interaction with Sensitive Land Uses is anticipated. PID development also enables transportation infrastructure modifications to be made in a preemptive and systematic manner to accommodate the requisite types of freight vehicles and modes.

Freight Infrastructure Preservation

Although typically not a target for focused land use preservation efforts, freight land uses and infrastructure are critical to the economic vitality of the region, especially freight system components in the urban core. Freight transportation infrastructure, such as freight railroads, intermodal facilities, industrial airports, and the roadway corridors that connect them to the National Highway System, should be preserved and maintained in accordance with business and economic needs.

Aging freight facilities, when at the end of their useful life, are frequently repurposed to other uses as a result of pressure from developers, advocacy groups, or negative perceptions about the freight industry. Between 2000 and 2005, over 70 locations with freight-related land uses changed from industrial to other uses. These changes were primarily to residential, retail, and vacant uses and occurred throughout the region. As this continues to occur, a phenomenon known as *freight sprawl* takes place, wherein freight businesses are forced out of the urban core and out into the periphery of the metropolitan area where land is affordable and available for freight uses. This can negatively affect the local economy by lengthening transit times for shippers, as well as increasing vehicles miles of travel, fuel expenditures, and cost of delay. If affordable, developable land cannot be found, shippers and freight businesses will move outside the region, reducing regional goods movement capacity.

In order to prevent freight sprawl from occurring, freight land uses should be preserved and redevelopment of older freight facilities should be encouraged by local governments. Newer freight facilities should feature high quality design features that eliminate land use conflicts and enhance the overall quality and character of the built environment.

A useful tool for planners and municipalities is the implementation of a PID. The North Central Texas region is home to several PIDs, among the most prominent is the International Inland Port of Dallas in southern Dallas County.

Another significant regional PID is the Alliance Texas development in northern Fort Worth. This industrial complex is in close proximity to the Fort Worth Alliance Airport, BNSF Railway's Alliance Intermodal Facility, and has direct links to IH 35W, an international trade route and critical freight corridor.

In support of the program objectives outlined in this plan, NCTCOG will pursue a robust set of freight planning policies and transportation infrastructure investments that facilitate successful, sustainable, and profitable freight-focused development. The preservation of freight land use is a key initiative in this plan. Freight land use preservation is driven by these elements:

- The implementation of and advocacy for Freight as a Good Neighbor Strategies
- Heightening awareness of freight considerations in the transportation planning process
- Capital projects that enhance multimodal freight connectivity throughout the region, and especially in the urban core

- Discouraging the rezoning of industrial land
- Monitoring the condition of key roadways and railroads
- Resolving land use conflicts involving freight-oriented developments

Policymakers at the municipal, county, and regional levels should actively consider the effects of freight on the built environment and leverage a high-quality freight network for economic development and environmental sustainability. Together, these promote the preservation of critical freight infrastructure throughout the region.

Table 3.3 defines the scoring criteria used to evaluate freight-related land use conflicts in the North Central Texas region.

Table 3.3: Freight Land Use Conflict Scoring Criteria

Freight Land Use Conflict Scoring Criteria	
Good Neighbor Strategies	**Railroad Infrastructure**
Sidewalks & Bicycle/Pedestrian Paths	Median Barriers
Raised Berms	Quad Gates
Supplemental Vegetation	Offset from Sensitive Land Use
Sound Walls	Quiet Zone
High-Quality Fencing	Rail-Related Connectivity Issues
Buffer Zones	Buffers Between Sensitive Land Use & Railroads
Site Design	Roadway Infrastructure
Loading Docks	Loading & Unloading Zones
Lighting	Truck-Related Roadway Damage
Vegetation & Fencing	Access via Non-Residential Road
Staging Areas	Adequate Truck Parking
Freight-Oriented Development Encroachment	Freight-Oriented Development
Environmental Justice Concerns	Pipeline Setbacks

Municipalities are encouraged to utilize the strategies outlined in this study in order to mitigate negative externalities and ensure that vulnerable populations are not unduly affected by land use conflicts. The implementation of Good Neighbor Strategies also enables municipalities to leverage freight infrastructure development as an economic revitalization tool, especially as freight transportation infrastructure is an increasingly important aspect of the regional economy. As demands in shipping, fulfillment, distribution, and parcel delivery services continue to rise, NCTCOG seeks to ensure equitable distribution of the benefits and externalities associated with freight development across all demographics and income levels.

Recommendations/Policy Toolkit

The purpose of this section is to identify key policies for municipalities to consider when seeking to improve the quality of freight land uses within their jurisdiction. It is structured as a four-step process for local decision makers to use in evaluating their freight land use policy. **Figure 3.7** shows the four-step process. The first step involves developing a community vision for freight and industrial land use. This

oftentimes can be adapted from previously developed economic development strategies and master plans and ensures that local officials understand not only the desires of their constituents, but also the needs of the industry they are seeking to develop.

Figure 3.7: Freight Policy Process

The second step involves the geographic designation of freight districts or an otherwise comprehensive strategy of freight facility site selection. Although industrial land development is usually initiated and carried out by the private sector, cities and counties can shape the manner in which it occurs through proper land use controls, generally taking the form of zoning, and including more specific regulations on site design.

Step two also involves the evaluation of existing and planned transportation infrastructure as it pertains to goods movement. The availability of logical and interconnected truck routes, rail heads, and intermodal hubs greatly impacts site selection for freight facilities. Communities should seek to channel freight traffic in ways that avoid negative interactions with Sensitive Land Uses while promoting the expeditious and safe conveyance of goods throughout their jurisdiction.

The third step involves the technical work of establishing site design regulations in accordance with the results of the previous two steps, along with input from industrial land developers, freight facility operators, and constituents.

In the fourth and final step, communities codify the desired ordinances, initiate needed planning programs, and execute relevant freight infrastructure development strategies. Subordinate to the final step, this section describes important considerations in ordinance development and freight project programming

After each step is outlined, a variety of relevant policies will be enumerated before the next step is presented.

Using this Toolkit

Although it is helpful for communities to begin the freight planning process at step one, in some communities, much work on economic and community development policies has already been done and, therefore, municipalities may wish to jump directly to steps two or three in order to avoid duplication of effort.

This policy guide is structured in a manner that allows it to be easily referenced on an as-needed basis, and not necessarily read through from beginning to end. Furthermore, the policies outlined in this section represent a distillation of technical planning tasks and programs into accessible, high-level tenants of each policy. When available, more detailed reference materials are provided for those who desire to learn more or become familiarized with nuances of the policy.

Although NCTCOG has compiled and commended these policies to member cities and counties, local conditions must be examined prior to policy implementation as economic, regulatory, or operational conditions may not lend themselves to policy success within a specific context. By way of example, *Policy 3-2: Establishing Curbside Loading Zones* provides a strategy of effectively utilizing curbside space to facilitate safe and efficient freight deliveries. However, this policy does not lend itself to more rural or exurban environments where lower population densities, roadway traffic, and commercial activity patterns generally do not produce a need for curbside freight deliveries.

Final Summary

This report included a literature review of technical documentation regarding freight land use planning, a summary of data collection activities, a typology of freight land uses in the North Central Texas region, analysis of collected data, a synthesis of literature review recommendations, and a policy toolkit for local governments to use in the freight land use planning process.

Compatibility concerns by land use type were considered and barriers to the preservation of freight land use were discussed. An analysis of regional freight facilities was conducted that assessed dispersion over time throughout region, age, and type. An assessment of freight infrastructure impacts on populations protected by environmental justice laws and policies was presented, alongside an analysis of freight facility proximity to sensitive social and cultural resources.

The Freight Land Use Policy Toolkit included in this report provides actionable strategies and polices that can be implemented or adopted by city and county governments (as well as special districts and transportation organizations) to prevent land use conflicts involving freight infrastructure and improve the overall performance of the regional freight network. A number of resources were provided to assist local planners in developing their own strategies and tailoring their approach to freight land uses in accordance with community objectives and goals.

NCTCOG will, as a result of this report, continue to pursue freight transportation planning solutions in the interest of achieving the regional objectives outlined in Mobility 2045, and partner with member governments to deliver innovative solutions to improve quality-of-life in the North Central Texas region.

3.5.6 The Economics of Infrastructure Projects and Freight

A challenging element of freight planning is capturing the value of freight, applying it to the benefit cost analysis of a project, and measuring the project's freight benefit. *Freight North Texas (2013)* identified the need for a tool that could be used to capture these benefits and leverage the data for use in competitive grant applications and capital project selection. As a result, NCTCOG partnered with the University of Texas at Arlington in 2021 to study methodologies for capturing the economic benefit of goods movement. This study provided a framework for quantifying and analyzing the freight economic benefits of infrastructure improvement projects. The framework will serve as a tool for analyzing both freight-related and non-freight infrastructure projects for their potential impacts on the freight transportation network.

With the rapid growth in freight demand, the North Central Texas region will be faced with increasingly congested and deteriorating highways. Freight-related infrastructure improvements are essential to continue economic growth in the Dallas-Fort Worth region. Under the status quo, it is not well

understood how infrastructure improvements would impact Dallas-Fort Worth's freight industry and regional economy. This lack of understanding is due to the inherently complex data-intensive process of quantifying the freight economic benefits of infrastructure improvement projects. It is with the aim of addressing this challenge that the NCTCOG University Partnership Program was conducted. The current study includes a comprehensive literature review, a freight economic analysis framework, extensive data collection, and the application of the developed framework for various project examples, along with a detailed case study.

Source: NCTCOG

Economic methods for quantifying the direct and indirect economic benefits of freight-related infrastructure improvements were examined through a thorough literature review. The literature review findings were utilized to design the freight economic analysis framework for quantifying and analyzing the freight economic benefits of infrastructure improvements in the Dallas-Fort Worth region. The assumptions for the application of the framework were described in detail. A variety of methods for quantifying the freight economic benefits were presented.

Thorough documentation was provided on applying the framework for quantifying and analyzing the freight economic benefits of infrastructure improvement projects. The framework was applied to five actual project examples and one detailed case study project. The case study was selected in collaboration with the NCTCOG technical panel. The results of the freight economic analysis using the framework provide the monetary values of direct freight economic benefits and indirect economic benefits of the projects. Direct freight economic benefits of infrastructure improvements are attributed to immediate cost reductions due to reduced truck travel times and increased freight reliability. Indirect economic benefits of infrastructure improvements are related to the impacts of infrastructure improvement projects on the overall economy and environment such as reduced pollutant emissions, job creation, and gross domestic product increase. Based on the freight economic cost-benefit analysis using the framework, each project example and the case study project were assessed using their net present value and benefit/cost ratio. The developed framework can help regional transportation planners formulate future infrastructure improvement projects and analyze their direct and indirect economic benefits for the regional freight economy.

3.5.7 North Texas Multimodal Operations, Velocity, Efficiency, and Safety Program – Freight and Railroads in North Texas

NCTCOG's North Texas Multimodal Operations, Velocity, Efficiency, and Safety Program (NT MOVES) is a program focused on railroad and road improvements in the North Texas region intended to enhance freight and passenger mobility across all modes. NT MOVES is long-range program that seeks to address rail mobility issues through collaboration and strategic investment into rail infrastructure. The program is an ambitious and innovative approach to resolving long-standing congestion issues. Both public and private rail sectors have come together to help identify and resolve rail bottlenecks and operational issues within the North Central Texas region. As noted in Section 2, the region has three Class I railroads, two short-line railroads, and has identified high-priority projects that, in turn, have been submitted for federal grants. As a result, NCTCOG was awarded $25 million through the Fiscal Year 2020 BUILD (Better Utilizing Investments to Leverage Development) grant to progress projects.

The rail-based efforts of the Goods Movement Program at NCTCOG falls within the NT MOVES Program. This includes BUILD grant projects, Clear Path™, and other elements that deal with passenger and freight rail interactions. This also includes elements that deal specifically with freight rail efforts such as the future of the Northeast Texas Rural Rail Transportation District corridor and rail/roadway interactions such as at-grade crossings and grade separations. All the different elements of the NT MOVES Program will be discussed in the rest of this section.

Source: NCTCOG

Fiscal Year 2020 BUILD Grant

As stated above, NCTCOG's NT MOVES submittal for the BUILD grant was selected and awarded $25 million to progress projects. These projects will eliminate 3.6 miles of single track, bringing the single-track mileage to just 11.4 miles, and increasing the double-track mileage to 23.6 miles on the Trinity Railway Express (TRE) corridor. The TRE corridor is used as the main passenger rail corridor between Dallas and Fort Worth with TRE, Amtrak, and multiple freight railroads operating on the corridor. It is one of the region's most congested rail corridors being highly used for both freight and passenger rail. These projected improvements include:

- Double track Medical Market Center to Stemmons Freeway (milepost 639.5) to the beginning of the existing double-tracked section west of Medical Market Center Station (approximately milepost 640.7), a distance of about 1.2 miles. Rehab the existing bridge over Inwood Road (milepost 640.41) and add adjacent bridge for second track. Add new bridge at Knights Branch (milepost 640.32) for second track. Replace current Noble Branch Bridge and add adjacent bridge for second track (milepost 639.62).
- Replace bridges at Walkers Creek (milepost 620.60) and Mesquite Creek (milepost 621.06) and construct 2.4 miles of a new second track from east of Handley Ederville Road to east of Precinct Line Road (milepost 618.7 to milepost 621.1).

Regional Rail Information System

In addition to the physical infrastructure project, the BUILD grant award also included funding for the implementation of a Regional Rail Information System (RRIS) using Clear Path™ technology developed for the Chicago Rail Complex. The project includes design, development concept of operations, and implementation of a hardware and software backbone structure that will enable all agencies and users of the Dallas-Fort Worth regional rail system to exchange timely, accurate, and actionable information on train movements in the terminal complex. This system will increase capacity of the Dallas-Fort Worth rail network by facilitating inter-carrier operations and enhancing the flow of passenger and freight trains through the complex.

> ***The objectives of RRIS are to address shared-use corridors and interconnected network issues, monitor ongoing performance measures, improve capital project selection, and facilitate public-private partnerships.***

RRIS Program Objectives

The RRIS Program will help create solutions that are first based on operations and communication. Then, with the information collected, the program will help with decisions made on capital projects to advance forward those that will have the greatest benefit for the region. The following are the specific areas in which RRIS will help.

Shared-Use Corridors and Interconnected Network

Resolving Congestion and Targeted Congestion: Utilizing a common operating picture of the entire regional rail system can provide a better way to handle specific areas of congestion, including:

- **TRE Corridor:** TRE's 34-mile corridor connecting Downtown Dallas with Downtown Fort Worth is a major rail corridor. It moves both passenger rail and freight rail through the middle of the region. The corridor is utilized by TRE; Amtrak; Fort Worth and Western Railroad; Dallas, Garland and Northeastern Railroad; Union Pacific Railroad; and BNSF Railway.
- **Downtown Carrollton:** The future Silver Line passenger service crosses a freight line known as the Madill Subdivision. The two lines will or are currently being utilized by Dallas Area Rapid Transit; Fort Worth and Western Railroad; Dallas, Garland and Northeastern Railroad; and BNSF Railway.
- **Control Point 217:** Located in the heart of Downtown Dallas where the TRE corridor meets the Union Pacific Railroad territory and changes in dispatching take place. The railroads that go

through the control point include BNSF Railway; Union Pacific Railroad; Dallas, Garland and Northeastern Railroad; and Amtrak.
- **Tower 55:** Located near Downtown Fort Worth and the IH 30/IH 35W interchange, Tower 55 is an at-grade rail crossing of north/south and east/west railroad tracks. It is used by BNSF Railway and Union Pacific Railroad.

Improving Ongoing Performance

Mobility, Connectivity, Reliability: It is expected Clear Path™ will help address growing environmental and fiscal constraints in transportation. By identifying bottlenecks and targeting specific areas of congestion, overall mobility, connectivity, and reliability will improve.

Efficiency and Operational Improvements: This includes new train slots for both passenger and freight railroads. This also helps to maximize existing assets, tracks, and facilities.

Safety:
- **Operational Improvements:** Assisting in maintenance of way.
- **Mode Shift:** As Clear Path™ helps to improve regional rail efficiency, this could cause customers to prefer a modal shift to rail.
- **Blocked Crossings:** A long-standing regional safety issue is at-grade crossings blocked by trains. With more efficient train movements comes a reduction in blocked crossings.

Future Projects and Partnerships

One of the biggest driving factors for creating RRIS is to help drive better capital projects across the region's rail network and assist in relieving congestion across the network. The system will help accomplish this in the following ways:

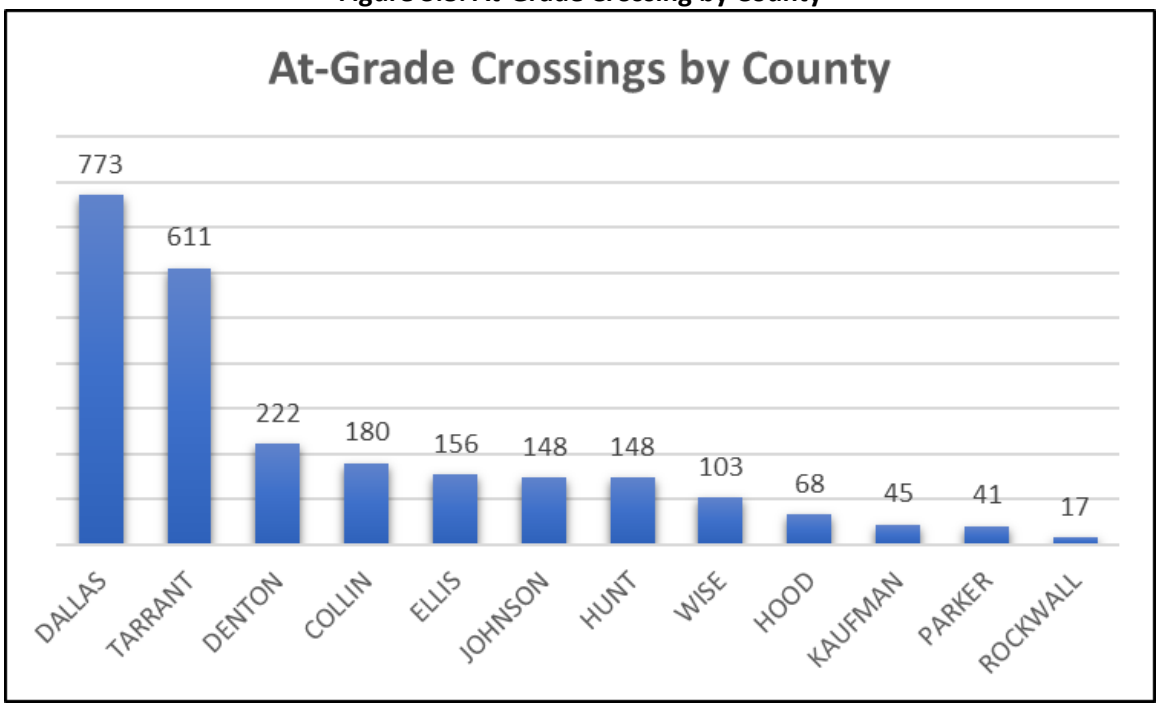
Provides Substantive Evidence for Multilateral Efforts to Relieve Key Pinch Points throughout the Regional Rail Network: Clear Path™ is a multilateral effort to relieve pressure at the bottlenecks discussed above in the Targeted Congestion section. The benefit from data sharing and historical use information components of the system makes such projects more competitive to receive funding from federal, state, and local sources**.**

Static Rail Modeling versus Dynamic Rail Modeling: Due to the dynamic, high-granularity data captured, future rail traffic models can be based on a broad array of system performance metrics across all of time and in greater detail. This results in more reliable and versatile model outputs.

Rail Crossing in North Central Texas

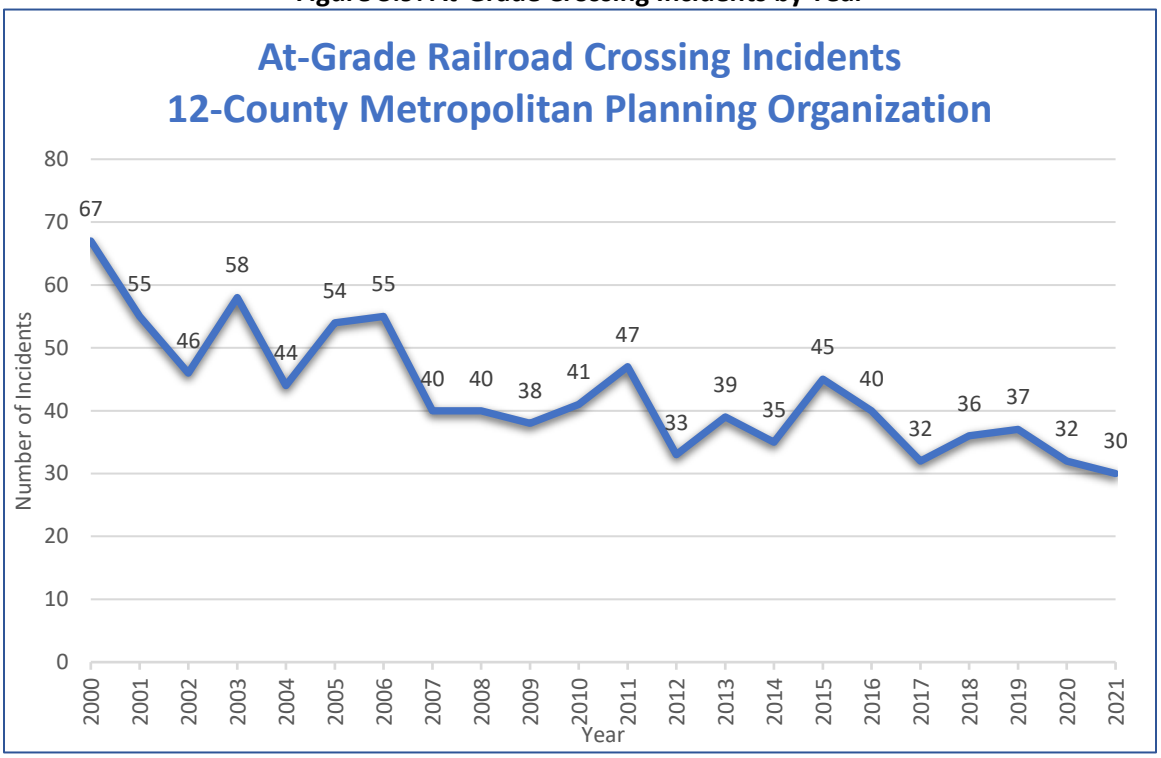
A large part of rail planning in the North Central Texas region is resolving rail and roadway interactions. There are 2,472 at-grade railroad-highway crossings within the 12-county region. A breakdown by county is shown in **Figure 3.8.**

Figure 3.8: At-Grade Crossing by County



A majority of the rail-related injuries and fatalities occur at at-grade crossings. NCTCOG tracks those incidents on a yearly basis, and there has been a downward trend in those incidents since the early 2000s. The number of incidents by year can be seen in **Figure 3.9**.

Figure 3.9: At-Grade Crossing Incidents by Year



It is important to review at-grade crossing issues and incidents in the context of the region's freight movement because the vast majority of incidents involve freight trains. As the region continues to grow economically and infrastructurally, additional train traffic for both transit and freight purposes can be expected. This, in combination with increasing amounts of automobile traffic, presents an expansion of opportunities for interactions between railroad and highway users. It is important that concerted planning efforts be made to understand trends in at-grade crossing incidents and procure actionable information that can make crossings safer, and effectively prioritize grade separation efforts within the region. Using this approach, NCTCOG has and continues to review the crossings in the region. Rail crossings have been prioritized and emphasis placed on specific crossings throughout the region. Working with cities, TxDOT, and regional rail partners, some crossings are considered high priority when funding becomes available for grade separations across the region.

The NETEX Corridor

The Northeast Texas Rural Rail Transportation District controls rail right-of-way in Northeast Texas, mostly out of the region. This right-of-way comes through the region in Hunt County and goes through Greenville. On the southside of Greenville, until the end of the right-of-way in Lavon, there is no rail infrastructure, meaning this unused right-of-way should be preserved for future transportation use. This need is recognized in the Mobility 2045 Update. There are several policies that place importance of right-of-way preservation. They can be seen below:

- Roadway Policies:
  - FT3-008: Encourage the preservation of right-of-way in recommended roadway corridors.
  - FT3-014: Evaluate and implement all reasonable options, such as asset optimization, to maximize corridor capacity, functionality, accessibility, and enhancement potential utilizing existing infrastructure assets and right-of-way.
- Transit Policies:
  - TR3-003: Existing and future public use rights-of-way should be monitored for appropriate public transportation service.
- Freight Policies:
  - FP3-013: Encourage regional railroads to participate in rail system planning, identifying issues, and the development of integrated operations with local commuter rail agencies.

These policies, as well as strong language included in the Freight and Transit sections of the update, will ensure the preservation of this corridor for future transportation use.

Rail planning through the NT MOVES Program is key to the success of the region's freight movement. Through the NT MOVES Program, partnerships are created and a more unified approach to the rail needs of region can be more quickly and successfully addressed.

3.5.8 Critical Urban Freight Corridors

Background

As the designated Metropolitan Planning Organization for the Dallas-Fort Worth-Arlington and Denton-Lewisville Urbanized Areas, NCTCOG is responsible for designating Critical Urban Freight Corridors (CUFCs) in the prescribed urbanized areas following federal guidance provided under 23 USC 167(f). CUFCs are important freight corridors that provide critical connectivity to the NHFN. By designating these important corridors, states can strategically direct resources toward improved system performance and efficient movement of freight on the NHFN. The designation of Critical Rural Freight Corridors and CUFCs will increase the state's NHFN, allowing expanded use of National Highway Freight Program formula funds and FASTLANE Grant Program funds for eligible projects that support national goals identified.

In 2018, NCTCOG coordinated with TxDOT, worked with the RFAC, and received Surface Transportation Technical Committee and Regional Transportation Council approval for the recommended CUFCs. The review process included evaluation of over 30 routes to see if they met federal and NCTCOG developed requirements. These requirements were given a point value with a maximum of 10 points possible. **Table 3.4** shows the scoring for the CUFCs. TxDOT allotted 102 miles to the region, divided among the top 12 routes. These routes became the region's CUFCs.

Table 3.4: CUFC Scoring Criteria

Requirements	Scoring	Explanation
Located within the Urbanized Area: Must be in an urbanized area.	Pass/Fail	If the corridor is not located in the Regional Urbanized Area, it does not quality as a CUFC.
Intermodal Connections: Connects an intermodal facility to the PHFS, the Interstate System, or an Intermodal Freight Facility.	0-2	A high priority was placed on intermodal connections due to their importance for ensuring freight mobility and economic stability. Corridors can score 0 points for no connections, 1 point for 1.
Located within a PHFS Corridor: Located within a corridor of a specified route on the PHFS and provides an alternative highway option important to goods movement.	0.25	If the corridor is within a 5-mile radius of a route on the PHFS, it scores .25 points.
Major Freight Generators: Serves a major freight generator, logistic center, or manufacturing and warehouse/industrial land.	1.0	Significant non-intermodal facility freight generators along or near the corridor score 1 point.
Regional Freight Importance: Important to the movement of freight within the region, as determined by the Metropolitan Planning Organization or the state.	0.75	If determined by the Metropolitan Planning Organization to have regional freight significance, the corridor scores .75 points.
AADT for Travel Volumes: AADT for trucks on or adjacent to the PHFS.	0.50	Truck volumes must be at least 5,000 AADT for limited access facility near the corridor or at least 1,000 AADT for arterials to score .5 points.
Percentage of Total Truck Volume: Percent of AADT for truck volumes on the PHFS corridors.	0.50	The percentage of Annual Average Daily Truck Traffic must be at least 10% along the corridor to gain a score of .50 points.
Metropolitan Transportation Plan: To ensure continuity with regiona transportation plans, a higher priority is placed on corridors already listed in the Metroplitan Transportation Plan.	1.0	Priority is given to corridors with projects currently in the plan. If the project is identified in the plan, it receives a score of 1 point.
Transportation Improvement Plan: To ensure continuity with regional transportation plans, a higher priority is placed on corridors already listed in the Transportation Improvement Plan.	2.0	Priority is given to corridors with projects currently in the plan. If the project is identified in the plan, it receives a score of 2 points.
10-Year Plan: To ensure continuity with regional transportation plans, a higher priority is placed on corridors already listed in the 10-Year Plan.	2.0	Priority is given to corridors with projects currently in the plan. If the project is identified in the plan, it receives a score of 2 points.
Total Possible Points	**10**	

AADT: Annual Average Daily Traffic
Percentage of Total Truck Volume: The percentage of Annual Average Daily Truck Traffic
PHFS: Primary Highway Freight System
CUFC: Critical Urban Freight Corridor

Once this process was completed, the criteria were submitted and included in the 2018 Texas Freight Mobility Plan. In preparation for the 2023 Texas Freight Mobility Plan, NCTCOG engaged in the review process of CUFCs once again.

2022 Corridor Review Process

In late 2021, NCTCOG, at TxDOT's request, reviewed the region's existing CUFCs to determine if they were still valid or if changes needed to be made. Forty-one regionally significant corridors were identified during the CUFC selection and review process. Following completion of this review, 12 corridors were selected and appropriated mileage. The mileage appropriated did not exceed the allotted centerline mileage limit for the urbanized area. Three CUFCs previously designated during the 2018 scoring session have updated scores. These three corridors and the criteria which warranted the resulting score change is listed below.

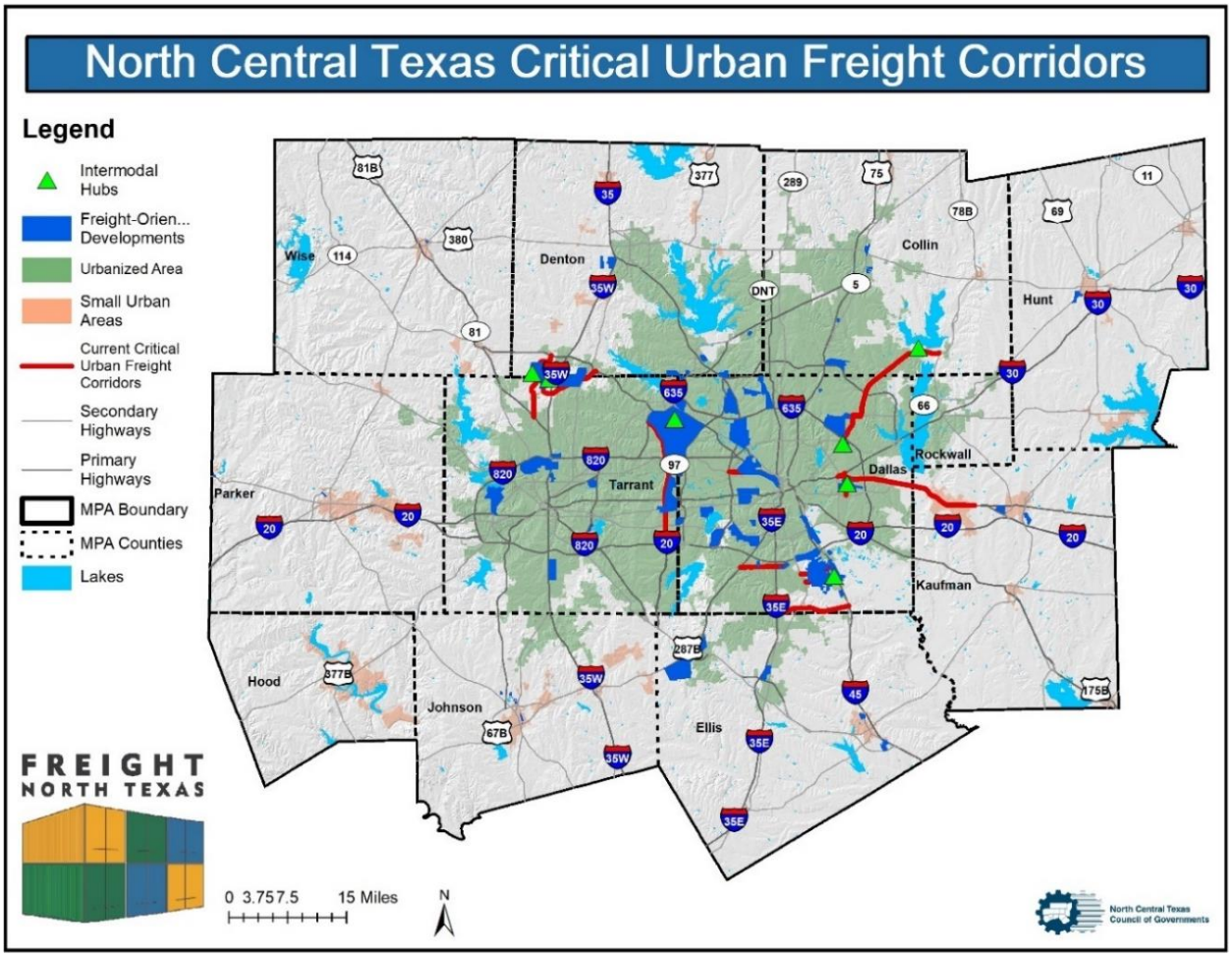
- US Highway 80: The rating for this corridor increased one (+1) point due to an increase in Annual Average Daily Traffic Truck Volume.
- Pleasant Run Road: The rating for this corridor decreased two (-2) points because Pleasant Run Road was removed from the Transportation Improvement Program for project completion.
- State Highway 170: This corridor had a decrease of two (-2) points because State Highway 170 was removed from the Transportation Improvement Program for project completion.

The four new corridors reviewed included:

- JJ Lemon Road in Dallas
- Northern Cross Boulevard in Fort Worth
- Bardin Road/Cummins Road in Arlington
- Will Rodgers Boulevard in Fort Worth

The current CUFCs for the North Central Texas region can be found in **Figure 3.10.** The complete list of CUFCs and the scorecard for the 2022 scoring can be found in **Appendix C** for reference.

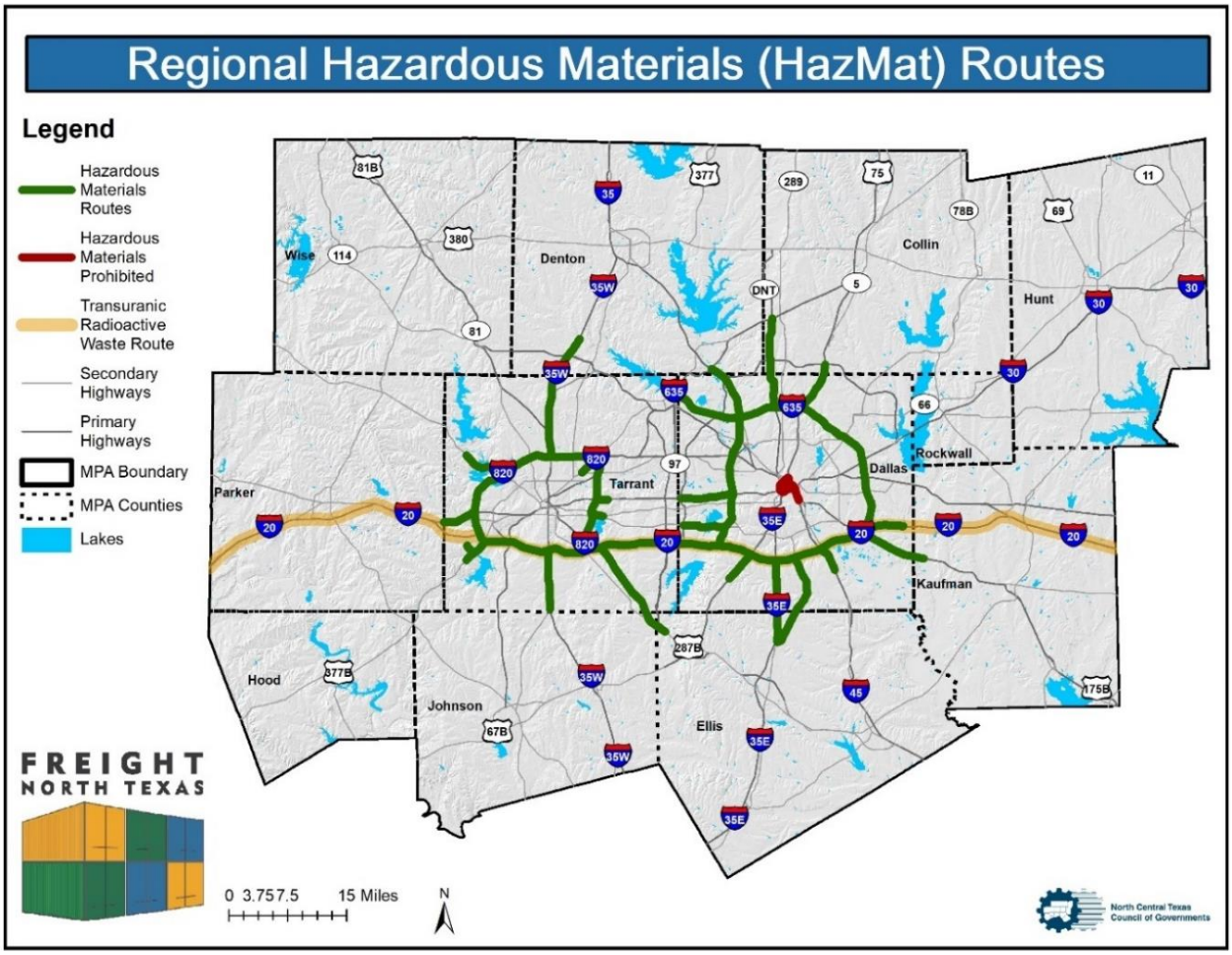
Figure 3.10: North Central Texas CUFC



3.5.9 Hazardous Material Routing

Hazardous material (HazMat) routing is an important part of planning freight movements in the region. For this reason, in 1985, NCTCOG released the Hazardous Materials Routing Study Phase I and Phase II. This study established regional HazMat routes that are still in use today. The current routes, shown in **Figure 3.11**, include IH 635 from IH 30 to State Loop 12, State Loop 12 from IH 35E to State Spur 408, all of State Spur 408, IH 820, and IH 20. Additionally, IH 20 is designated as the Federal Motor Carrier Safety Administration (FMCSA) Transuranic Radioactive Waste Route. This is a nationwide route to move radioactive waste. Phase II of NCTCOG's Hazardous Materials Routing Study helped designate where hazardous materials should not be routed through Downtown Dallas due to potential hazards.

Figure 3.11: Regional Hazardous Materials Routes



2020 Route Review

In 2020, a review of the routes established in 1985 was completed. The objective of this review was to determine if there is a need to update HazMat routing in the North Central Texas region. The report addressed population trends, FMCSA routes, railroads, major hazardous material end users, daily traffic counts, hazardous material incidents, and stakeholders.

This review considered changes that may have impacted HazMat routing in the Dallas-Fort Worth region since the previous HazMat study. In addition to an evaluation of the current HazMat routes, this review included an evaluation of potential alternative HazMat routes throughout the region. Potential alternative routes include IH 30, SH 183, IH 35W, and IH 35E.

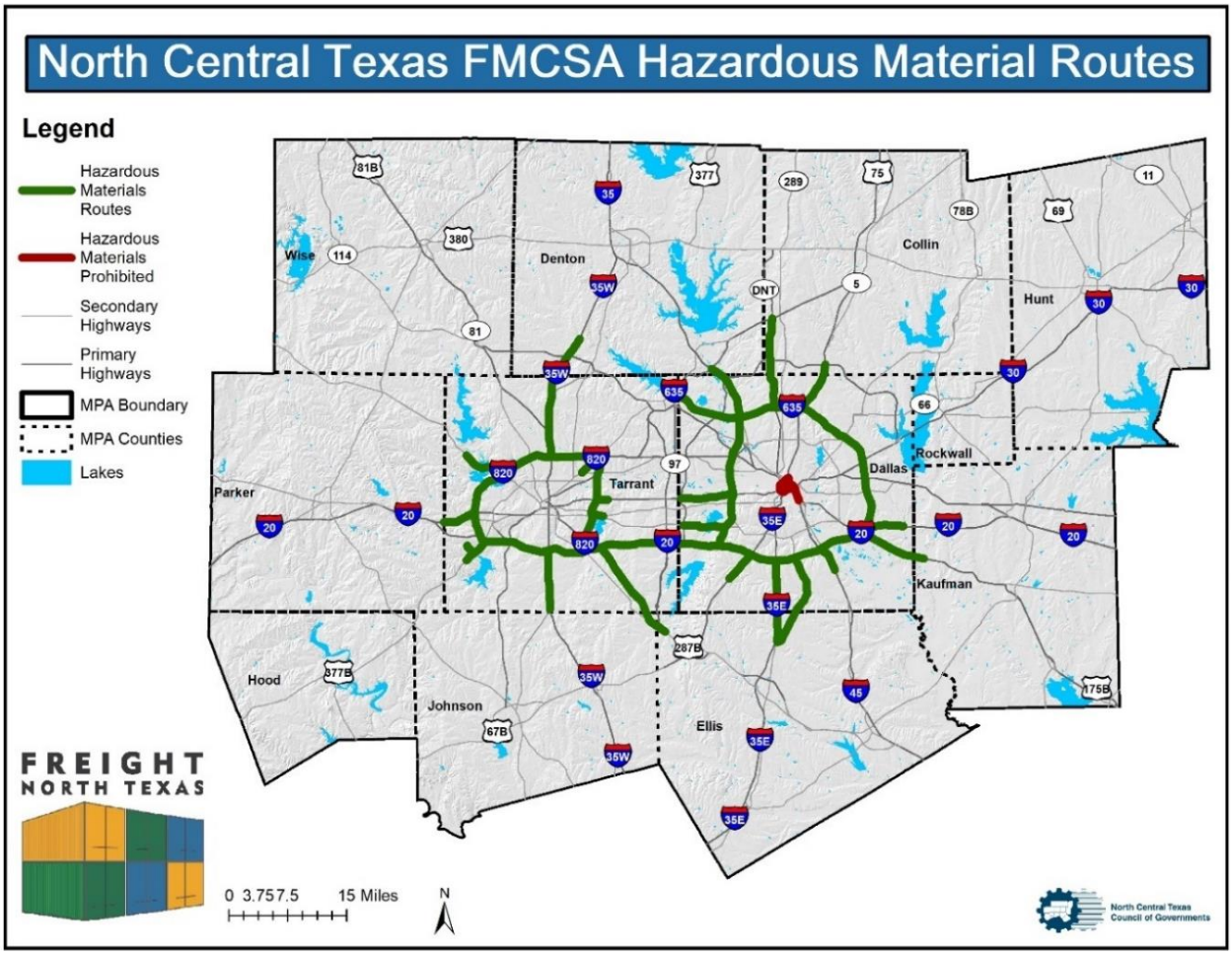
In the review, it was concluded that current regional HazMat routing utilizes the "loop" freeways and the only limited access facility that does not move through Downtown Fort Worth or Downtown Dallas goes through the entire region. There has been growth and change along these corridors, but it is in line with growth in the rest of the region.

The alternative routing (IH 30, SH 183, IH 35W, and IH 35E) is not as compatible with HazMat movements. There has been growth along these corridors and there are built-in challenges such as moving through Downtown Fort Worth and Dallas.

FMCSA Routes and Federal Register

FMCSA is the agency that oversees HazMat routes in the country. These routes have been established on the federal level and are listed in the Federal Register. These include all the local routes in our region and the local restrictions on hazardous materials through specific areas such as Downtown Dallas. Local routes are an important part of the first/last mile connections for major hazardous material carriers. **Figure 3.12** shows the hazardous material routes for the North Central Texas region. For a complete list of all local routes in the Federal Register, please see the attached document.

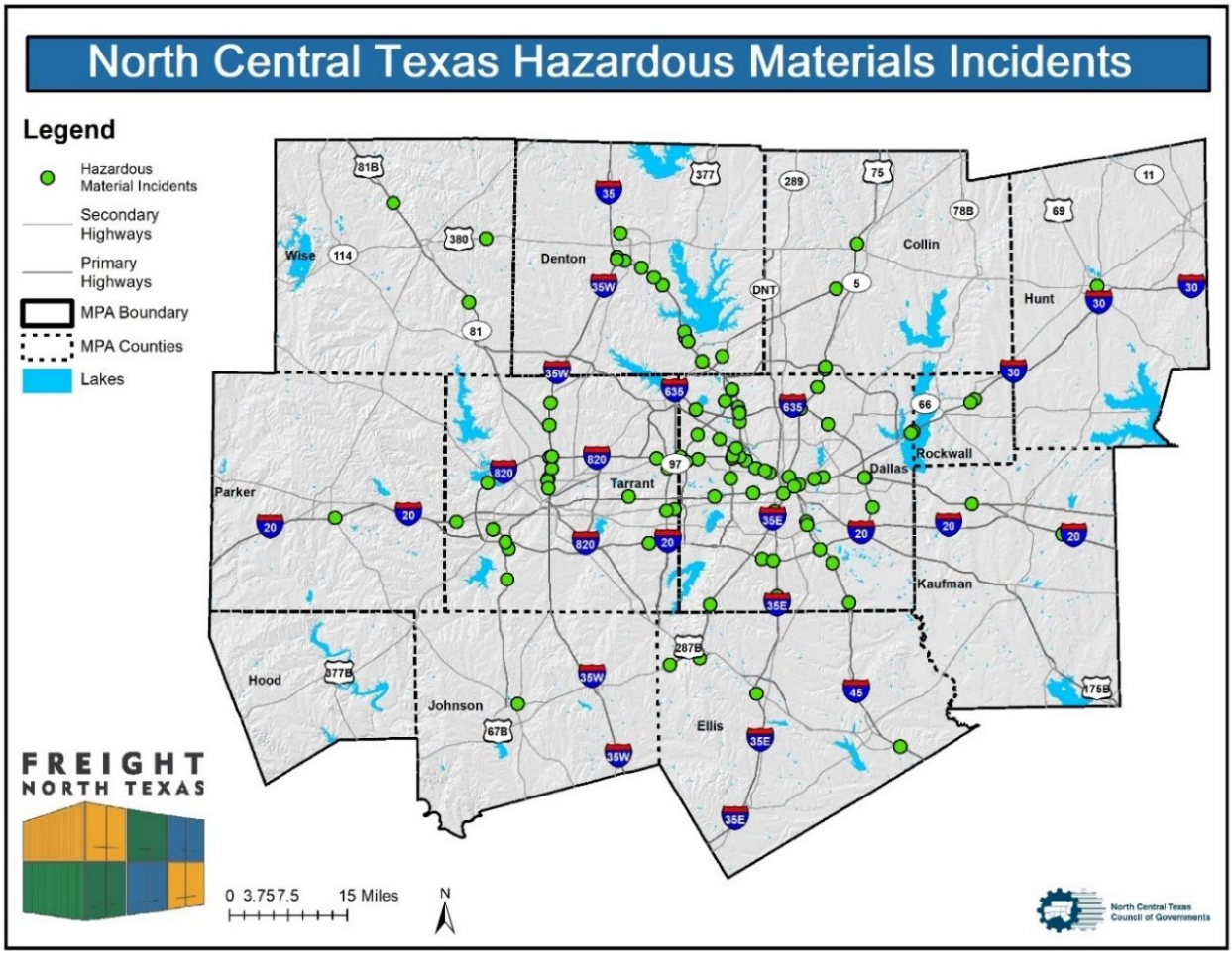
Figure 3.12: FMCSA Hazardous Material Routes



HazMat Incidents

NCTCOG tracks crash data for the entire region, including HazMat crash incidents. In the last five years, there have been 87 HazMat incidents, with only 10 (11.5 percent) of those occurring along the current designated HazMat routes. The number of HazMat incidents should be greater on or near the regional routes, as HazMat carriers are required to travel these routes. Please see **Figure 3.13** for a map of the hazardous material incidents over the last five years. This is limited to incidents on limited access facilities.

Figure 3.13: Regional Hazardous Materials Incidents



The HazMat routes should have alternatives, such as continuous frontage roads, to redirect traffic somewhere along that route. Furthermore, cities along the recommended route must ensure they have sufficiently trained personnel, along with inter-agency and inter-city communications in place, to manage a major HazMat incident.

Hazardous material routing issues are continually tracked and analyzed by NCTCOG. Reviews of the incidents, routing, and the material are conducted at regular intervals. Different teams, both within the Transportation Department and other departments at NCTCOG, work on the issues related to hazardous material routing on a regular basis.

3.5.10 Freight and Technology

New and emerging technologies are always going to affect freight transportation. This is because of the need to improve and make the freight network more efficient. Over the last several years, we have seen an increase of new technologies currently being used or that will soon be used in the freight industry. These include electronic driver logs, automated vehicles, connected vehicles, and alternative delivery methods.

Automated vehicles (AV) and connected vehicles have the potential to have far reaching impacts on the freight industry as a whole. As the industry deals with numerous issues, there is one that always comes forward. That is driver shortages. Driver shortages will be assisted with improvement of AV trucks. NCTCOG recognizes the importance of AV and like technologies to the future of the transportation system. For this reason, there is a team that specializes in Transportation Technology. More information about this program can be found on their website.

In addition to AVs, NCTCOG has moved forward with automated transportation systems (ATS) and freight signal optimization.

ATS and Freight: ATS broadly refers to shared-use automated transportation form-factors operating at non-highway speeds. ATS systems may run on demand or as a fixed schedule, may be grade separated on a closed corridor, may have the ability to get out of dedicated right-of-way, and may or may not be tied to public transit systems. They do not operate across the entire roadway system as most public transportation systems do but, as mentioned, address campus- and corridor-level pinch points.

The freight element of this project is – can the technology be used to move freight? Part of the project is to identify what standards and specifications are needed to move freight in an ATS environment. Once those are determined, a pilot project will be identified and NCTCOG will move forward with a test of the concept.

Freight Signal Optimization: This project focuses on optimizing the flow of freight through signalized intersections by identifying "problem" traffic signals and applying a technology solution that prioritizes freight movement. This project is a technology solution to optimize the flow of trucks from freight-oriented developments to limited access facilities.

The benefits of this project include:

- Truck travel time savings
- Improved traffic flow
- Public health
- Any adverse impacts (e.g., cross traffic delay)
- Compare with alternative solutions (e.g., signal retiming)

This project is the result of the Freight Congestion and Delay Study, which was discussed earlier in this section. The goal is to have a software or technology solution that is low cost to cities that are going to use it. This will make it something that can be used at different times throughout the day.

These projects represent a technological approach to traditional freight problems such as truck congestion caused signal timing in freight-oriented areas and the need for short, closed freight networks. These and other new technologies will have a sizable impact on the movement of freight. NCTCOG will continue to monitor and incorporate potential impacts of new technologies into the planning process as they emerge.

3.5.11 Corridor Studies

NCTCOG's Freight Team does many corridor studies each year to help parts of the region with rail or truck related concerns. Corridor studies are smaller initiatives or short-term studies that help promote better planning and support to the region. If there is a local freight concern within the region, analyzing

and completing these corridor studies gives local governments the tools or recommendations to resolve the specific problem. For example, an initial corridor study NCTCOG took part in was to support the city of Terrell, or the FM 429 realignment project. Listed below are examples of corridor studies that have been completed or are in the process of being completed.

Cleburne Truck Route Evaluation

NCTCOG and the city of Cleburne worked together on evaluating the feasibility of constructing a bypass around the southern side of Cleburne. The bypass would remove traffic from Downtown Cleburne and provide a potential truck route for traffic between the industrial areas south of Cleburne and the rest of the region.

In early 2017, NCTCOG completed the evaluation on a proposed southern loop around the city of Cleburne. The evaluation found that the southern bypass was not currently feasible for the following reasons:

- The volumes projected for the roadway do not warrant its construction.
- Other projects in the Cleburne area have recently been completed, including the Chisholm Trail Parkway and the US 67 Northern Bypass.
- Safety and truck issues may be addressed using other measures such as modifying truck routes through the city, installing traffic calming features, and/or developing a bypass using mainly upgraded existing streets with a small number of new connections.

As part of the evaluation, pass-through commercial vehicle traffic in the downtown area was studied and potential solutions for reducing traffic were identified. These solutions included removing the truck route from BU 67 and transitioning truck traffic to the Highway 67 bypass, reducing vehicle speeds in the downtown area, and incorporating bike lanes, in addition to providing on-street passenger vehicle parking in Downtown Cleburne. These proposed improvements would discourage trucks from making rigid left turns from BU 67 to SH 171/174 and increase the walkability of the downtown area. Also, since SH 171/174 are on the State Freight Network and are an important freight corridor, they would stay open to truck traffic, but signage would be put up to show the proper movement into and out of the downtown area. These are simple and cost-effective solutions that would reduce truck congestion without impacting downtown or surrounding areas.

Cold Springs Road

NCTCOG conducted a technical analysis in Fort Worth on Cold Springs Road and the impacts of freight movement in the area. The purpose of this analysis was to research and assess existing concerns in the area, as well as recommend mitigation strategies to improve overall freight movement.

The methodology of this report is drawn from data collection and site visit analysis. This report concludes with a series of recommendations and mitigation strategies. These recommendations promote land-use compatibility, easier movement of freight, and effective conflict mitigation amongst freight-oriented properties and other land-use types.

Lancaster Truck Route Evaluation

NCTCOG evaluated potential concerns related to the city of Lancaster's truck route network. NCTCOG staff conducted an on-site review to observe traffic, assess roadway conditions, and evaluate the design and functionality of Lancaster's designated truck route network. Additionally, NCTCOG reviewed local and regional truck routes to better match infrastructure to freight transportation demand.

Lancaster Belt Line Road

NCTCOG conducted a technical evaluation to explore the increase of freight movement off Belt Line Road. Belt Line Road in southeast Lancaster is quickly becoming a large freight-oriented development with heavy freight movement coming through the area. A large Walmart distribution center is being built along Belt Line Road and other freight facilities are being considered in the area as well, which will result in rapid freight growth off Belt Line Road. The outcome will include a significant increase in truck traffic.

Source: NCTCOG

Recommendations include rebuilding Belt Line Road as a concrete, three- to four-lane road to accommodate current and future freight movement. Also, the city should continue with the Sunrise reconstruction to the south of Belt Line Road. The city should also resolve steep shoulder slope and drainage issues and keep their existing truck route designations.

Martin Luther King Jr. Blvd. Truck Routing Review

NCTCOG reviewed Martin Luther King Jr. (MLK) Blvd. in the city of Dallas and arrived with a solution that would potentially reroute truck traffic away from this corridor. The portion of the road reviewed was from Robert Cullum Blvd. (SH 352) to Lamar Avenue. The goal was to create a Complete Street in this corridor and to eliminate truck traffic on MLK Blvd. NCTCOG worked with The Real Estate Council (TREC) and the city of Dallas on the Complete Street design, which was part of The Real Estate Council Better Block Program. This document reviewed the freight conditions on MLK Blvd., as well as examined streets that could be used to reroute trucks in the area.

Downtown Dallas Rail (Control Point 217)

Rail activity in Downtown Dallas is important to the regionial rail impact as a whole. Currently, the Downtown Dallas area is the location of many rail improvement projects. In the area, there are both passenger and freight rails in operation. BNSF Railway; Dallas, Garland and Northeastern Railroad; and Union Pacific Railroad are freight rails that operate in the region and TRE and AMTRAK are passenger rails that run through the region. Also, the Dallas Area Rapid Transit light rail runs parallel to these rails but does not coincide with other rails. Currently, TRE, Dallas-Fort Worth's commuter rail service, has two trains operating every hour, running from 4:00 AM to 12:00 PM, depending on if it is going westbound or eastbound. For each station, roughly 30 trains pass through each day. The rail improvements address concerns with rail congestion, rail time, and delays. Many of these projects are interdependent of each other; they depend on each other for completion and improvements. There are several rail projects at different stages of development in the Downtown Dallas area that will improve rail delays and congestion. This document will describe all current/future rail projects in this area. It will address the projects, their costs, timelines, and how they are interdependent of one another. This document was created to explain the current/future projects occurring in the Downtown Dallas area that will help reduce congestion and increase rail delivery times.

The biggest of these projects is Control Point (CP) 217. CP 217's impact on the rest of the improvement projects is vital to the efficiency and effectiveness to freight and commuter rail in the region. Staff proposed additional tracks near the JFK Junction to allow freight trains to pass with less interaction with passenger trains. These improvements will result in and save 1.3 minutes of delay per train trip. This might not seem like a lot, but with hundreds of trains passing through the area daily, it will make a huge difference in efficiency.

Additionally, the recently completed Regional Rail Study by TxDOT identified a $140 million investment for CP 217, including improvements to Forest Avenue and the Union Pacific Railroad Mineola Extension. These improvements will reduce rail delays by 7.5 minutes per train. More specifically, these improvements include a track extension from Trinity Junction so the double track on the Union Pacific Railroad Mineola Extension is complete. These changes will help with the flow of rail congestion and improve rail efficiency. It will allow rail traffic to move uninterrupted, therefore, creating more smooth and timely delivery of goods.

CP 217 improvements will help fix train traffic by adding the third mainline/bypass track – the TRE to Fair Park, a potential intermodal transportation facility, and existing IH 30 rail bridge improvements.

These highlighted corridor studies show the role and importance short-term studies have on planning for freight in North Central Texas. It shows the collaboration with the region's cities and partners, the impact freight has on a local level, and demonstrates the importance of cost-effective small solutions and the impact they have.

3.5.12 Freight and Safety

Safety in freight movement is a high priority in the goods movement industry and needs to be properly tracked and evaluated on a consistent basis. Freight highway safety in the region is annually tracked by reviewing and analyzing truck-involved crashes. Analysis focuses on the crash location, possible causes, impact on traffic congestion, and potential solutions to improve highway safety involving truck movements.

NCTCOG monitors commercial motor vehicle crashes each year. **Table 3.5** shows the commercial motor vehicle, or truck crashes, from 2017 to2021 with 2021 having the highest number of crashes. There was a decrease in crashes from 2019 to 2020, then an increase in 2021. This data represents all crashes in the 12-county region and came from TxDOT's Crash Records Information System. According to TxDOT, a reportable motor vehicle traffic crash is defined as any crash involving a motor vehicle in transport that occurs or originates on a traffic way, results in injury to or death of any person, or damages any property of any one person to the apparent extent of $1,000. These crashes are reported and used as data for NCTCOG's Safety Campaign and other projects each year to encourage safety within the region.

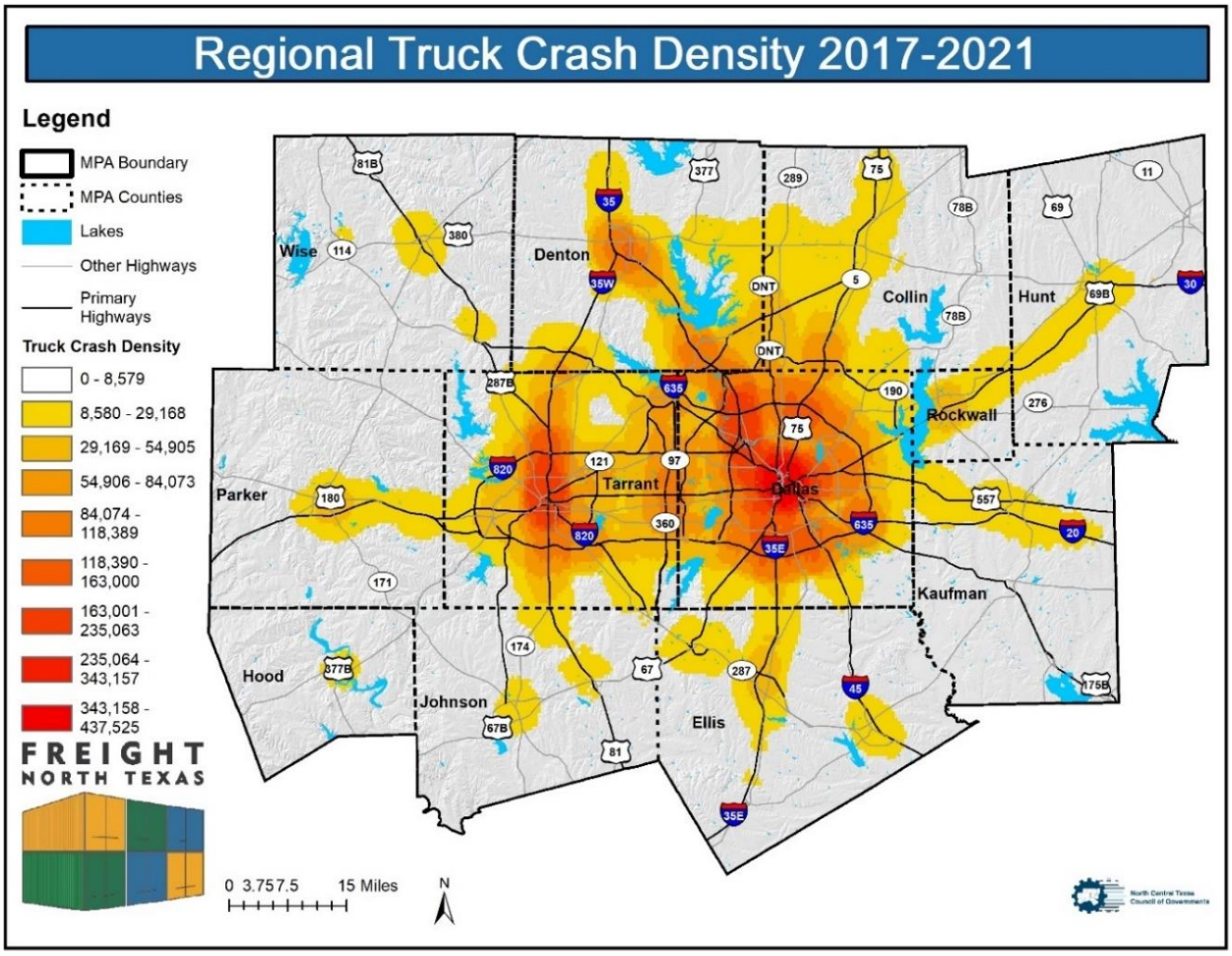
Table 3.5: Commercial Motor Vehicle Crashes

Year	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Not Injured	Unknown	Total
2017	86	203	769	1,348	5,855	89	8,350
2018	75	213	758	1,300	5,829	79	8,254
2019	79	192	745	1,408	6,192	107	8,723
2020	90	197	677	1,190	5,513	106	7,773
2021	106	267	820	1,244	6,585	63	9,085
TOTAL	**436**	**1,072**	**3,769**	**6,490**	**29,974**	**444**	**42,185**

Source: TxDOT

Figure 3.14 displays the regional truck crash density from 2017 to 2021. This map shows areas within the region where there are high densities of truck crashes. For example, north of Downtown Fort Worth and Dallas County have the highest truck crash density numbers. These areas are known to have high volumes of truck movement, so the need for optimum safety precautions is imperative to lower these numbers not only in these specific areas, but also within the region. NCTCOG's Freight Safety Campaign is to reduce truck crashes. In 2021, NCTCOG used memes, a play on words, and relevant slogans to convey the safety messages that helps reduce these numbers.

Figure 3.14: Regional Truck Crash Density



NCTCOG conducts a Freight Safety Campaign; the 2021 Safe Driving Campaign began in early spring and ended in the fall. The last safety campaign took place in 2021. The goal of the 2021 campaign was to reduce freight-related accidents and inform the public about safe driving practices near large commercial motor vehicles. Truck and passenger vehicles interact daily, which can present possible life-threatening incidents. These can be mitigated through a greater awareness and safer driving habits. Reduce the risk, prevent the crash. **Figure 3.15** is an example of a freight creative that was used to promote the 2021 Safety Campaign.

Operation Lifesaver and NCTCOG collaborated for the Railroad Crossing Safety portion of the Campaign. The purpose of this campaign is to reduce rail crossing-related accidents and inform the public about safe rail crossing practices. It is important to keep our communities safe through continued rail crossing safety education; therefore, NCTCOG will continue doing safety campaigns.

Figure 3.15: Freight Creative

Source: NCTCOG

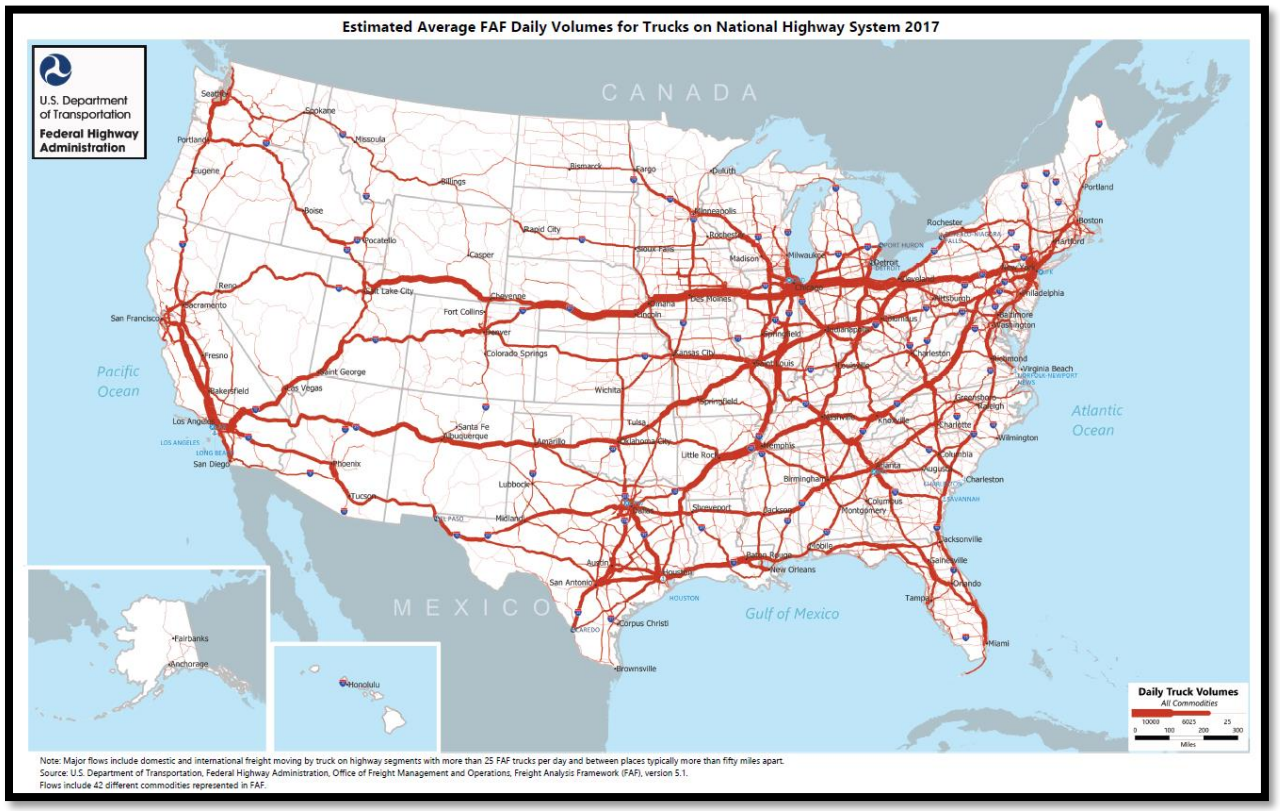
The region's safety is a top priority for NCTCOG. It is important to improve safety anyway possible. Through driver awareness, geometrical improvements, Intelligent Transportation Systems, and better response training, NCTCOG is committed to improving the safety of all elements of freight movement. This also includes programs, such as the Freight Safety Initiative, to provide educational materials and knowledge to the community to help spread awareness on truck and rail safety. Through the Freight Safety Campaign, safety messages and materials are used to help reduce crashes and promote safe habits among the community. With the help of this campaign and other preventative measures, crash numbers should decrease and make the roads more secure.

3.6 Region to State Connectivity and Emergency Logistics Planning

The North Central Texas region serves as a significant hub for goods movement at the national and state level. Located along key rail and highway corridors, as seen in **Figure 3.16**, a dense network of pipelines, and the presence of multiple high-capacity air cargo facilities situate the Dallas-Fort Worth metroplex at a nexus for economic activity. These rail, roadway, pipeline, and air cargo connections enhance the economic importance of the region for both the State of Texas and the Nation.

The diversity of industrial activities that take place in North Central Texas requires the support of highly developed transportation infrastructure across multiple modes. This section analyzes these interregional, national, and international connections.

Figure 3.16: Freight Analysis Framework Daily Volumes for Trucks



3.6.1 North Central Texas Freight and Neighboring Areas

The breadth of economic and industrial activity within the region provides opportunity, services, and resources for the residents of North Central Texas; however, the regional economy is also linked to multiple other geographies. Freight transportation infrastructure facilitates the movement of goods seen in **Figure 3.17** across regional, state, and national boundaries. The sections that follow will examine nearby geographies and their economic connections to the North Central Texas region, including the nature of these connections by mode as seen in **Figure 3.18**. Unless otherwise specified, data on freight tonnage, dollar value, and commodity flow patterns is sourced from the Freight Analysis Framework Version 5 (FAF5), a joint effort between the Federal Highway Administration and the Bureau of Transportation Statistics.[37]

[37] For domestic geographies – unless otherwise specified – FAF data reflects Total Commodity Flows (including both domestic and foreign cargo) for the year 2022. These dollar values and/or tonnage amounts will be enclosed in parenthesis after commodities when they are listed. Foreign geographies, tonnage, and value amounts reflect the 2022 projections regardless of mode or location of entry into the United States. More information about FAF5 can be found here: https://faf.ornl.gov/faf5/Default.aspx

Figure 3.17: Top 10 Regional Import Commodities by Value

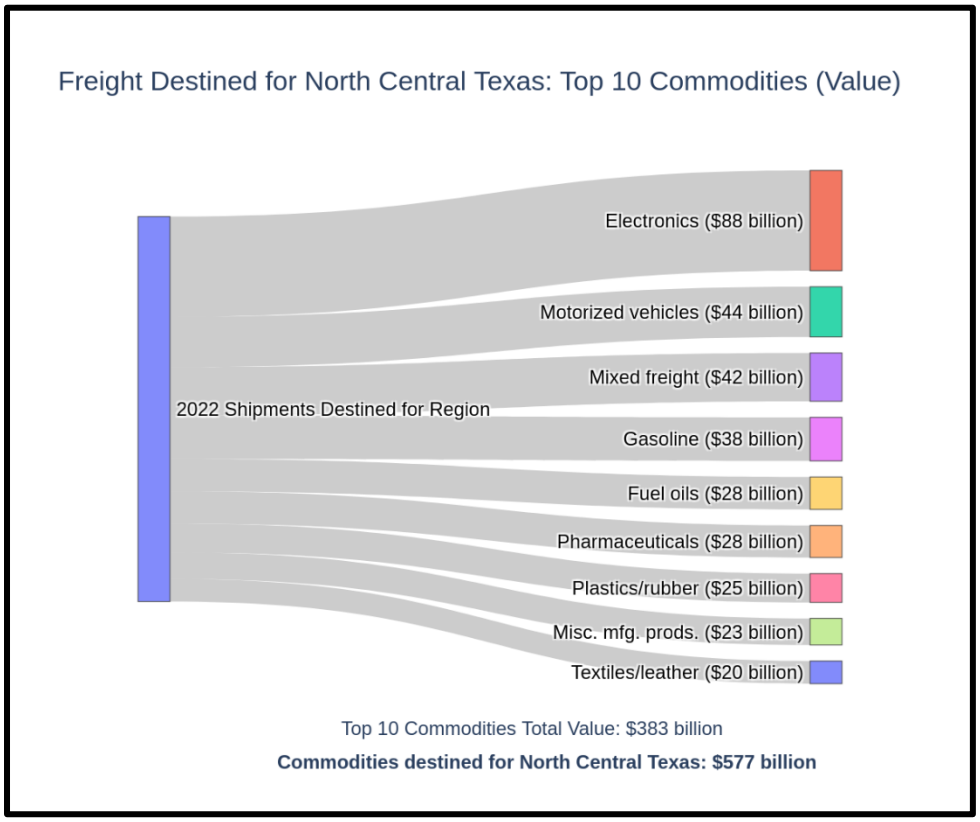
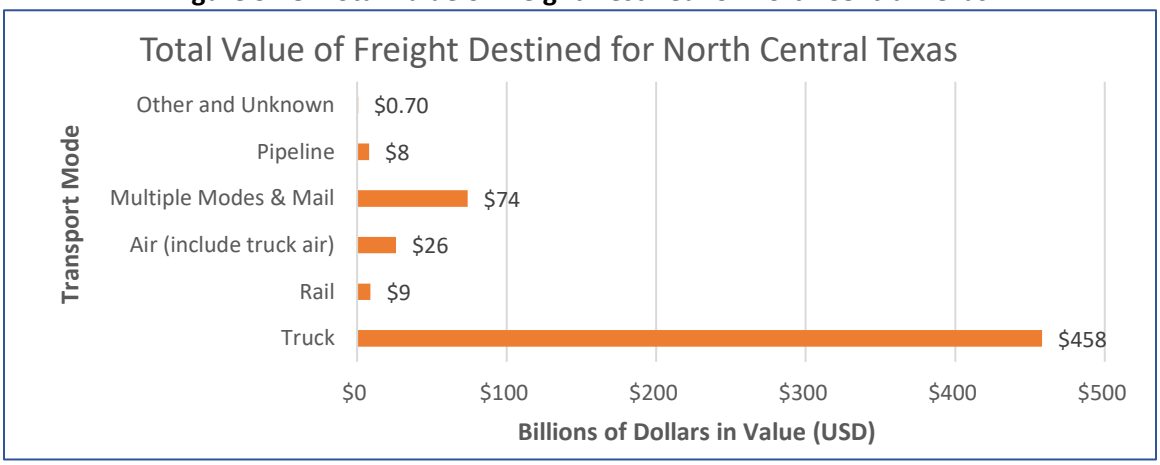


Figure 3.18: Total Value of Freight Destined for North Central Texas



National Connections: The United States and Mexico

Mexico is the State of Texas' largest trading partner. The total value of trade with Mexico and the State of Texas in 2019 was $212.9 billion, or 34 percent of all Texas' international trade.[38] FAF5 projects that in 2022, the total value of all goods from Mexico destined for the region (regardless of point of entry) will be $37.8 billion, or 18 percent of all Texas trade with Mexico. A list of the top 10 commodities imported and exported, by value and weight, between Mexico and the region, can be seen in **Table 3.6**. In addition, FAF5 forecasts that $327 million of goods will enter the US from Mexico directly by way of the North Central Texas region's freight connections as seen in **Figure 3.19**.

Table 3.6: Top Regional Imports and Exports To and From Mexico

Imports and Exports: Mexico and Dallas-Fort Worth Region

By Value

Top 10 Imports from Mexico to Dallas-Fort Worth

Rank	Commodity	Value (2022 USD)
1	Electronics	$19,153,577,800
2	Motorized Vehicles	$5,176,192,700
3	Machinery	$2,716,126,600
4	Precision Instruments	$1,498,574,200
5	Other Agricultural Products	$1,242,074,400
6	Furniture	$1,227,522,500
7	Textiles/Leather	$1,037,694,100
8	Articles – Base Metal	$1,003,201,500
9	Other Foodstuffs	$801,532,200
10	Plastics/Rubber	$543,891,500

Top 10 Exports from Dallas-Fort Worth to Mexico

Rank	Commodity	Value (2022 USD)
1	Electronics	$10,833,930,400
2	Plastics/Rubber	$3,816,462,700
3	Machinery	$3,407,896,000
4	Gasoline	$3,086,033,200
5	Motorized Vehicles	$2,856,894,600
6	Coal n.e.c.	$2,331,798,500
7	Fuel Oils	$1,717,873,800
8	Basic Chemicals	$1,706,129,600
9	Mixed Freight	$1,043,966,300
10	Articles – Base Metal	$916,541,400

By Weight

Top 10 Imports from Mexico to Dallas-Fort Worth (2022)

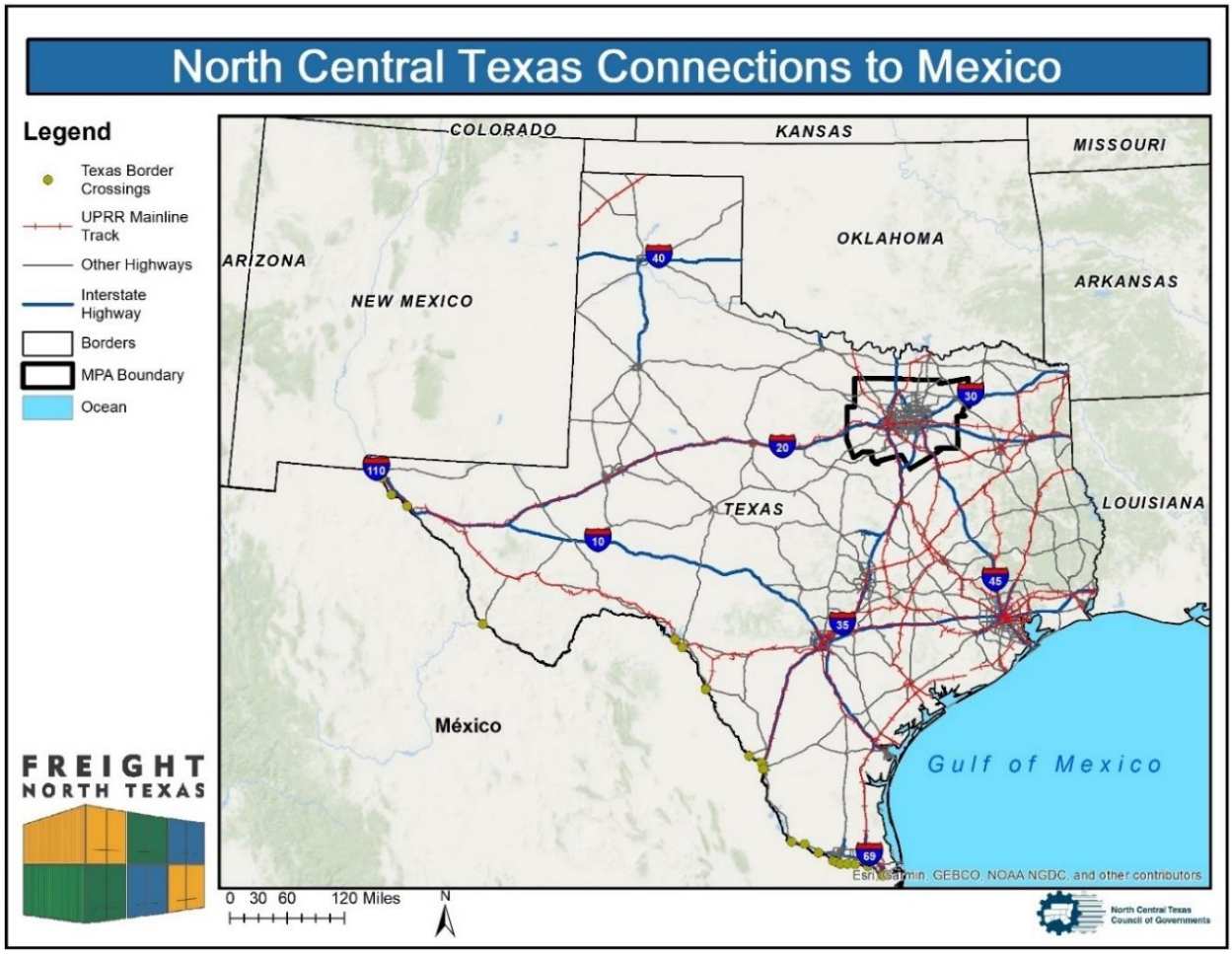
Rank	Commodity	Tons Imported
1	Gravel	3,004,400
2	Other Agricultural Products	1,164,200
3	Nonmetal Mineral Products	906,500
4	Motorized Vehicles	756,200
5	Fuel Oils	752,000
6	Other Foodstuffs	710,700
7	Electronics	562,600
8	Base Metals	504,400
9	Articles – Base Metal	387,600
10	Machinery	381,100

Top 10 Exports from Dallas-Fort Worth to Mexico (2022)

Rank	Commodity	Tons Exported
1	Coal n.e.c.	11,985,800
2	Gasoline	6,143,200
3	Fuel Oils	3,894,000
4	Basic Chemicals	2,462,900
5	Plastics/Rubber	884,800
6	Coal	868,300
7	Waste/Scrap	716,500
8	Cereal Grains	695,100
9	Electronics	629,700
10	Base Metals	500,300

[38] *2020 International Trade Corridor Plan,* Texas Department of Transportation https://ftp.dot.state.tx.us/pub/txdot-info/iro/border-trade-report.pdf

Figure 3.19: North Central Texas Connections to Mexico



The section that follows will discuss each mode of connection between the North Central Texas region and Mexico.

Highway Connections: Multiple highways connect Mexico to the region, most notably IH 35 and IH 10. These routes, and the US and State Highways that connect them to border crossings, are vital for goods movement into the region and Nation. Northbound commercial vehicle traffic from the Texas-Mexico border increased 112 percent from 1996 to 2019.[39] 79.9 percent by weight and 82.7 percent by value of all goods imported into the region travel by truck; 82.8 percent by value and 53.9 percent by weight of exports are transported out of the region by truck. As residents and businesses in the region rely on goods brought in from Mexico, maintaining these freight routes and the industrial facilities that support them is of great importance.

[39] *Border Entry Data (1996-2019),* Bureau of Transportation Statistics

The top commodities imported by truck from Mexico are:

1. Electronics ($14.1 billion)
2. Motorized Vehicles ($4.0 billion)
3. Machinery ($2.6 billion)

The top commodities exported from the region by truck to Mexico are:

1. Electronics ($10.6 billion)
2. Plastics/Rubber ($3.2 billion)
3. Machinery ($2.8 billion)

Railroad Connections: Data generated by FAF projects that in 2022, over $9 billion of goods will be delivered to the North Central Texas region via railroad; $1.3 billion worth of these goods (or roughly 14 percent) will originate from Mexico. In terms of weight, almost 10 percent of goods imported to the region from Mexico arrive via railroad (1.1 million tons). Primary railroad corridors in Texas that connect Mexico to North Central Texas include the Union Pacific lines adjacent to the IH 10, IH 20, and IH 30 corridors, as well as the US 90 corridor west of San Antonio. These lines tie into railroads owned by Ferromex, a North American Class I railroad that primarily operates in north and central Mexico.

The primary commodities imported from Mexico to the region by rail include:

1. Motorized Vehicles ($980 million in value)
2. Base Metals ($142 million in value)
3. Fuel Oils ($47 million in value)

Primary exports to Mexico from the region by rail include:

1. Plastics/Rubber ($618 million in value)
2. Machinery ($617 million in value)
3. Motorized Vehicles ($501 million in value)

Industrial products, raw materials, vehicles, and energy products comprise the bulk of Mexican goods traded with North Central Texas and transported via railroad. Products high in weight, as well as hazardous materials, are well-suited to transport by railcar due to increased energy efficiency and reduced risk of collision with other vehicles.

Airport Connections: FAF5 anticipates that in 2022, air cargo will comprise 0.4 percent of regional imports from Mexico by value, and 0.014 percent by weight. In 2022, more than $139 million worth of goods will enter the region via airplane routes from Mexico to the North Central Texas region. Electronics ($74 million), miscellaneous manufacturing products ($25 million), and precision instruments ($17 million) are the top commodities imported to the region by air from Mexico. Electronics ($179 million) is also the region's top export commodity to Mexico by air, followed by motorized vehicles ($41 million), and machinery ($30 million). Relative to other modes of transportation, air transport comprises a relatively small portion of regional trade with Mexico.

Pipeline Connections: Exports of natural gas to Mexico by pipeline is the largest component of US natural gas trade, accounting for 40 percent of all US gross natural gas exports in 2019.[40] Products exported by pipeline comprised 4.5 percent of regional exports to Mexico by value, and 20.4 percent of exports by weight. Top exports transported by pipeline to Mexico were coal products not elsewhere classified (n.e.c.) ($933 million), gasoline ($620 million), and fuel oils ($129 million). Products imported to the North Central Texas region via pipeline make up 0.12 percent of all imports from Mexico by value, and 1 percent of all imports by weight. Basic chemicals ($29 million), gasoline ($15 million), and coal products n.e.c. ($200,000) were the top imports.

NCTCOG Regional Connections to other US States

The Dallas-Fort Worth metroplex is a nexus of trade amongst the neighboring states of Louisiana, New Mexico, and Oklahoma, and a robust network of multimodal transportation connections facilitates the movement of goods to rural and urban communities throughout the southcentral United States. The sections that follow will examine the economic impact the North Central Texas region has on neighboring states, as well as what commodities are imported into the region.

For state trade analysis, GIS pipeline data was not available to be analyzed outside of Texas; as such, pipeline analysis for the states of Oklahoma, Louisiana, and New Mexico relied solely on FAF5 data.

Interstate Connections: New Mexico

The State of New Mexico relies heavily on the State of Texas for the importation of goods to its borders. **Figure 3.20** shows an increasing trajectory by value of shipments from Texas to New Mexico. While regional trade with New Mexico is facilitated heavily by pipelines and highways, as seen in **Figure 3.21**, other reginal freight connections include rail and airports, as shown in **Figure 3.22**. Petrochemical products, agricultural products, machinery, electronics, mixed freight, and motorized vehicles comprise the top commodities traded with New Mexico. Notably, 89 percent by weight (79 percent by value) of commodities imported from New Mexico arrive via pipeline.

Top imports to the region from New Mexico include:

1. Electronics ($3.4 billion)
2. Coal n.e.c. ($311 million)
3. Other Foodstuffs ($209 million)

Top Exports from the region to New Mexico include:

1. Electronics ($3.2 billion)
2. Mixed Freight ($948 million)
3. Machinery ($651million)

[40] According to the US Energy Information Administration (https://www.eia.gov/todayinenergy/detail.php?id=44278)

Figure 3.20: North Central Texas Connection to New Mexico

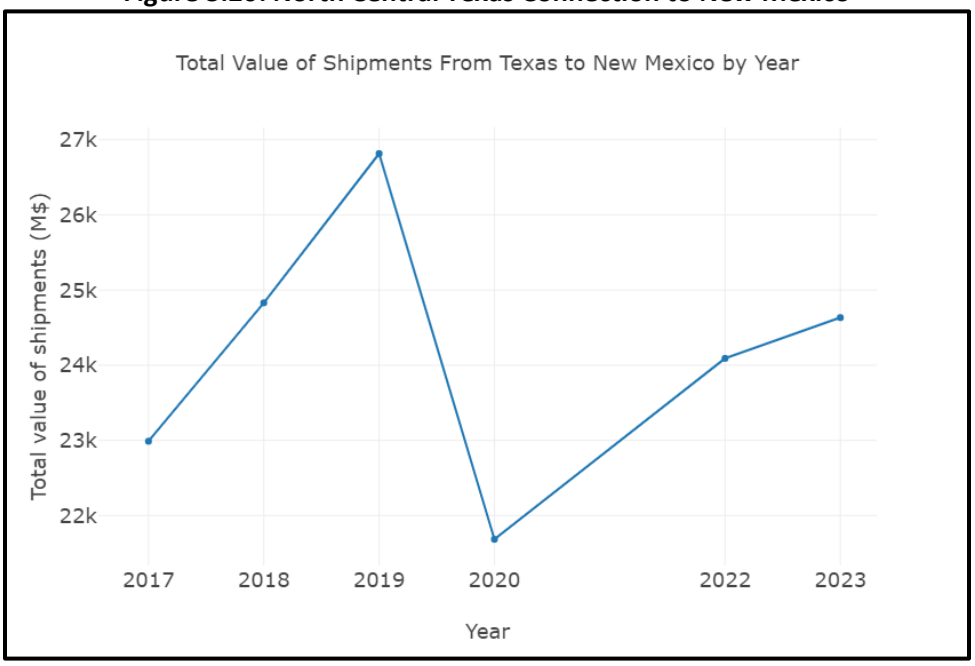


Figure 3.21: Regional Imports from New Mexico by Mode (2022)

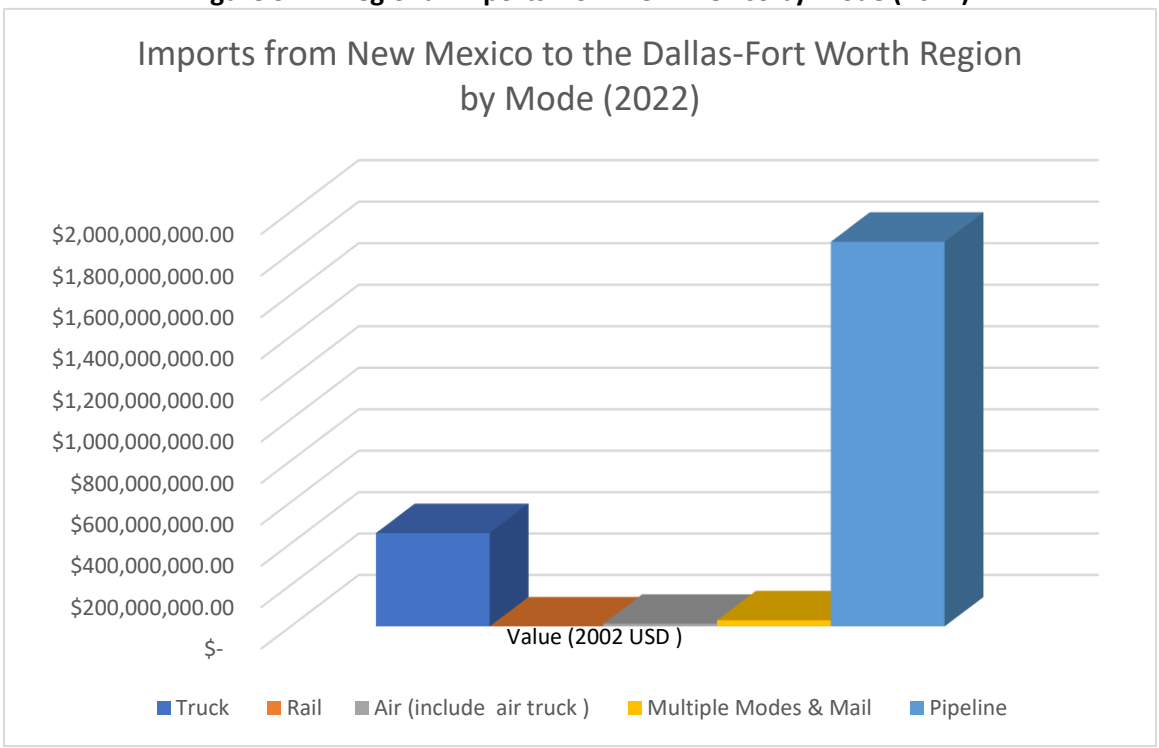
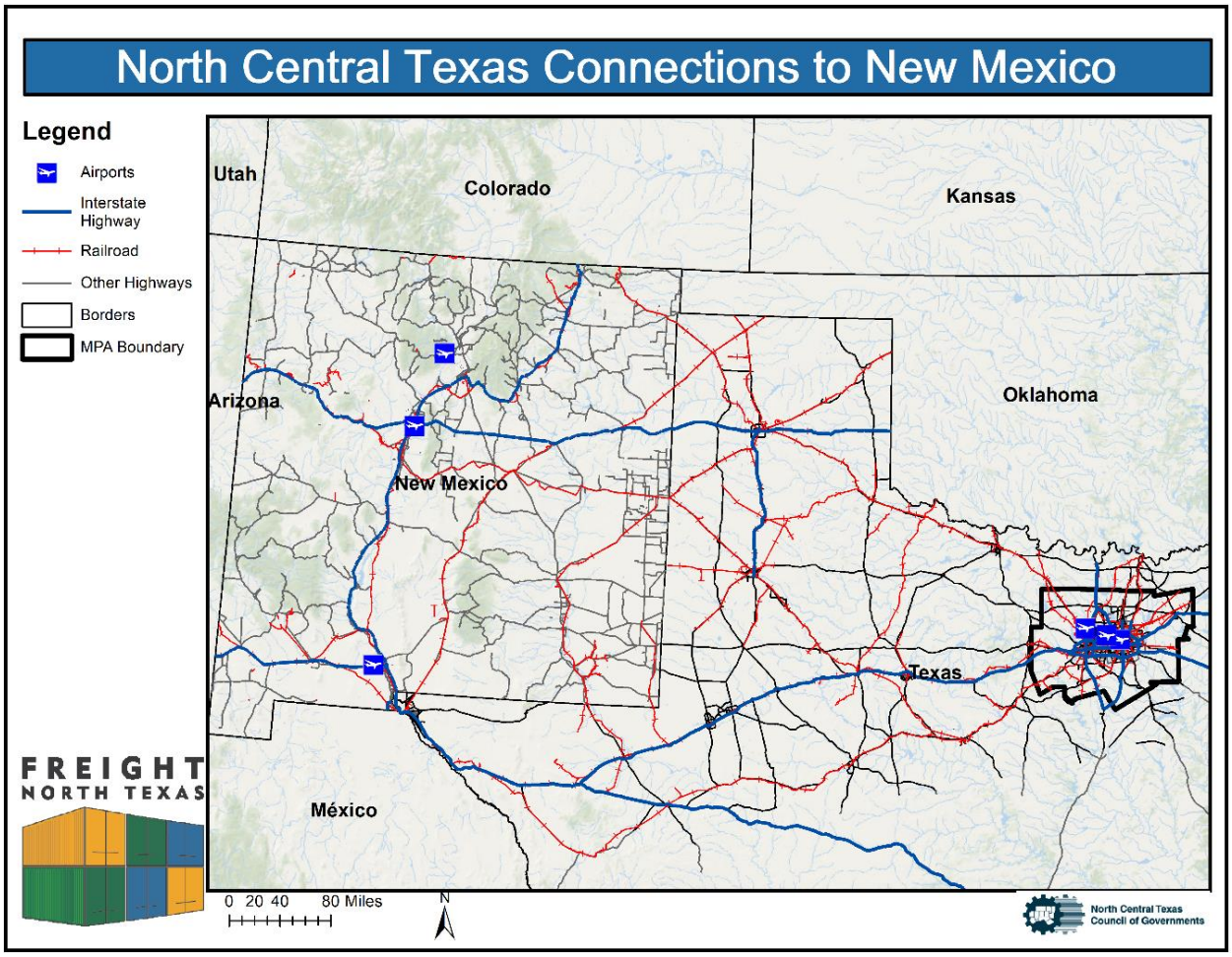


Figure 3.22: Total Value of Shipments from Texas to New Mexico by Year[41]



The Dallas-Fort Worth region is an important source of goods for the economy of New Mexico. FAF5 projects nearly $3.1 billion of electronics and $1 billion of mixed freight will be exported from the region to New Mexico in 2022. The "Mixed Freight" FAF commodity category includes supplies and foodstuffs for restaurants, groceries, hardware or plumbing supplies, office supplies, and miscellaneous assorted freight. Retail trade accounts for the largest share of the New Mexico economy as a whole,[42] and the majority of New Mexico's imports come from Texas (more than $24 billion annually) with more than 29 percent of that freight by value coming from the Dallas-Fort Worth region alone.

Likewise, the North Central Texas region imports a large quantity of petrochemical products from New Mexico. FAF commodity category "coal n.e.c." includes lubricating oils and greases, refined petroleum oils, oils obtained from bituminous minerals, liquefied natural gas, propane, butane, and other gaseous

[41] Note: Values for 2017-2020 are observed, while 2022-2023 are projected by FAF5.
[42,42] *Quarterly Economic Summary of New Mexico*, New Mexico Economic Development Department (June 2022) (https://edd.newmexico.gov/wp-content/uploads/2022/06/June-2022-Economic-Summary-New-Mexico.pdf)

hydrocarbons. Mining, quarrying, and oil and gas extraction in the northwestern Permian Basin comprises a large portion of the state's economy (11 percent of taxable gross receipts).[43]

Highway System Connections: There are multiple major highway corridors that connect the region to various regions within New Mexico. The primary routes include US 287, IH 40, US 180, IH 20, US 84, and IH 10. By value, 86 percent of both imports and exports between the region and New Mexico rely on trucking alone to get to their destination. It should be noted, however, that when evaluating by overall cargo tonnage, only 14 percent of goods are transported by truck. This is due to large quantities of low-value commodities (usually raw or unprocessed hydrocarbons), transmitted by pipeline. Higher value commodities and consumer goods tend to be transported by truck.

Top import commodities transported by truck (both by tonnage and value) from New Mexico to North Central Texas are electronics ($3.4 billion), other foodstuffs ($210 million), and milled grain products ($65 million). Top exports from the region to New Mexico by truck are electronics ($3 billion), mixed freight ($932 million), and machinery ($638 million).

Railroad System Connections: According to FAF data, a nominal amount of trade between the North Central Texas region and the State of New Mexico occurs via railroad. No rail commodity data was available to analyze.

Airport Connections: The primary airports that serve New Mexico include Albuquerque International Airport and Santa Fe Municipal Airport. Cargo transported by air composes 3 percent by value of all imports from New Mexico to the region, and 1 percent of all exports. The top regional air cargo export to New Mexico is pharmaceuticals, which is projected to comprise 75 percent of air cargo shipments in 2022, with a combined value of $115 million. Electronics and mixed freight were second and third by value at $18 million and $11 million, respectively.

Fifty percent of regional air cargo imports from New Mexico are comprised of electronics, with an annual value of $65 million. Machinery ($23 million) and precision instruments ($21 million) were the second and third most traded commodities by air, comprising 18 percent and 16 percent, respectively.

Pipeline Connections: Forty-six percent of US natural gas exports in 2021 were by pipeline, of which 70 percent went to Mexico and 30 percent went to Canada (2021 was the first year that liquid natural gas exports exceeded natural gas exports by pipeline).[44] Natural gas is almost exclusively transported by pipeline, thus making the network of pipelines that connect the NCTCOG region and Mexico highly important. Based on data from the US Energy Information Administration and FAF5, NCTCOG staff estimate that roughly one-twentieth of all natural gas imported by Mexico comes from the North Central Texas region.

FAF indicates that the largest pipeline export by value from the region to Mexico is coal n.e.c. (which includes gaseous hydrocarbons such as natural gas). In 2022, it is estimated that exports of this commodity alone will exceed $933 million, followed by gasoline and fuel oils at $621 million and $129 million, respectively.

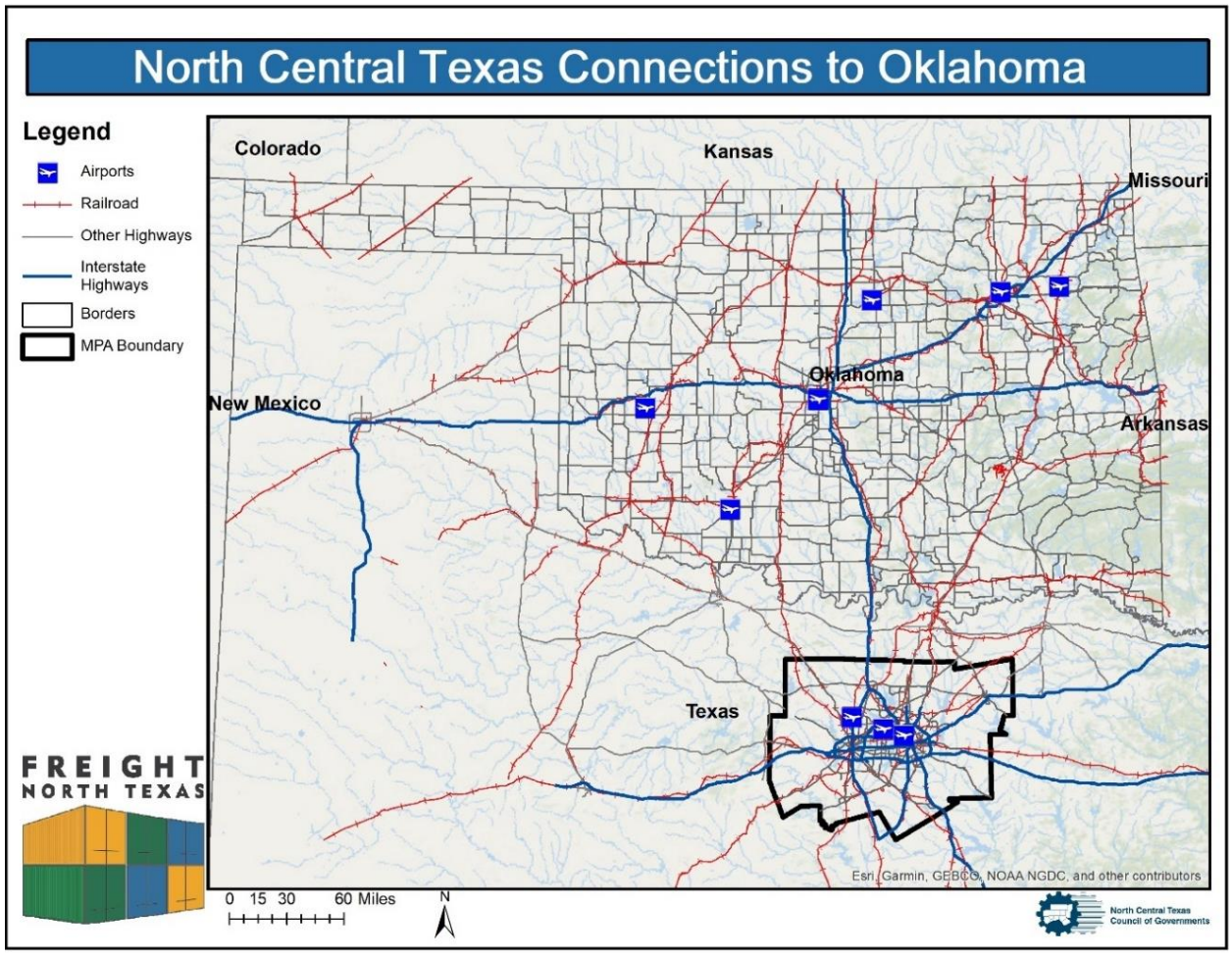
[44] According to the US Energy Information Administration

Imports from Mexico to the region by pipeline are comparatively small. The top pipeline import by value is basic chemicals, which includes both inorganic (hydroxides of sodium and potassium, sulfur, aluminum oxide, carbon dioxide, hydrogen, nitrogen, oxygen, etc.) and organic chemicals (cyclic hydrocarbons, phenols, aldehydes, acyclic alcohols, cyclic polymers of aldehydes, etc.); the region is expected to import $29 million in 2022, as well as $15 million of gasoline and $200,000 of coal n.e.c.

Interstate Connections: Oklahoma

The distance from the geographic center of the North Central Texas region to the state line with Oklahoma is 70 miles, making the State of Oklahoma the region's closest state neighbor. Interstate Highway 35, a major transnational trade corridor, links the region to Oklahoma City, the state's capital and largest city, as seen in **Figure 3.23**. Truck and pipeline are the main freight transportation modes for goods moving north into Oklahoma, as well as goods imported into North Central Texas.

Figure 3.23: North Central Texas Connections to Oklahoma



Highway System Connections: IH 35 is the primary highway corridor that facilitates both import and export of goods to and from the region by truck. According to TxDOT data, nearly 10,000 trucks a day (18.5 percent of all traffic) travel in both directions on IH 35 between the Dallas-Fort Worth metroplex

and Oklahoma. The vast majority of shipments to Oklahoma are conveyed via truck. FAF5 data projects that in 2022, more than $17 billion in goods will be shipped from North Central Texas via truck to destinations within Oklahoma, which comprises 85 percent by value (65 percent by weight) of all regional Oklahoma-bound shipments. With regard to imports, 70 percent by value (45 percent by weight) of shipments originating in Oklahoma and destined for the NCTCOG region are conveyed by truck.

Table 3.7: Top Exports and Imports to Oklahoma by Weight and Value

Imports and Exports: Oklahoma and Dallas-Fort Worth Region

By Value

Top 10 Imports from Oklahoma to Dallas-Fort Worth

Rank	Commodity	Value (2022 USD)
1	Gasoline	$1,550,900,000
2	Chemical Products	$932,000,000
3	Pharmaceuticals	$674,300,000
4	Basic Chemicals	$596,700,000
5	Newsprint/Paper	$504,600,000
6	Coal n.e.c	$428,000,000
7	Plastics/Rubber	$379,800,000
8	Machinery	$284,200,000
9	Wood Products	$241,000,000
10	Other Foodstuffs	$190,000,000

Top 10 Exports from Dallas-Fort Worth to Oklahoma

Rank	Commodity	Value (2022 USD)
1	Mixed Freight	$3,678,700,000
2	Pharmaceuticals	$2,292,600,000
3	Electronics	$2,081,800,000
4	Coal n.e.c	$1,941,400,000
5	Machinery	$1,717,400,000
6	Motorized Vehicles	$1,532,300,000
7	Miscellaneous Manufacturing Products	$1,158,800,000
8	Base Metals	$937,800,000
9	Chemical Products	$757,700,000
10	Articles – Base Metals	$569,700,000

By Weight

Top 10 Imports from Oklahoma to Dallas-Fort Worth (2022)

Rank	Commodity	Tons Imported
1	Coal n.e.c	6,961,200
2	Gravel	3,350,900
3	Nonmetal Mineral Products	768,300
4	Mixed Freight	658,200
5	Gasoline	560,800
6	Fuel Oils	479,800
7	Meat/Seafoods	238,700
8	Other Foodstuff	218,000
9	Electronics	203,100
10	Wood Products	201,000

Top 10 Exports from Dallas-Fort Worth to Oklahoma (2022)

Rank	Commodity	Tons Exported
1	Coal n.e.c	3,332,800
2	Mixed Freight	1,089,000
3	Base Metals	576,600
4	Other Foodstuffs	386,300
5	Other Agricultural Products	306,900
6	Nonmetal Mineral Products	291,200
7	Gasoline	261,100
8	Wood Products	220,200
9	Cereal Grains	217,500
10	Plastic/Rubber	168,800

The top commodity by both value and weight moved by truck from Dallas-Fort Worth to Oklahoma is mixed freight ($3.6 billion and 1.1 million tons in 2022).[45] Other exports and imports between the two include pharmaceuticals, machinery, base metals, coal n.e.c., meat/seafood, and nonmetal mineral products, as seen in **Table 3.7**.

Railroad System Connections: Multiple Class I rail corridors run though both Oklahoma and the Dallas-Fort Worth region. BNSF Railway and Union Pacific Railroad owned tracks constitute the primary regional rail connections to Oklahoma. The Union Pacific Duncan Subdivision runs northwest of the region and north through Oklahoma, while the Choctaw Subdivision runs northeast and parallel to Duncan. Additionally, the BNSF Madill Subdivision runs north into Oklahoma on the east side of the region, while the Wichita Falls and Fort Worth subdivisions run northwest and due north, respectively. Although the Kansas City Southern owned track in the region does not run directly north into Oklahoma, it runs east along the Greenville subdivision into Louisiana, then runs north into Arkansas and eventually Oklahoma.

FAF data suggests that, as a portion of all regional exports to Oklahoma by value, very few shipments that originate in Dallas-Fort Worth terminate in Oklahoma (less than 0.02 percent). The only commodity group exported is nonmetallic mineral products, which includes hydraulic cements, ceramic products, glass and glass products, and other mineral products such as stone, granite, and gypsum.

Fifty-six percent of regional imports from Oklahoma by rail are composed of gravel, with fertilizers and waste/scrap making up 37 percent and 6 percent, respectively. Overall, regional imports by rail comprise 0.2 percent of total imports by value and 16 percent by weight.

Airport Connections: Major airports that serve the State of Oklahoma include the Will Rogers World Airport in Oklahoma City, and the Tulsa International Airport in Tulsa. The top commodities by value flown from Dallas-Fort Worth to airports in Oklahoma include electronics ($41 million), machinery ($20 million), and precision instruments ($16 million). The top commodities exported by air from airports in Oklahoma to Dallas-Fort Worth include machinery ($44 million), electronics ($26 million), and transportation equipment ($10 million).

Pipeline Connections: Like North Central Texas, the State of Oklahoma is home to a robust petrochemical harvesting and transportation industry. Oklahoma and the NCTCOG region are gateway zones and tributaries for the Gulf Coast pipeline corridor, which runs into the rest of the North American market. Natural gas is the top regional export by pipeline to Oklahoma. $590 million in value of commodities in the coal n.e.c. category (largely natural gas and other gaseous hydrocarbons) are estimated to be shipped to destinations in Oklahoma in 2022. Crude petroleum is the only other pipeline commodity flowing to destinations in Oklahoma; almost 3 million tons of crude will move in 2022.

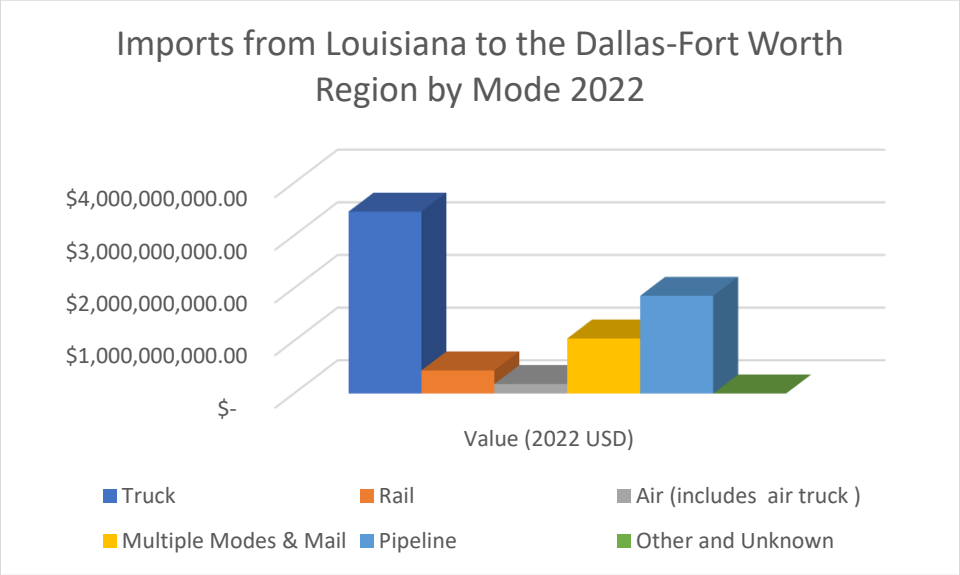
Natural gas is also the top pipeline import from Oklahoma to the North Central Texas region. In 2022, $1.06 billion of natural gas and other gaseous hydrocarbons are expected to be imported via pipeline, along with a nominal amount of fuel oils such as diesel fuel and heating oil.

[45] The mixed freight commodity category includes groceries and food items for convenience and grocery stores, supplies and food for restaurants, hardware or plumbing supplies, office supplies, and other miscellaneous goods.

Interstate Connections: Louisiana

Louisiana is the region's third largest trading partner by value of export volume amongst US states; FAF5 projects that in 2022, more than $12 billion and nearly 10 million tons of goods will be exported from the NCTCOG region into Louisiana. These goods are transported by truck, pipeline, and multiple modes and mail, as seen in **Figure 3.24**.

Figure 3.24: Regional Imports from Louisiana by Mode (2022)



Highway System Connections: The primary roadway connecting the region to Louisiana is IH 20, which has annual average daily traffic of 32,745; 35 percent of which are trucks (11,460 trucks daily on average). Although a smaller corridor, US 80 is also an important route for freight trips to and from the region into Louisiana. The annual average daily traffic for US 80 near the border of Louisiana (before it feeds into IH 20) is 3,955, of which 7.4 percent is truck traffic. This route is expected to have moderate growth over the next 20 years.

The top commodities by value moved by truck from the region into Louisiana include motorized vehicles ($2 billion), mixed freight ($1.3 billion), and pharmaceuticals ($1 billion). Top commodities imported to the region from Louisiana by truck include chemical products ($839 million), pharmaceuticals ($487 million), and newsprint/paper ($385 million). The chemical products commodity category includes paints and varnishes, inks, essential oils, cosmetic product additives, insecticides, glues, natural minerals, engine fluid additives, water treatment preparations, and other chemical products not elsewhere classified (including chemicals used in wood distillation, the manufacture of wood pulp, gelatin, enzymes, and prepared waxes).

The newsprint/paper commodity category includes the pulp of fibrous cellulosic materials, paper and paperboard in rolls or sheets, paper products (toilet paper, tissues, napkins, sanitary products), and other packing containers of paper, paperboard, and cellulose wadding/fibers.

Railroad System Connections: Major rail lines that connect Louisiana to the North Central Texas region are the Union Pacific Railroad Dallas Subdivision, and the Kansas City Southern Greenville Subdivision. Both of these lines connect to Shreveport, Louisiana and feed into other rail corridors throughout the state. FAF data indicates that most rail traffic coming into the region from Louisiana comes from New Orleans and Baton Rouge, as indicated in **Table 3.8.**

Table 3.8: Rail Imports from Louisiana to North Central Texas in 2022

Regional Rail Imports from Louisiana (2022)		
Origin	**Tons of Freight**	**Value of Freight**
New Orleans	204,900	$227,800,000
Baton Rouge	78,900	$105,000,000
Lake Charles	29,600	$76,300,000
Rest of Louisiana	29,200	$29,800,000

Source: FAF5

Top commodities imported via rail include plastics/rubber ($172 million), basic chemicals ($103 million), and chemical products ($65 million). Top exports from North Central Texas to Louisiana are transportation equipment ($89 million), machinery ($1.5 million), and articles of base metals ($1.4 million). The transportation equipment commodity category includes railway equipment, aircraft and spacecraft, ships, boats, and floating structures.

Airport Connections: Federal Aviation Administration records indicate that Louis Armstrong New Orleans International Airport, Shreveport Regional Airport, and Lafayette Regional Airport are the primary air cargo facilities in the State of Louisiana. However, investments are being made to enhance air cargo capacity at Chennault International Airport and a new air cargo airport is planned to be constructed near Donaldsonville, Louisiana as part of the Louisiana Transportation Center, a multimodal transportation complex.

The top commodities exported from the region to Louisiana via air are precision instruments ($19.6 million), transportation equipment ($9.3 million), and pharmaceuticals ($8.3 million). The most prolific air cargo imports to the region from Louisiana by value are animal feed ($61 million), machinery ($42 million), and miscellaneous manufactured products ($19 million). The precision instruments category includes eyewear, optical elements, photographic and photocopying machines, navigational instruments and appliances, length-measuring hand instruments, meteorological instruments, surveying instruments, mathematical calculation equipment and appliances, medical specialty equipment, and instruments for industrial process control. Major industrial operations in both Tarrant and Dallas counties manufacture many of these products and they are frequently transported to customers via air due to their small size and high value.

The animal feed commodity category encompasses forage, pellets of meat and seafood, residues of cereals or leguminous plants, eggs in the shell, raw skins and hides, and other products of animal origin. The miscellaneous manufactured products category is broad and includes arms, ammunition, toys, sporting equipment, clocks, watches, prefabricated buildings, writing or drawing instruments, precious metal forms and shapes, pearls and precious stones, and musical instruments.

Pipeline Connections: The pipeline network that connects North Central Texas and Louisiana facilitates the transport of 55 percent of regional imports from Louisiana and 64 percent of regional exports to Louisiana by weight. By value, Louisiana is the state from which the largest amount of commodities are imported by pipeline, estimated to be $1.9 billion in 2022. Major pipeline imports include gasoline ($1.5 billion) and coal n.e.c./natural gas ($309 million). Gasoline is the top commodity imported by value across all modes from Louisiana. Major pipeline exports from the region to Louisiana include crude petroleum ($78 million) and coal n.e.c./natural gas ($1.3 billion).

Regional Connections to Texas Cities

A diverse regional economy and highly developed transportation infrastructure connections to other Texas cities facilitate a large amount of trade within the State of Texas, as seen in **Table 3.9**, with the total freight flows destined to the Dallas-Fort Worth region and originating from the Dallas-Fort Worth region. The North Central Texas region exports 32 percent more freight by value than it imports in trade with other Texas cities.

Table 3.9: Freight Flows to and from Major Texas Cities

Total Freight Flow Destined for Dallas-Fort Worth		
Originating City	**Total Freight Value (2022)**	**Percent of Total**
Austin	$4,747,600,000	6%
Corpus Christi	$2,294,800,000	3%
El Paso	$7,684,800,000	9%
Houston	$50,557,200,000	61%
Laredo	$13,402,900,000	16%
San Antonio	$4,805,000,000	6%
Total	**$83,492,300,000**	**100%**
Total Freight Flows Originating in Dallas-Fort Worth		
Austin	$10,953,500,000	9%
Corpus Christi	$4,690,000,000	4%
El Paso	$10,597,700,000	9%
Houston	$64,374,900,000	56%
Laredo	$13,496,800,000	12%
San Antonio	$11,200,200,000	10%
Total	**$115,313,100,000**	**100%**

The North Central Texas region is situated at the north end of the Texas Triangle, a national megaregion and system of highway corridors that connects the largest cities in Texas; namely, Dallas-Fort Worth, Houston, Austin, and San Antonio. IH 45, IH 35, and IH 10 make up the "triangle," in which the majority of the state's population resides. Infrastructure connecting other portions of the Texas Triangle to the NCTCOG region facilitates trade in order to meet the demand for goods and services generated by these populous areas. FAF5 projects that the combined value of goods exported from the Dallas-Fort Worth region to other cities in the Texas Triangle will be $86,528,600,000 in 2022.

The NCTCOG region is also a significant goods movement link for Texas cities outside of the Texas Triangle, including Laredo, El Paso, Midland-Odessa, and Corpus Christi.

The sections that follow will analyze the economic connections between the NCTCOG region and other major Texas cities, including an overview of goods movement by mode, and identification of major commodities.

Intercity Connections: Houston

Houston is the region's largest trading partner amongst major Texas cities. FAF5 anticipates more than $114 billion in combined trade between the two regions by the end of 2022, both cities and the main corridor that connects them form the eastern edge of the Texas Triangle, as seen in **Figure 3.25**. IH 45 forms the major roadway component of this corridor, in addition to airplane routes from the Dallas-Fort Worth International Airport to the Houston Intercontinental Airport, Class I rail lines, and multiple major pipelines. The Houston metroplex falls under the transportation planning jurisdiction of the Houston-Galveston Area Council (HGAC), and the Houston-The Woodlands-Sugar Land Metropolitan Statistical Area has a population of 7,122,240 as of the 2020 Census.

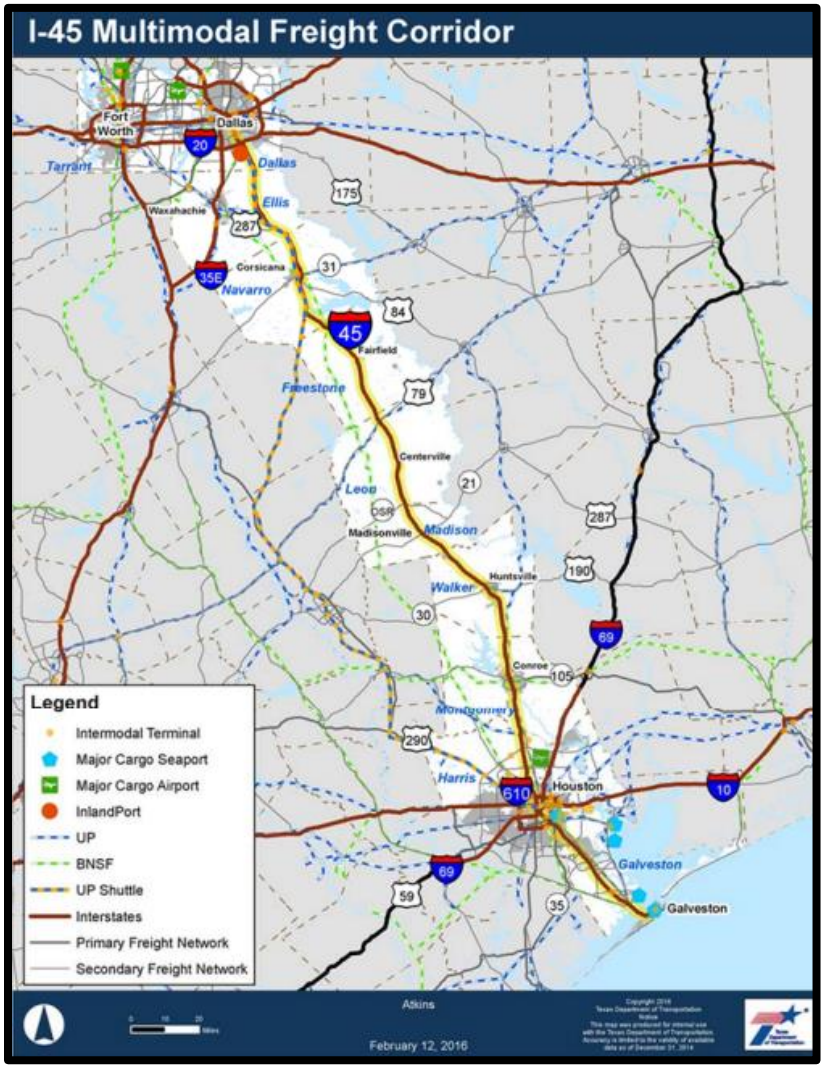
FAF5 projects that the top commodities shipped from Dallas-Fort Worth to Houston in 2022 will be:

1. Electronics ($9.1 billion)
2. Coal n.e.c. ($6.3 billion)
3. Pharmaceuticals ($5.8 billion)

FAF5 projects that the top commodities shipped from Houston to Dallas-Fort Worth in 2022 will be:

1. Electronics ($9.4 billion)
2. Machinery ($6.1 billion)
3. Motorized Vehicles ($5.8 billion)

Figure 3.25: Regional Conections to the Houston Area



Source: TxDOT

Highway Connections: The primary roadway connecting North Central Texas and Houston is IH 45, a 276-mile-long corridor which runs north-south between the two cities through mostly rural areas. It is the most heavily traversed multimodal freight corridor in the State of Texas[46] and an element of the national Primary Highway Freight Network designated by the Federal Highway Administration. IH 45 is uniquely important because it connects to all modes of freight transportation throughout the corridor and provides direct access to the Ports of Houston and Galveston.

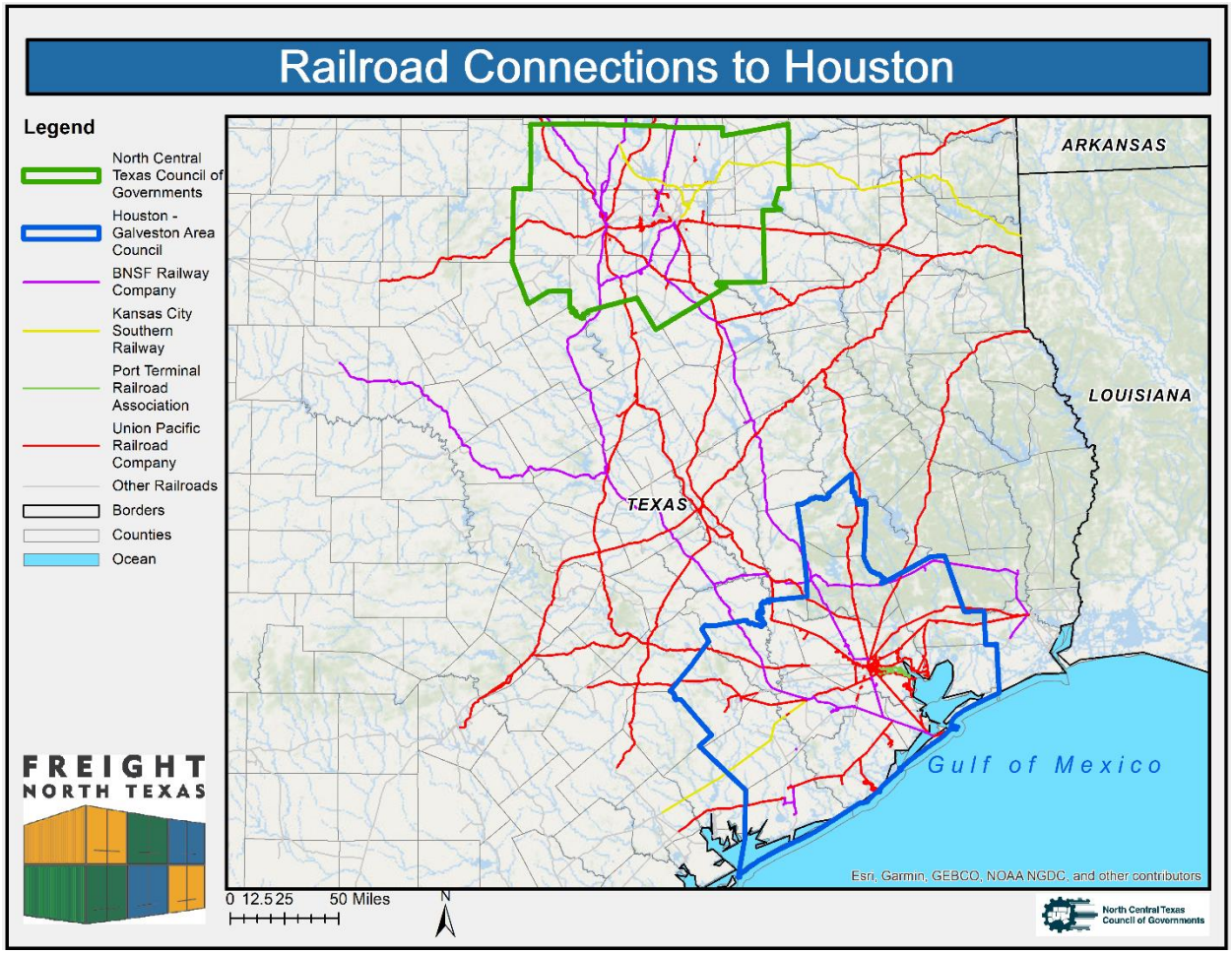
In 2020, the Houston Ship Channel Complex processed 276 million tons of combined foreign and domestic waterborne tonnage; it annually contributes $802 billion to the American economy and handles 70 percent of Gulf Coast container traffic.[47] The Port of Galveston houses Texas' main cruise

[46] TxDOT, *I-45 Freight Corridor Plan Executive Summary* (2016), (https://ftp.txdot.gov/pub/txdot/move-texas-freight/studies/i45-freight-corridor-plan.pdf)
[47] Port of Houston, *Statistics* (https://porthouston.com/about-us/statistics/)

ship channel, and contributes more than $6.4 billion to the Texas economy.[48] IH 45 is the vital link that connects these facilities to warehouses, distribution centers, inland ports, international airports, and major industrial centers.

Railroad Connections: Multiple rail corridors connect North Central Texas to the Houston Metroplex shown in **Figure 3.26**, most of which is owned by BNSF Railway and Union Pacific Railroad. Although Kansas City Southern owns track in both the NCTCOG and HGAC regions, their rail lines do not directly connect to each other. The Port Terminal Railroad Association is a short-line railroad that services the Houston Ship Channel Complex and provides rail connectivity to other major rail lines, acting as the final link for railcars destined for (or originating in) the Port of Houston. Major commodities moved through the rail corridor include electronics, machinery, base metals, agricultural products, gasoline, and fuel oils.

Figure 3.26: Rail Connections to Houston



[48] Texas Comptroller of Public Accounts, *Economic Data for the Port of Galveston* (https://comptroller.texas.gov/economy/economic-data/ports/snap-galveston.php)

Airport Connections: Both the NCTCOG and HGAC regions contain airports of state and national significance. The Houston area is serviced by the George Bush Intercontinental Airport, as well as the William P. Hobby Airport, both of which offer regular service to Dallas-Fort Worth International Airport and Dallas Love Field Airport. Major commodities moved by air between the two cities include transportation equipment, electronics, machinery, motorized vehicles, and furniture.

Pipeline Connections: Both the NCTCOG and HGAC regions are home to significant petrochemical industry operations, as seen in **Table 3.10**, and pipelines form the vital link that allows safe and efficient transport of petroleum products, as seen in **Figure 3.27**. The Barnett Shale formation in the western counties of the NCTCOG region produce large quantities of natural gas; in 2021, the region produced 824 billion cubic feet. FAF5 estimates that in 2022, approximately 41 percent by value of natural gas and associated products will be shipped via pipeline only within the NCTCOG region, with the remainder exported to other parts of the country, and $344 million of product going to Houston. National natural gas exports reached a record high in 2021, and the US continues to export natural gas to 41 countries.

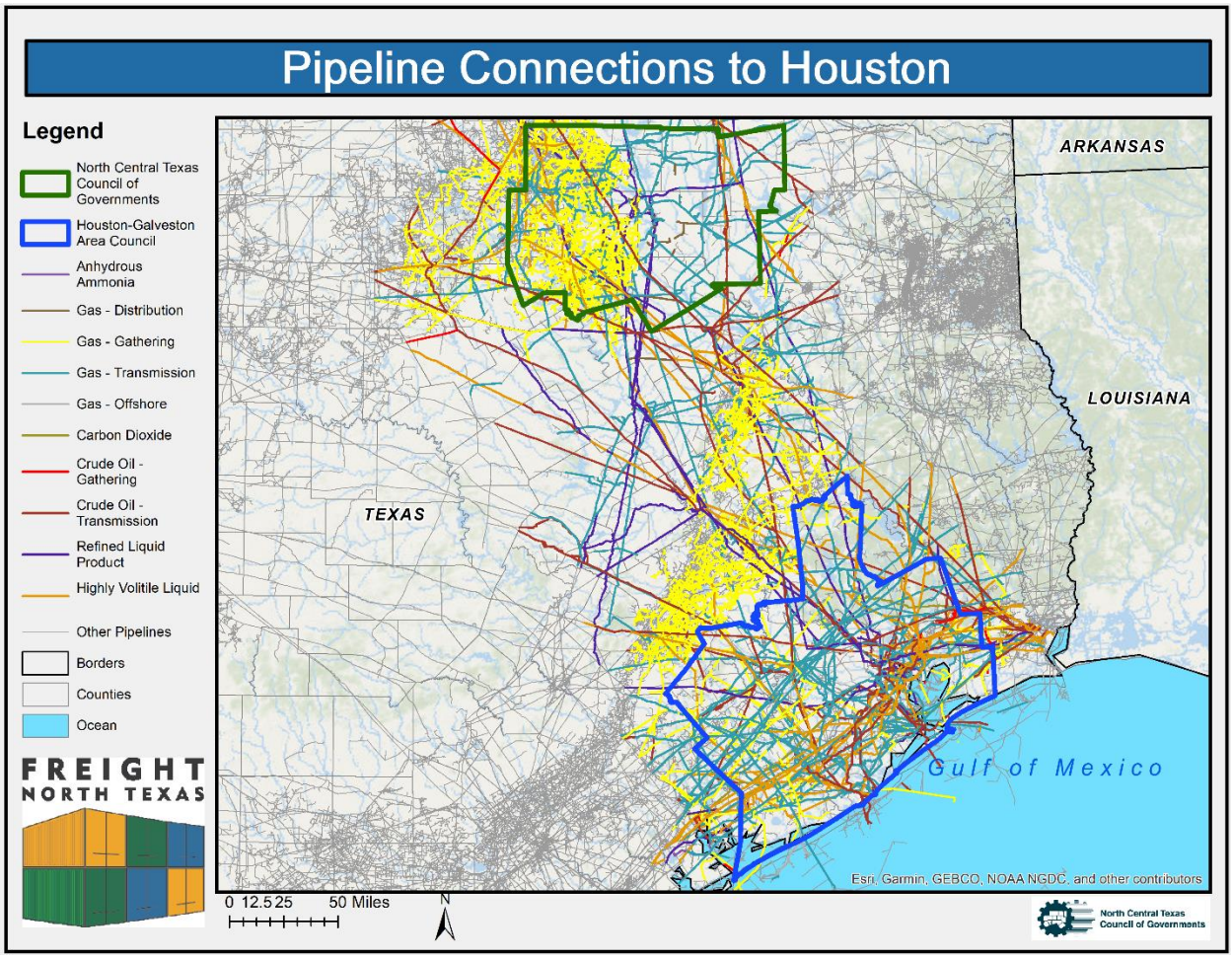
Table 3.10: NCTCOG Regional Oil and Gas Production

NCTCOG Region Oil and Gas Production by County (2021)		
County	**Total Gas Production (mcf)**	**Total Oil Production (bbl)**
Collin	-	-
Dallas	6,491,860	
Denton	132,004,205	11,096
Ellis	2,244,318	3
Hood	26,462,637	-
Hunt	-	940
Johnson	128,666,175	-
Kaufman	-	41,686
Parker	46,901,503	335
Rockwall	-	-
Tarrant	325,711,710	-
Wise	156,028,429	139,999
Total	**824,510,837**	**194,059**

Port facilities in the HGAC region receive shipments of petrochemicals, such as liquefied natural gas, via pipeline from the NCTCOG region that are then loaded onto tanker vessels and sold abroad. The pipeline corridors to Houston are vital links to the international natural gas marketplace. The vast majority of gaseous hydrocarbons are moved via pipeline (with the exception of small amounts of propane).

Airports are major pipeline customers, especially for refined liquid products, such as aviation fuel and diesel. Major airports connected to the NCTCOG and HGAC pipeline network include Dallas-Fort Worth International Airport, Love Field, Alliance Airport, George Bush Intercontinental Airport, and William P. Hobby Airport. Multiple smaller airports within the HGAC/NCTCOG pipeline corridor, such as the Waco Regional Airport (Waco, TX) and Easterwood Field (College Station, TX), also rely on these connections for fuel transportation.

Figure 3.27: North Central Texas Pipeline Connections to Houston



In addition to gathering and distribution lines, this pipeline corridor also contains vital sections of larger regional, Interstate, and international transmission pipelines. These connections facilitate the safe transportation of petrochemicals to storage facilities, refineries, treatment facilities, and direct delivery to customers, power plants, major industrial developments, and chemical plants. Major pipelines running from the HGAC region to the NCTCOG region are shown in **Table 3.11**.

Table 3.11: Major Pipelines Between HGAC and NCTCOG

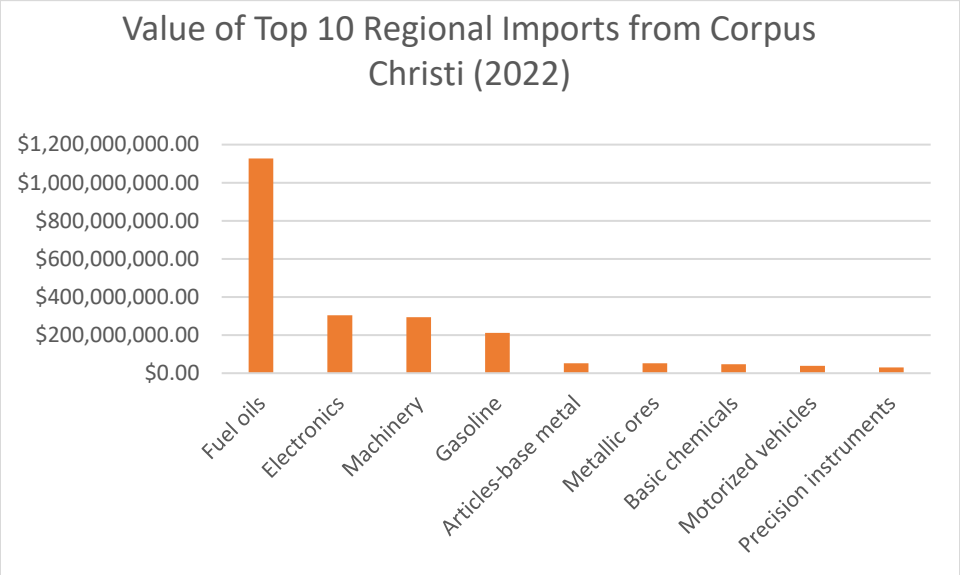
Major Pipelines – HGAC & NCTCOG Region				
Explorer	Explorer Pipeline Company	8.63”-28”	Refined Petroleum Products	The major pipeline network transports fuel from refineries in the gulf coast region to the Midwest. It transports aircraft fuel to the Dallas-Fort Worth International Airport and Love Field Airport and completed a new 36-mile expansion in the North Dallas area in early 2022. It is jointly owned by Phillips 66, Marathon, Energy Transfer, and Shell.
Exxon Mobil	Exxon Mobil Pipeline Company	8.63”	Refined Petroleum Products	This pipeline connects the gulf coast area to markets in South Texas and North Central Texas. It runs north from the HGAC region along the SH 6 corridor to Waco, TX, then northeast into the NCTCOG region to Love Field.
Magellan	Magellan Midstream Partners	10.75”	Refined Petroleum Products	The Magellan pipeline is a large common carrier refined products pipeline running from the gulf coast through the North Central Texas region, and up to the Midwest and Northern United States.
Permian Express	Permian Express Partners	16”	Crude Oil	This crude oil pipeline is a part of a joint venture and runs from the gulf coast (Nederland, TX) through North Central Texas and Oklahoma, with connections in Corsicana and Wortham. These lines also run west of the region, providing takeaway capacity to the Permian Basin complex.
ET Fuels System	Energy Transfer Company	24”	Natural Gas	This pipeline system is comprised of Interstate natural gas pipeline and related storage facilities. It connects to multiple high-growth markets, power plants, utilities, and other pipeline networks: the Waha Hub near Midland, TX; the Katy Hub in Houston, TX; and the Carthage Hub in East, TX.
ETC Katy	Energy Transfer Company	24”-48”	Natural Gas	The ETC Katy Pipeline serves producers in East and North Central Texas and provides access to the ETC Katy Hub.

Intercity Connections: Corpus Christi

The city of Corpus Christi is situated along the Texas Gulf Coast, approximately 190 miles south of Houston. The economy of Corpus Christi is largely comprised of oil and gas support industries, hospitality, petroleum refineries, engineering services, pipeline related structure construction, and port activities.[49] The population of the Corpus Christi Metropolitan Statistical Area was 445,823 as of the 2020 Census. FAF anticipates the total value of commodities that will be traded between the two regions will be nearly $7 billion in total. This is seen in **Figure 3.28**, where the top regional imports from Corpus Christi include fuel oils ($1,127,027,600), electronics ($304,666,800), and machinery ($293,236,400).

[49] Localintel, Inc., *Employment Estimates (2020),* (https://businessintexas.com/texas-regions/south-texas/corpus-christi/)

Figure 3.28: Value of Top 10 Regional Imports from Corpus Christi

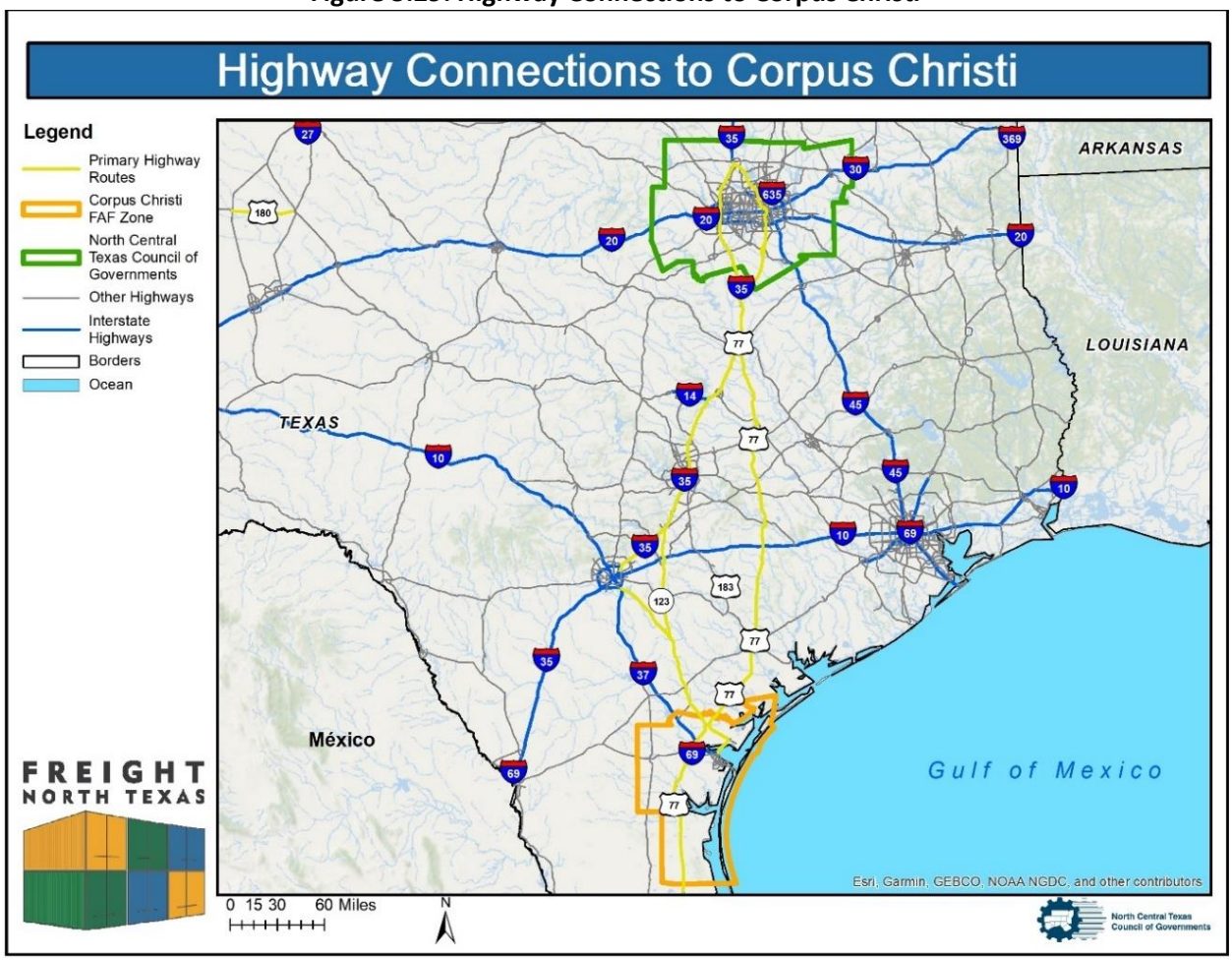


Highway Connections: The primary highway connections between the NCTCOG region and Corpus Christi include IH 35, IH 69, US 180, US 181, US 77, and SH 80, as seen in **Figure 3.29**. The majority of freight moved between the two regions is transported by truck, as seen in **Table 3.12**. Top imports to the region by truck include fuel oils ($519 million), gasoline ($204 million), and machinery ($187 million). Top exports from the region to Corpus Christi are the same as imports, with the exception of basic chemicals ($243 million) taking the place of machinery.

Table 3.12: Imports and Exports by Mode – Corpus Christi

Exports from Region to Corpus Christi			Imports from Corpus Christi to Region		
Mode	**Value (USD)**	**Percentage**	**Mode**	**Value (USD)**	**Percentage**
Truck	$3,893,014,500	83%	Truck	$1,349,080,500	59%
Rail	$12,092,400	0%	Rail	$811,456,300	27%
Air (includes truck air)	$374,883,600	8%	Air (includes truck air)	$292,200,600	13%
Multiple Modes & Mail	$385,265,400	8%	Multiple Modes & Mail	$25,705,700	1%
Pipeline	$24,285,900	1%	Pipeline	$14,825,500	1%
Other & Unknown	$437,600	0%	Other & Unknown	$1,503,500	0%
Total	**$4,689,979,400**	**100%**	**Total**	**$2,294,772,100**	**100%**

Figure 3.29: Highway Connections to Corpus Christi



Railroad Connections: Corpus Christi and the surrounding areas are served mainly by Union Pacific Railroad and Kansas City Southern rail lines that link into the Houston, San Antonio, and south Texas terminals. A nominal amount of goods are exported from the region to Corpus Christi via rail and are limited mostly to base metals such as iron, steel, copper, and aluminum in annual projected amounts valued at roughly $12 million. More substantial rail movements exist regarding commodities imported to the region from Corpus Christi, which is comprised of mostly fuel oils ($608 million) and small amounts of base metal articles ($4 million).

Airport Connections: The primary airport servicing the Corpus Christi area is the Corpus Christi International Airport, which enplaned 650,933 tons and deplaned 3,199,606 tons of air freight in 2021, which includes all origins and destinations.[50] Air cargo makes up a small portion of trade between the North Central Texas region and the Corpus Christi region, 8 percent and 13 percent of exports and imports, respectively. The top commodities exported from the region to Corpus Christi are electronics ($123 million), machinery ($107 million), and precision instruments ($21 million). The top commodities

[50] Corpus Christi International Airport, *2021 General Activity Report,* (https://corpuschristiairport.com/userfiles/file/2021_December_GAR.pdf)

imported to the region via air from Corpus Christi are electronics ($221 million), pharmaceuticals ($33 million), and transportation equipment ($29 million).

Pipeline Connections: The transport of goods via pipeline between the North Central Texas and Corpus Christi regions is nominal, comprising 1 percent of imports and exports. Imports into the region by this mode are primarily coal n.e.c. and gasoline ($8 and $7 million, respectively). Pipeline exports from the region to Corpus Christi include crude petroleum ($18 million) and coal n.e.c. ($6.2 million).

Intercity Connections: El Paso

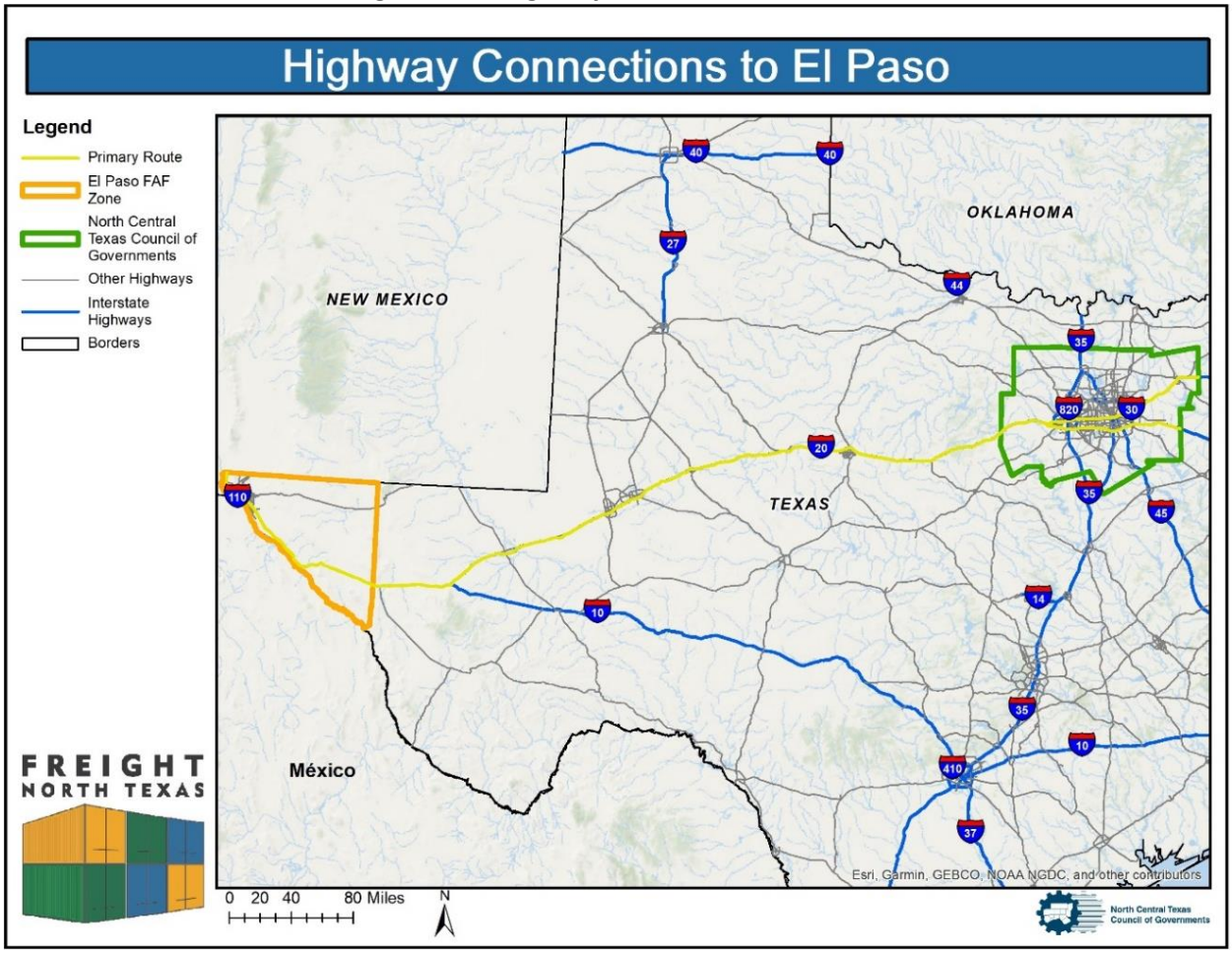
The El Paso metropolitan area is a major trade partner with the NCTCOG region and had a population of 1,088,420 as of the 2020 Census, up 8.1 percent from 2010. Robust growth and its geographic location make El Paso a gateway for goods flowing into Texas from Mexico; these factors, combined with its connections to significant transportation network infrastructure, facilitate large scale international trade within the region. The economy of El Paso is highly dependent on foreign trade with Mexico, especially freight transportation and international manufacturing.

Highway Connections: The vast majority of goods moved between the two regions is transported by truck, as seen in **Table 3.13**. Trucks alone are projected to transport an amount of cargo valued at nearly $16 billion during the year 2022. The primary highway that connects the El Paso metro area to North Central Texas is the IH 10 and IH 20 corridor, which branches off to form the beginning point of IH 30 within the NCTCOG Metropolitan Planning Area, as seen in **Figure 3.30**. This critical stretch of Interstate not only provides a pathway for goods flowing into the US from Mexico, but also connects the Midland-Odessa and Abilene areas to the NCTCOG region.

Table 3.13: Imports and Exports by Mode – El Paso (2022)

Imports to Region from El Paso by Mode			Exports from Region to El Paso by Mode		
Mode	**Value (USD)**	**Percentage**	**Mode**	**Value (USD)**	**Percentage**
Truck	$7,307,586,500	95.1%	Truck	$8,747,919,100	82.7%
Rail	$20,753,000	0.3%	Rail	$191,308,600	1.8%
Air (includes truck air)	$342,352,600	4.5%	Air (includes truck air)	$399,510,600	3.8%
Multiple Modes & Mail	$12,541,500	0.2%	Multiple Modes & Mail	$663,690,500	6.3%
Pipeline	N/A	0.0%	Pipeline	$576,305,800	5.4%
Other & Unknown	$1,564,600	0.0%	Other & Unknown	$576,305,800	5.4%
Total	**$7,684,798,200**	**100%**	**Total**	**$10,578,734,600**	**100%**

Figure 3.30: Highway Connections to El Paso

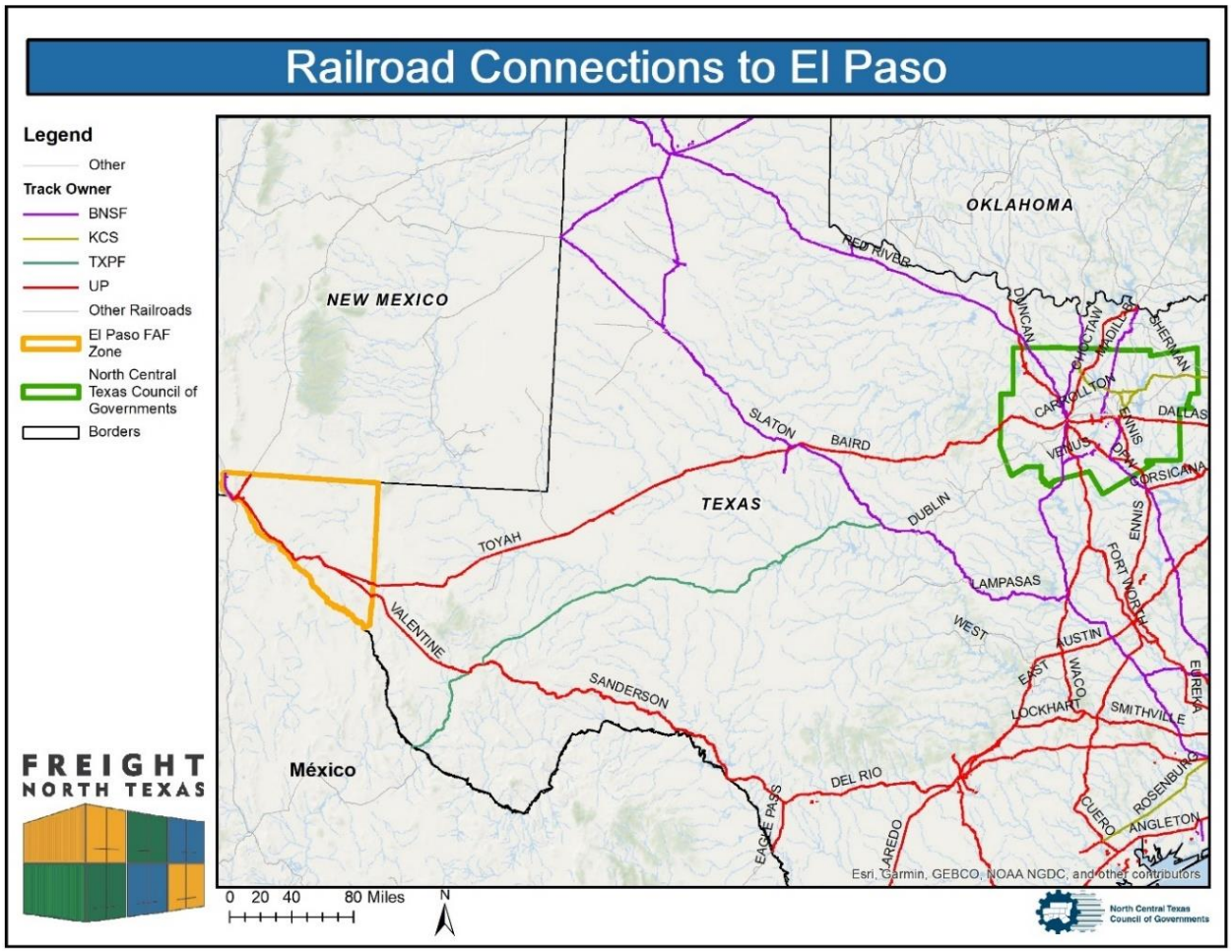


The top regional imports moved over the highway from El Paso are electronics ($4 billion), machinery ($869 million), and precision instruments ($555 million). Exports to El Paso include electronics ($3.7 billion), plastics/rubber ($709 million), and precision instruments ($626 million).

Railroad Connections: The most direct route by railroad from El Paso to Dallas-Fort Worth is by way of the Toyah and Baird subdivisions of the Union Pacific Railroad owned line, shown in **Figure 3.31**, which follows the IH 10, IH 20, and IH 30 corridors.[51] A comparatively nominal amount of freight is transported by rail between the two regions. The top commodities imported to the region by rail from El Paso are base metals ($9 million), plastics/rubber ($7 million), and nonmetal mineral products ($3 million). Top commodities exported from the region to El Paso by rail are machinery ($45 million), motorized vehicles ($38 million), and gasoline ($26 million). Notably, the region also is anticipated to export 117,000 tons of cereal grains to El Paso via rail in 2022; this commodity was the highest by weight, followed by gasoline and waste/scrap.

[51] Alternate rail paths are also available, especially by way of the BNSF Railway Lampasas Subdivision, Texas Pacifico Railroad, and Union Pacific Railroad Valentine Subdivision.

Figure 3.31: Regional Railroad Connections to El Paso



Airport Connections: The primary airport servicing the El Paso metroplex is the El Paso International Airport. In 2021, El Paso International Airport enplaned 44,654 tons and deplaned 59,318 tons, for a total of 103,972 tons.[52] Based on FAF air cargo tonnage data, NCTCOG staff estimate that roughly 3 percent of El Paso International Airport air cargo tonnage is destined to or coming from Dallas-Fort Worth. The top commodities imported from El Paso by air are electronics ($128 million), machinery ($119 million), and precision instruments ($40 million). The top air cargo commodities exported from the region to El Paso are electronics ($230 million), pharmaceuticals ($26 million), and transportation equipment ($31 million).

Pipeline Connections: FAF data on pipeline imports from El Paso was not available at the writing of this document, 5.6 percent of regional exports to El Paso are transported by pipeline. Commodities exported to El Paso are gasoline ($324 million), fuel oils ($128 million), and coal n.e.c. ($125 million).

[52] El Paso International Airport, *Monthly Activity Report (May 2022)* (https://elpasointernationalairport.com/assets/documents/Airport/About/Operating-Reports/05-May-22-MD.pdf)

Intercity Connections: Austin

Austin is the Capital of the State of Texas and the Austin-Round Rock-Georgetown Metropolitan Statistical Area had a population of 2,352,426 as of the 2020 Census. Major industries in the Austin area include manufacturing, information technology, financial services, various high-tech industries, and professional/business services. Additionally, Austin is situated along a major international trade corridor; may of the goods coming into the region from Southern Texas and Mexico must travel through the Austin metroplex. Trade with the Texas Capital is a significant portion of the regional economy. The combined value of goods traded with Austin is estimated to be $15.7 billion in 2022, with a combined cargo tonnage of 9.2 million tons. Austin resides within the Capital Area Council of Governments planning jurisdiction.

An overview of the top commodities traded between the two regions can be seen in **Table 3.14**:

Table 3.14: Top Commodities Traded between Dallas-Fort Worth and Austin

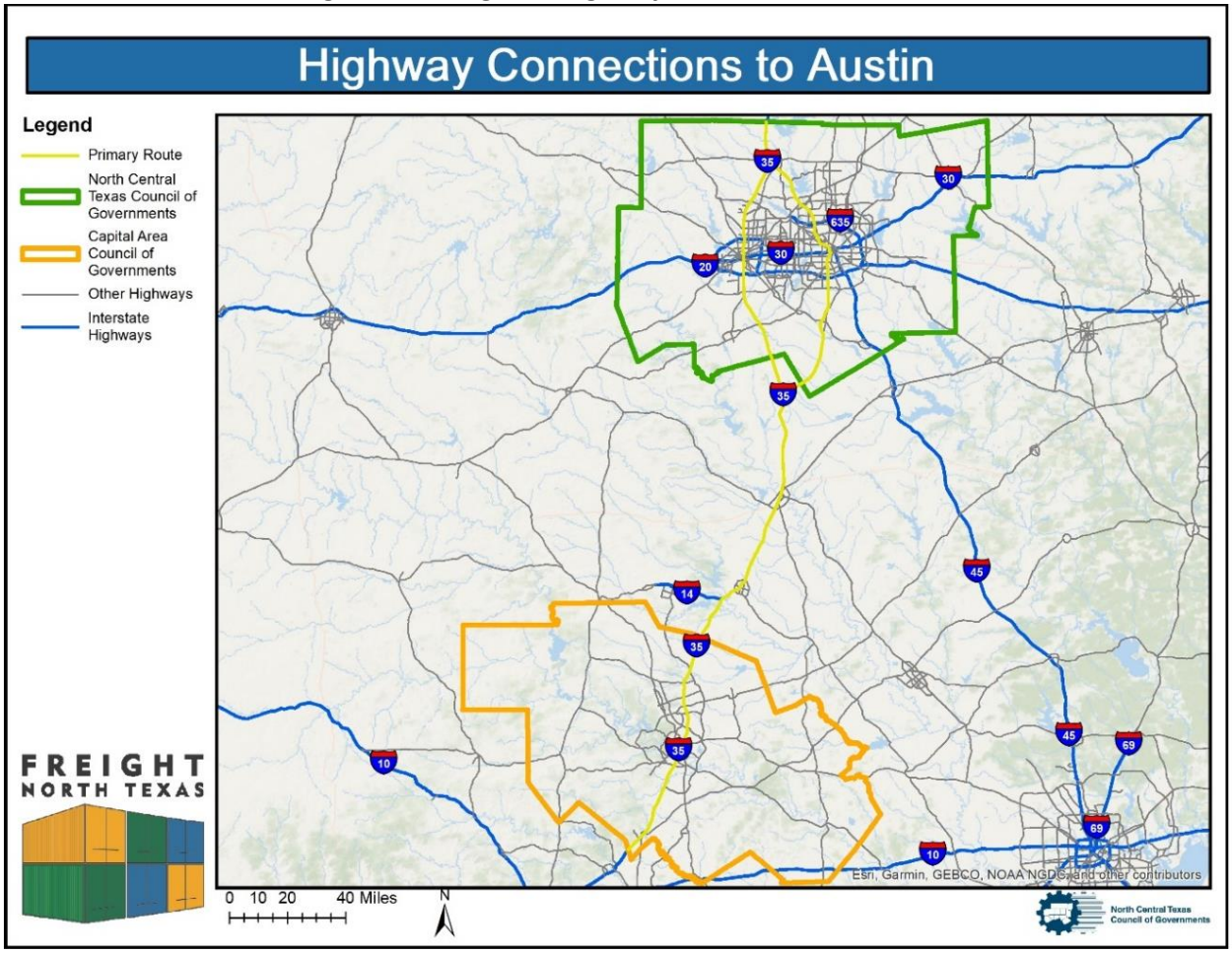
Top 10 Imports from Austin to Dallas-Fort Worth / **Top 10 Exports from Dallas-Fort Worth to Austin**

Rank	Commodity	Value (2022 USD)	Rank	Commodity	Value (2022 USD)
1	Electronics	$1,493,800,000.00	1	Electronics	$2,428,200,000.00
2	Machinery	$803,600,000.00	2	Mixed Freight	$1,321,500,000.00
3	Miscellaneous Manufactured Products	$625,600,000.00	3	Pharmaceuticals	$1,061,700,000.00
4	Mixed Freight	$243,800,000.00	4	Motorized Vehicles	$1,021,300,000.00
5	Precision Instruments	$234,600,000.00	5	Miscellaneous Manufactured Products	$703,500,000.00
6	Gravel	$206,000,000.00	6	Chemical Products	$615,100,000.00
7	Nonmetal Mineral Products	$160,600,000.00	7	Textiles/Leather	$511,800,000.00
8	Plastics/Rubber	$145,500,000.00	8	Plastics/Rubber	$417,500,000.00
9	Furniture	$138,300,000.00	9	Wood Products	$344,100,000.00
10	Pharmaceuticals	$93,500,000.00	10	Machinery	$328,400,000.00

Highway Connections: The primary highway connection between Austin and the Dallas-Fort Worth metroplex is a 104-mile section of IH 35 as seen in **Figure 3.32,** which has annual average daily traffic of 79,246 north of the Austin metroplex. Nearly one in four vehicles traveling north from Austin on IH 35 is a truck, meaning the facility accommodates approximately 19,415 trucks per day. The vast majority of regional trade with Austin occurs over highways; 80 percent of imports by value and nearly 100 percent of imports by weight are moved by truck, as are 89 percent by value and 90 percent by weight of regional exports to Austin.

The top commodities by value imported to the region by truck from Austin are electronics ($1.2 billion), machinery ($750 million), and miscellaneous manufactured products ($262 million), as seen in **Figure 3.33**. Top commodities imported by tonnage are gravel (4.3 million tons), nonmetal mineral products (830 million tons), and basic chemicals (156 million tons).

Figure 3.32: Regional Highway Connections to Austin

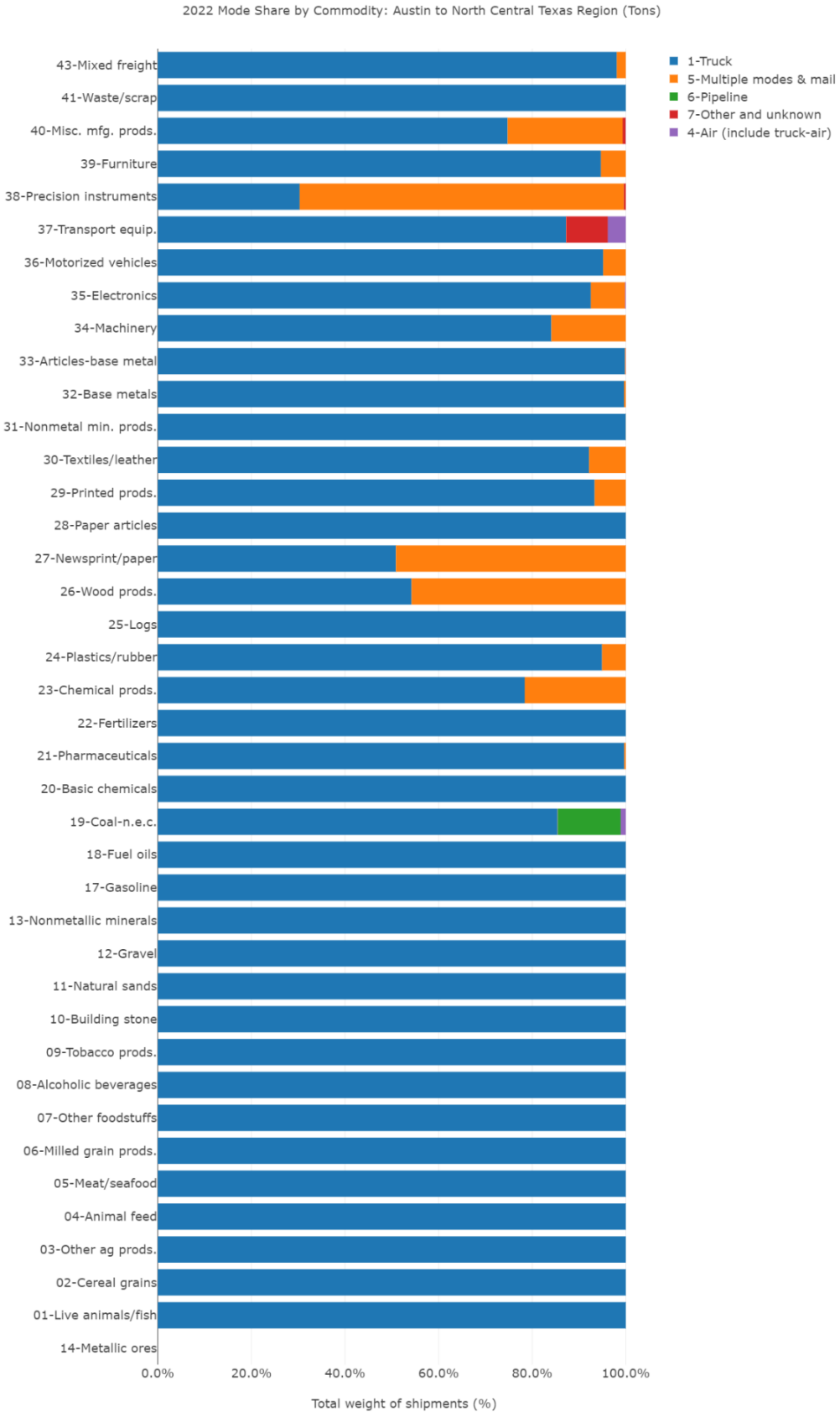


The top commodities by value exported by truck to Austin are electronics ($2.1 billion), mixed freight ($1.2 billion), and motorized vehicles ($965 million). By tonnage, they are natural sands (414,700 tons), mixed freight (393,500 tons), and nonmetal mineral products (387,400 tons).

Railroad Connections: Although the railroad corridor that runs parallel to IH 35 is a major thoroughfare for freight rail movements, only a nominal amount of goods that are transported by railroad between Austin and North Central Texas originate and terminate between the two regions. FAF data on these movements was not available at the writing of this document.

Airport Connections: The primary airport serving the Greater Austin Metropolitan Area is Austin-Bergstrom International Airport, which landed 342,239 tons of air cargo in 2021. Dedicated air freight is nominal relative to other modes of goods movement for regional trade with Austin. Electronics ($8.6 million) is the primary commodity category exported by air to Austin, and FAF data suggests that the only commodity imported from Austin by air are small amounts of miscellaneous manufactured products at an estimated annual value of roughly $100,000.

Figure 3.33: Mode Share by Commodity between Austin and North Central Texas



Pipeline Connections: Although regional pipeline imports from Austin are nominal, the region exports petrochemicals and gaseous hydrocarbons to the Austin area by pipeline. FAF estimates that in 2022, 252,300 tons of petroleum products valued at $53.5 million will be piped to Austin from North Central Texas.

Other Connections: NCTCOG staff observed that 19.8 percent of shipments from the Austin region to the NCTCOG region by value are conveyed using multiple modes and mail, the highest proportion amongst any of the region's trade partners observed during this analysis. Commodities moved in this category include precision instruments, newsprint/paper, wood products, chemical products, and miscellaneous manufactured products.

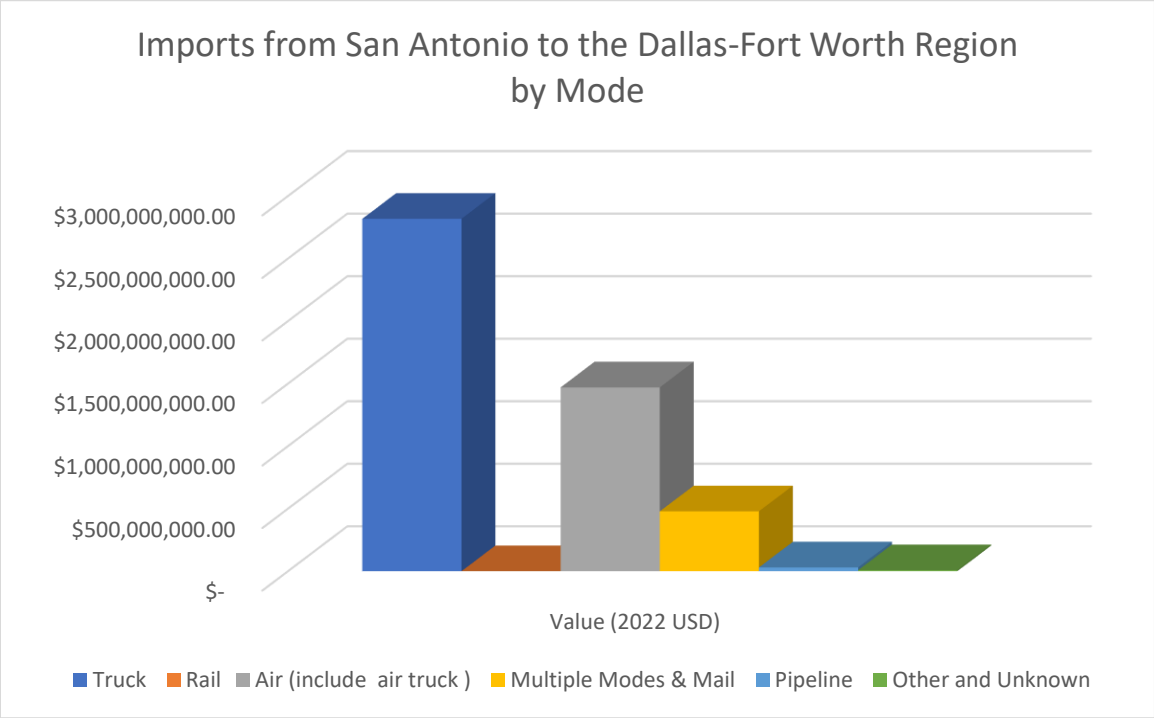
Intercity Connections: San Antonio

The San Antonio metro area is situated south of Austin along the IH 35 corridor and falls under the jurisdiction of the Alamo Area Council of Governments (AACOG). Significant economic activity in San Antonio occurs in the fields of biotechnology, information technology, healthcare, aviation, and energy production. The San Antonio region is also home to significant amounts of military infrastructure, especially Joint Base San Antonio, which includes four smaller Army and Air Force installations. The population of the San Antonio Metropolitan Statistical Area is 2,558,143 as of the 2020 Census. Energy products, as well as manufacturing and construction materials, are all key imports from the San Antonio region.

Highway Connections: The primary highway connection from San Antonio to the Dallas-Fort Worth metroplex is IH 35, with a secondary highway connection along the US 281 corridor. Annual average daily traffic along IH 35 ranges from 112,918 in sections north of New Braunfels to 56,429 just before IH 35 splits into IH 35W and IH 35E south of the NCTCOG boundary line. Approximately one in five vehicles on IH 35 crossing the north boundary line of AACOG is a truck (23,374 trucks per day). US 281 has annual average daily traffic of 9,999 where it crosses the north AACOG boundary line, and a truck percentage of 13.3 percent (1,330 trucks per day).

As seen in **Figure 3.34**, trucking is the primary transportation mode for goods moving between Dallas-Fort Worth and San Antonio. FAF estimates predict that over $2.8 billion in imports to North Central Texas and $8.4 billion in exports to San Antonio will travel over highways between the two regions in 2022. This accounts for 75 percent of exports by value (95 percent by tonnage), and 59 percent of imports by value (84 percent by tonnage). The top commodities transported by truck from San Antonio to North Central Texas are fuel oils ($419 million), coal n.e.c. ($365 million), and base metals ($349 million). By tonnage, the top import commodity is gravel (1,577,100 tons), followed by fuel oils and base metals.

Figure 3.34: Regional Imports from San Antonio by Mode



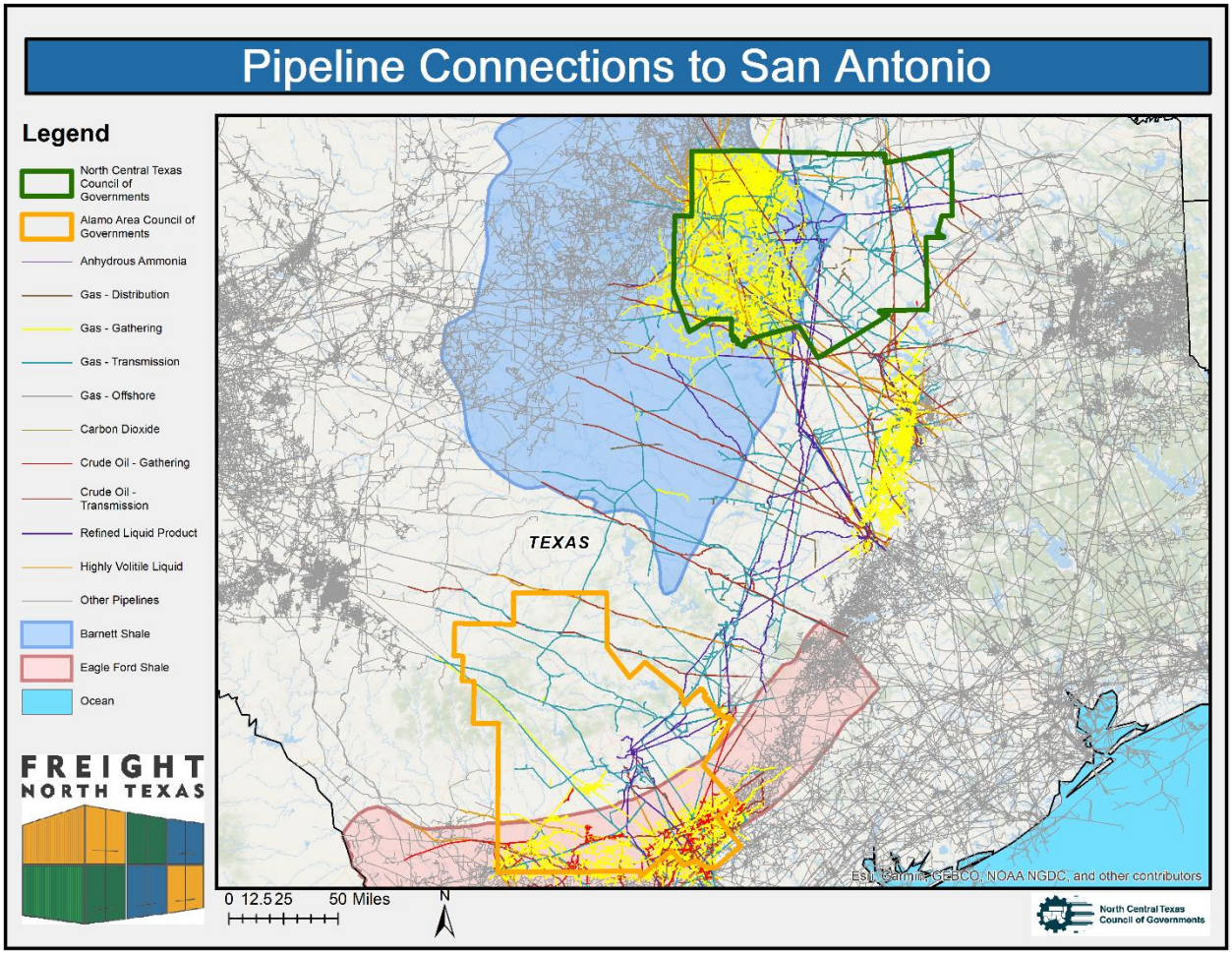
The top commodities by value exported from the region to San Antonio are pharmaceuticals ($2.7 billion), mixed freight ($1 billion), and motorized vehicles ($662 million). By tonnage, top exports are nonmetallic minerals (603,200 tons), nonmetallic mineral products (364,400 tons), and other foodstuffs (324,700 tons). The other foodstuffs commodity category includes dairy products, processed vegetables, processed fruits, nuts, coffee, tea, animal or vegetable fats (oils), sugars, and confectionary products.

Railroad Connections: Although significant amounts of rail traffic move through the railroad corridors between the Dallas-Fort Worth metroplex and San Antonio, a nominal amount of these movements originate and terminate within the two regions. FAF data on rail imports from San Antonio was not available at the writing of this document. Exports by rail were limited to commodities in the waste/scrap category, which includes metallic waste (slag, ash, residues), as well as nonmetallic waste (sawdust, wood waste, waste and scrap glass, waste, and scrap paper, etc). Materials in the amount of 7,800 tons, valued at an estimated $2.3 million, are expected to be shipped by rail in 2022.

Airport Connections: The primary airport servicing the San Antonio region is the San Antonio International Airport, which is the 36th busiest cargo airport in the United States. San Antonio International Airport landed 891,732,300 tons of air cargo in 2021, less than 1 percent of which is from the North Central Texas region, according to NCTCOG estimates using FAF data. The primary commodity classes imported via air cargo from San Antonio are electronics ($655 million), machinery ($511 million), and precision instruments ($113 million). Top air freight exports from Dallas-Fort Worth to San Antonio are electronics ($1.18 billion), transportation equipment ($231 million), and pharmaceuticals ($172 million).

Pipeline Connections: The AACOG region contains portions of the Eagle Ford Shale Play in South Texas, thus the southern portion of the region has a robust pipeline network, although not many of them connect directly to the NCTCOG region. Pipelines that connect Dallas-Fort Worth and San Antonio run mostly along the IH 35 corridor and are natural gas transmission and refined liquid product system types, as seen in **Figure 3.35**.

Figure 3.35: Pipeline Connections to San Antonio



Pipeline imports from San Antonio are comprised of fuel oils ($26 million) and coal n.e.c. ($4.4 million). Regional exports to San Antonio by pipeline are comprised of coal n.e.c. ($21 million) and small amounts of crude petroleum ($400,000). For both tonnage and value, 1 percent of all imports from San Antonio are transported by pipeline, while this mode accounts for 3 percent of exports to San Antonio by weight.

3.6.2 North Central Texas Goods Movement System Connectivity: Strengths, Weaknesses, Opportunities, and Threats Analysis

Strengths, Weaknesses, Opportunities, and Threats Analysis is an evaluation framework that seeks to assess the current status of a system or project, as well as the factors that are most likely to impact what will happen to it in the future. This section applies the Strengths, Weaknesses, Opportunities, and Threats Analysis methodology to findings with the preceding connectivity analysis in **Section 3.6.1.**

Strengths: The NCTCOG region is a well-connected logistical crossroads for nearby geographies. The primary strength of the North Central Texas goods movement network is the strong Interstate Highway connections and robust trucking infrastructure, which facilitates more trade by value and tonnage than any other mode. FAF data projections estimate that in 2022, goods exported from North Central Texas will have a combined value of roughly $493 billion, and combined imports will have a value of $458 billion, together totaling more than $951 billion, or nearly half of the Texas Gross State Product. The capacity and service provided to freight operators by regional highway infrastructure is a major advantage of the Dallas-Fort Worth region and makes it an attractive location for businesses to establish their operations.

Regional pipeline connectivity is another major strength of the goods movement network. By tonnage, pipelines move the second greatest annual quantity of goods behind trucking, a combined 64 million tons in imports and exports. Pipelines are also unique because they almost exclusively transport hazardous materials; the availability of this transport mode reduces the need to transport volatile energy products via truck or rail, thereby enhancing safety, efficiency, and air quality.

Weaknesses: According to FAF projections for 2022, railroad shipments comprised 1 percent of regional exports by value (2 percent by tonnage), and 2 percent of imports by value (3 percent by tonnage). Given the extent of rail infrastructure both throughout the region and in other nearby markets, railroads appear to be underutilized for freight transportation in the North Central Texas region. Gravel, energy products, motorized vehicles, and other heavy bulk commodities are all prime candidates for transport via train; however, many of these products are often transported by truck instead. This may indicate that the necessary connections to potential customers do not exist, or that fulfillment of shipments via rail is not a feasible business option for shippers due to price, timeframe, or amount of available car space.

Opportunities: Multimodal connectivity – or the extent to which the different transport modes connect to one another – is strong in the Dallas-Fort Worth region. Intermodal infrastructure such as the Alliance and Dallas-Fort Worth airports, multiple rail intermodal facilities, and two major inland ports open up opportunities to complete shipments using a variety of modes, depending on the freight market and commodity being transported. Currently, approximately 13 percent of all combined shipments by value (5 percent by tonnage) originating or terminating in North Central Texas utilize multiple freight transportation modes during conveyance. There may be additional opportunities to expand the use of intermodal transfers to complete shipments in the region in support of freight network resiliency, air quality, level-of-service, and efficiency.

Threats: The North Central Texas region is highly dependent on the highway mode of goods movement for exports, imports, and intraregional shipments. This presents a threat to the regional economy, as the trucking industry faces a severe driver shortage, truck parking issues, and efforts by cities to curb the ability of trucks to use local streets. Furthermore, trucking fleets are subject to volatility in fuel prices and often compete with private motorists for the use of highly congested urban roadways.

3.6.3 Emerging Technology

The North Central Texas region is home to numerous freight transportation technology development firms and continues to be an area of interest at the national level for the implementation of automated

and connected vehicles. Additionally, NCTCOG is pursuing technology solutions to freight transportation, both in terms of infrastructure improvement and operational efficiency. This section provides an overview of current efforts, as well as future aspirations for new applications of technology to enhance the regional freight network.

Automated trucking is the implementation of remote sensing, machine learning, and high-capacity telecommunications capabilities to allow for the semiautonomous and fully-autonomous operation of freight delivery vehicles. Automation serves to address a worsening truck driver shortage and overcome limitations pertaining to daily drive time limits, truck parking shortages, loading and unloading wait times, human error, and driver fatigue. The NCTCOG Freight Program seeks to promote the development of infrastructure that enables automated trucking to occur on corridors throughout the region as automated trucking technological maturity improves and becomes more widely implemented.

In many freight-oriented developments throughout the region, traffic signals on first- and last-mile connector streets cause delays for trucks. NCTCOG is pursuing a system of improvements to traffic signals in key freight zones throughout the region that would give signal priority to freight vehicles, thus reducing delay and congestion while improving freight network efficiency. These improvements utilize artificial intelligence, advanced sensors, and connected telematics systems to identify commercial vehicles apart from private motorists. This is part of broad efforts to mitigate congestion within the region using technology, such as dynamic messaging and mobile alerts, for drivers regarding compromised routes due to blocked railroad crossings, construction zones, and traffic accidents.

Lastly, NCTCOG is pursuing a combination of infrastructural and technological solutions to manufacturing and logistics issues across the region in support of greater freight mobility and industrial efficiency. This includes the development of a modular platform that can be used across the region to deliver freight units in a dedicated right-of-way on a continuous, automated basis without the need for intermodal transfer. This infrastructure solution could be used to increase productivity by providing direct links between suppliers of raw materials and manufacturers, or between manufacturers and transportation/distribution terminals.

As technological advancements continue to impact the freight transportation network, the NCTCOG Freight Planning Program will work with multiple stakeholders to evaluate the viability of emerging freight transportation technologies and potential for applications within the region.

Summary

This section discussed the policies, initiatives, program objectives, performance measures, and elements of the regional goods movement network. Elements of the network discussed included an overview of significant infrastructure across various modes, as well as infrastructural connections and trade patterns with multiple nearby geographies. NCTCOG undertakes multiple systems of projects and planning programs in order to foster improved freight infrastructure, economic development, better air quality, and meet environmental justice goals. This section also contained an overview of recommended *Freight North Texas (2013)* follow-up studies that have been completed since the original plan. These studies helped to identify issues with various freight network components and propose solutions that can be pursued by NCTCOG and its member governments.

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4.0 Freight North Texas Recommendations

Freight is an important component to the North Central Texas region's economy and to the quality of life for regional residents. The freight perspective should be brought into the project selection decision-making process and policy phase of infrastructure projects. It is critical that the freight perspective is received and fulfilled to encourage better overall freight planning. The policies and projects intended to enhance freight mobility are in detail below.

4.1 Recommended Policies

4.1.1 Existing Policies

As discussed in **Section 3.3**, NCTCOG has specific policies that encourage completion of certain goals. These policies are important because they solve or mitigate concerns throughout the region and support better regional freight planning. This increases the movement of goods in a more efficient and sustainable way. The Mobility 2045 Update, adopted in 2022, has been updated to the current policies the NCTCOG Freight Team abides by. NCTCOG's Freight Team has 13 freight policies that were adopted in 2022. These policies range from freight safety measures, education, enhanced intermodal activity, technology improvements, better freight planning, and more. To be more specific, the policies are listed below. The number assigned to each policy is how they are numbered in the Mobility 2045 Update.

- **FP3-001:** Foster regional economic activity through safe, efficient, reliable freight movement while educating elected officials and the public regarding freight's role in the Dallas-Fort Worth region's economy.
- **FP3-002:** Encourage the freight industry to participate in freight system planning and development to improve air quality and delivery time reliability.
- **FP3-003:** Identify and maintain regional freight networks to meet business and consumer demand benefiting everyday life.
- **FP3-004:** Enhance intermodal freight activity through innovation, facility development, and improved connections to the freight network by requiring local governments to create a dedicated and recurring funding source for projects that enhance freight mobility.
- **FP3-005:** Enhance freight-oriented land-use sustainability by requiring local governments to adopt compatible zoning requirements and address environment justice pertaining to freight-oriented development land uses.
- **FP3-006:** Incorporate technological advancements into the freight system.
- **FP3-007:** Improve efficiency by promoting safety, mobility, and accessibility on the freight networks.
- **FP3- 008:** Monitor freight traffic annually along major corridors and major freight facilities through the creation and maintenance of a regional freight database.
- **FP3-009:** Incorporate freight analysis and involve the freight community in the planning process of all transportation projects.
- **FP3-010:** Improve air quality related to freight through adopting local ordinances prohibiting truck engine idling.
- **FP3-011:** Improve railroad safety through public education, innovation, and partnering with local governments to address railroad crossings safety improvements.
- **FP3-012:** Incorporate technological advancements into the regional freight network.

- **FP3-013:** Encourage regional railroads to participate in rail system planning, identifying issues, and the development of integrated operations with local commuter rail agencies.

4.1.2 New and Updated Policies

One of the overall goals of having a regional freight plan is to better guide the policies, programs, and projects currently in use. This leads to new and updated policies. These policies take advantage of the extensive review and analysis discussed in **Section 3**. The following are recommended new and updated policies based on the guidance of *Freight North Texas 2022*. The underlined portions are what would be added to each policy. These include the following:

Updated Policies

- **FP3-012:** Incorporate technological advancements into the regional freight network with both public and private partnerships. This would recognize the importance of sharing the improvement of freight movement with regional partnership.
- **FP3-005:** Enhance freight-oriented land-use sustainability by requiring local governments to adopt compatible zoning requirements and address environment justice pertaining to freight-oriented development land uses. Work with local governments as needed to address specific land use issues related to freight.
- **FP3-009:** Incorporate freight analysis using the Freight Economic Analysis Tool and involve the freight community in the planning process of all transportation projects.

New Policies

- Improve truck parking throughout the region and identify funding sources to assist with the creation of new truck parking. This new policy would see added importance placed on the truck parking in the region. It would emphasize the need for recurring funding for such projects.
- Enhance freight movements through identifying specific freight focus issues and eliminating them. This is to better state the importance of removing targeted freight congestion by elimination of truck bottlenecks, rail congestion issues, and geometry issues that affect freight movements.

4.2 Program Recommendations

To achieve the policies above, specific programs must be implemented. NCTCOG programs include data collection, freight system planning, freight outreach activities, land-use planning, and NT MOVES. These programs support studies and track specific quantitative data. They encourage communication among stakeholders and the community with outreach activities. These programs help make sure the policies above are included in future and current studies.

The update to Mobility 2045 supports the following programs associated with freight:

Data Collection

The program's purpose is to collect data and monitor freight traffic in the region, including:

- Vehicle classification counts and vehicle movements
- Freight Travel Demand Forecasting Model
- Freight transportation facility inventory
- Federal Highway Administration, state, local, and private data sources
- Economic information regarding the impact of freight

- Data will be collected for the region and, particularly, for areas with freight facilities and high freight traffic. Capital improvement needs will be documented as well.

Data will also be used to help determine where potential issues may arise in the freight system and will help create projects addressing these issues. It will also be used in outreach to elected officials and policy makers to communicate freight's importance to the region.

Freight System/Network Planning
The planning efforts and studies listed below are part of the Freight System/Network Planning Program:

Safety: Increase public and freight operators' safety through education and projects.

Freight Rail: Continue various regional rail planning efforts, including:

- Complete the Regional Rail Study and implement recommendations
- Railroad Crossing Banking Program
- Railroad Safety Education Program
- Railroad Crossing Quiet Zone Planning
- Railroad Crossing Reliability Partnership Program

Freight Routes: Identify, analyze, and improve freight routes, including:

- Innovative solutions (e.g., truck-only lanes)
- Develop and keep Critical Urban Freight Corridors up-to-date
- Bottleneck removal projects
- New technologies (e.g., automated vehicles)
- Improve truck parking availability
- Infrastructure improvements on primary and secondary freight networks and local truck routes
- First/last mile access improvements
- Operations improvement on key freight routes
- Implement projects to enhance network connectivity

Hazardous Materials Routing: Analyze/reevaluate hazardous materials routing to ensure safe movement of hazardous materials and reevaluate current routes to account for current population and employment data.

Freight Outreach Activities: This program's purpose is to engage in educational and outreach activities within and outside the freight sector. Outreach participants include professionals in the freight industry, public officials, and the general public. This outreach will increase the understanding of freight's importance to the region and of long-term freight planning for the public, industry professionals, and decision makers.

Land-Use Planning: This program's purpose is to help ensure compatible land uses are considered near freight development, including:

- Railroad tracks
- Intermodal facilities
- Freight-oriented developments
- Truck routes and other major freight carry roadways

- Truck parking facilities
- This program will help create safer and more efficient freight centers

NT MOVES: The purpose of this program is to address long-range freight rail planning needs. The program seeks to address rail mobility issues through collaboration and strategic investment into rail infrastructure. The program resolves long standing congestion issues by working with both public and private rail sectors to help identify and resolve rail bottlenecks and operational issues within the North Central Texas region.

This program will be realized by completion of rail projects and initiatives, including, but not limited to:

- Awarded Fiscal Year 2020 BUILD Grant projects (double track Medical Market Center to Stemmons Freeway and Handley Ederville Road to east of Precinct Line Road)
- Regional Rail Information System
- Professional Engineering Agreements with freight railroads and the Transit Rail Insurance Program

In addition to these programs already established in the new Metropolitan Transportation Plan, there are new programs that would benefit and improve different elements of freight within the region. The following are also recommended:

Freight Communication Program

The Freight Communication Program is a new program. Currently, this program includes the freight newsletter, Regional Freight Advisory Committee, and the Freight Safety Initiative. These projects encourage communication to freight stakeholders and the community and provide education and resources to increase freight safety and awareness in the region.

The goal is to expand these efforts and promote completed and future freight studies with stakeholders across the region. For example, the Land-Use Analysis, Environmental Justice Analysis, and more are all valuable to freight stakeholders and the public to understand better planning practices and ways to reduce negative impacts regarding freight planning.

In the future, there are plans to create a freight forum to discuss and communicate with freight stakeholders about current initiatives and share what other freight stakeholders are working on as well. This will promote coordination and knowledge among the freight sector. Staff would also like to encourage further communication with local governments within the region. Discussions and meetings would serve the region well and promote NCTCOG's present and future studies. This will benefit and educate other planners, which will encourage better planning practices.

There will also be collaboration within NCTCOG with other teams, including the Air Quality Team, and efforts to further inform different stakeholders about freight focused issues such as reducing truck emissions as it relates to freight movements. The Air Quality Team has initiatives like the SMARTE Program, which revolves around freight and ways to reduce truck emissions within the region. This program is a way to promote certain freight studies that have been completed and address a need: reducing emissions.

The Freight Communications Program is a way to expand and educate the freight community, as well as implement freight programs. Current and future studies have valuable data, findings, and recommendations that local governments, potential freight stakeholders, and the community can all benefit from. Providing these resources will encourage and promote better practices.

Freight Project Tracking Program

Tracking freight projects within the region that are not classified as freight projects, but still benefit the region, is a vital part in better planning for the community. These include roadway improvements, grade separations, roadway safety programs, traffic signal synchronization, and Intelligent Transportation Systems. These programs provide important data that supports numerous studies each year. These programs also broaden the scope of what is occurring within the region and provide quantitative data to support the community. It will also assist with coordination within NCTCOG to make sure initiatives that may have a negative impact on freight are known and mitigated properly, thus not impeding the movement of goods in the region.

4.3 Recommended Freight System Changes

Multiple follow-up studies have been completed pursuant to the recommendations in *Freight North Texas (2013)*. These follow-up studies identify ad-hoc – as well as systematic – improvements that are needed to enhance regional freight mobility. This section provides a summation of these recommended improvements.

4.3.1 Roadway Geometry

Roadways throughout the region have design issues that make them difficult for trucks to successfully navigate, both on local streets and major highways. These issues are comprised largely of:

- Jughandle highway ramps
- Steeply graded ramps and roadways
- Humped railroad crossings (addressed further in **Section 4.3.3**)
- Intersections with insufficient turn radii for commercial vehicles

The regional roadway network – especially along truck routes and CUFCs – should readily accommodate the movement of trucks. Remediation for geometric roadway issues, such as the ones listed above, usually involves partial or complete roadway reconstruction for the affected segment. In some areas, remediation may not be possible due to geological, environmental, cost, or engineering limitations. The NCTCOG Freight Planning Program will continue to advocate for best practices in roadway design to regional road designers, builders, and maintainers. Improvements in this regard will serve to improve Truck Travel Time Reliability, at-grade crossing safety, and overall freight mobility.

4.3.2 Truck Parking

The NCTCOG region, like much of the United States, faces a shortage of truck parking. The lack of safe, readily available truck parking forces drivers to park illegally and in often unsafe conditions. Illegal truck parking generates risk on the part of the truck driver, as well as other motorists and residents, by occupying road shoulders and increasing the risk of a collision, especially under nighttime conditions. Truckers may also be forced to park in nearby residential areas, which can cause disturbances and result in local conflict with freight operators.

In order to increase truck parking availability, new truck parking facilities must be constructed within and nearby freight corridors throughout the region. NCTCOG will pursue partnerships with stakeholders to construct truck parking along corridors with greatest unmet demand. Truck parking facilities also present opportunities to further implement technology solutions to transportation problems such as alternative fuels and automated vehicle infrastructure. The Freight Program will attempt to meet environmental, technological, and economic goals through its efforts to foster the development of greater regional truck parking capacity.

4.3.3 At-Grade Railroad Crossings

The Metropolitan Planning Area contains 3,293 at-grade crossings. Many of these are in need of geometric and safety-related improvements. Geometric issues include *humped crossings*, or crossings that have a steep grade over a short distance between the track and the intersecting roadway. Humped crossings can be dangerous for commercial vehicles with long trailers, as well as private vehicles with low ground clearance, as they can become stuck on the tracks and become vulnerable to collision with oncoming trains.

Safety devices are a key aspect of railroad crossing infrastructure; these include emplacements such as active and passive warning devices. Active warning devices include flashing lights, bells, horns, and gates. Passive warning devices include advance warning signage, crossing medians, median barriers, lighting, and roadway markings. Crossings that lack sufficient active or passive safety devices can pose a threat to pedestrians, cyclists, motorists, and train operators passing through the crossing.

Blocked crossings – when a train is occupying the tracks and blocking roadway traffic – is another area where improvement is needed. Crossings that are close to yard leads or industrial spurs are often blocked as trains move back and forth through the crossing while building trains or conducting switching operations. Additionally, trains need to perform crew changes in areas that are easily accessible for crewmembers, which may result in trains blocking crossings for long periods of time. Roadway traffic can face lengthy and costly delays when alternative routes are limited or unavailable. Operational improvements can often help alleviate these issues; additionally, there are a number of infrastructural improvements that can be made to provide advance warning to motorists and identify alternate routes.

As part of ongoing freight planning efforts, NCTCOG continues to evaluate and analyze the condition of at-grade crossings throughout the region, as well as identify opportunities to fund improvements to crossings with the greatest degree of need.

4.3.4 Freight and Land Use

Although freight facilities and the transportation networks that connect them are vital to the regional, state, and national economies, some industrial land uses can have harmful effects on communities when located nearby incompatible development. The NCTCOG *Freight Land Use Analysis (2022)* will serve as a guidepost for the identification of problem areas and regional trends. The Freight Planning Program will seek to empower municipalities and land use decision makers with regional analysis and statutory best practices to prevent land use conflicts from occurring, as well as to mitigate existing conflicts. These best practices will also be used to promote the preservation of freight land use within urban freight districts and reduce freight facility dispersion.

4.3.5 Freight Pilot Projects

This program would allow for projects that specifically improve the movement of freight. It would focus on projects that are not traditional infrastructure projects but rather ones that would be innovative and future facing. They would typically be, but not be limited to, low-cost solutions. The goal would be to develop shovel-ready projects that could be implemented when funding becomes available. These projects would be the result of study and analysis conducted as part of *Freight North Texas*, specifically innovative tools such as the Economic Analysis Tool and RRIS. The projects could include truck only lanes, grade separations, automated truck ports, off-peak deliveries, and first/last mile projects. It is important to note that these would be pilot projects and it would need to be seen how they perform as part of this program. The follow-up assessment would be a key element of the program to see if these projects are solutions that can be completed throughout the region.

4.4 Freight North Texas Follow-Up Studies

This document, *Freight North Texas 2022*, provides a current North Central Texas regional freight system plan and is an exhaustive review and guide of freight planning in the region. It is important to build upon this effort. To continue freight planning efforts, the following should be completed.

4.4.1 New Follow-Up Studies

These new studies would bring new insights into goods movement in the region and give further analysis to better plan for the region. They include the following:

Truck Bottleneck Study

The purpose of the truck bottleneck study is to identify and mitigate truck bottlenecks in the regional freight network. The primary result of this study will include a list of truck bottlenecks classified by severity, type, and location (in addition to other relevant metrics), as well as strategies and policies for remediating truck bottlenecks.

Rail Pathing Study

This study will help identify unused capacity throughout the region's rail network, for both freight and passenger rail. This study will identify the capacity of the existing rail infrastructure and infrastructure that will be constructed in the future. The study will provide a new framework to estimate capacity effect of the capital projects. This study will use information from RRIS to better understand rail freight movements.

Air Cargo Analysis

Air cargo is important part of the freight system in the region and as Section 3 showed, there is more and more of it being moved through the regional airports year after year. This study would help better understand how cargo is moving into the region, what is being moved through the region, where in the region it is going, the economic impact of air cargo, and the needs of the industry in the region. The airports, as stakeholders, will be an important part of those analyses. Recommendations will be made to help improve the movement away from the airports.

Truck Routing Study

One of the datasets NCTCOG maintains is all the municipal trucks in one database, along with a map. This study will build on this database and identify issues with the region's truck routes. The study will examine the issues with truck routes, including disconnect from city to city, internal routing issues within a city, and specific pathing issues for trucks in the region. The end goal is to work with cities to resolve issues and create a venue for cities to work with each other to resolve connectivity issues that exist in the region.

Rail Crossing Analysis

This analysis will be an evaluation to assess, analyze, and provide input for rail crossings within the region. The goal for this analysis includes identifying all crossings, a field review of each crossing, an analysis of the crossings, recommendations with a prioritized list of crossing improvements, and report development. Stakeholder participation will be vital to ensuring the accuracy and efficiency of the measures outlined in this evaluation. The report will also include strategies and policies for mitigating future rail crossing conflicts. The first city where this review will be enacted is the city of Fort Worth. The lessons learned from this analysis will be a template for evaluating all rail crossings in the North Central Texas region.

Truck Safety Analysis

Truck safety has a huge impact on the movement of goods in the region. It is important to track medium- and heavy-duty vehicle accidents in the region to identify areas of concern. This analysis will look into the known causes of accidents and how many have happened, as well as other indicators to better understand how to deal with the truck safety issues within the region. GIS and a database will need to be created and updates will need to be tracked on a monthly basis. This will help educate and inform the freight safety initiative and create better outcomes.

Commodity Flow Model

The purpose of the commodity flow model is to better estimate the average weekday movement of commodities by trucks within the region. This data would be used in combination with commodity flow estimates from the Statewide Analysis Model and the Federal Highway Administration's Freight Analysis Framework to produce estimates of total commodity movements within and through the Dallas-Fort Worth region. Commodity rates refer to an estimate of the tons of a commodity that are being shipped or received. This model would better help the understanding of freight movements within the region. It will help refine NCTCOG's understanding of how the region's freight-oriented developments interact with one another.

First-and-Last Mile Improvement Study

This study will address first/last mile issues such as the ones that were identified in the Freight Congestion and Delay Study. The study will look into issues at additional focus areas and expand on the elements reviewed in the Freight Congestion and Delay Study. These issues would include truck access issues and capacity issues. This study will focus on practical and low-cost solutions that will address specific issues in the region's freight-oriented developments. Funding will need to be identified to implement the different recommendations.

4.4.2 Updates on Studies Completed

An important part of the first *Freight North Texas* was the follow-up studies, which helped create datasets and establish an important understanding of freight movements in the region. For this reason, it is important to update several of these studies. This will allow the datasets and information within to remain up-to-date and current while NCTCOG continues to improve the elements of goods movement across the North Central Texas region.

Truck Parking Study Update

As outlined in Section 3, the original Truck Parking Study was completed in 2018. The importance of truck parking has only grown nationally, and in the region, since TxDOT completed their own statewide truck parking study. There are now new approaches and technologies to truck parking that have become more developed since the completion of this study. It is important to have NCTCOG's approach to remain connected to these changes. To do so, the data collected and the areas reviewed need to be brought up-to-date and reviewed once again.

Freight Congestion and Delay Update

The first of the follow-up studies was completed in 2016. It has since become a key document to first/last mile planning for the region. The focus on inexpensive projects has led to the freight optimization project discussed in Section 3. Much of the analysis in this study was done both through modeled and observed data. The update on this study would review that data for the existing focus areas in the study, as well as look at new focus areas to expand the impact of the analysis.

Freight Land Use Analysis Update

The Freight Land Use Analysis includes a policy toolkit to help cities develop better freight-oriented developments. The follow-up on this analysis would focus on the impact of the toolkit and working with cities within the region to help with specific issues and concerns raised by the original analysis. The end results of the analysis is to help freight become a good neighbor and, therefore, help preserve freight-focused land uses, which will prevent additional sprawl.

4.5 Summary

This section focused on the recommendations of this freight plan. New freight policies and programs that will enhance freight mobility within the region were brought to the forefront. It is important that these policies and programs are incorporated into the planning process to help better assist freight movements in the North Central Texas region. It also provides a description of specific future follow-up studies that will showcase goods movement for the region. These studies will provide data and recommendations of freight-specific concerns within the region, which will help mitigate and improve planning for the overall community. The end goal of this section, and the plan overall, is to improve the movement of goods in the region, thus improving traffic flow for all system users.

Conclusion

The residents and businesses of the North Central Texas region rely on the freight network to convey the goods, materials, and energy that enables a high standard of living and access to economic opportunities. The region is geographically situated at a crossroads between multiple nationally

significant goods movement corridors, which enables a high degree of freight mobility, lower costs for shippers, increased reliability, and multimodal transportation options. Efficient and timely goods movement has fostered a diverse and vibrant regional economy and will continue to support and bolster the economy as freight infrastructure is improved.

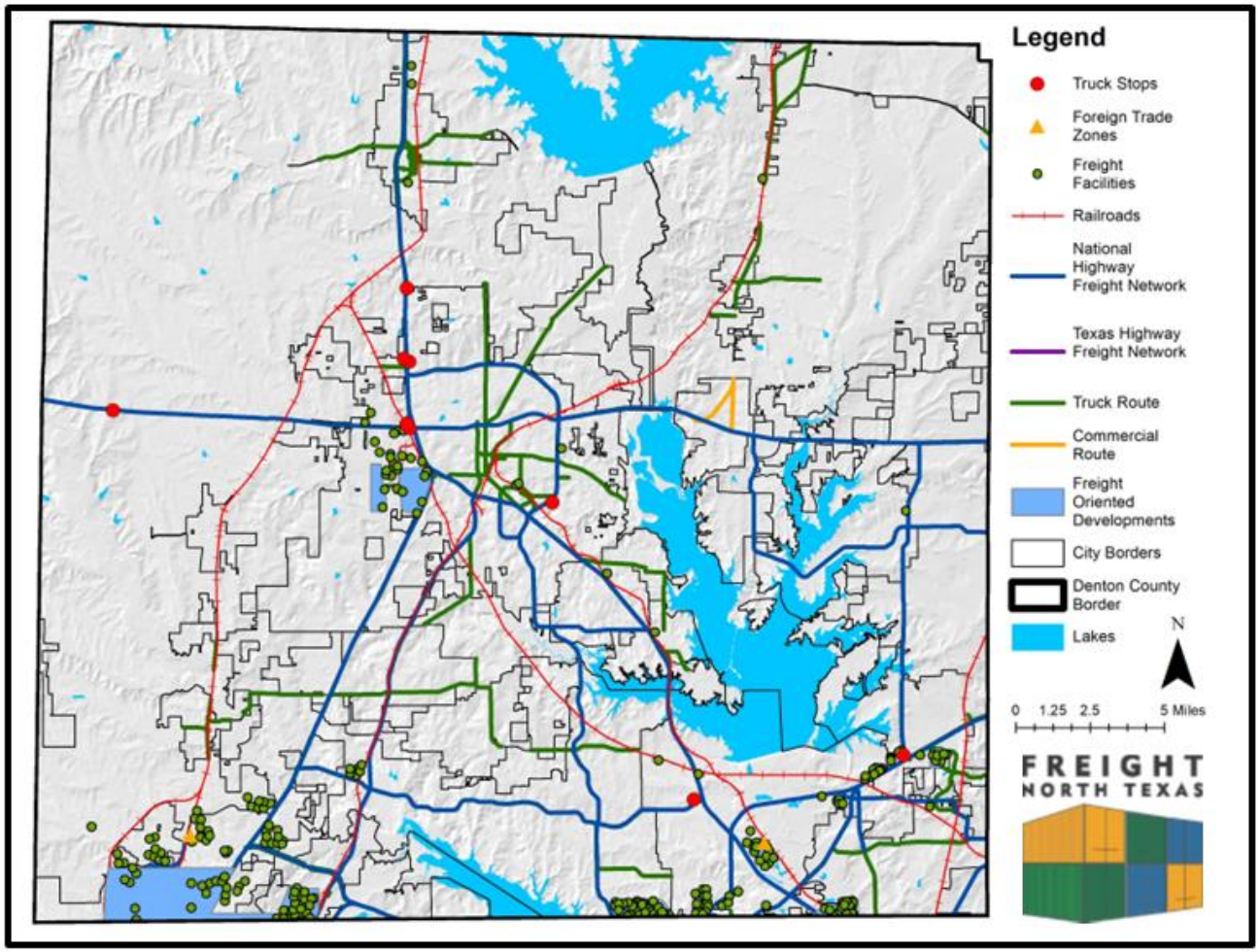
Although the region's freight network is robust, multiple challenges lie ahead in the coming years. NCTCOG anticipates the regional population will increase by 50 percent by 2045 to a total of 11,411,579. The demand on the freight system generated by such a rapid and significant increase in population will be severe, and significant investment in freight infrastructure will be needed to keep pace with growth and continue to provide a high quality-of-life for residents of the region. Additionally, disruptions in the global supply chain during the COVID-19 pandemic highlighted the need to build resiliency into the freight system. Although much of freight system resiliency is driven by operational patterns, high-quality infrastructure and the availability of multiple modal options can help freight businesses respond quickly to supply chain disturbances.

As the region continues to advance technological solutions to transportation problems, goods movement is an essential component of the overall regional strategy. Improvement in air quality can be achieved by reducing congestion and delay for trucks and trains, identifying and implementing better freight vehicle routes, and promoting the use of alternative fuels for freight activities. Automated and connected trucks have the potential to alleviate the driver shortage, enhance safety, and increase efficiency and performance. The Freight Program will work with regional institutions of higher education to develop a trained and proficient workforce and identify innovative, data-driven solutions to goods movement issues that leverage emerging technologies.

As the North Central Texas region becomes more populous and the challenges of achieving effective goods movement increase in prominence, the NCTCOG Freight Planning Program will continue to identify opportunities for capital improvement using dynamic funding sources, leverage private and public sector partnerships, foster collaboration, collect data, analyze system conditions, and promote freight planning best practices amongst the region's cities, counties, and special districts. This regional freight system plan provides the blueprint for these activities and highlights the path forward for the attainment of program objectives. In addition to bolstering national and state transportation networks, these objectives will galvanize a flourishing regional economy that provides the residents of North Central Texas with diverse opportunities, economic freedom, and a high quality of life.

Appendix A: Full County Freight Scans

Denton County – Freight Scan



As a gateway into the Dallas Fort Worth region, Denton County is home to some of the premier freight facilities in the nation. The primary trade route for international goods to and from Texas, IH 35, runs down the heart of the county further supporting its first-class freight infrastructure. Large freight employers bring business and jobs into the county, which increases population.

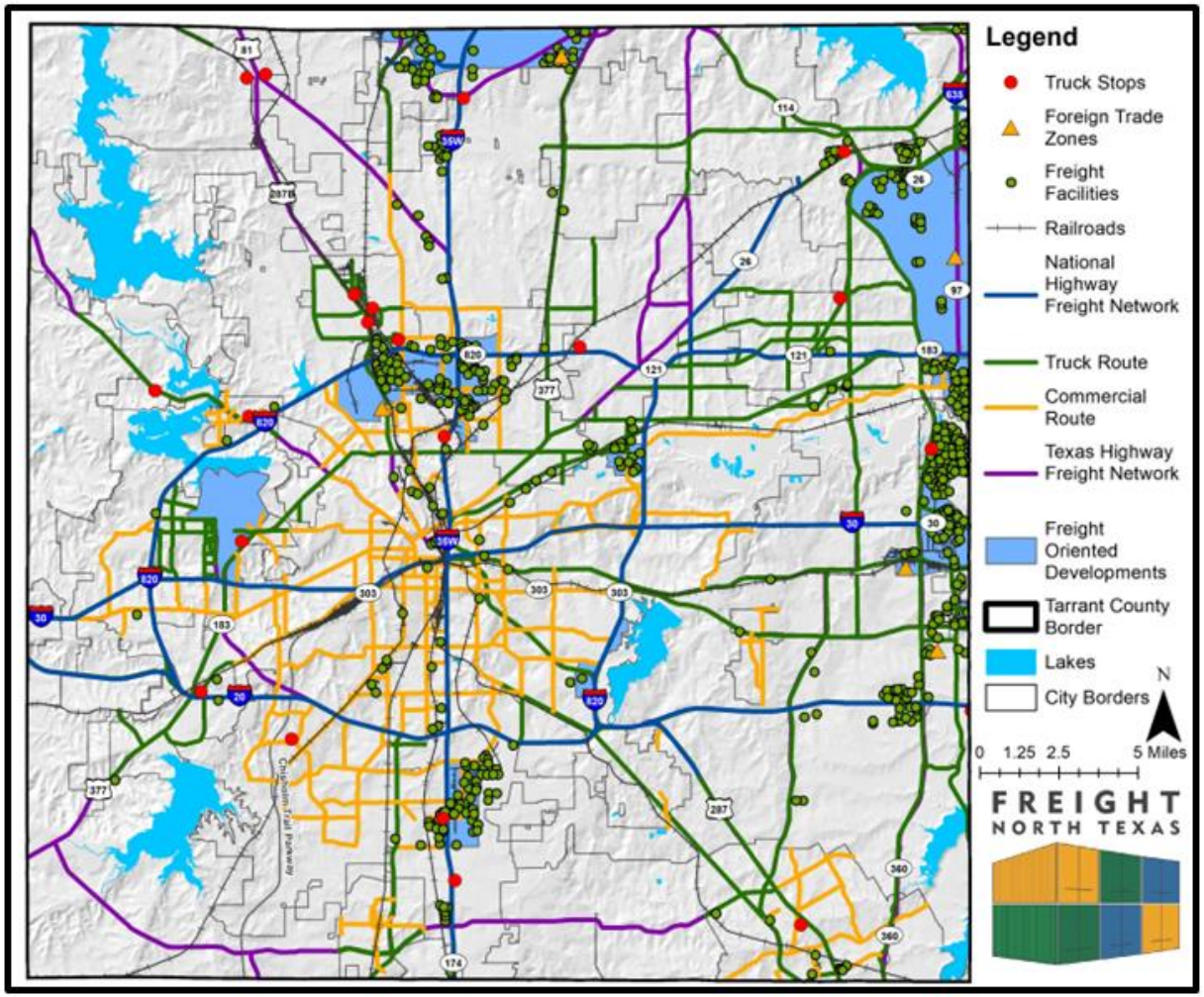
Freight Facts:

Major Freight Employers:
- Frito Lay
- AT&T Distribution
- FedEx
- Peterbilt Motors

Freight Employment:
- 6.03% of all jobs in Denton County are freight related.

Denton County's infrastructure consists of over 1,600 miles of railway, roadway, and pipeline.

Tarrant County – Freight Scan



Located at the crossroads of major national and international trade routes, freight plays an integral role in the social and economic development of Tarrant County. Several industries located within the county rely directly on the efficiencies of the county's freight system. Tarrant County has a robust pipeline network and designated space for freight-oriented developments which allows for continued freight growth in the county.

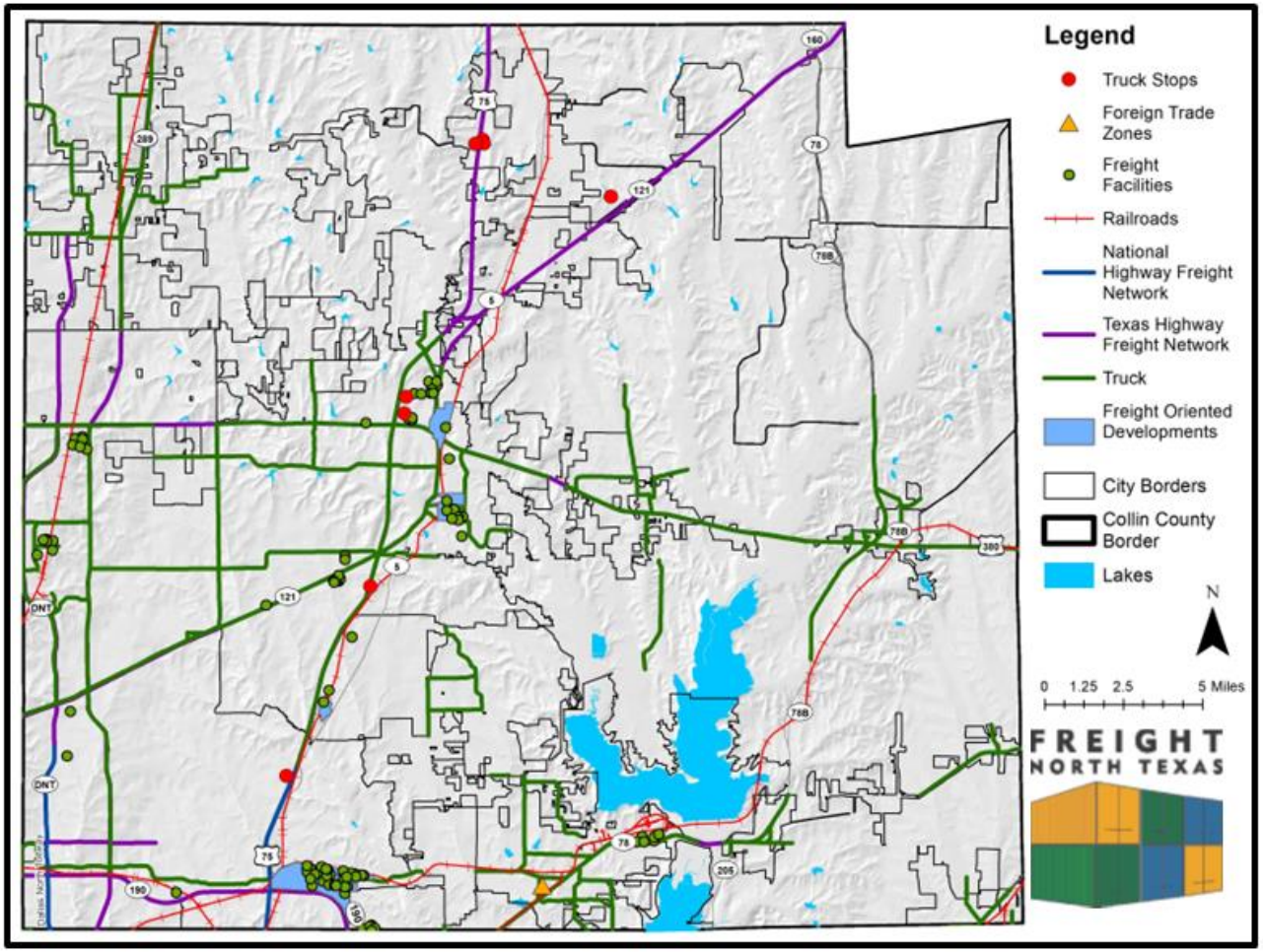
Freight Facts:

Major Freight Employers:
- Lockheed Martin
- BNSF Railway

Freight Employment:
- 9.16% of all jobs in Tarrant County are freight related.

Tarrant County's infrastructure consists of over 2,500 miles of railway, roadway, and pipeline.

Collin County – Freight Scan



As one of the fastest growing areas in the nation, Collin County relies on the efficient delivery of goods to ensure the continued growth of the county. Denton has three freight railroads and a major federal highway that attracts several major manufacturing industry leaders to locate in the county.

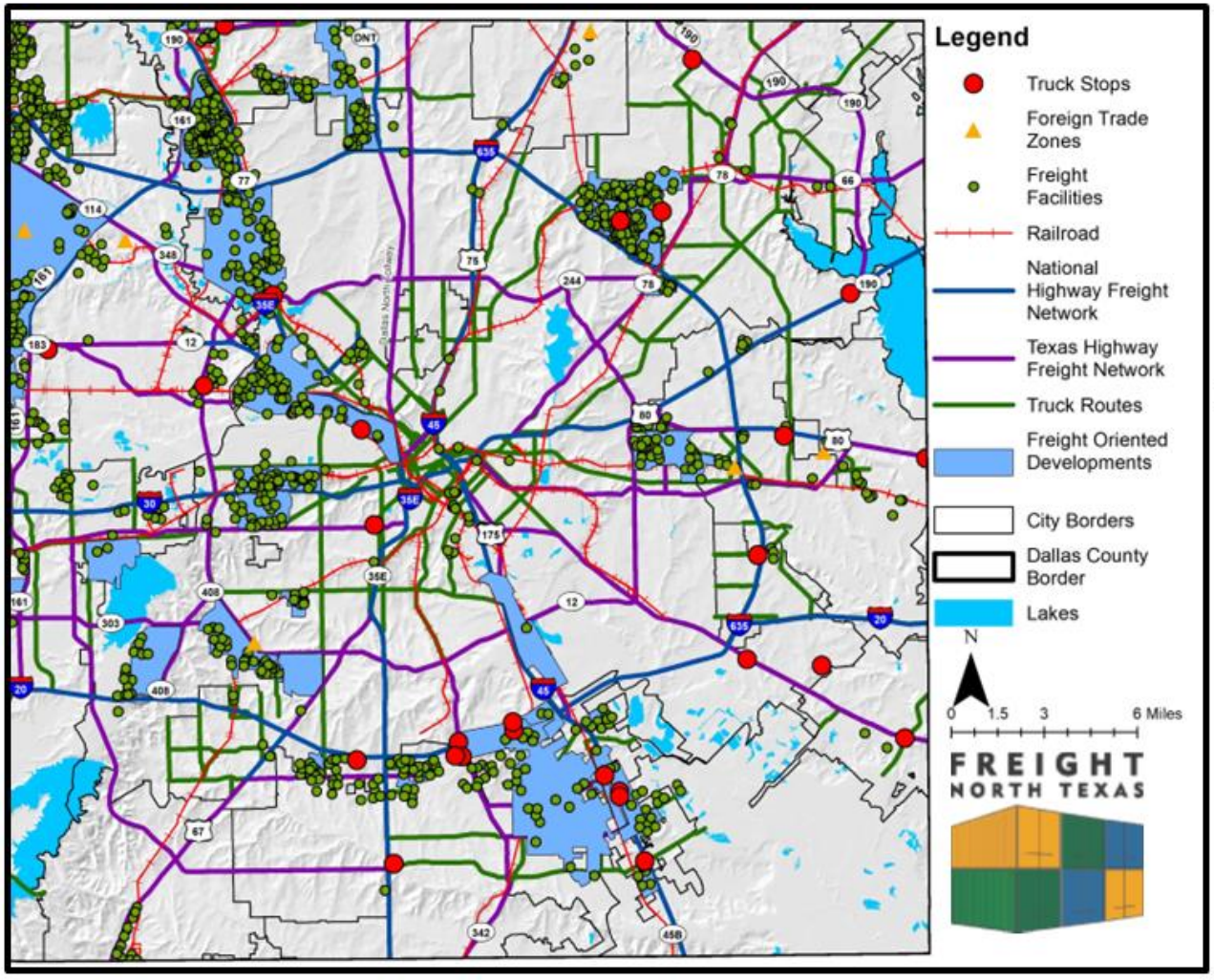
Freight Facts:

Major Freight Employers:
- Raytheon Technologies
- Hewlett-Packard

Freight Employment:
- 1.9% of all jobs in Collin County are freight related.

Collin County's infrastructure consists of over 770 miles of railway, roadway, and pipeline

Dallas County – Freight Scan



Dallas County has the strategic advantage of having direct access to major freight corridors serving the nation's largest cities and ports via four Interstate Highways and freight railroads. Several industries located within the county rely directly on the efficiencies of the county's freight system.

Freight Facts:

Major Freight Employers:

- PepsiCo
- Texas Instruments
- UPS
- Parkland Hospital

Freight Employment:

- 376,950 total jobs which is 10.5 percent of local area employment.

Dallas County's Infrastructure consists of over 1,400 miles of railway, roadway, and pipeline.

Appendix B: Mobility 2045 Update Freight Policies and Programs

To be inserted into the PDF

Appendix C: Critical Urban Freight Corridor Information

To be inserted into the PDF

Appendix D: Policy Toolkit

Cities and local governments can use the Policy Toolkit as discussed in Section 3.5.5. A more detailed explanation of the Policy Toolkit is below. It is structured as a four-step process for local decision makers to use in evaluating their specific policies. **Figure D.1** shows the four-step process. The first step involves developing a community vision for freight and industrial land use. This oftentimes can be adapted from previously developed economic development strategies and master plans and ensures that local officials understand not only the desires of their constituents, but also the needs of the industry they are seeking to develop.

Figure D.1: Four-Step Freight Policy Process

The second step involves the geographic designation of freight districts or an otherwise comprehensive strategy of freight facility site selection. Although industrial land development is usually initiated and carried out by the private sector, cities and counties can shape the manner in which development occurs through proper land use controls, generally taking the form of zoning, and including more specific regulations on site design.

Step two also involves the evaluation of existing and planned transportation infrastructure as it pertains to goods movement. The availability of logical and interconnected truck routes, rail heads, and intermodal hubs greatly impacts site selection for freight facilities. Communities should seek to channel freight traffic in ways that avoid negative interactions with Sensitive Land Uses while promoting the expeditious and safe conveyance of goods throughout their jurisdiction.

The third step involves the technical work of establishing site design regulations in accordance with the results of the previous two steps, along with input from industrial land developers, freight facility operators, and constituents.

In the fourth and final step, communities codify the desired ordinances, initiate needed planning programs, and execute relevant freight infrastructure development strategies. Subordinate to the final step, this section describes important considerations in ordinance development and freight project programming.

After each step is outlined, a variety of relevant policies will be enumerated before the next step is presented.

Using this Toolkit

Although it is helpful for communities to begin the freight planning process at step one, in some communities, much work on economic and community development policies has already been done and, therefore, municipalities may wish to go directly to steps two or three in order to avoid duplication of effort.

This policy guide is structured in a manner that allows it to be easily referenced on an as-needed basis, and not necessarily read through from beginning to end. Furthermore, the policies outlined in this section represent a distillation of technical planning tasks and programs into accessible, high-level tenants of each policy. When available, more detailed reference materials are provided for those who desire to learn more or become familiarized with nuances of the policy.

Although NCTCOG has compiled and commended these policies to member cities and counties, local conditions must be examined prior to policy implementation as economic, regulatory, or operational conditions may not lend themselves to policy success within a specific context. By way of example, *Policy 3-2: Establishing Curbside Loading Zones*, provides a strategy of effectively utilizing curbside space to facilitate safe and efficient freight deliveries. However, this policy does not lend itself to more rural or exurban environments where lower population densities, roadway traffic, and commercial activity patterns generally do not produce a need for curbside freight deliveries.

To assist local governments in evaluating the suitability of these policies to local conditions, a rating description was developed that addresses the relative cost of implementation, amount of time required for implementation, and the level of impact policy implementation would have on freight network conditions. The policy rating descriptions are listed in **Table D.1**. These descriptions are grouped into *Low, Medium,* and *High* for each category, and are listed in italicized text beneath the policy numerical designation and title in the following section.

Table D.1: Policy Rating Descriptions

Cost		Time Required		Impact	
Low	Cost is nominal - requires only staff time and administrative costs.	Low	Policy can be enacted immediately and will require little time for public meetings or outside agency involvement. Less than 6 months.	Low	Policy has a relatively small direct impact on freight network conditions.
Medium	Policy will require one-time expenditures between $10,000 to $50,000 or will result in a moderate enduring financial obligation to the municipality.	Medium	Will require a minimum of 6 months to implement and may take as long as 4 years to complete or become effective.	Medium	Policy has the potential to moderately impact freight network conditions.
High	Policy will require one-time expenditures greater than $50,000 or significant recurring costs.	High	Policy is long term or continues indefinitely; a minimum of 4 years or longer will be required for implementation or project completion.	High	The highlighted policy or project is highly impactful on freight network conditions.

Note: All policy rating descriptions represent rough estimates on the basis of information available to NCTCOG staff at the time of publishing this report. NCTCOG makes no guarantees as to the actual cost, time requirements, or system impact that result from the implementation of these policies.

Create a Vision: Identifying Community Freight Development Goals

During this step, municipalities establish their overall strategy and approach to goods movement infrastructure. Many cities and counties have such policies expressed in their community master plan or

comprehensive plan and should refer primarily to those when developing the foundation for municipal freight policies and programs. Other communities may find it necessary to conduct charrettes and other forms of community outreach to gauge the sentiment of the citizenry more precisely as it pertains to freight development.

Once community input has been gathered, planning staff should develop revisions and/or amendments to the comprehensive plan, as well as other documents or plans that codify city goals and objectives. Participation of local economic development agencies is important for these activities, as the needs and objectives of local businesses will also need to be assessed.

Some amount of educating the public on freight-related issues may be necessary to adequately implement the policies relevant to the community vision for goods movement. Involving local and regional freight business associations to help determine answers to frequently asked questions about the freight industry is useful if outside expertise is needed.

Policy 1-1: Freight Inclusion in Community Outreach Programs

Cost: Low | Time Required: Low | Impact: Medium

Although community surveys are a common tool for measuring public interest, they rarely include questions about freight policies and infrastructure. Communities should engage with constituents concerning existing freight-related policies. Surveys should cite specific policy goals, then ask the resident whether they are in favor of, opposed to, or would like to provide a public comment on the policy in question. Once enough responses have been collected, cities can decide which policies need to be reconsidered or pursued more vigorously. Surveys can also be used as an outlet for any freight-related complaints and overall public awareness,

It is useful to include more general community economic goals, such as what the resident sees as the most important local industry to be involved in, and ask whether they have experienced negative interactions with freight facilities or commercial vehicles within the community. Cross referencing this outreach effort with local law enforcement data can be useful as well, since public complaints against noise, illegal truck parking, and idling are often geospatially catalogued. This information can help determine which freight facilities or districts need remediation.

Policy 1-2: Performing Local Economic Studies

Cost: Low | Time Required: Medium | Impact: Medium

In order to make more informed decisions regarding freight development strategy, municipalities should undertake key economic studies. Although Census-based economic data is universally available and has sub-city levels of granularity, it can become outdated rapidly, and may not answer specific economic questions. Conducting economic studies can be done through university partnerships, consultants, or local economic development agencies. There are two types of economic studies that are particularly useful for making freight development policy decisions at the local level. The first is an Economic Gap Analysis, and the second is an Economic Structure Analysis.

An Economic Gap Analysis is a tool that allows communities to gain insight on which products or services residents tend to purchase locally versus those that are purchased externally or imported. This type of analysis is an indicator of how well the local economy serves the needs and desires of residents and usually expresses what percentage of a given product or service is purchased locally.

An Economic Structure Analysis is a study that assesses the overall local economic structure, including the composition of employment by sector, wage levels, historic growth and decline, and a comparison of how the local economy compares to the regional economy. For freight planning purposes, the most important part of this study is the evaluation of industry concentrations and supply chain relationships.

It should be noted that trends in e-commerce utilization, as they pertain to the aforementioned economic studies, should be evaluated as well. Residents will often turn to online shopping services in order to acquire items they cannot find locally, or whose online counterpart is more competitively priced. It may also be the case that local businesses are participating significantly in e-commerce activities, exporting a significant proportion of their products to customers outside the locality. Since e-commerce is a highly freight-dependent economic phenomenon, this information will provide a more comprehensive foundation upon which to base a freight development strategy.

Once the economic analysis is complete, local decision makers will be faced with deciding on a distinct freight development strategy, a few examples of which are summarized by the following statements:

1. Focus developing supply chain infrastructure around major local industries, capitalizing on local economic strengths.
2. Use freight development projects and programs to bolster the industries and markets that residents are unable to participate in locally, closing economic gaps.
3. Adopt a mix of fortifying goods movement infrastructure for primary local industries and expanding economic accessibility for residents.

Policymakers should also consider the various ancillary industries that provide services to local businesses, as they may be reliant upon or support trucking, railroading, air cargo, or pipelines.

Policy 1-3: Establishing or Participating in a Local Freight Industry Advisory Committee

Cost: Low | Time Required: Low-Medium | Impact: Medium

Although goods movement is largely a private sector operation, public policy decisions have a large impact on new freight facility location due to land use control resting with local cities; therefore, both policymakers and freight industry professionals have a vested interest in ensuring open lines of communication with each other. An effective and transparent venue for accomplishing this are local Freight Advisory Committees (FACs). FACs are standing committees that advise local policymakers on matters that affect freight network conditions and infrastructure, as well as matters of regional or local significance. They are comprised of both public and private sector stakeholders in the local freight system and are convened on either a regular or ad-hoc basis. **Table D.2** shows who should participate in FAC stakeholder meetings.

FACs are most commonly established at the regional level or above and are convened by Metropolitan Planning Organizations. NCTCOG conducts Regional Freight Advisory Committee[53] meetings on a quarterly basis for the North Central Texas region, while the Texas Department of Transportation convenes the Texas Freight Advisory Committee.[54] Some municipalities that are home to large amounts of freight development may determine that it is necessary to establish a more localized FAC in order to meet specific policy objectives.

Table D.2: Recommended Freight Advisory Committee Stakeholder Participation

Public Sector	Private Sector
• City Council Members • Planning Department Director & Staff • Transportation Planning Staff (Local & Metropolitan Planning Organization) • Planning & Zoning Commission Members • Economic Development Staff Representatives • DOT District Staff Representative	• Industrial Land Development Staff Representatives • Local Freight Operations Managers • Local Freight Business Owners & Executives • Directors of Business Development • Drivers & Freight Industry Employees

Matters that should be considered at FAC meetings are significant transportation projects and policies (e.g., truck routing ordinances), changes in industrial land use regulations, and master plan (comprehensive or transportation) development. FAC meetings are also opportunities for municipal and/or economic development staff to solicit industry feedback on programs and projects, as well as for outside agencies (state/national stakeholders, regional/local businesses) to present ideas for regional transportation system improvement. Industry feedback is especially important in Smart Growth communities as cities consider issues of urban and transportation design, road diets, and bicycle/pedestrian infrastructure. Such projects should be evaluated to ensure that access by freight shippers to their customers is not unduly impeded. Participation in some form of FAC is strongly recommended for municipalities and freight businesses.

Policy 1-4: Discouraging Incompatible Land Use Development

Cost: Low | Time Required: Low-Medium | Impact: High

Freight land use compatibility issues usually occur as a result of zoning and permitting authorities not fully considering community goals in practice relative to freight-oriented facilities. Other times, conflicts arise as land uses change over time or are rezoned without proper impact analysis. Ultimately, as land use controls in Texas are chiefly with the municipality, cities must ensure deliberate execution and enforcement of the planning and zoning policies outlined in the comprehensive plan.

Prior to rezoning parcels of land or granting construction permits, cities should evaluate whether the improvements are in line with previously established zoning guidelines, and whether the improvement makes sense for the location wherein it is to be implemented. By way of example, freight facilities may cause harmful effects to community health and safety when constructed near Sensitive Land Uses (SLUs). SLUs are characterized by their susceptibility to negative externalities generated by freight land

[53] https://www.nctcog.org/trans/about/committees/regional-freight-advisory-committee
[54] https://www.dot.state.tx.us/move-texas-freight/committees/freight/default.htm

uses, including lighting, noise, vibration, odors, traffic conditions, accessibility restrictions, and safety risks. SLUs include, most frequently, low-density residential properties; however, mixed-use, light commercial, and some institutional properties can likewise be degraded in quality by close placement to freight facilities. Environmental justice communities and the land uses that support them should also be considered SLUs.

The Good Neighbor Strategies presented throughout this report[55] represent a body of creative and effective methodologies to help mitigate the negative freight land use externalities and promote the successful integration of freight infrastructure in communities, towns, and cities. These strategies seek to bolster economic performance and productivity while providing low-cost access to the global marketplace. NCTCOG strongly encourages municipalities to consider implementation of these strategies wherever freight land use exists. **However, the most effective land use conflict mitigation strategy is to prevent incompatible land uses from being developed in the first place.** Regardless of where a given city is in the freight planning process, discouraging incompatible development at every available opportunity is a vital component of optimizing and preserving freight infrastructure and ultimately leads to more livable and prosperous communities.

Policy 1-5: Performance Measurement and Monitoring

Local freight network performance measures are tied to specific outcomes and goals established by a governing body and are observed in order to ascertain whether or not those outcomes are being achieved. Additionally, performance measurement can serve as a tool for use in prioritizing the allocation of funding for maximum effectiveness and promoting transparency for constituents as to why certain projects are funded and why others are not. Establishing and monitoring performance measures for the freight network is essential to a data-driven approach to transportation system improvement.

At the regional and sub-regional levels of government, examples of freight network performance measures include:

- Truck Travel Time Reliability: This metric assesses how much extra time truckers and fleets must plan into their trips to arrive at their destination at the desired time due to variability in local highway network conditions.
- Freight Bottlenecks: This metric measures the amount of freight-related congestion on local streets, especially in districts with a high concentration of freight activity.
- At-Grade Railroad Crossing Conditions: This metric assesses the physical conditions, geometry, and presence of safety measures of at-grade rail crossings within the jurisdiction.
- Commercial Vehicle Related Crashes: This metric measures the frequency and locations of truck-related motor vehicle incidents within the jurisdiction.

Municipalities are encouraged to consider both these and other performance measures that assess the areas of greatest need and align most closely with the community goals outlined in the comprehensive plan or transportation plan adopted for the jurisdiction. Data collection and analysis activities in support of performance measure monitoring can help drive freight land use compatibility and preservation in three key ways:

[55] See both *Site Selection & Transportation: Identifying Freight Districts and Assessing Freight Mobility* and *Site Design: Industrial Property Attributes* for an enumeration of specific Good Neighbor Strategies.

1. By identifying local freight issues and directing funding to capital projects that address them.
2. By promoting awareness of freight network issues and fostering partnerships with local businesses to deliver solutions.
3. By tracking the effectiveness of previously employed strategies.

Performance measures help to identify the most urgent needs in the local transportation network. Local governments can implement a wide range of solutions to address freight system performance in a manner that targets the performance measures they most want to prioritize. Municipalities are encouraged to leverage regional partnerships to maximize both performance measurement and project delivery.

Recommended Resource: The National Center for Fatality Review and Prevention Report 33: *Improving Freight System Performance in Metropolitan Areas: A Planning Guide (2015)*[56]

Policy 1-6: Freight Safety Public Awareness Program

The goal of this policy is to increase public visibility of freight safety concerns and influence the behavior of transportation system users to prevent freight vehicle-related incidents. This can be accomplished by establishing a communication initiative that uses advertisement and messaging campaigns to raise awareness. Two key issues that should be considered as part of this campaign are:

- Driving habits: Focusing on motorist actions that can contribute to commercial motor vehicle crashes such as following trucks too closely or not giving them enough room to stop or maneuver while driving.
- Railroad Safety: Highlighting safe practices to use when traversing an at-grade railroad crossing (for motorists, bicyclists, and pedestrians).

Municipalities and other districts may have their own challenges unique to that area; safety initiatives should focus on these as well and communicate what local governments are doing to improve safety as part of the campaign. Local governments should also avail themselves of regional, state, and national safety data resources that contain information on their jurisdiction and use them to tailor safety campaigns on the most relevant issues for them.

Site Selection and Transportation: Identifying Freight Districts and Assessing Freight Mobility

As the name implies, the Site Selection and Transportation phase has two distinct parts. In the first part, the geographic areas within a municipality wherein the community may wish to foster or dissuade industrial land development are decided. This frequently takes the form of business parks, master-planned industrial developments, and corporate campuses. In addition, they can include districts established by local governments wherein freight facilities are subject to additional leniency or severity under the city's zoning code such as planned manufacturing districts or planned industrial districts.

The second part of this phase is the consideration of transportation network strengths and weaknesses as they pertain to freight. Truck route ordinances, locomotive quiet zones, grade separation projects, airport access, intermodal hub connections, and highway infrastructure are all relevant examples of transportation system components to be examined. It is critical to investigate not only transportation

[56] https://www.trb.org/Publications/Blurbs/172487.aspx

assets within the municipal boundary, but also those that connect to the local system as part of a larger regional network.

The site selection and transportation evaluation processes involve the decision of where freight development should generally take place (or not take place), and ultimately seek to benefit the community and local businesses by preventing land use conflicts and developing infrastructure that best caters to the needs of surrounding properties.

Key Tasks:

- Designate planned industrial districts
- Establish communication with private industrial landowners and developers
- Identify local transportation system shortfalls, bottlenecks, and externalities as they pertain to goods movement
- Review truck route ordinances, railroad connections, and multimodal freight hub access

Recommended Resource: The National Center for Fatality Review and Prevention Report 13: *Freight Facility Location Selection: A Guide for Public Officials (2001)*

Policy 2-1: Truck Routing Ordinance Establishment and Review

Cost: Low | Time Required: Low-Medium | Impact: High

The designation and maintenance of truck routes are critical for quality of life and efficient freight movement through local roadways. Although most cities in the North Central Texas region have truck routes designated by ordinance, they must be regularly reviewed and updated on the basis of changes in transportation network conditions, changes in land use, and regional freight network connectivity concerns.

The primary purpose of truck routing ordinances is to channelize commercial vehicle movements along routes that are most suitable for truck traffic, while also dissuading them from taking unsuitable routes as much as possible. By default, all state highways, US highways, and Interstate Highways are truck routes. For local and county roads, however, municipalities must regulate which roadways receive such a designation. Truck route selection criteria are outlined in **Table D.3.**

Table D.3: Truck Routing Designation Criteria

Physical Criteria	Connectivity Criteria
• Favorable intersection geometry • Sufficient bridge height • Absence of low-weight bridges • Overhead clearance • Road weight capacity limits • Minimal at-grade rail crossing interaction • Separation from bicycle/pedestrian infrastructure	• Commercial development/district access • Freight-oriented development & industrial area access • Arterial or highway connections • Intermodal facility access • Truck parking facility access

The following paragraphs describe in greater detail these criteria:

Favorable Intersection Geometry: Trucks require a wider turning radius than traditional automobiles, and intersections along truck routes that require trucks to make sharp right turns will be damaged as a result of repeatedly being driven over by heavy tractors and trailers. The Texas Department of Transportation, the American Association of State Highway and Transportation Officials, and the National Association of City Transportation Officials have published intersection design and right turn radius recommendations for buses and trucks with various wheelbase lengths. NCTCOG recommends truck routes have at least these minimum design standards to accommodate safe turning maneuvers by trucks at intersections. The types of trucks that frequent nearby establishments should also be noted. See *Policy 2-7: Roadway and Intersection Geometry Review* for more information.

Sufficient Bridge Height: Truck routes should not require trucks to pass under low-clearance bridges. Trucks may be required to transport irregularly shaped or tall objects, including various configurations of containers, at times. In order to accommodate this, bridge heights of 18.5 feet[57] or more along the entirety of the truck route are desirable; however, a minimum of 14 feet is generally necessary for standard truck trailers.

Absence of Low-Weight Bridges: Bridges with weight capacity restrictions under 80,000 pounds should be avoided when designating truck routes, if at all possible; otherwise, truck route signage may direct commercial traffic to take an alternative route.

Overhead Clearance: As with bridge height, truck routes should not be designated along roadways with low-hanging utility lines, trees, streetlights, or building features that occupy overhead space. A vertical clearance of 18.5 feet should be provided based on bridge height standards advised by the Texas Department of Transportation for the Texas Highway Freight Network.

Road Weight Capacity Limits: Roadways selected for truck route designation should be of sufficient weight capacity to accommodate freight vehicles up to 80,000 pounds. Municipalities with certain heavy manufacturing activities may consider developing roadways capable of accommodating overweight vehicles (more than 80,000 pounds) on the basis of industry feedback.

Minimal At-Grade Rail Crossing Interaction: Although rail crossings are common in industrial areas with rail access, truck routes should avoid at-grade crossings to minimize freight delay due to blocked crossings. Additionally, humped crossings (rail crossings with sharp height increases) may not be navigable by some commercial vehicle trailers. See *Policy 2-3: At-Grade Rail Crossing Improvement Plan* for more information.

Separation From Bicycle/Pedestrian Infrastructure: Due to visibility, turn radius, and stopping distance concerns, trucks should not be routed through areas where there is a significant presence of bicycle/pedestrian pathways, sidewalks, trails, and bike lanes. Trucks can be routed on roads with such infrastructure as long as separation measures are emplaced (walls, rails, lane dividers, etc.).

[57] https://ftp.txdot.gov/pub/txdot/move-texas-freight/resources/executive-summary.pdf

Commercial Development/District Access: Truck routes should provide logical access to consumers of freight services, especially retail stores and restaurants. Dedicated commercial and mixed-use districts should be accessible either from the truck route directly or via a short auxiliary route.

Freight-Oriented Development and Industrial Area Access: Freight-oriented developments are areas of heavy freight activity. These areas usually have warehousing or distribution facilities that bring in the freight movement. Industrial area access are streets that are adjacent to industrial and manufacturing developments. This allows for easier freight movement and access.

Arterial or Highway Connections: Arterial streets interconnect different highway connections. These connections increase freight mobility and movement.

Intermodal Facility Access: Intermodal facilities include different transportation areas like airports, rail terminals, truck terminals, bus terminals, and coast ports to pick up and drop off loads. These facilities alternate between different ways of distribution to move goods more efficiently.

Truck Parking Facility Access: Truck parking facilities are areas where trucks are allowed to park safely. These lots are designated for trucks only and allow for truckers to rest.

Policy 2-2: Address Local Truck Parking Availability

Cost: Medium-High | Time Required: Medium | Impact: Medium

Locating safe and convenient truck parking is a major challenge for many drivers, forcing them to sacrifice, on average, 56 minutes each day of what productive drive time would otherwise be.[58] This concern led the United States Congress to pass Jason's Law in late 2012, authorizing federal funds to be spent on truck parking facilities, and raising awareness of the severity of truck parking issues throughout the nation. Both NCTCOG[59] and TxDOT[60] have completed truck parking studies, mutually confirming that significant truck parking shortages exist in both the region and state.

Providing additional truck parking options has multiple benefits to the local freight system. As referenced above, safety is a top concern for most truck drivers. Not only do they need places to park that have crime-deterring features, but the ability to find parking easily decreases parking illegally on road shoulders and along highway ramps, and reduces driver stress and distraction. Commercial vehicle operators are also subject to federally mandated hours-of-service limitations which force them to take breaks and limit the number of hours in which they may drive consecutively. When taking their mandatory breaks and ceasing to drive after their time limit has been reached, drivers must find a place to park, as electronic logging devices (which all commercial motor vehicles must legally have) count time spent trying to find parking against their overall limit. Truck parking availability also increases the efficiency and productivity of drivers, thereby benefitting the freight system overall.

Municipal staff and policy bodies should consider evaluating the availability of truck parking along major freight corridors and throughout their jurisdiction. In addition to the regional corridors identified in the NCTCOG Truck Parking Study, the evaluation should include:

[58] According to research by the American Transportation Research Institute
[59] https://resources.nctcog.org/trans/goods/freight/documents/TPSMasterDraftUpdated2018_FINAL.pdf
[60] https://ftp.txdot.gov/pub/txdot/move-texas-freight/studies/truck-parking/final-report.pdf

- Areas with a high concentration of illegal truck parking
- Areas surrounding municipally designated truck routes and regional Critical Urban Freight Corridors
- Corridors within regionally identified freight-oriented developments
- Areas with elevated rates of parked truck-related traffic accidents or delays

Once the overall local need for truck parking has been determined, cities should identify land that could be set aside or zoned specifically for truck parking facilities and engage with local/regional land developers to propose a truck parking facility be constructed. The most important amenities for truck drivers to have at a truck parking facility, as identified in the TxDOT study, are safety features (such as lighting), food/dining, showers, and public bathrooms. Private trucks stops are much more likely to have these types of amenities than public safety rest areas; however, publicly owned safety rest areas can be designed to accommodate these features as well.

Additionally, cities should coordinate with Metropolitan Planning Organization staff to identify funding opportunities and seek planning/project development assistance, as NCTCOG freight planning efforts include truck parking development and assessment.

Recommended Resource: NCTCOG *Truck Parking Study (2018)*[61]

Policy 2-3: At-Grade Rail Crossing Improvement Plan

Cost: High | Time Required: High | Impact: High

At-grade railroad crossings are significant components of the regional freight network. They are typically constructed when a corridor is anticipated to have low roadway or railroad traffic, when demanded due to rail/road alignment constraints, or when cost limitations prohibit the crossing from being grade separated. As traffic levels increase, at-grade crossings can generate costly delays for private and commercial motorists, especially when crossings are blocked by trains performing switching operations or crew changes. Additionally, at-grade crossings represent a safety hazard, as motorists can become stuck on the railroad tracks due to mechanical failure, or while trying to beat the train through the crossing. Furthermore, at-grade crossings represent a liability to railroad operators since safety equipment at crossings (flashing signals, gates, and sensors) occasionally fail, which poses a danger to both locomotives and roadway vehicles.

Grade separation of at-grade crossings should be performed whenever finances and logic permit. Although since a single grade separation can range in cost between $10 million and $40 million, municipalities and Metropolitan Planning Organizations often seek alternative spot treatments to improve safety and traffic flow through crossings. **Table D.4** outlines recommended strategies for at-grade crossing improvement.

[61] https://www.nctcog.org/getmedia/b5a888c4-1be5-426d-a193-b91e93bdb1b5/TPS-Master-Updated-2018_FINAL2_1.aspx

Table D.4: At-Grade Railroad Crossing Improvement Strategies

Solution	Estimated Cost	Impact
Traffic Signal Preemption	High	Improves safety through crossing signal integration with roadway traffic signals.
Four-Quadrant Crossing Gate Installation	High	Improves safety by omnidirectionally prohibiting motorist passage through a crossing while activated.
Median Barrier Installation	High	Improves safety and traffic flow by increasing visibility and channelizing automobile movement.
Flexible Delineator Post/Bollard Installation	Medium	Improves safety by adding an inexpensive barrier between lanes leading up to a crossing.
Close At-Grade Crossing	Medium	Improves safety and locomotive traffic flow by reducing opportunities for automobile/locomotive interaction.
Blocked Crossing Warning & Detection System	Medium	Improves automobile traffic flow by warning motorists of a blocked crossing and suggesting detours.
Crossing Reconstruction	High	Improves safety and overall traffic flow by replacing damaged infrastructure and correcting geometry.
Roadway Rerouting/Realignment	Low-Medium	Improves safety and traffic flow at a potentially lower cost than grade separation.

It should be noted that the cost factors outlined above represent a combination of both rail agency and city costs. Although cities may pursue these treatments on crossings within their jurisdiction, rail agency ownership of the right-of-way will result in the need for coordination and planning. Rail agencies may decide not to construct these improvements if it interferes with their operations or if the cost of maintenance or liability is too high. The above strategies are described in greater detail below.

Traffic Signal Preemption: This type of improvement ties in railroad crossing safety equipment with nearby roadway traffic signals. Typically, once a train is detected, the system causes the traffic signals to halt automobile traffic from navigating the crossing for an amount of time prior to the train's arrival. This prevents motorists from attempting to beat the train across the crossing and allows additional time for automobiles to clear the track.

Four-Quadrant Crossing Gate Installation: Four-quadrant gates are a type of crossing gate that features two gates on either side of the crossing and functions to prohibit motorists from driving around single gate arms, as is common with standard two-arm gate systems.

Median Barrier Installation: Median barriers installed at grade crossings assist in keeping automobiles in their respective lanes, as well as provide additional separation between opposing directions of traffic as motorists approach a crossing. Median barriers can also influence automobiles to drive more slowly, similar to road diet strategies.

Flexible Delineator Post/Bollard Installation: These are typically brightly colored and reflective plastic or metal posts installed along the centerline striping of the roadway leading to the crossing deck-plate in

either direction. These provide an additional visual cue to motorists and encourages slower speeds as they navigate the crossing.

Close At-Grade Crossing: The closure of an at-grade railroad crossing is warranted when concerns surrounding safety, accessibility, and locomotive traffic flow are raised, or if municipalities determine that roadway routing solutions are more appropriate than crossing modification solutions. Crossing closure is one of the least expensive solutions and can result in mutual benefits for cities and rail agencies.

Blocked Crossing Warning and Detection System: This improvement strategy leverages technology to communicate with motorists and advise them when an at-grade crossing is being blocked by a train. These systems utilize external sensors or tie into the crossing signal system to send alerts via smartphone navigation applications, dynamic message signs, or on-board telematics systems to help drivers take alternative routes, thereby improving the flow of traffic and reducing both private and commercial vehicle delay.

Railroad Crossing with Supplemental Safety Measures

Source: NCTCOG

Crossing Reconstruction: Crossings with an obsolete design and geometric problems are the best candidates for reconstruction. A common warrant for crossing reconstruction is solving “humped” crossings, where the roadway grade increases sharply on either side of the tracks. These crossings can cause damage to vehicles with low ground clearance and can prevent long freight trailers from successfully navigating the crossing – instead becoming trapped on the tracks and risking collision with a locomotive. Other reasons for reconstruction include poor intersection angles, deckplate condition, and inhibited lines of sight for highway users.

Roadway Rerouting/Realignment: It is important to remember that improving an at-grade crossing may not always be the best solution. For instance, roadway solutions to traffic flow and accessibility issues may be less expensive and more effective in the long term, especially when right-of-way procurement is required to implement desired modifications. Potential roadway solutions include new road construction, roadway realignment, and routing restrictions (e.g., truck routing). Proximity of the at-

grade crossings to the nearest grade-separated crossing in a given corridor should be analyzed for alternative routing possibilities.

Cities are encouraged to develop a definite plan and strategy for at-grade crossing improvement that is nested in the transportation development priorities of local and regional transportation plans. Especially with regard to at-grade crossing issues, community input and outreach is important. Likewise, communication with rail agencies is vital in addressing crossing concerns, since they have ownership of the rail infrastructure and determine the standards to which engineering, design, and construction must be completed. Municipalities should engage rail agencies early and often concerning plans for at-grade crossing improvement and be willing to consider alternative strategies that achieve community goals. Refer to the *Funding Strategies* section of this report for strategies to overcome financial constraints.

Policy 2-4: Locomotive Quiet Zone Designation

Cost: Medium | Time Required: Low-Medium | Impact: Low

"Quiet Zones," or no-horn restrictions, are geographic and/or temporal prohibitions on train horns. Trains are required by law to blow their horns when approaching at-grade crossings and highly populated areas for the purpose of alerting nearby pedestrians, cyclists, and motorists that a train is approaching and to stay clear of the tracks. Quiet zones may be used in order to reduce noise disturbances to residences and businesses in close proximity to an at-grade crossing.

Although local governments have the legal authority to enact quiet zones, they must coordinate with the rail agency that owns the track, as well as state transportation authorities who will make determinations about what supplemental safety measures are required to be installed at the crossing in order to facilitate the quiet zone. After any required supplemental safety measure installation is complete, the quiet zone can be enforced. Challenges to implementation include crossing geometry concerns, a history of frequent accidents, and inadequately installed safety systems. Rail agency collaboration is key – if the track owner has construction scheduled or maintenance concerns surrounding the crossing, the city may have to delay the implementation timeline or contribute financially to crossing remediation.

As city staff contemplate the creation of quiet zones, they should be sure to confirm that crossing inventory data maintained by the Federal Railroad Administration aligns with actual crossing conditions and, if possible, perform an internal assessment of traffic and safety conditions. The city must also determine what the boundaries of the quiet zone shall be, and whether or not it will be a *partial quiet zone*, wherein train horn restrictions are set in place only during certain hours of the day or night.

Quiet zones can reduce noise disturbances in communities located near at-grade crossings, which improves quality of life and land values, thereby lessening freight rail disbenefits. Cities seeking to implement quiet zones should initiate multilateral conversations early in the process and be prepared to provide information on traffic patterns and safety conditions to approving agencies, as well as maintain a flexible timeline for regulatory requirements.

Recommended Resource: ***Federal Railroad Administration Train Horn and Quiet Zone Fact Sheet***[62]

Policy 2-5: Commercial Vehicle Bans

Cost: Low | Time Required: Low | Impact: Medium

Commercial vehicle bans (or "truck bans") restrict the movement of trucks on selected thoroughfares, most commonly, residential streets. Many truck routing ordinances restrict the movement of trucks on routes other than designated truck routes except for the purpose of navigating to a delivery or pick up location that is not on a truck route. Commercial vehicle bans, however, restrict all truck traffic from traversing the designated streets, regardless of destination, and impose fines on violators. This strategy may require the passing of a separate truck ban ordinance, as well as the installation of signage. The enactment of such bans should be done on the basis of:

- Local traffic studies with an emphasis on commercial vehicles
- Community input and complaints
- Accessibility to businesses
- Proximity to truck routes
- Alternative routing considerations
- Feedback from local businesses (especially freight operators)

Commercial vehicle bans can also augment safety in areas with high volumes of pedestrian and cyclist traffic such as near schools, parks, and neighborhoods. Roadways not constructed to accommodate freight vehicles (either geometrically or because of pavement material) can sustain damage as a result of heavy trucks using them; truck bans should be considered for these roadways as well. Cities should be specific about what types of vehicles are included in the ban and list height, weight, or cargo restrictions, as well as any intended exceptions to the policy (e.g., deliveries to schools).

Policy 2-6: Planned Industrial District Designation

Cost: Low-High | Time Required: Low-Medium | Impact: High

The deliberate designation of land for freight uses is one of the most vital aspects of a local freight planning program. PIDs are designated as part of the zoning code and include regulations on site design, transportation infrastructure design, and support services/utilities that cater to the needs of freight business operations and the local community. Examples of major regional PIDs include Alliance Texas in Fort Worth and the International Inland Port of Dallas. Site selection criteria for PIDs are as follows:

- Expeditious access to Interstate Highways or major state/US highways
- Proximity and access to intermodal transfer hubs
- Low cost of land
- Proximity to major centers of commerce
- Proximity to manufacturing or natural resource harvesting operations

Although local business environment and available incentives are considered, these factors are not primarily how freight businesses select where to locate. "Freight facilities will only consider locations that fulfill the primary objective of moving goods in the most efficient manner from point of origin to

[62] https://railroads.dot.gov/sites/fra.dot.gov/files/2019-11/FRA%20Train%20Horn%20and%20Quiet%20Zone%20Fact%20Sheet.pdf

destination. This trumps most other considerations."[63] As such, access to customers and transportation infrastructure that facilitates the timely movement of goods are essential in choosing where to locate a PID. Industry feedback and consulting with regional planning agencies is strongly encouraged during the site selection process.

Once a site has been selected, the city must determine what site design characteristics it wishes to stipulate, if any.[64] This determination should be based on community goals outlined in the municipal comprehensive plan; however, site design regulations in PIDs may differ from those imposed on freight developments, which are bound by sensitive or otherwise non-freight land uses. Within PIDs, the potential for land use conflicts is mitigated by virtue of the collocation of like land uses; however, Good Neighbor Strategies should be implemented along PID boundaries. Site design regulations should not be overly restrictive within the PID so as to reduce cost of development and free up private developers to implement the most functional designs.

Transportation connections and accessibility for freight vehicles across modes must be designed and built into the PID early in the process. This includes intersection geometry, pavement/road construction, and railroad access. Other considerations may include alternative fuel infrastructure for corporate fleets such as liquified natural gas, compressed natural gas, hydrogen, and high-capacity electric charging stations. Pipeline or pipeline terminal access may be desired and should be investigated in consort with industry partners.

The *Freight Village* concept – as exemplified in the Alliance Texas development – should also be considered. "A freight village is a defined area, often master-planned, within which all activities relating to the transport, logistics, and distribution of goods are carried out by various operators. Freight villages are effectively clusters of freight and logistics facilities where any number of supply chain activities (such as consolidation, value-added activities, and transloading) occur within the boundaries of the district."[65] Freight villages also tend to feature logistics sector support services such as mechanics, truck parking, international trade services, and housing/lodging for employees in close proximity. The reduction of operating costs by consolidating a wide range of freight and logistics services into a single geographic location increases productivity and augments overall freight system efficiency. Reductions in vehicle miles traveled and emissions due to this consolidation may also contribute to air quality goals.

Policy 2-7: Roadway and Intersection Geometry Review

Cost: Medium | Time Required: Medium | Impact: High

Freight vehicles depend on reliable and functional road network connections in order to complete their daily shipping tasks. When roadways restrict commercial vehicle movement due to geometric or design issues, freight network performance is impaired and risks regarding safety, damage to equipment, and damage to infrastructure increase. It is, therefore, important to ensure sound design principles that accommodate freight vehicles are included in major thoroughfares throughout the local transportation network, especially along designated truck routes.

[63] *National Center for Fatality Review and Prevention Report 13: Freight Facility Location Selection: A Guide for Public Officials,* pg. 29
[64] Public officials and staff are encouraged to refer to the following section of this chapter for site design policies.
[65] *Federal Highway Administration Freight Land Use Handbook* (2012), pg. 3-16

In order to ensure the ability to accommodate freight vehicles, municipalities should conduct a review of roadways and intersections to identify designs or infrastructure that are unsuitable for freight vehicles. Examples of roadway designs that can cause issues for trucks include:

- "Jug-handle" ramps
- Tight right turns
- "Humped" at-grade railroad crossings (see *Policy 2-3: At-Grade Rail Crossing Improvement Plan)*
- Ramps or roadways that have steep changes in grade
- Low vertical clearance (low-height power lines, bridges, trees, etc.)
- Load-restricted roads and bridges
- Roundabouts that are small in size and/or lack an "apron" for large vehicles and trailers

Once problem areas have been identified, cities and counties should develop a program of projects to remediate them, establish a timeline, and identify relevant funding sources.[66]

Carrying out geometric roadway improvements has several benefits. Oftentimes heavy freight vehicles will damage roadway infrastructure by running over curbs where there is insufficient room to make turns with trailers, and by colliding with signage, bridges, and poles. Although these are caused by driver error in some situations, infrastructure conditions can also contribute to roadway damage when drivers are not made aware of the need to take an alternate route or if their destination can only be accessed by unsuitable routes. A related concern is safety, as traffic incidents can result from drivers trying to overcorrect during turns or due to collisions with the aforementioned infrastructural components. Designing intersections and thoroughfares with freight vehicles in mind results in improved infrastructure condition, reduced maintenance cost, and increased safety.

Land use context and function should be considered before determining to alter roadway geometry. Thoroughfares that feature large volumes of pedestrian and bicycle activity may not be good candidates for conversion into freight corridors, for example. Instead, municipalities are encouraged to consider alternative routing solutions and the designation of service roads that accommodate freight vehicles and loading/unloading activities.

All freight network infrastructure inherently operates as part of a regional, state, national, and international system, especially as increases in e-commerce drive further economic globalization. Because of this, once a system of projects has been identified, coordination with other local and regional transportation agencies is recommended in order to best prioritize projects and thereby optimize the flow of freight traffic in, though, and out of municipal boundaries.

Policy 2-8: Local Freight Land Use Conflict Evaluation

Cost: Low-Medium | Time Required: Medium | Impact: Medium

Land use conflicts between freight and sensitive land uses results in various negative externalities while making the task of freight land use preservation in the urban core more difficult. Compatibility amongst local land uses is an important component of quality of life and has wide-ranging impacts. Municipalities are encouraged to refer to the previous sections of this report for a more detailed enumeration of freight land use compatibility impacts. Although this report offers a wide-area assessment of freight land

[66] See *Policy Implementation: Enacting Ordinances and Executing Programs* for potential funding strategies.

use compatibility in the North Central Texas region, cities may elect to conduct more localized investigations, especially those with higher concentrations of freight activity in their jurisdiction.

At the local level, the primary task in this evaluation is the identification of specific land use conflict sites throughout the jurisdiction or in certain sub-districts.

Types of land uses that should be examined for conflicts include:[67]

- Distribution centers
- Warehouses
- Rail yards
- Manufacturing and/or assembly plants
- Chemical processing facilities
- Pipeline terminals
- Airports
- Natural resource harvesting or processing sites

The following criteria can be used to identify conflict sites:

- Freight-related noise, light, and vibration pollution
- Freight facility juxtaposition with sensitive land uses (residential, institutional, mixed-use) that do not have Good Neighbor Strategies
- Community complaints (both private residents and local businesses)
- Illegal truck parking issues
- Truck routing issues
- Blocked at-grade railroad crossings

The above criteria represent some of the most common freight land use conflict issues; however, other adverse impacts that require more granular analysis to detect may be present. These might include environmental impacts (either ecological or environmental justice), traffic delay, roadway safety, bike/pedestrian safety, and reduced freight system performance. Communities may also take issue with the location and aesthetic of freight land uses – conversations amongst community stakeholders are recommended to arrive at a workable solution.

Land use conflict identification can be accomplished via several methods. Local geographic information system analysis can be conducted that identifies locations where industrial or freight land uses are in close proximity to Sensitive Land Use types such as residential and light commercial. Once these sites have been identified, they can be analyzed on a case-by-case basis to make determinations about whether or not a conflict is present. Alternatively, a manual, systematic review can be done of known industrial sites in the county or municipality. This method tends to suit smaller or less dense communities and yields a more refined initial list of sites. City staff are encouraged to include known problem areas and sources of community complaints in their site evaluations. NCTCOG welcomes requests for technical assistance in the land use conflict identification process.

Once local land use conflicts have been identified, cities should make plans to address them. Working with private freight businesses and developers, cities can redesign problem sites and/or emplace Good

[67] Additional examples and descriptions of freight facility types can be found in ***Section 2: Freight Land Use Typology***

Neighbor Strategies.[68] Identifying and addressing freight land use conflicts directly supports the preservation of freight land uses in the North Central Texas region, especially in more dense urban districts.

Policy 2-9: Freight Land Use Preservation Plan

Cost: Low | Time Required: Medium | Impact: Medium

The preservation of freight land uses within the urban core is an essential component of NCTCOG's approach to regional freight planning. Maintaining distribution, warehousing, and manufacturing centers in close proximity to the commercial and residential land uses that consume freight services contributes to improved regional traffic conditions, improved air quality, and a more efficient freight network. This is accomplished by mitigating the effects of freight sprawl, preserving green fields for other uses, and redeveloping brownfields for more productive uses.

In order to facilitate this, cities may consider developing a Freight Land Use Preservation Plan. These plans identify key industrial and logistics assets within the jurisdiction and codify the city's commitment to maintain these land uses specifically for goods movement infrastructure. Additionally, these plans may set forth under what conditions the city will consider zoning alterations and outline the designation of Planned Industrial Districts.[69] Freight Land Use Preservation Plans should draw heavily from the community's comprehensive plan, seeking to support the economic and community development goals specified therein. They should also be subordinate to the local and regional freight plans, if already published. Cities are encouraged to coordinate with Metropolitan Planning Organization staff where technical assistance is required in plan development.

Prior to developing the plan, planning staff should work with local economic development agencies or business associations to identify specific sites or facilities that are of high importance for the local and regional freight network and make deliberate efforts to retain or optimize their zoning designation. In practice, proposals by public and private entities to alter the zoning of industrial sites should be evaluated with a baseline commitment to maintaining logistics infrastructure, ensuring that freight land uses are converted only when absolutely necessary. As an alternative to converting freight land to other uses, cities should consider soliciting proposals for freight redevelopment in underperforming, vacant, or obsolete industrial properties. Local economic structure and gap studies are useful in identifying highly productive freight facilities and logistics industry employers that can help inform land use preservation priorities.[70]

Policy 2-10: Brownfield Redevelopment

Cost: Medium-High | Time Required: Medium | Impact: Medium

According to the US Environmental Protection Agency, brownfields are defined as "A property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."[71] Typically, the cost of environmental remediation

[68] Refer to *Policy Implementation: Enacting Ordinances and Executing Programs* for potential funding strategies to use in mitigating land use conflicts.
[69] See *Policy 2-6: Planned Industrial District Designation* for more information.
[70] See *Policy 1-2: Performing Local Economic Studies* for more information.
[71] https://www.epa.gov/brownfields/overview-epas-brownfields-program

required to develop these properties acts as a significant barrier to private investors, meaning that brownfield properties often remain undeveloped.

Municipalities should consider offering monetary or tax incentives to private developers willing to invest in the restoration and conversion of these properties; brownfields are often good candidates for logistics facility siting due to the low impact geological and ecological factors have on freight operations in comparison to other business types. Additionally, brownfield redevelopment may offer substantial benefits to the community, including increased employment, residential property values, and tax revenues. Superfund sites also represent opportunities for remediation and redevelopment into productive freight facilities, and there are eight such sites within the North Central Texas region.[72]

Public-private partnerships may be utilized to help cover cleanup costs and give the city additional stake in the development project if the community has specific goals relative to the site or district in which it is located. *Policy 4-1: US Environmental Protection Agency Brownfield Revitalization Program* identifies a potential source of federal funding for brownfield redevelopment projects.

Policy 2-11: Rail Infrastructure Evaluation

Cost: Low-Medium | Time Required: Low-Medium | Impact: Medium

Rail infrastructure evaluations are systemic examinations of all rail network components within the geographic area specified. The purpose of performing a rail system evaluation is to identify local issues and opportunities for rail system improvement, especially with respect to rail yards, intermodal facilities, and at-grade crossings. These evaluations should be done in close collaboration with transit agencies and freight rail operators that own track within municipal boundaries

If not already done, a comprehensive geographic information system database of local railroad assets should be acquired or compiled.[73] Abandoned rail lines or industrial spurs no longer in use should be noted as well, as they have potential uses for conversion to other land uses. Subsequently, municipal staff may begin analyzing the local rail network for land use conflicts (especially near rail yards and crossings) with residential and commercial properties. Rail yards should have robust buffers between them and nearby non-industrial land, and at-grade crossings should be analyzed for potential quiet zone designation.

Municipalities may also investigate level-of-demand for additional freight or passenger rail access within their jurisdiction by engaging with community stakeholders and local business. Meetings with rail agencies and Metropolitan Planning Organization transportation representatives may also help to identify if any rail bottlenecks exist, and what regional plans are being pursued in order to remediate them. Cities should endeavor to be actively involved in project planning and coordinate other infrastructure improvements in tandem with rail network improvements as needed.

[72] https://www.epa.gov/superfund

[73] The Federal Railroad Administration has county-level crossing and rail databases available for download from their website: https://railroads.dot.gov/maps-and-data/maps-geographic-information-system/maps-geographic-information-system.

Policy 2-12: Off-Peak Delivery Programs

Cost: Low | Time Required: Low-Medium | Impact: Medium-High

Off-peak delivery programs encourage trucking companies and businesses to conduct deliveries during times of day other than peak travel hours, typically between 6 AM to 9 AM and 4 PM to 7 PM. Such programs can take multiple forms and may target a specific geographic area (sub-municipal district or corridor) or a specific industry. Typically, these programs are enacted to reduce conflict between private passenger automobiles and freight transportation operations by conducting and receiving freight shipments outside of peak travel demand hours associated with daily commutes. Program objectives are to reduce the amount of idling and costly delay that freight vehicles encounter when traveling on congested freeways in urban areas.

Off-peak delivery programs have the potential to bring about a variety of benefits:

- Decreased in-transit delay reduces cost of shipping services
- More consistent roadway conditions increase reliability of shipments
- Decreased idling time results in fewer emissions from freight vehicles
- More fuel-efficient trips results in cost savings to freight businesses
- Freight vehicles operating in off-peak hours are less likely to encounter pedestrians and bicyclists in dense urban areas, thereby increasing safety
- Segregation of commercial vehicle and private automobile traffic reduces severity of collisions, increasing safety

Enacting off-peak delivery programs requires participation from both freight businesses and local freight consumers. Freight consumers, specifically, must be willing to receive shipments during off-peak hours, and shippers performing the deliveries must be both willing and capable of adjusting to non-traditional delivery schedules. This level of coordination represents a sizable challenge for policy implementation.

Cities should identify which businesses are willing and able to participate in an off-peak delivery program via public outreach efforts (surveys, local business associations, interviews, etc.). Offering incentives to participate in the program may be an effective way to generate interest, in addition to public awareness presentations that demonstrate benefits and cost savings.

Policy 2-13: Cargo Vehicle Type Restrictions in Dense Urban Areas

Cost: Low | Time Required: Low | Impact: Medium

Goods movement in high-density environments represents geometric and safety challenges for many large freight vehicles. In such areas, restrictions on large freight vehicles (e.g., Class 8 tractor-trailer combinations) may be considered along certain thoroughfares, or in specific districts where automobile traffic and street/intersection geometry create unsafe or unsuitable conditions for those vehicles. Restrictions on vehicle fuel types may also be considered if municipalities are seeking to encourage the use of alternative fuel freight vehicles.

Enacting vehicle bans of this type usually require an ordinance to be enforced by local law enforcement agencies. At a minimum, signage must be installed to identify areas where the vehicle restrictions are in

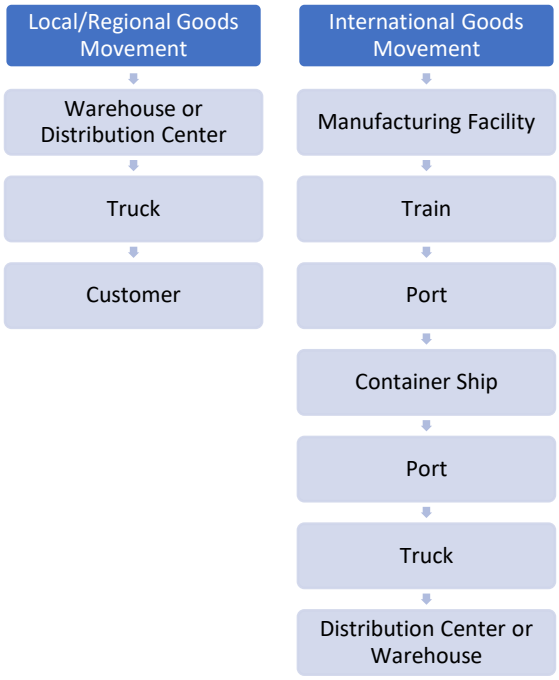
effect. When drafting the ordinance, exceptions to the policy should be identified such as emergency or service vehicles.

Policy 2-14: Encourage Intermodal Transfers

Cost: Low | Time Required: Low-Medium | Impact: High

Intermodal transfers occur when cargo is moved from one type of transportation platform to another along its journey to the destination or customer. Local or regional shipments are more likely to occur via a single mode, whereas transcontinental shipments are frequently transferred to different modes two or three times before they reach their final destination. **Figure D.2 s**hows an example of intermodal transfers.

Figure D.2: Intermodal Transfers



The mode by which cargo is conveyed is usually decided by factors such as required delivery timeframe, size and weight of the cargo, fragility, distance, overall cost, and accessibility. At the municipal level, a vital part of contributing to ease of intermodal transfer is facilitating expeditious first/last mile connections to intermodal hubs – or locations where cargo is moved between modes (e.g., airports and intermodal yards). For major freight-generating businesses or industrial operations, direct connections to rail or pipeline infrastructure is most efficient.

Trucking is the primary mode through which goods are shipped largely due to the level of access provided by the roadway network to both production and manufacturing sites, as well as to commercial businesses and other customers. However, freight and logistics sector businesses benefit from direct connections to airports and intermodal rail yards, as it provides options to shippers as to the mode by which their products are shipped. Whenever possible, cities should ensure good connections from

freight-oriented developments to intermodal facilities, which can be accomplished through sound truck routing and roadway infrastructure improvements.

The Association of American Railroads notes that "US freight railroads, on average, move one ton of freight more than 470 miles per gallon of fuel,"[74] and is usually preferred for long-haul freight shipments. However, fuel efficiency in trucks has increased significantly over the past two decades, and some destinations do not have direct or nearby access to railheads. Other considerations include the need to take more vehicles off congested urban roadways, which is accomplished by increasing rail network connectivity and encouraging mode shift. Although normally a regional concern, cities can help bolster these efforts by encouraging rail access to industrial areas and promoting freight-oriented development in and around rail yards and intermodal facilities.

Although the North Central Texas region features a large and well-established rail network, there remain many large freight-generating businesses that do not have direct access to rail spurs. Industrial campuses and business parks should be analyzed for opportunities to add such capacity within the municipal jurisdiction. Cities should also gather feedback from local businesses to see which ones would most benefit from direct rail service. All feedback and potential sites should then be taken to industrial landowners, developers, and track-owning railroad operators in the corridors specified for feasibility analysis and industry feedback.

Policy 2-15: Utilize Freight Delivery Hubs

Cost: Low-Medium | Time Required: Low | Impact: Medium

Freight delivery hubs are facilities that allow consolidated delivery of parcels and freight for multiple customers to a single location. This strategy is especially effective in high-density urban areas where delivery directly to the customer is complicated by tight spaces and lack of access for freight vehicles.

Freight delivery hubs can be scaled to match the needs of businesses and customers. For example, "freight lockers" are temporary and secure storage areas for parcels located at a business or residential location; once delivered to the freight locker, the customer receives a notification and is sent a one-time access code that is entered at the locker, allowing them to retrieve their package.

For businesses requiring larger deliveries, a freight hub may take the form of a small warehouse with easy access for trucks. Once the customer's delivery is made at the freight hub, a notification is sent to the customer, who can then dispatch a smaller vehicle (either cargo van or pickup truck) to the freight hub to retrieve the shipment. This enhances efficiency and performance for customers in dense urban areas where large freight vehicles cannot move or conduct deliveries as safely or quickly.

Policy 2-16: Freight Vehicle Emissions Reduction Program

Cost: Medium | Time Required: Medium | Impact: Low

The North Central Texas region (as of the writing of this report) is in a state of nonattainment for air quality standards set forth by the Environmental Protection Agency. Freight vehicles such as trucks, locomotives, and cargo aircraft contribute to overall greenhouse gas emissions. In pursuit of regional air

[74] https://www.aar.org/wp-content/uploads/2020/06/AAR-Sustainability-Fact-Sheet.pdf

quality goals, greenhouse gases, nitrogen oxides, and particulate matter emissions created by freight operations should be reduced by replacing outdated equipment, increasing operational efficiency, and improving infrastructure wherever possible. Municipalities can assist local businesses in reducing their air pollution emissions by establishing a program that promotes awareness and assists with implementation of emissions reduction strategies for freight operators.

A common method of reducing emissions is the replacement or repowering of freight fleet vehicles. A wide range of associated expenses are eligible to be funded by state and federal programs, including the repowering of fleet vehicles (conversion to alternative fuels) and replacement of older, less fuel-efficient vehicles with more fuel-efficient conventionally fueled vehicles, as well as the purchase of new alternative fuel vehicles. Alternative fuels frequently considered for freight uses include battery electric (for local delivery vehicles or yard equipment), liquid natural gas, compressed natural gas, and hydrogen.

Another method of reducing emissions is by making operational modifications to shipping, manufacturing, and delivery processes. Examples of this include off-peak delivery programs,[75] freight delivery hubs,[76] truck routing reviews,[77] expanding mass transit access to industrial employment centers, and others. Municipal and regional coordination with freight businesses is necessary to implement operational modifications. Public sector entities must be willing to assist in providing the needed resources and coordinate such efforts across multiple private and public organizations to achieve implementation.

The use of local, state, and federal funding opportunities for freight vehicle emissions reductions strategies can help overcome fiduciary obstacles in the implementation of this policy.

Policy 2-17: Promoting Freight Technology and Innovation Programs

Cost: Medium | Time Required: High| Impact: High

A recent wave of innovative technology applications in the freight transportation industry have resulted in the need for local governments to consider how to integrate these technologies into the existing transportation system, and how private sector users are applying them to business operations. Examples of these technologies include:

- Driverless and automated trucks
- Unmanned aerial systems and drones
- Automated freight delivery robots
- Automated freight shuttle systems

Many of these emerging technologies require high-quality roadway infrastructure to operate safely and effectively, and coordination with public sector law enforcement and transportation agencies is crucial as new transportation technologies are tested and deployed. Cities are encouraged to communicate with local freight businesses that are involved with freight technology developers and prioritize transportation system improvements where automated vehicles are being used or tested.

[75] See *Policy 2-12: Off-Peak Delivery Programs*
[76] See *Policy 2-15: Utilize Freight Delivery Hubs*
[77] See *Policy 2-1: Truck Routing Ordinance Establishment & Review*

Furthermore, technologies that enhance the performance of existing infrastructure should be fostered (e.g., traffic signal optimization technologies, roadway sensor equipment upgrades, etc.). Cities may also pursue operational modifications to infrastructure within freight-oriented developments in order to augment efficiency and safety such as programming signals along freight corridors to prioritize the flow of commercial vehicle traffic over that of private motorists.

Lastly, municipalities may also pursue investment in infrastructure for alternative fuel and automated vehicles such as automated vehicle truck ports, hydrogen fuel stations, and electric charging stations. Developing infrastructure for these technologies can foster investment by outside businesses and promote innovation, economic development, and freight transportation system efficiency.

Policy 2-18: Establish Truck Lane Restrictions

Cost: Low | Time Required: Low | Impact: Medium

Truck lane restrictions prohibit trucks from driving in specified lanes on freeways, usually the leftmost lane and, occasionally, the middle lane. The purpose is to separate private automobile traffic from commercial vehicle traffic, which has been shown to improve safety by reducing the severity and frequency of accidents involving commercial vehicles and improve the flow of traffic overall.[78] These restrictions are implemented jointly by local and state governments.

Truck Lane Restrictions

Source: NCTCOG

A highway corridor (or portion of a corridor) is recommended for truck lane restrictions if it meets the following criteria:

- Annual average daily truck traffic is higher than 4 percent
- At least 10 percent of truck traffic is using the lane for which a truck lane restriction is being contemplated

[78] According to research completed by the Texas Transportation Institute, https://static.tti.tamu.edu/tti.tamu.edu/documents/0-4761-S.pdf

- Is absent of left exits
- Has at least three travel lanes (excluding frontage roads)

Researchers recommend that truck lane restrictions be implemented in highway sections of not less than six continuous miles and should begin and end at roughly one mile beyond any entry or exit ramps to allow sufficient opportunity for motorists to move into the correct lane. Local governments should conduct a review of highway conditions and verify commercial vehicle activity data prior to implementing truck lane restrictions, and monitor their performance once emplaced. Overall, truck lane restrictions offer a relatively low-cost method to improve mobility and safety for highway users.

Policy 2-19: Regulate Site Design and Industrial Property Attributes

Cost: Medium | Time Required: Medium | Impact: Medium

In the site design phase, communities contemplate the characteristics of specific sites, facilities, and plots of land, rather than focusing on broad geographical subdivisions of the city. The local government should regulate the design of freight facilities in accordance with the community's economic strategy and the vision identified in the community's master plan. Many of the Good Neighbor Strategies outlined in earlier sections of this report can be implemented during the site design phase such as mandating the emplacement of buffer zones and limiting access to freight facilities via residential roadways. *Policy 3-3* of this toolkit outlines specific design requirements planning staff may consider implementing.

The community may also elect to stipulate more specific and quantitative regulations, such as floor-area ratio and building coverage percentage restrictions, depending on density goals and geospatial context. Many of the same types of regulations found in a form-based zoning code can be utilized, especially if the industrial district in question is historically or socially significant. Alternatively, if the site is located in an extant freight-oriented development, site design requirements may be more lenient since SLUs will not be nearby. Planners must be careful in crafting site design stipulations not to be overly restrictive, as certain design features may make developing an industrial facility too costly or impede business operations to an extent that private developers are unwilling or unable to accommodate. Open communication with both planning staff and policy bodies is crucial during this step, as site design stipulations may need to undergo multiple rounds of administrative review and alteration.

Key Tasks:

- Determine design aspects that need to be regulated (if any)
- Develop design standards
- Synchronize planning and land use permitting office disposition toward conditional use permit applications
- Solicit industrial developer feedback on proposed regulations

Recommended Resource: The National Cooperative Highway Research Program Research Report 844: *Guide for Integrating Goods and Services Movement by Commercial Vehicles in Smart Growth Environments (2017)*

Site Design

This section of the toolkit provides recommendations that pertain to the physical form of freight facilities, especially with regard to those identified in Land Use Type 1 (Warehousing and Distribution). It also covers policies that should be considered in the third step in planning for freight land uses, which is to determine what the community wishes to require of new and existing freight land uses regarding their physical form. These requirements will depend on the goals stated in the local comprehensive plan and transportation plan, and community and private sector feedback.

Multilateral partnerships and open communication with private sector partners should be employed in this step to identify barriers to implementation such as cost and structural feasibility. In areas of land use conflicts or areas of concern (see **Section 3.0** of this report), the policies outlined in this section of the toolkit can be utilized as treatments to mitigate or prevent conflicts. Properties within highly industrialized districts should be considered differently from other properties since the sensitivity of adjacent land uses is likely to be lower. Additionally, planners should pay attention to areas where land uses are transitioning or where they are likely to transition to other uses and ensure that Good Neighbor Strategies are implemented prior to new developments.

Policy 3-1: Utilize Off-Street Loading Facilities

Cost: Medium | Time Required: Low-Medium | Impact: Medium

Off-street loading facilities are stations or docks at a facility where freight vehicles can easily park and load or unload cargo, thereby eliminating the need for trucks to park on streets to make deliveries. This policy is applicable for commercial and industrial facilities in dense urban environments where loading docks and staging areas for commercial vehicles do not exist, and where freight deliveries must occur within streetside loading zones.

Streetside loading zones, especially during peak hours, can present safety risks to freight vehicle operators, take up valuable streetside parking space, and have the potential to impede the flow of both motor vehicle and pedestrian traffic. Furthermore, streetside loading zones require more time for unloading, and thus are less efficient for businesses. Cities with dense urbanized areas within their jurisdiction should consider the designation or construction of off-street loading facilities for new buildings and for those undergoing significant renovation. Off-street loading facilities can take the form of internal loading bays, loading zones within attached parking garages, designated alleyways, or other versatile spaces that can be reserved for freight activity during certain times of day. These offer several benefits:

- Increased safety for motorists and truck drivers
- More efficient deliveries
- Fewer blocked lanes in adjacent thoroughfares
- More efficient and safe routes for pedestrians and cyclists

Designating additional space for freight activity on the property may not always be possible due to building configuration or the price of land. In these scenarios, cities should designate curbside loading zones that safely accommodate freight vehicles and loading/unloading activities in dense urban environments.

Policy 3-2: Designate Curbside Loading Zones

Cost: Low | Time Required: Low | Impact: Low

Curbside loading zones are designated spaces along the road shoulder or street parking spaces where commercial vehicles are permitted to park and load or unload cargo (often for a specified amount of time). When the use of off-street loading facilities is not available, curbside loading zones should be designated, especially in dense urban areas. The municipality should work with local businesses to identify sites where curbside deliveries are required.

Oftentimes, shortages of on-street parking spaces cause freight drivers to park illegally. This makes it difficult for trucks to complete deliveries safely and quickly, and not impede the flow of traffic on high-volume urban roadways. In areas where parking and loading spaces are difficult for delivery vehicles to find and use, freight operators may have decreased on-time performance, while businesses suffer from increased shipping costs. Bicycle, pedestrian, and motor vehicle safety can likewise be adversely affected without space for commercial vehicles to conduct staging and loading along busy urban thoroughfares.

Policy 3-3: Establish Site Design Requirements (Good Neighbor Strategies)

Cost: Medium | Time Required: Medium | Impact: High

The cornerstone of freight land use compatibility is effective site design. This policy highlights multiple aspects of freight facility design that should be considered when developing or redeveloping freight land uses, addressing land use conflicts, or attempting to improve existing facilities.

Sound Wall Emplacements: A sound wall is a barrier that reduces the level of noise adjacent land uses are exposed to. Sound walls are especially effective when combined with vegetation such as trees and shrubs and can be a valuable addition to a buffer zone or setback, depending on the severity of existing land use conflicts or the proximity of a freight facility to an SLU. A sound wall is of good quality if it reduces measurable noise emissions a minimum of five decibels and is at least six feet high. A sound wall is often not needed if supplemental vegetation, high-quality fencing, or sufficient offsets are in place.

Earthen Berm Emplacements: Earthen berms are mounds of earth, rock, gravel, sand, or similar material that is piled up around the periphery of a property as a barrier or as part of a buffer zone. In addition to impeding access to the property, they can help block unappealing sight lines and mitigate noise and light emissions. These can be required by zoning codes or mandated by agreements between local governments and freight businesses. Berms can be combined with supplemental vegetation or fencing to break up unappealing sight lines.

Staging Area Requirements: Freight facilities should provide sufficient space for delivery vehicles to park while waiting for their opportunity to load or unload cargo. This prevents truck parking and safety issues while ensuring the flow of traffic on nearby streets is not impeded. Municipalities should communicate with freight businesses that lack sufficient staging areas regarding operational adjustments that can be made. This strategy may also be relevant for commercial facilities that frequently receive large freight deliveries.

Establish Sustainability Requirements: Depending on community, local government, and private sector goals for sustainability, municipalities may consider encouraging or requiring freight businesses and developers to implement design features that reduce carbon emissions and preserve ecological assets. Examples of these include:

- Requiring the use of electrically powered material handling equipment
- Offering incentives for the installation of solar panels in parking areas or on the roofs of warehouses/distribution centers
- Systems that harvest and recycle rainwater within the facility
- Installing high-efficiency lighting and equipment throughout the facility
- Considering implementing Leader in Energy and Environmental Design standards and certification

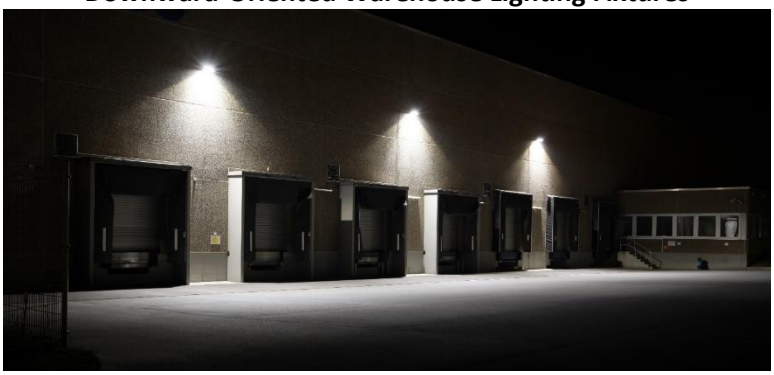
Local governments should be mindful of the costs associated with sustainable technologies and work with private sector partners to incentivize their implementation using financial or regulatory tools. For example, a city may offer to pay for a portion of new battery electric material handling exchange at a new warehouse or relax building height restrictions in exchange for the developer achieving at least an Energy and Environmental Design Bronze certification. Sustainability and environmentally sensitive sight design can support both public and private sector emissions reduction targets while enhancing the overall quality of the development.

Equipment and Container Storage Regulation: Municipalities are recommended to consider the implementation of requirements for the storage of equipment and materials (separate from staging area requirements mentioned earlier in this policy) such as storing material handling exchange, shipping containers, palletized goods, and other items that are required for freight operations.

Furthermore, zoning ordinances can be used to establish minimum setback requirements for facilities near SLUs. These mandate the emplacement of a minimum distance between nearby buildings. Although not always necessary in freight-intensive districts, minimum setbacks for new freight development should be considered for industrial properties located near commercial, residential, or institutional land uses. While buffer zones can easily be constructed as an improvement to an existing property, setbacks must be implemented before new freight facilities are developed.

Facility Exterior Lighting Requirements: Municipalities should consider the implementation of design requirements for light fixtures that limit light pollution. These requirements should, at a minimum, ensure that light fixtures are directed downward (minimizing light pollution in the night sky) and away from nearby SLUs, especially private residences. Depending on sustainability goals, it may also be desirable to require the use of high-efficiency bulbs to reduce energy consumption and environmental impact, and if interior lighting is included in the regulation, mandate the installation of motion sensors and other sustainability focused technologies.

Downward-Oriented Warehouse Lighting Fixtures



Source: Getty Images

Policy Implementation: Enacting Ordinances and Executing Programs

This step is the culmination of the previous three steps and involves the codification of selected ordinances and zoning code recommendations. Proposed ordinances should be considered by policy bodies (e.g., planning/zoning commission, city council, others as necessary) and officials should execute agreements and partnerships with freight operators in their jurisdiction.

Policy 4-1: US Environmental Protection Agency Brownfield Revitalization Program

Cost: Low | Time Required: Low-Medium | Impact: Medium

The Brownfield Revitalization Program is administered by the Environmental Protection Agency and offers grants and loans for site cleanup and environmental remediation, including assessment and job training activities. Since site cleanup cost is often a major barrier to private sector investment in these properties, municipalities should consider applying for funding through this program when planning brownfield redevelopment projects.

Key highlights:

- Grants for site cleanup may be applied for in amounts up to $500,000 for one or multiple brownfield sites
  - Applicants may only submit one Cleanup Grant proposal during each competition cycle
  - Requires a 20 percent local cost share (can be waived if the municipality has a population of less than 50,000)
- Brownfields Assessment Grant funds may be used for planning activities, cleanup plan development, and community involvement
  - Different grants and amounts for communitywide and site-specific assessments, as well as for assessment coalitions (see below table)
- Multipurpose Grants may provide up to $800,000 in funding for a range of cleanup and assessment activities in a target area
  - At the time of application, the applicant must own a site that meets the legal definition of a brownfield site within the target area wherein cleanup activities may be conducted
  - Requires a $40,000 cost share, which may be in the form of money, labor, material, or services, and must be for eligible and allowable costs

Municipalities interested in brownfield remediation activities other than assessment, cleanup, and redevelopment, may also consider applying for Environmental Workforce Development and Job Training Grants[79] and State and Tribal Response Program Grants.[80]

This toolkit provides a universal way to promote better land-use decisions across the region. There is no one-size-fits-all solution because every city is unique. However, it is important to use this toolkit as a guide to help promote sustainability and quality-of-life for communities in the region. Freight transportation is the community's link to the global economy and is, therefore, vitally important to preserve and use land in a sustainable way.

Brownfields Assessment Grant Types		
Grant Sub-Type	**Maximum Award**	**Remarks**
Communitywide Assessment Grant	$300,000	Used when a specific site is not identified and the applicant intends to spend grant funds on more than one site.
Site-Specific Assessment Grants	$200,000	Used when a specific site is identified and the money will be spent on this site only.
Assessment Coalition Grants	$600,000	Used when one lead agency manages the Environmental Protection Agency cooperative agreement for multiple other eligible entities, and assessment will be conducted in each coalition member's community.

Policy 4-2: Zoning Strategies

Cost: Low | Time Required: Medium | Impact: High

Zoning plays a critical role in freight land use preservation and is instrumental in the implementation of the Good Neighbor Strategies outlined elsewhere in this section. Statutorily designating freight land uses along key industrial corridors or activity centers helps prevent encroachment and can be a way for municipalities to foster freight land use development where it otherwise does not exist. Zoning is also a primary tool in brownfield redevelopment strategies, as well as other redevelopment activities of underperforming land uses. This policy enumerates a variety of zoning strategies and how they pertain to freight land use.

Conventional Zoning: Conventional zoning techniques can be used to separate industrial land from other land use types by defining industrial and freight-related land use designations and implementing them into the zoning ordinance. The following should be considered when zoning for freight land:

- Freight districts should have sufficient access to truck routes, highways, railroads, airports, or intermodal facilities based on the type of facility being constructed.
- Transportation infrastructure should be constructed to accommodate the anticipated levels of truck traffic or other freight traffic that new development would generate (roadway geometry, overhead clearance, weight capacity, etc.).

[79] https://www.epa.gov/brownfields/environmental-workforce-development-and-job-training-ewdjt-grants
[80] https://www.epa.gov/brownfields/state-and-tribal-response-program-grants

- Municipalities may choose to adopt additional design requirements in addition to basic zoning specifications to ensure that freight facilities maintain the visual character of their surroundings.
- While large facilities with intensive freight activity may be located at a distance from SLUs, smaller facilities may be preferable to designate in mixed-use areas.

Local planners should develop design guidelines and zoning requirements that balance the objectives outlined in the comprehensive plan and the needs of local businesses.

Form-Based Code: Form-based code (FBC) is a common zoning strategy that focuses on the physical form of the built environment rather than the uses that comprise the structures. Many cities use FBC to maintain a certain look and feel of a neighborhood, downtown district, or historical district. In new developments, it is used to create vibrant public spaces with a mix of uses, often mandating a similar design language to be used throughout.

Because the focus of FBC is on the quality of the public realm and not the uses of structures and land, certain types of freight land use development can be a valuable addition to a form-based zoning district. Most types of Land Use Type 1 (Warehousing and Distribution) and some types of Land Use Type 5 (Manufacturing and Processing) are especially eligible for inclusion in FBC districts, provided Good Neighbor Strategies are implemented and there is sufficient access to rail lines or highways.

There are multiple key areas of emphasis stakeholders should address when considering freight in an FBC environment:

- Medium- and heavy-duty trucks often have poor sightlines in the immediate vicinity of their vehicles. In the interest of safety, truck traffic should be routed away from areas with significant pedestrian or bicycling activity. The entryways and exits should be facing away from significant bike/pedestrian thoroughfares.
- Some types of freight facilities produce or process large amounts of chemicals or other hazardous materials. These facilities may not be optimal for inclusion in FBC districts. If included, care should be taken to minimize pollution and safety concerns.
- Planners and land use decision makers should work with freight land developers on the design of their facilities and develop standards for the accommodation of operational and functional features as necessary (lighting, loading bay placement, staging areas, etc.).

Readers are directed to **Sections 3.1** and **3.2** of this document for more information on the attributes and issues pertaining to unique types of freight facilities.

Performance Zoning: Performance zoning, rather than based on the physical attributes or purpose of developments, focuses on the intensity of activity within a property and the effects they have on surrounding land uses. These regulations allow land use decision makers a large amount of flexibility in where industrial properties are located, as long as the impacts of the freight development on other properties is small. In order to be effective and feasible, municipalities desiring to implement performance zoning must:

- Identify clear and relevant performance metrics for land uses within the designated district
- Designate a method by which the performance of properties will be monitored and the regulatory mechanism by which it will be enforced

Performance zoning may be an effective tool, especially in high-demand areas of development near industrial sites. Local governments may implement performance standards that, while regulating certain design aspects, allow compatible development adjacent to industrial properties, as long as the external impacts of the industrial properties are kept within a certain threshold. Examples of metrics relevant for industrial properties include:

- Noise emissions from industrial activities during nighttime hours
- Intensity of light emissions during nighttime hours
- Truck-related traffic congestion on surrounding roadways
- Safety incidents involving trucks or freight equipment involving surrounding properties
- Ground, water, or air pollution measurements

It should be noted that feedback from residents and business owners, as well as site visits to affected areas, should always be considered when measuring impacts on other land uses.

This toolkit is a great asset for cities and local governments to make effective and efficient planning decisions for their communities. The toolkit is available and ready to use for freight stakeholders and cities. For any questions or concerns, please contact freight staff.