REGIONAL FREIGHT PLAN

Working Paper 1: Existing and Future Conditions

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Acronyms / Abbreviations

AADT	Annual Average Daily Traffic
AADTT	Annual Average Daily Truck Traffic
ARA	Accident Reports Act
ARIES	Automated Reporting Information Exchange System
ATRI	American Trucking Research Institute
BTS	Bureau of Transportation Statistics
CIND	Central Railroad Co. of Indiana
CMAQ	Congestion Mitigation and Air Quality
EJ	Environmental Justice
ELD	Electronic Logging Devices
FAA	Federal Aviation Administration
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FRSA	Federal Railroad Safety Act
GDP	Gross Domestic Product
HGL	Hydrocarbon Gas Liquids
HHPA	Hoosier Heritage Port Authority
ICC	Index of Crash Cost
ICF	Index of Crash Frequency
IMPO	Indianapolis Metropolitan Planning Organization
INDOT	Indiana Department of Transportation
IND	Indianapolis International Airport
INRD	Indiana Rail Road Company
ISSR	Indiana Southern Railroad
LI	Louisville & Indiana Railroad Co
LOS	Level of Service
LRTP	Long-Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century
MDL	Manufacturing/Distribution/Logistics
MQJ	Indianapolis Regional Airport
MUTCD	Manual of Uniform Traffic Control Devices
NAICS	North American Industry Classification System
NHPFN	National Highway Primary Freight Network

NHS	National Highway System
NPMRDS	National Performance Management Research Data Set
NS	Norfolk Southern
PDO	Property-Damage-Only
PHED	Peak Hour Excessive Delay
ROW	Right of Way
STRAHNET	Strategic Highway Network
SWOT	Strength, Weaknesses, Threats, and Opportunities
TAZ	Transportation Analysis Zone
TDM	Travel Demand Model
TIF	Tax Increment Financing
TTTR	Truck Travel Reliability
TYQ	Indianapolis Executive Airport
US	United States
USDOT	United States Department of Transportation
USPS	United States Postal Services

Executive Summary

The Indianapolis Metropolitan Planning Organization (IMPO) is the designated planning organization for Central Indiana, responsible for investing federal transportation funds in the highways, transit, non-motorized transportation, and other modes of people and goods movement in the eight counties of Marion, Boone, Hamilton, Hancock, Hendricks, Johnson, Morgan, and Shelby.

The IMPO is conducting this Regional Freight Plan to identify the regional planning needs, prioritize multimodal infrastructure improvements, and develop policy recommendations to enhance the freight corridors and areas in the Central Indiana region.

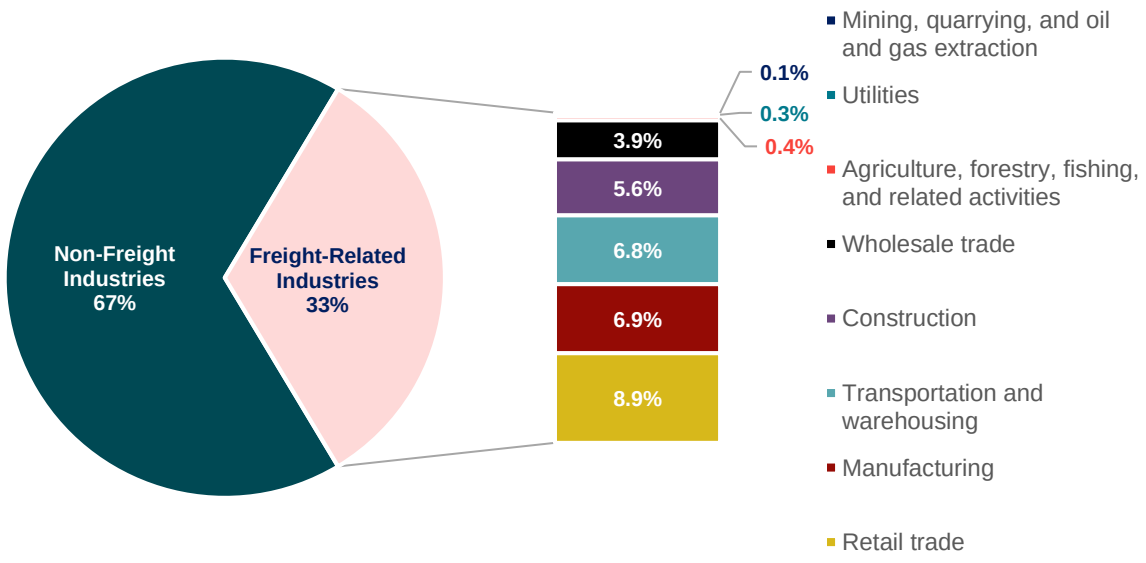
The IMPO Regional Freight Plan will provide a clear understanding of the region's freight system, link the freight operational performance to the local industry activities, and identify freight needs and issues.

The Plan will include key findings and relevant content from previous related studies, plans, and formal documents, including the Indiana Department of Transportation (INDOT)'s Multimodal Freight Plan and Long-Range Transportation Plan (LRTP), IMPO's LRTP 2045 and 2015 Freight Plan, and other local documents to provide an up-to-date understanding of Central Indiana's freight network and identify existing and future freight needs in the region.

IMPO Region's Economic Context

The region's economy is supported by industries that rely on the transportation of physical goods to support their operations. These freight-related business establishments employ over 33 percent of the region's workforce. In particular, manufacturing, retail and wholesale trade, and transportation stand out as important freight-related industries in the region.

Figure 1: Freight-related Employment – 8-County Region



Source: CPCS analysis of Bureau of Economic Analysis Data (2019), 2021.

IMPO Region's Freight Transportation System

Nearly 70 percent of the cargo tonnage moved in the Indianapolis-Carmel-Muncie area is carried by trucks. Meanwhile, pipelines carry 23 percent of the cargo, and carload rail traffic represents about 7 percent of the cargo tonnage moved in the area. The rest is carried by air cargo and combination of modes (including intermodal rail).[1] The region is served by about 370 miles of interstate, 140 miles of US highways, and 190 miles of state highways. Several weigh-in-motion stations, public truck stops, industrial parks, public refrigerated warehouses, and intermodal/transload facilities also support the region's freight activities. The corridors that serve relatively high truck volumes include I-65, I-69, I-70, I-74, I-465 (or USS Indianapolis Memorial Highway), I-865, US-31, US-36, US-40, and IN-37.

Additionally, about 220 miles of CSX Class I railroad and over 100 miles of regional and short line operations serve the region, supported by two intermodal rail terminals and eight truck/rail transload facilities. Also, the Central Indiana & Western Railroad serves Industrial Recyclers, a transload facility in Anderson, which is about 30 miles northeast of Indianapolis.

The IMPO region also has a robust air cargo infrastructure network, which contains one cargo service airport and five reliever airports identified by the Federal Aviation Association (FAA). The Indianapolis International Airport (IND) is ranked the eighth largest cargo airport in the US, handling over 1,000,000 metric tons of freight in 2019. The IMPO's freight system assets also include multiple natural gas, petroleum products, hydrocarbon gas liquids pipelines which deliver liquefied goods to and through the Indianapolis Metropolitan Area.

IMPO Region's Freight System Condition

During freeway peak commute periods, there are small pockets of congestion in the Indianapolis metropolitan area that impact trucking operations. Additionally, there are safety hotspots in the region where truck-involved collisions occur. Over 5,100 truck-involved collisions occurred in the region between 2015 and 2019, leading to 2,649 injuries and 121 deaths.[2]

In terms of the rail system condition, about 46 percent of the Class I system and nearly 8 percent of the short lines in the region can accommodate double-stacked trains. Also, almost the entire length of Class I and Class II railroad tracks in the IMPO region can carry 286,000 pound railcars. This compares to a much lower 11 percent of the short line system in the IMPO region is 286,000 pound capable. The freight rail system in the Indianapolis region experienced 58 incidents in 2019, which led to 8 deaths and 12 injuries. Trespassing incidents accounted for 62 percent of the 2019 freight rail casualties.

Between 2014 and 2019, 90 incidents occurred at at-grade highway-rail crossings in the region resulting in 11 deaths and 39 injuries. Single-unit trucks and tractor-trailers were involved in 18 percent of the highway-rail grade crossing incidents in the IMPO region.[3]

Next Steps for the IMPO Regional Freight Plan

This Working Paper provides context for all future work on the IMPO Regional Freight Plan. The data and analysis presented in this Working Paper will be complemented with feedback and insight from stakeholder consultations and committee meetings. Together, this data and feedback will be used to create a comprehensive assessment of the region's freight-related needs, issues, and potential improvements in Working Paper 2, Indianapolis Regional Freight System Strengths, Weaknesses, Opportunities and Threats.

[1] FHWA, FAF 4.5, accessed July 2021.

[2] CPCS analysis of road safety data provided by IMPO, 2021.

[3] CPCS analysis of FRA Safety Database, 2021.

1 Introduction

Key chapter takeaway

This chapter provides an overview of the findings from the review of the relevant reports, studies, and documents at the state, regional, and local levels. It also provides a high-level assessment and summary of the Central Indiana regional freight system and industries.

Key takeaways from the review of relevant studies, plans, and documents include:

- The IMPO region has a dense highway network supporting truck activity in the region and is complemented by a carload and intermodal rail presence that provides the region's industries with access to the national rail network for a wide variety of goods. Additionally, the Indianapolis Airport is the 6th largest air cargo airport in the U.S.
- The IMPO region has a thriving and growing business hub based in part on its proximity to other major markets, including Chicago and Cincinnati. Manufacturing and industrial businesses continue to thrive in the region.
- There are pockets of issues in the IMPO region related to bridge and pavement conditions and vehicular congestion.
- Marion County has a few areas where Environmental Justice is an issue.

An intertwined system of Interstates, US Highways, State Highways, and local routes connect the region's shippers, distributer, and consumers. The IMPO region is also served by one Class I railroad and four short lines as well as several rail-served facilities. The Indianapolis International Airport (IND) provides air cargo is the eighth largest cargo airport in the country and home to the world's second-largest FedEx facility.

The freight-related industries located in the eight counties of the IMPO region generate over 39 percent of the region's GDP. Manufacturing, wholesale trade, and retail trade are the top three GDP contributors among the region's freight-related industries. Over half of the region's freight-related businesses are located in Marion County and about 15 percent are in Hamilton County. Only agricultural businesses are dispersed throughout the region and tend to be in more rural areas in each county.

1.1 Background

The Indianapolis Metropolitan Organization (IMPO) is the designated planning organization for Central Indiana, responsible for investing federal transportation funds in the highways, transit, non-motorized transportation, and other modes of people and goods movement in an area that covers all of Marion County and portions of Boone, Hamilton, Hancock, Hendricks, Johnson, Morgan, and Shelby Counties.

The IMPO's Regional Freight Plan is currently under development to identify the regional planning needs, prioritize multimodal infrastructure improvements, and develop policy recommendations to enhance the freight corridors and areas in the Central Indiana region. The Plan will provide a clear understanding of the region's freight system, link the freight operation performance to the local industry activities, and identify freight needs and issues.

This Working Paper provides a synthesis of the extent of current freight operations in the IMPO region and the characteristics of the existing freight transportation system that supports the movement of goods. The Working Paper includes a high-level assessment of freight mode shares in the region and

a description of freight-related industries. Next, freight systems in the region are examined using a modal approach. The same modal approach is also used to present a high-level overview of expected growth in freight activities and potential impacts on the transportation system performance.

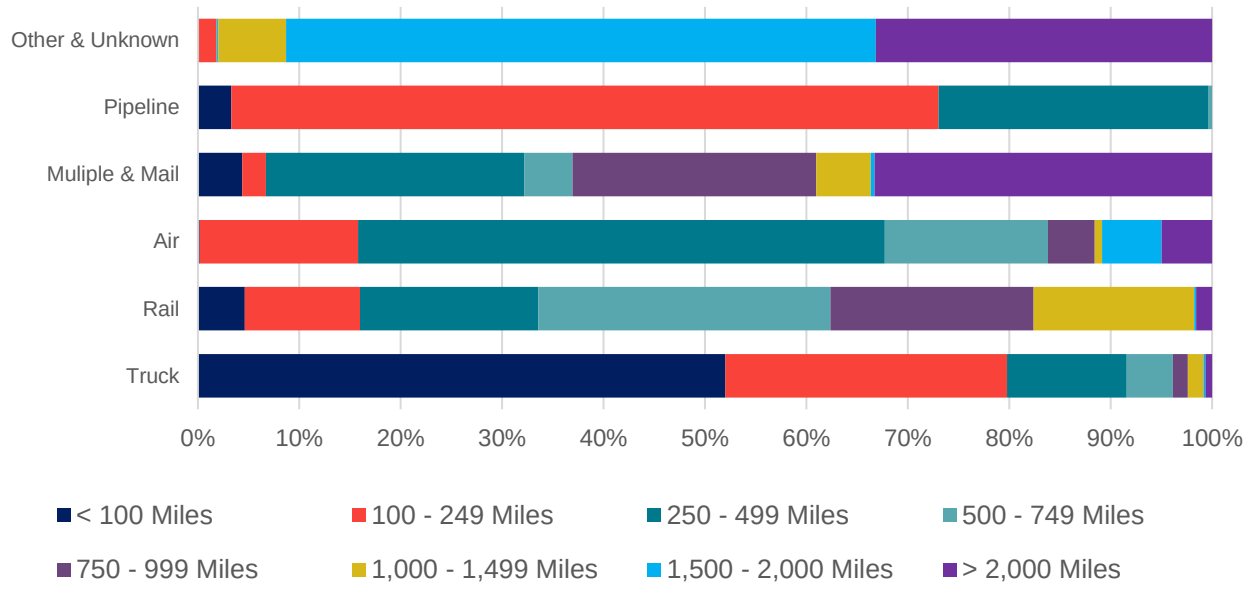
1.2 IMPO's Multimodal Freight System

The IMPO region's transportation system is a foundational asset to the economic vitality of Central Indiana. A system of Interstates, US Highways, State Highways, and local routes connect the region's producers, shippers, distributers, and consumers. The IMPO region is also served by one Class I railroad and four short lines, as well as several rail-served facilities. The Indianapolis International Airport (IND) provides air cargo, is the eighth largest cargo airport in the country, and home to the world's second-largest FedEx facility.

1.2.1 Freight System Modal Shares

According to Freight Analysis Framework 4.5 (FAF 4.5) 2020 estimates, nearly 69 percent of the cargo tonnage moved in the Indianapolis-Carmel-Muncie commodity flow survey area[4] is carried by trucks. Meanwhile, pipelines carry 23 percent of the cargo, and rail lines carry about 7 percent of the cargo tonnage moved in the area. The rest (less than 1 percent), is carried by air cargo and combination of modes (multiple and mail category). As Figure 2 shows, about 80 percent of the truck trips in the Indianapolis-Carmel-Muncie area over distances of 250 miles or less. This is while about 47 percent of rail trips serve origins and destinations that are between 250 and 750 miles apart, and 68 percent of origins and destinations served by air cargo trips are between 250 and 750 miles apart.

Figure 2: Modal Share of Freight Over Various Distances in Indianapolis-Carmel-Muncie Area



Source: CPCS analysis of FAF 4.5 Database.
*Other category includes air and truck, mail, multiple, and unknown modes.

Coal and petroleum products, gravel and crushed stones, gasoline, ethanol, and aviation fuels, and base metal are the top commodities moved in the Indianapolis-Carmel-Muncie area using various modes. More than 90 percent of the gravel and crushed stone originated, destined, or moving through the area is carried by trucks. Businesses carrying cereal grains and prepared foods also heavily rely

[4] The FAF analysis zone is not the same as the Indianapolis MPO boundary. The FAF zone is a larger area with more FAF zones, so non-MPO activities are included in this commodity information.

on trucks for transporting their cargo. These commodities are also carried by rail, while rail is the primary mode of transportation for logs, lumber, and fuel woods. The highest volumes of cargo transported by air are pharmaceuticals, chemical products, and plastics. Coal and petroleum products are primarily carried by pipelines in the area (Figure 3).

Figure 3: Commodity Volumes in Indianapolis-Carmel-Muncie Area

Commodity Category	2020 Annual Volume (1,000 Tons)
Coal and Petroleum Products	26,328
Gravel and Crushed Stone (excludes Dolomite and Slate)	20,208
Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene and Fuel Alcohols)	12,001
Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes	10,971
Cereal Grains	10,790
Non-Metallic Mineral Products	10,074
Prepared Foodstuffs, Fats and Oils	9,740
Waste and Scrap (excludes of agriculture or food)	5,674
Mixed Freight	5,643
Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)	4,978
Motorized and Other Vehicles (includes parts)	4,775
Animal Feed, Eggs, Honey, and Other Products of Animal Origin	4,612
Miscellaneous Manufactured Products	4,564
Fertilizers	4,267
Wood Products	3,539

Source: CPCS analysis of FAF 4.5 Database, 2020 forecasts.

1.3 IMPO's Freight-Related Industry

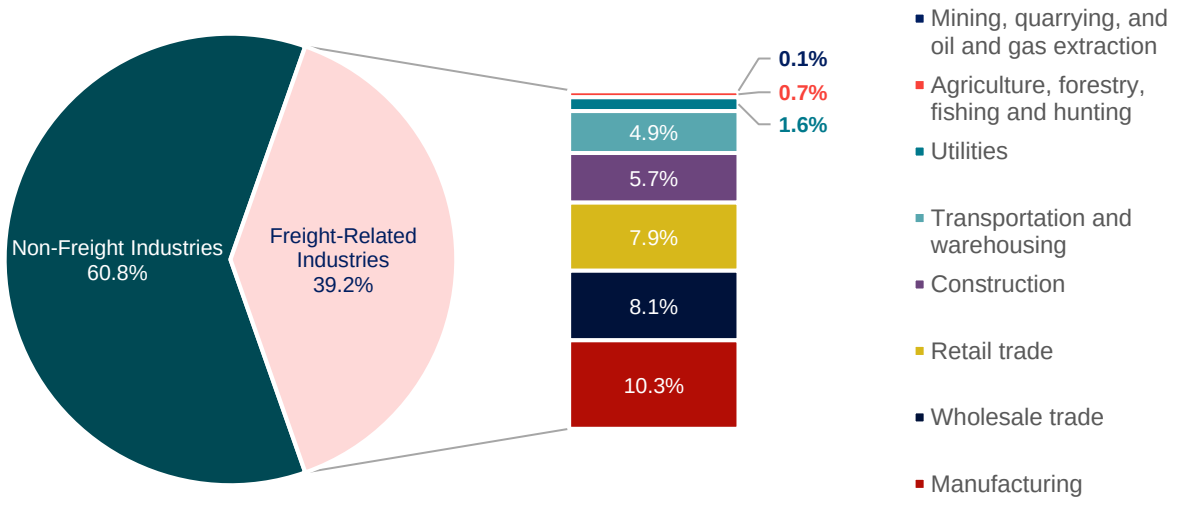
1.3.1 Freight-Related Economy

Freight-related industries are industries that highly rely on the freight transportation system for their operations. These include:

- Agriculture, forestry, fishing, and related activities
- Mining, quarrying, and oil and gas extraction
- Utilities
- Construction
- Manufacturing
- Wholesale Trade
- Retail Trade
- Transportation and Warehousing

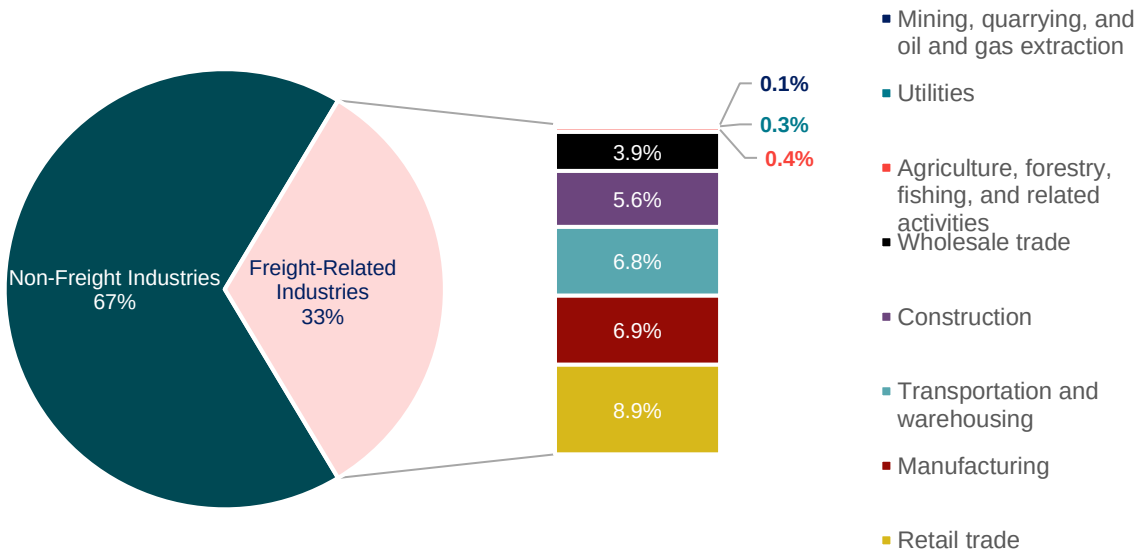
Within the eight counties of the IMPO region, the freight-related industries generate over 39 percent of the Gross Domestic Product (GDP). As shown in Figure 4, manufacturing (10.3%), wholesale trade (8.1%), and retail trade (7.9%) are the top three GDP contributors among the identified freight-related industries. In comparison to the freight-related industries' shares of GDP, their shares of employment illustrated in the figure below take up a lower percentage (32.8%) of the total employment in the area. The three industries with the highest employees are retail trade (8.9%), manufacturing (6.9%), and transportation and warehousing (6.8%).

Figure 4: Freight Contribution to Economic Output (measured in dollars) – 8-County Region



Source: CPCS Analysis of Bureau of Economic Analysis Data (2019), 2021.

Figure 5: Freight-related Employment – 8-County Region



Source: CPCS Analysis of Bureau of Economic Analysis Data (2019), 2021.

1.3.2 Freight-Related Business Environment

A welcoming business environment attracts new investments and accelerates the growth of existing business establishments. Multiple national polls and researches have recognized Indiana's top-ranked business environment with its government efficiency, fiscal stability, affordability, etc. While the Indianapolis metropolitan region shares those business advantages, its access to multiple interstates and railroad services (details in Chapter 2) and high concentration of logistics facilities (Figure 7 and Figure 5) enhance its business friendliness.

Additionally, Indiana attained high ranks in multiple categories that are key factors for the manufacturing and logistics business site selections. According to the report card shown in Figure 6, Indiana is the nationwide lead in manufacturing industry health, logistics industry health, tax climate, and global reach. Most the other categories also improved or remained stable between 2016 and 2017.

Figure 6: Manufacturing & Logistics Report Card for Indiana (2016 & 2017)

Category	Variable Measured	2016 Rating	2017 Rating
Manufacturing Industry Health	• Share of total income earned by manufacturing employees • The wage premium paid to manufacturing workers relative to the other states' employees • The share of manufacturing employment per capita.	A	A
Logistics Industry Health	• Share of logistics industry income from total state income • The employment per capita • The commodity flows data by both rail and road • Infrastructure spending as the per capita expenditure	A	A
Human Capital	• Educational attainment at the high school/collegiate levels • The first-year retention rate of adults in colleges • No. of associates degrees annually on a per capita basis • The share of adults enrolled in adult basic education	C	C
Worker Benefit Costs	• Health care premiums • Long-term health care costs • Workers' compensation costs per worker • Fringe benefits of all kinds as a share of worker costs	C+	B
Tax Climate	• Corporate taxes • Income and sales and use taxes • Property and unemployment insurance tax data	A	A
Global Reach	• The per capita exported manufacturing goods • The growth of manufacturing exports • The amount of manufacturing income received annually from foreign-owned firms in a state • Adaptability of the state's exporters to demand changes • The reach of foreign direct investment	A	A
Sector Diversification	The Herfindahl-Hirschman Index*	C	C

Category	Variable Measured	2016 Rating	2017 Rating
Productivity and Innovation	• Manufacturing productivity growth • Industry R&D expenditures on a per capita basis • The per capita number of patents issued annually	B+	B

Source: Conexus Indiana, Manufacturing & Logistics Report Card for the United States, 2017. Note: The Herfindahl–Hirschman Index, a commonly accepted measure of market concentration. The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers.[5]

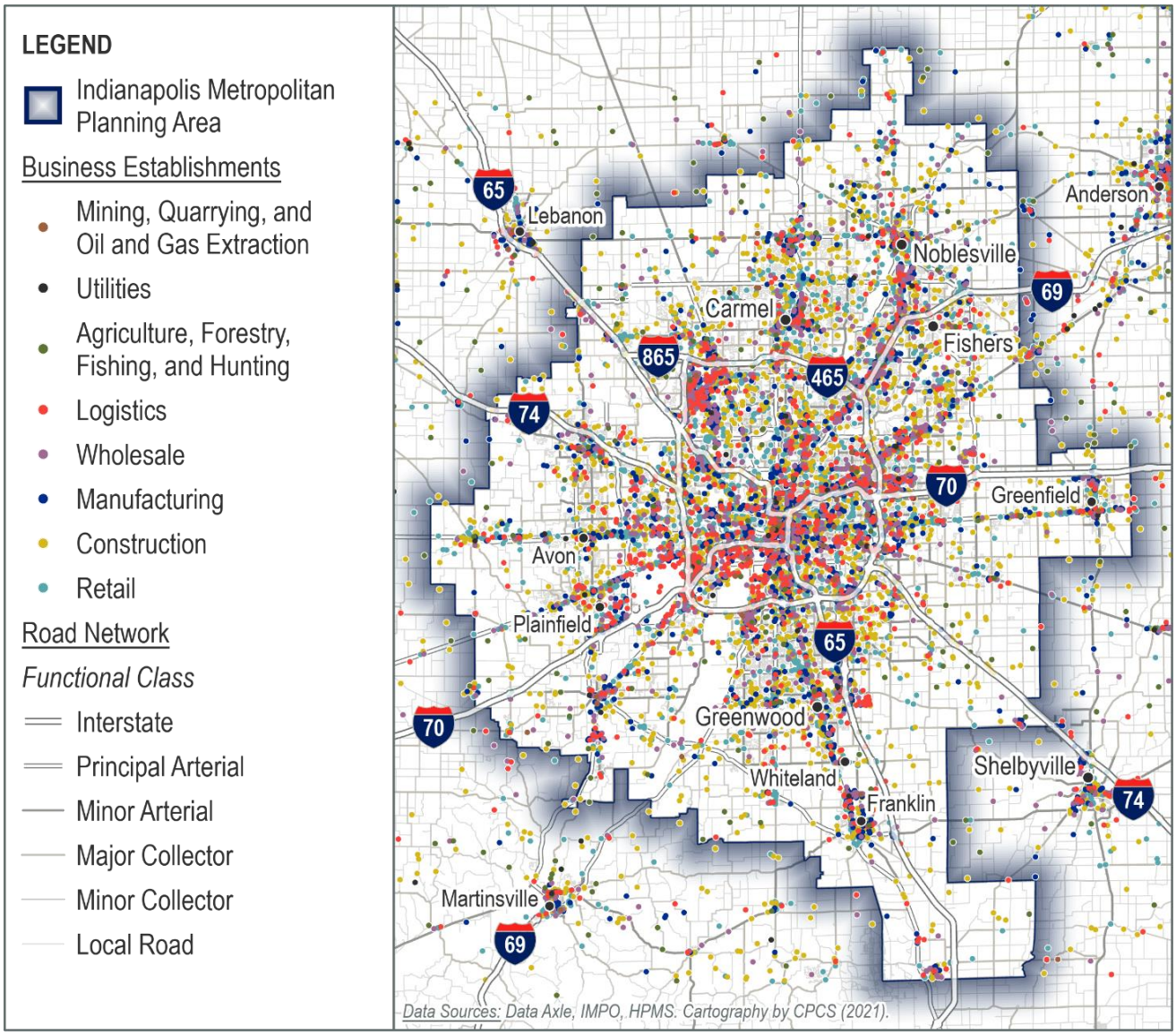
1.3.3 Freight-Related Establishments

As shown in Figure 7, freight-related industries are scattered across the 8-county IMPO region but tend to cluster closer to the city of Indianapolis. Consequently, nearly 51 percent of the freight-related businesses are located in Marion County, over 15 percent in Hamilton County.[6] These ratios of freight-related businesses located in the more urban counties of the 8-county region are relevant in nearly every freight-related industry except for agriculture, forestry, fishing, and hunting, and utilities. Agricultural businesses are especially dispersed throughout the region and tend to be in more rural areas in each county.

[5] The Herfindahl-Hirschman Index, July 31, 2018. https://www.justice.gov/atr/herfindahl-hirschman-index

[6] Data Axle Employment Establishments Data, 2021.

Figure 7: Freight-Related Industry Clusters



IMPO's 8-county region's largest freight-related industry, by the number of establishments, is retail trade. The industry has 8,761 businesses, which represents almost 46 percent of the number of freight-related establishments. Nearly two-thirds of the retail trade businesses in the region lie in Marion and Hamilton Counties. Construction (23%), manufacturing (12%), and wholesale trade (11%) are the other major industries with establishments in the region.

Figure 8: Freight-Related Establishments in the IMPO Region by 2-Digit and 6-Digit NAICS Code

Sector (2-Digit NAICS Code)	No. of Freight-Related Establishments	Prominent Sub-Sectors (6-Digit NAICS)	Largest Employers (Sample)
Retail Trade	8,761	Department Stores (452210); Supermarkets and Other Grocery (445110)	Amazon (Marion); Walmart (Johnson); Kroger (Marion) Meijer (Marion); Goodwill (Marion); Target (Hamilton); Kohl's (Hendricks);

Sector (2-Digit NAICS Code)	No. of Freight-Related Establishments	Prominent Sub-Sectors (6-Digit NAICS)	Largest Employers (Sample)
		New Car Dealers (441110); Automotive Parts and Accessories (442310)	Menards (Hendricks); Herff Jones (Marion)
Construction	4,351	New-Single Family General Contractors (236115); All Other Specialty Trade Contractors (238990)	Mr. Electric of Central Indiana (Hendricks); Raytheon Technical Services (Marion); TOA LLC (Morgan); PMG Enterprises (Marion)
Manufacturing	2,278	Commercial Printing, except Screen and Book Printing (32111); Machine Shops (33270); Establishments Primarily Engaged in Misc. Manufacturing (339999)	Eli Lilly & Co. (Marion); Rolls-Royce Corp. (Marion); Fukai Toyotetsu Indiana Corp. (Boone); Allison Transmission Holdings (Marion); Keihin IPT Manufacturing (Hancock)
Wholesale Trade	2,065	Industrial Machinery & Equipment (423830); Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers (423610); Motor Vehicle Supplies and New Parts (423120)	New Era Technology (Marion); Target Distribution Center (Marion); Corteva Agrisciences (Marion); Roche Diagnostics (Hamilton); Home Goods Distribution Center (Hendricks)
Transportation & Warehousing	1,262	Specialized Freight Trucking (484230); General Freight Trucking, Local (484110)	YRC Freight (Marion); Old Dominion Freight Line (Marion; Indianapolis International (Marion); Indy GO Public Transportation (Marion); XPO Freight Inc. (Hendricks)
Agriculture, Forestry, Fishing, & Hunting	259	All Other Misc. Crop Farming (111998)	Crossroad Farms Dairy (Marion); Apple Works (Johnson); Cargill (Marion); ET Ag Center (Morgan)
Utilities	63	Electric Power Distribution (221122); Water Supply & Irrigation Systems (221310)	Duke Energy Indiana (Hendricks); Citizens Natural Gas (Marion); Midcontinent Independent (Hamilton); Indianapolis Power & Light (Marion)
Mining, Quarrying, and Oil and Natural Extraction	60	Crude Petroleum Extraction (211120); Construction Sand & Gravel Mining (212321)	Martin Marietta Aggregates (Marion); Jackson Oil & Solvents (Marion); Marathon Oil (Hendricks); C&J Well (Boone)

Source: Data Axle, IMPO, 2021.

2 Overview of Existing Truck Operations

Key chapter takeaway

The IMPO region is served by about 370 miles of Interstate, 140 miles of US highways and 190 miles of State highways. Additionally, the region is served by several weigh-in-motion stations, public truck stops, industrial parks, public refrigerated warehouses, and intermodal/transload facilities. The region's corridors that serve relatively high truck volumes include I-65, I-69, I-70, I-74, I-465 (or USS Indianapolis Memorial Highway), I-865, US-31, US-36, US-40, and IN-37.

Analysis of truck activity tracker data provided by StreetLight reveals that about half of all the truck trips originated from or destined in the IMPO region start and end in the four areas: 1) Baden Manor- the I-465/IN-37 interchange; 2) Sycamore Heights- the area northwest of the I-465/I-70 interchange; 3) Zionsville- the area south of the I-65/IN-267 interchange; and 4) Wholesale District/Old Southside-the area northwest of the I-70/I-65 interchange. All of these areas are served by the Interstate system; however, their relatively high concentration of trucking activity can lead to congestion and other impacts in the IMPO region.

Truck speed and travel time data analysis using StreetLight platform shows that the region's average truck speeds in 2019 were generally higher than 46 mph along the interstate system. However, other major highways of the region, including US-421, US-52, US-40, US-36, IN-37, IN-67, and IN-37, experience truck speeds lower than 46 mph. Also, peak hour delays are generally not a major problem for trucks traveling along the region's interstates. However, segments of I-465 between I-70 and US-31, I-70 and I- 65 highways inside the I-465 loop, North College Ave. and West 86th St. in Indianapolis downtown, and IN-39 between US-40 and I-70 near Center Valley experience relatively long hours of daily delay for trucks. Truck travel times in the region are higher along corridors that carry traffic from outside of the I-465 corridor to downtown Indianapolis, such as E 16th St. which runs parallel to I-70 between I-465 and I-65, W 30th St. running parallel to I-65, and N Capitol Ave. in downtown Indianapolis.

In terms of truck safety impacts, truck-involved collisions that occurred in the region between 2015 and 2019 led to 121 deaths and near 2,649 injuries with various severity levels. Sideswipe collisions are the leading type of truck crashes in the region (32 percent). Also, rear-end crashes are responsible for about 33 percent of injuries and 29 percent of the truck-involved fatalities in the region.

2.1 Description of Roadway Network

The IMPO region is served by about 370 miles[7] of interstate, 140 miles of US highways, and 190 miles of State highways. Figure 9 shows the region's roadway system. The previous IMPO Regional Freight Plan used a tiered approach to classify major freight corridors for all modes that carry goods within the Indianapolis Regional Freight System.

The highway system tiers were identified using various criteria, including National Highway Primary Freight Network (NHPFN), National Highway System (NHS), Strategic Highway Network (STRAHNET), or Indiana Commerce Corridor designation, daily truck volumes, functional classification, connection to intermodal facilities, and access to major industry clusters. Highway tiers are listed and described below:

[7] Centerline miles.

- Tier 1 – Primary Freight Network: The FHWA defines an NHPFN as a roadway network that includes not more than 27,000 centerline miles. The Moving Ahead for Progress in the 21st Century Act (MAP-21), which directed the FHWA to define an NHPFN, also allowed an additional 3,000 centerline miles critical to freight movement.
- Tier 2 – Remainder of Interstates and Commerce Corridors: defined as the remainder of Interstate highways and commerce corridors identified by State DOT not included in the NHPFN.
- Tier 3 – Regional Freight Corridors: determined based on two different criteria. The first includes roadways not included in Tiers 1 and 2 and classified as freeway, principal arterial, minor highway, or major collector with an AADT over 1,000. The second criteria in Tier 3 may include roadways with an AADT of less than 1,000 but are critical for regional freight connectivity.
- Tier 4 – Freight Connectors: roadways not included in Tiers 1, 2, or 3 that connect to freight generators in the region. Often, freight generators are located in significant manufacturing, industrial, and commercial areas that rely upon freight movements for efficient commerce.

Figure 9: IMPO's Road Freight System

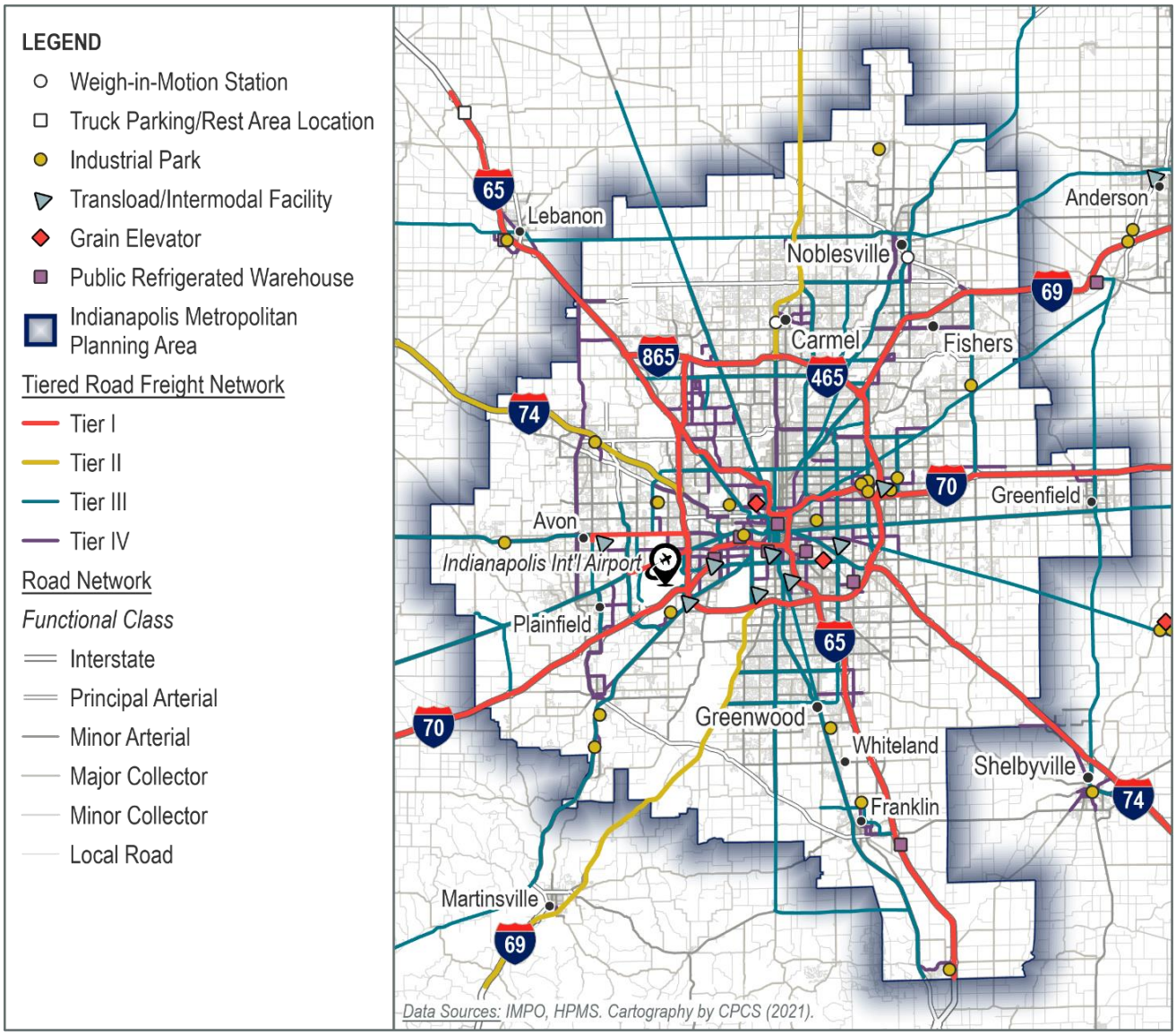


Figure 9 also shows the locations of weigh-in-motion stations, truck stops, industrial parks, and intermodal/transload facilities that connect the truck modes to other freight modes, including rail, air cargo, and grain elevators. As shown, two truck weigh stations are located within the IMPO region. However, public truck stops are located just outside of the IMPO's boundaries. Several private truck stop operators, including Love's, Flying J, Pilot, and TA have facilities within the IMPO region, primarily along the interstates, namely I-70, I-69, I-65, I-465, and I-74.

2.2 Truck Clusters and Freight Flows

2.2.1 Truck Trip Origins and Destinations

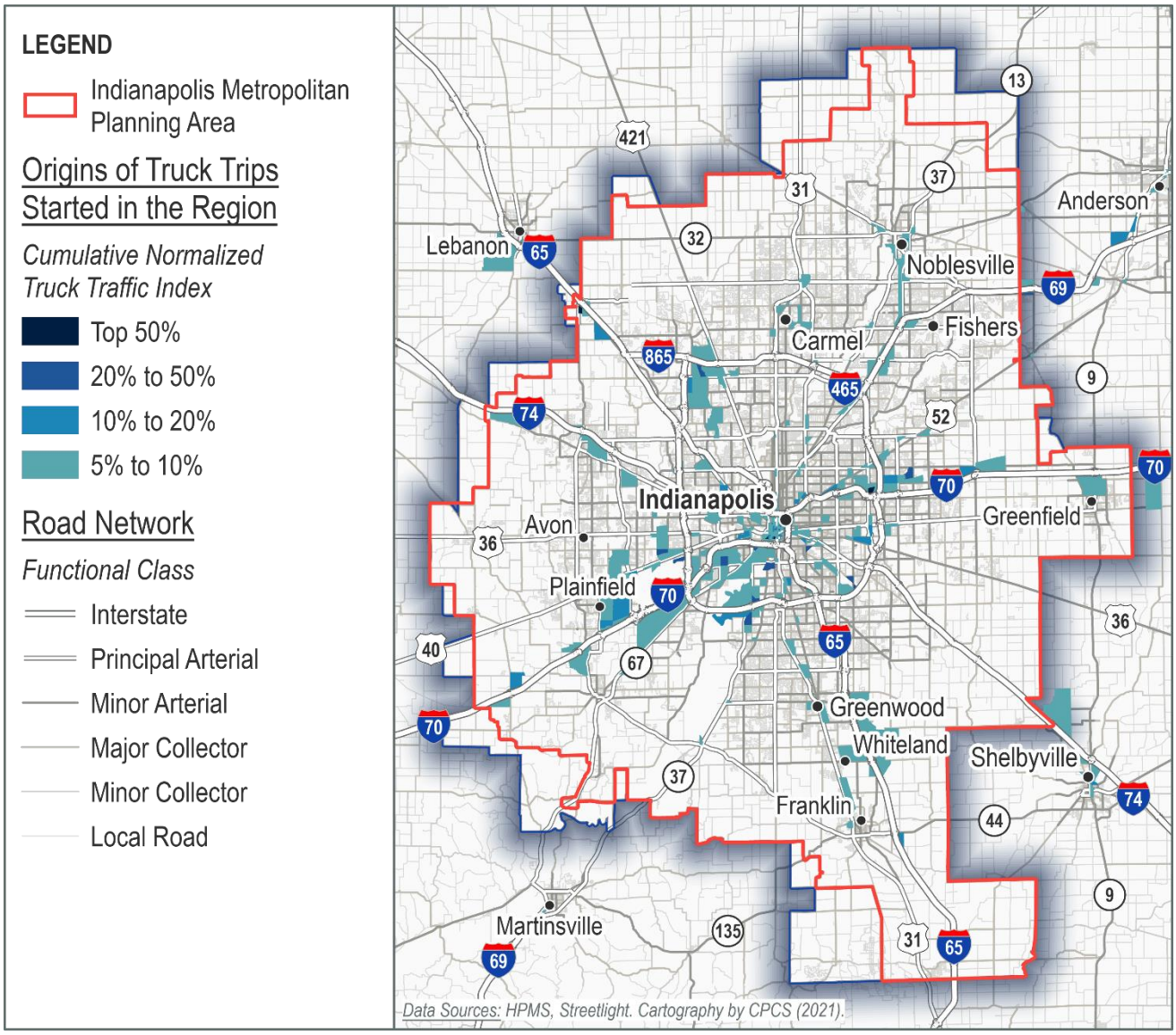
An assessment of common truck trip origins and destinations in the IMPO region is conducted based on vehicle tracking data provided by StreetLight. IMPO maintains a StreetLight subscription, which enables the users to analyze and visualize information related to traffic flow and performance. StreetLight collects vehicle tracking data from a variety of sources, including INRIX's database derived from in-vehicle electronic devices such as cellphones, onboard navigation systems, and truck Electronic Logging Devices (ELDs).

StreetLight aggregates and generalizes the vehicle tracking data to preserve user's privacy and anonymity. StreetLight's analytical platform allows users to query the origins and destinations of truck trips at the level of Transportation Analysis Zones (TAZs). For each TAZ in the IMPO region, truck trip indices are extracted that are then used to compare the levels of trucking activity among specific regions. The truck trips originated from and ended in the IMPO region, normalized by TAZ areas are shown in Figure 10 and Figure 11. As the maps show, about 50 percent of the truck trips originated from or destined to the IMPO region start and end in the following four areas:

- The area surrounding the I-465/IN-37 interchange south of Indianapolis, where the Harding Quarry, several truck stops, truck dealerships, and logistics facilities are located. Over 20,000 trucks travel along this segment of I-465 daily, which is 19 percent of the segment's total AADT.
- The area northwest of the I-465/I-70 interchange east of Indianapolis, where several distribution facilities and construction material suppliers are located. Nearly 40,000 trucks travel along the segments of I-465 and I-70 at this location, which is about 12 percent of the total AADT.
- The area south of the I-65/IN-267 in Whitestown, where several logistics and distribution facilities and construction material shops are located. Over 18,000 trucks travel along this segment of I-65 daily, which is about 23 percent of the total AADT.
- The area bordered by Kentucky Ave, Madison Ave, CSX rail tracks, and I-70 south of downtown Indianapolis, where a brewery and several truck shops, distribution facilities, and an intermodal rail yard are located.
- Industrial area located southeast of I-465/I-865 interchange in Indianapolis.

The industrial areas near CSX's Avon Terminal and CN/INRD Intermodal Terminal in Indianapolis also had a relatively high number of truck trips. However, these areas are not shown with darker colors in the following maps (Figure 10 and Figure 11) since the truck trip densities (normalized by TAZ areas) for these locations are lower compared to the five areas listed above.

Figure 10: Origins of Truck Trips Started in the Region

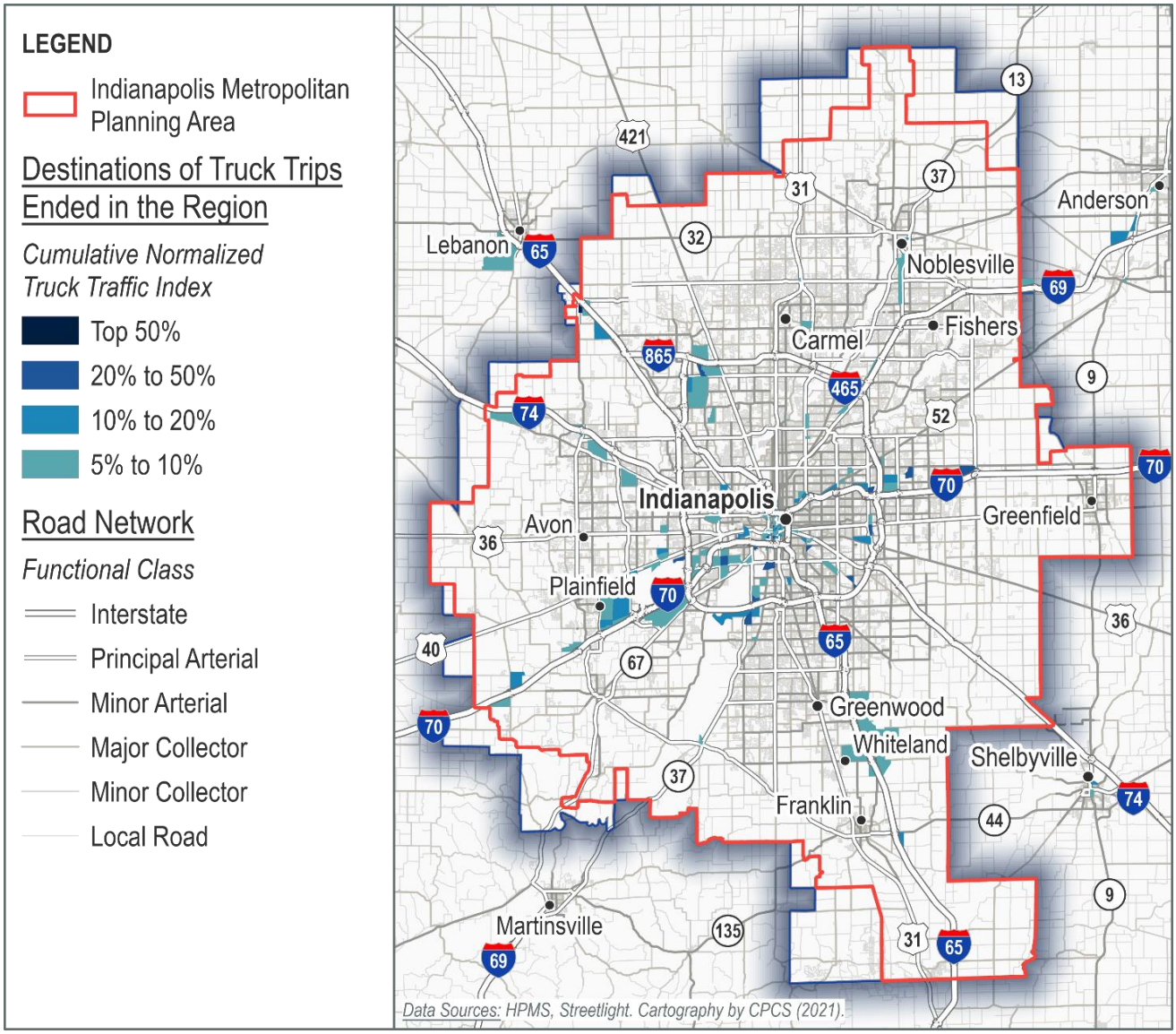


Other moderately common truck origins/destinations in the region are:

- The industrial areas around CSX rail spur southwest of Indianapolis, between I-70 and West Raymond St,
- The area west of the White River, bordered by I-70, Kentucky Ave, and CSX railroad tracks,
- The logistics facilities located north and west of the Indianapolis International Airport (IND),
- The areas around Love's Travel Stop in Mooresville and the Pilot Travel Center in Greenfield,
- The area near FedEx facility on Massachusetts Ave northwest of downtown Indianapolis, and
- The area bordered by East 30th St, Massachusetts Ave, and I-465, east of Indianapolis.

These areas account for 15 to 40 percent of the truck trips originated from or destined in the IMPO region.

Figure 11: Destinations of Truck Trips Ended in the Region



2.2.2 Regional Freight Clusters Identified in the Previous Studies

Regional Freight Activity Centers

In 2020, IMPO developed a study of activity centers in the region to help with establishing a system for funding allocation to local governments for various land development and transportation investments. The following activity center types were identified according to the IMPO staff's knowledge of the region:

- Downtown Indianapolis: the most commercially developed area at the center of the Indianapolis Metropolitan Area.
- Regional Mixed-Use Center: the areas outside of downtown Indianapolis with access to transit and a mixed land use consisted of shops, restaurants, offices, and residential spaces.
- Main Street Center: low-density activity centers with mixed commercial and residential use spaces located along a local street.

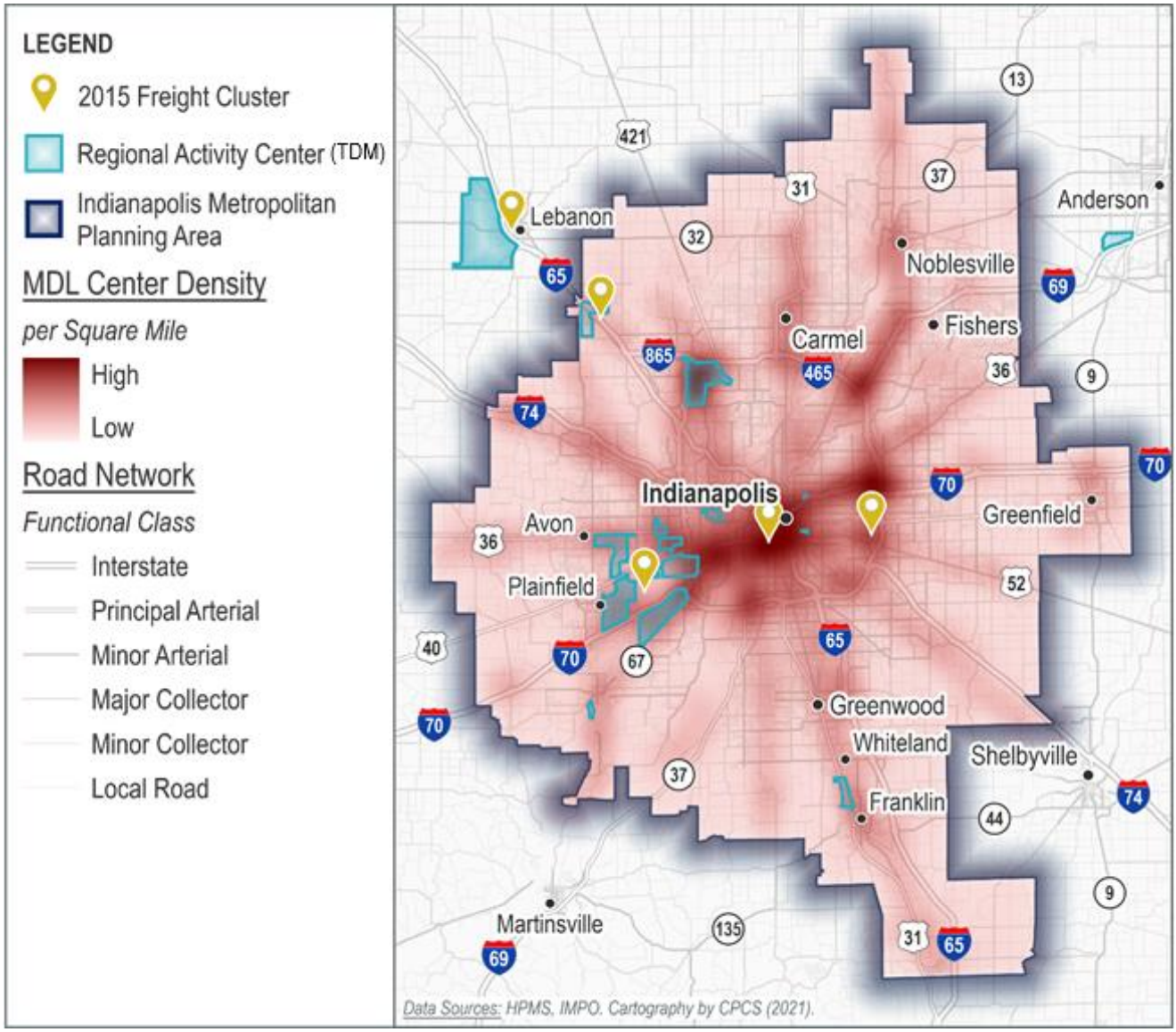
- Lifestyle Center: areas with primarily commercial (shops and restaurants) uses with low-density residential and office spaces.
- Shopping Center: areas with low to medium intensity concentration of retail and service shops.
- Special Use Center: areas with a concentration of unique land uses such as educational and medical campuses.
- Manufacturing/Distribution/Logistics centers: areas with a concentration of light to heavy industrial establishments, warehousing facilities, and distribution centers.
- Employment Center: areas with a high concentration of employment centers

A grid-based geometry is used by the IMPO to analyze land use in the region. Cells within each grid measure ½ mile by ½ mile, and several indicators are used to identify the dominant type of activity within each grid, including population, employment, intersection traffic counts, truck counts, access to various modes of transport, land use, and average lot sizes, and availability of vacant lots. A scoring criterion is then used to rank the grids based on the level of concentration of the criteria listed above and inform investment prioritization.

The region's existing and emerging Manufacturing/Distribution/Logistics (MDL) centers are directly linked with freight activities as they have relatively high levels of trucking activity or access to other modes of goods movement. Figure 12 shows the concentration of MDL centers in the IMPO region. Cells with higher MDL activity scores (shown in a darker shade) are primarily clustered in the following areas:

- The area southeast of the I-465/I-865 interchange where the Buckeye Partners' liquid petroleum handling and distribution terminal as well as several shopping centers, auto part dealers, packaging, storage, and warehouse facilities, and parcel shipping facilities (UPS and USPS) are located;
- The area surrounding the I-69/I-465/Binford Blvd interchange where several shopping centers and construction material shops are clustered;
- The area within the I-465/I-70/Massachusetts Ave triangle where several distribution facilities and construction material suppliers are located;
- The area between I-70 and Massachusetts Ave east of the I-70/I-65 north split, where several distribution facilities and construction material suppliers are located;
- The area north of I-70/I-65 south split between the interchange and East Washington St, where several warehousing and distribution facilities, cold storage facilities, and construction material suppliers are located;
- The area south of I-70 and southwest of downtown Indianapolis, where the Indianapolis Intermodal Rail Terminal is located;
- The area west of I-465 where the Indianapolis International Airport, Avon intermodal rail terminal, and several freight logistics facilities are located;
- The area surrounding the I-465/IN-37 interchange south of Indianapolis, where the Harding Quarry, two truck stops, truck dealerships, and several logistics facilities are located.

Figure 12: Freight Activity Centers and Clusters



Freight MDL centers are also identified as a result of the IMPO Truck Model, a two-phased update of the IMPO Travel Demand Model, using commercial vehicle probe data provided by the American Trucking Research Institute (ATRI). Major truck origins and destinations identified in this process are listed in Figure 13 and also shown as blue polygons in Figure 12.

Figure 13: Regional Activity Centers Identified in the IMPO Travel Demand Model Update

Freight Activity Center ID	No. of TAZs	Freight Establishments
Anderson	3	Industrial land use southwest of Anderson, including Nestle USA, IMI Aggregates, Carter Logistics, and FedEx distribution facility
Anson	5	Industrial land use and ruck facilities northwest of Zionsville, including Love's Travel Stop, Coca Cola distribution, Amazon Fulfilment Center, and Cummins Distribution

Freight Activity Center ID	No. of TAZs	Freight Establishments
Circle City Industrial	2	Circle City Industrial Complex near east of downtown Indianapolis and industrial land north of facility
CSX	3	CSX's Avon Intermodal Terminal and industrial facilities along the Ronald Regan Parkway
IIA Warehouse 1 & 2	8	Industrial land use north of Indianapolis International Airport, including Target distribution center, FedEx facility, and Amazon Fulfilment and Return Center
Keystone and 70	2	Industrial land use northwest of I-70/ N Rural Rd interchange
N Senate	2	Industrial land use northeast of I-65/ N West St interchange
NE IA Airport	10	Industrial land use northeast of the Indianapolis International Airport
North Franklin	4	Industrial land use north of Franklin, including Carter Lumber and Amcor Plastics
NW IA Airport	13	Industrial land use northwest and west of the Indianapolis International Airport
Park 100_96th_Michi	18	Park 100 Industrial area located southeast of Zionsville
Red Cats/Full Beauty	3	Industrial land use north of Southwestern Ave, including Full Beauty Brands and Indianapolis Pallet Wholesale
S Mooresville	1	Industrial land use south of Mooresville
Speedway	5	Industrial land use south of Indianapolis Motor Speedway Museum
SW IA Airport	3	Industrial land use south of the Indianapolis International Airport, including FedEx and United States Postal Service facilities
SW Lebanon	3	Industrial land use west of I-65 in Lebanon

Source: CPCS analysis of IMPO's ITDM Update Report, 2021.

2015 Freight Clusters

The previous IMPO freight plan developed in 2015 used a combination of desk research, business establishment data, land use and real estate information, and truck traffic volumes to identify the regional clusters with a significant concentration of freight activity. As a result, the following five freight clusters were identified (illustrated in Figure 12):

- I-65 Lebanon: the area surrounding the I-65/IN-32 interchange where several distribution centers and storage facilities are located;
- I-65 Whitestown: the area along I-65 east of IN-267 where several distribution centers and storage facilities are located;
- Ameriplex/Indianapolis International Airport: the area between US-40 and IN-67 west of I-465 where the Indianapolis International Airport and several logistics facilities are located;
- I-70 Madison/Harding: the area north and south of I-70 in Old Southside and West Indianapolis where several warehousing and storage facilities and construction material suppliers are located;

- I-70 Shadeland: the area surrounding the Shadeland Ave/Brookville Rd interchange where several logistics facilities and a rail transload facility are located.

2.2.3 Concentration of Freight Activity in the IMPO Region

Review of the top freight origins and destinations identified through the StreetLight data analysis in conjunction with the MDL centers, regional activity centers identified in the IMPO Travel Demand Model update, and the freight clusters previously identified in the IMPO Freight Plan 2015 reveals that the following freight activity centers/clusters have grown or remained unchanged since 2015:

- Whitestown (Anson): the area south of the I-65/IN-267.
- IND Airport: the area north and west of the Indianapolis International Airport.
- Wholesale District/Old Southside: the area northwest of the I-70/I-65 interchange.
- SW Lebanon: industrial land use west of I-65 in Lebanon.

Meanwhile, several freight activity centers have emerged in the region and increased in importance and impact on the transportation system over the past few years. These centers are listed in Figure 14 and will be investigated along with the activity centers listed above for analysis of freight-related impacts, needs, and challenges in the next tasks.

Figure 14: Regional Centers of Freight Activity (Emerging and Growing in Importance)

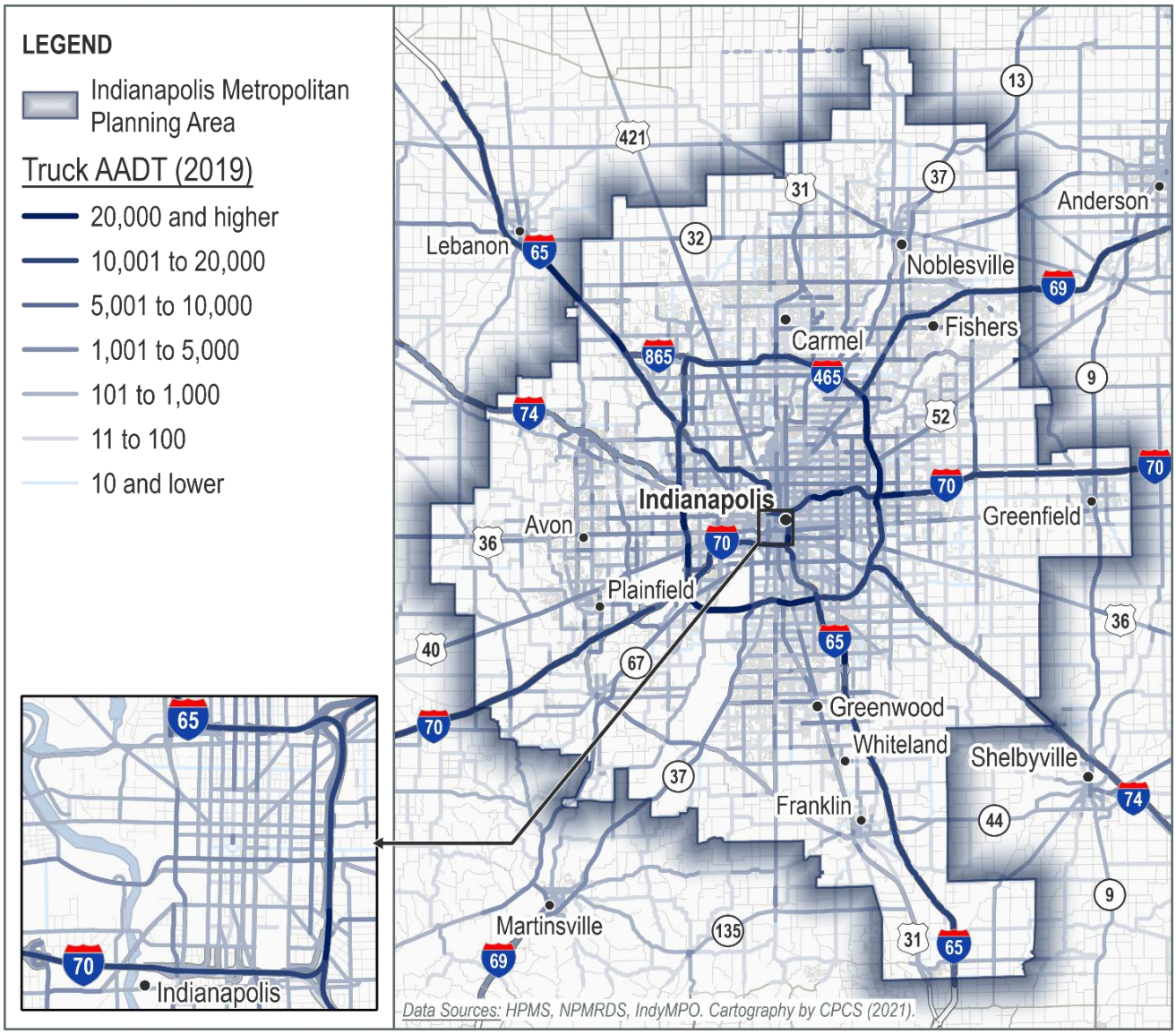
Freight Activity Center	MDL Centers Study	TDM Update	StreetLight Analysis
Industrial area located southeast of I-465/I-865 interchange in Indianapolis	✸	✸	✸
Area surrounding the I-465/IN-37 interchange south of Indianapolis, (Harding Quarry)	✸		✸
Area northwest of the I-465/I-70 interchange east of Indianapolis	✸		✸
Area southeast of Indianapolis along I-70		✸	✸
Area bordered by East 30th St, Massachusetts Ave, and I-465, east of Indianapolis	✸		✸
CSX Avon Terminal		✸	✸ (X)
North Franklin: along US-31		✸	✸ (X)
Area near FedEx facility on Massachusetts Ave northwest of downtown Indianapolis		✸	✸
Area bordered by I-70, Kentucky Ave, and CSX railroad tracks		✸	✸
Area surrounding the I-69/I-465/Binford Blvd interchange	✸		
Areas around Love's Travel Stop in Mooresville and the Pilot Travel Center in Greenfield			✸
IIA Warehouse 1 & 2		✸	
S Mooresville		✸	
Speedway		✸	

Source: CPCS analysis, 2021. (X) based on truck trip counts instead of truck trip densities.

2.3 Truck Count Data Analysis

Trucking activities in the IMPO region are served by six interstates as well as a network of US highways and state and county routes. These corridors carry relatively high truck volumes to, from, and through the densely populated Indianapolis metropolitan area. Figure 15 provides an overview of truck-specific traffic volumes in the IMPO region and shows which routes are the most important based on Annual Average Daily Traffic (AADT) volume.

Figure 15: Truck AADT



Key Corridors

The trucks traveling in the IMPO region are served by several major interstates, national and state corridors, as well as a network of county and local routes that provide last-mile connection to the major highways. This section provides an overview of the region's corridors that serve relatively high truck volumes, namely Interstate 65 (I-65), I-69, I-70, I-74, I-465 (or USS Indianapolis Memorial Highway), I-865, US Highway 31 (US-31), US-36, US-40, and State Route 37 (IN-37).

I-65

I-65 is a major cross-country, north-south highway that originates from Mobile, AL, and ends in Gary, IN. I-65 enters Indiana in Jeffersonville after traveling through Alabama, Tennessee, and Kentucky and crossing the Ohio River. Upon entering the Hoosier State, I-65 continues running north and reaches Indianapolis before curving to northwest and meeting I-90 in its northern terminus in Gary, IN. The route connects the capital city Indianapolis with the Greater Chicago region and Louisville, KY. Within the Indianapolis Metropolitan Region, I-65 passes through Shelby, Johnson, Marion, Hendricks, and Boone Counties and runs concurrently with I-70 in Downtown Indianapolis. In 2019, I-65 served an Annual Average Daily Traffic (AADT) of 46,120 vehicles in IMPO. Approximately 6,680 of these vehicles were trucks, meaning that rucks made up about 14.5 percent of traffic.

I-69

I-69 is a north-south route along a 1660-mile corridor. The route consists of separated segments southwest of the original, continuous portion from Indianapolis to the northern terminus in Port Huron, MI, at the Canadian border. The southwest extension is planned to traverse through Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, and Texas, terminating at the US-Mexico border. Currently, the “I-69 Finish Line” project is in the process of connecting Martinsville, IN, to the original I-69 segment in Indianapolis. Once the work is complete, I-69 will link southwest Indiana to the US-Canadian border. In the Indianapolis Metropolitan Region, I-69 interchanges with I-465 before going northeast. The AADT within the Indianapolis Metropolitan area was 50,816 in 2019. Truck traffic (5,135) accounted for about 10 percent of the daily traffic.

I-70

I-70 is an east-west Interstate Highway that starts at the west terminus in Cove Fort, UT and ends at the east terminus in Baltimore, MD. The 2,150.57-mile Route goes through ten states, including Maryland, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Missouri, Kansas, Colorado, and Utah. I-70 enters Indiana around Terre Haute before crossing the Wabash River. In the Indianapolis Metropolitan Area, the Route traverses through Plainfield and Indianapolis and passes by the Indianapolis International Airport. The AADT within the Metropolitan area was 40,532 in 2019, with about 16 percent of it being truck traffic.

I-74

I-74 is a diagonal Interstate Highway that runs northwest-southeast direction. The western terminal is at the interchange with Interstate 80 in Davenport, Iowa and the eastern end is at the interchange with Interstate 75 in Cincinnati. Ohio. I-74 also has several fragmented sections in North Carolina. Within Marion County, I-74 merges with I-465 and travels across Indianapolis. The AADT within the Indianapolis Metropolitan Area was 25,011 in 2019. Truck traffic accounted for about 19 percent (4,826) of the total AADT.

I-465

I-465 or USS Indianapolis Memorial Highway is a beltway circling Indianapolis. The majority of the highway falls into the boundary of Marion County, except for two small segments in Boone and Hamilton Counties. The total length of I-465 is approximately 53 miles. The beltway intersects with numerous interstates and US highways that heading in the direction of Indianapolis, including I-65, I-69, I-74, US-31, US-36, and US-40. It was completed

in 1970 and went through a major widening project on the east bound in the late 1990s to early 2000s, and on the west bound (Accelerate465) between 2009 and 2012. The multiple intersections with other major highways make I-465 one of the busiest roadways in the Metropolitan Area. In 2019, the AADT of I-465 was 90,635 and the truck AADT was 11,850.

I-865

I-865 is an auxiliary route of I-65 northwest of Indianapolis, near Zionsville. The 4.72-mile of interstate runs concurrently with US-52 and connects I-65 to I-465. The short section experienced an AADT of 31,609 and a truck AADT of 7,414 in 2019.

US-31

US Route 31 or US Highway 31 is a north-south US highway that starts at the intersection with US-90/US-98 in Spanish Fort, Alabama and ends at the interchange with I-75 south of Mackinaw City, Michigan. The 1,280-mile highway travels through Alabama, Tennessee, Kentucky, Indian, and Michigan. US-31 merges with I-465 on the south side of Indianapolis and exits I-465 in Carmel. INDOT has started a few improvement projects along the 20-mile segment between S.R. 38 in Hamilton County and S.R. 931 in Howard County in 2020.[8] The AADT on US-31 was 29,146 in 2019. The truck traffic accounted for 5.7 percent of the total AADT.

US-36

US Route 36 or US Highway 36 stretches 1,414 miles from its eastern terminus at the Rocky Mountain National Park, Colorado to the western end at US-250 in Uhrichsville, Ohio. The entire highway crosses six states, including Colorado, Kansas, Missouri, Illinois, Indiana, and Ohio. US-36 joins the I-465 beltway at the south side of Indianapolis and exits east of the city before continuing to Lawrence, McCordsville, Fortville, and Pendleton. The AADT of US-35 in the Indianapolis Metropolitan Area was 21,702 in 2019. The truck AADT was about 1,099.

US-40

US Route 40 or US Highway 40 is an east-west US highway that is also known as the Main Street of America. Created in 1926, the original western terminus of US-40 was in San Francisco, California. The portion between San Francisco and Utah was replaced by Interstate 80. Currently, the highway runs from the junction with I-80 IN Silver Summit, Utah, to Atlantic City, New Jersey. Within the Indianapolis Metropolitan Area boundary, US-40 passes through Plainfield and becomes Washington Street as it travels through the northern edge of Indianapolis International Airport. Instead of going through Indianapolis, the route connects to I-465 on the west side of Indianapolis and exits on the east before entering Cumberland. The AADT was 18,424, and the truck AADT was 1,055 in 2019.

IN-37

Indiana State Route 37 is a four-lane divided highway running 229.4 miles in length. The southern segment starts at the junction with IN-66 in Tell City near the Ohio River and ends at IN-9 south of Marion. The northern segment begins at the junction with I-469 northeast of Fort Wayne and terminates at the Indiana-Ohio state line. An improvement

[8] INDOT U.S. 31 Project. https://www.in.gov/indot/3973.htm.

project for the portion of IN-37 in Fishers and Noblesville is currently underway. I-69 construction also results in the closure of a nearly 5-mile section of IN-37 north of Martinsville for most of 2021. In 2019, the portion of IN-37 in the Indianapolis Metropolitan Area had an AADT of 18,048 and a truck AADT of 1,547.

2.4 Truck Mobility and Reliability

Truck mobility describes the ease or efficiency of goods movement using the roadway system – a lower level of effort and cost of moving would indicate a high-mobility condition, while the complexity and cost of transportation increase as mobility decreases. Reliability refers to the distribution of travel times and is an indicator of the degree by which travel times vary along the transportation network during various hours of the day, days of the week, and for various road users.

Moving goods in a transportation system with low mobility and reliability leads to inefficiencies and can pose additional costs to the shippers, users of the transportation system, and society in general, all of which can affect a region's economic well-being. The following measures have been evaluated to understand freight mobility and reliability in the IMPO region:

- Truck travel speed, which is a measure of overall mobility for trucks;
- Truck peak hour delay, a measure of additional time required to travel roadway in traffic congestion;
- Truck Travel Time Reliability Index, a measure of the variability of truck travel speeds.

These measures were evaluated using one year's worth of truck GPS probe data from 2019, aggregated and analyzed through IMPO's StreetLight subscription. StreetLight platform aggregates a variety of data sources to estimate traffic volume and mobility data, including truck GPS data collected using tracking devices installed by private trucking companies to monitor fleet performance and driver behavior. Although measures extracted from StreetLight provide valuable insights into travel patterns for various modes, the tool has some limitations, including:

- The relatively small sample of trucks and vehicles used to compute average annual volumes that may not be representative of all road users;
- The disproportionate coverage of larger commercial fleets compared to small trucking companies due to the more widespread use of GPS tracking systems across large fleets.
- The reliance on cell phone coverage to capture GPS data means that sparsely-populated areas with poor cell phone service may have reduced data availability.

Due to these caveats, we will validate the results of StreetLight data analysis through inputs provided by the freight stakeholders in the IMPO region.

2.4.1 Truck Speed

Analysis of average truck speeds during peak periods provides an in-depth understanding of the highway system performance in serving truck travel demands. Figure 16 shows the average peak period truck speeds along highways and local roads of the IMPO region. As the map shows, average truck speeds in 2019 were generally higher than 46 miles per hour (mph) along the interstate system. However, other major highways of the region, including US-421, US-52, US-40, US-36, IN-37, IN-67, and IN-37, experience truck speeds lower than 46 mph.

Figure 16: Average Truck Speeds – All Roads

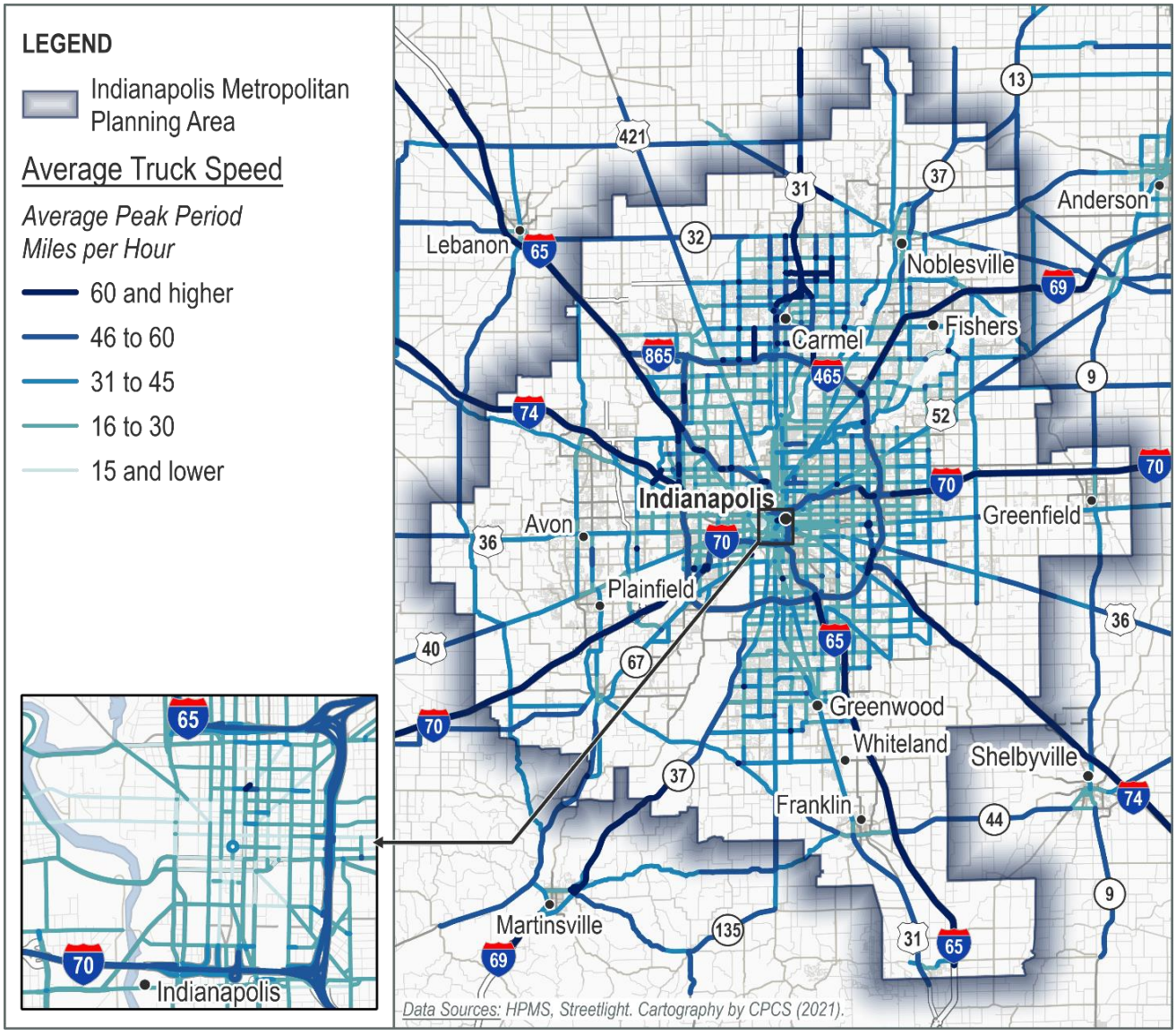


Figure 17 shows the average peak period truck speeds in the IMPO region for the interstate and US highways only. As shown, average speeds along the interstates are generally around 50 mph or higher. However, average speeds are lower than 40 mph for some US highways, including US-36, US-31, US-40, US-52, and US-421. Average truck speeds are significantly low along US-136, between IN-267 and in Ronald Regan Parkway in Brownsburg.

Figure 17: Average Truck Speeds – Interstates and US Highways

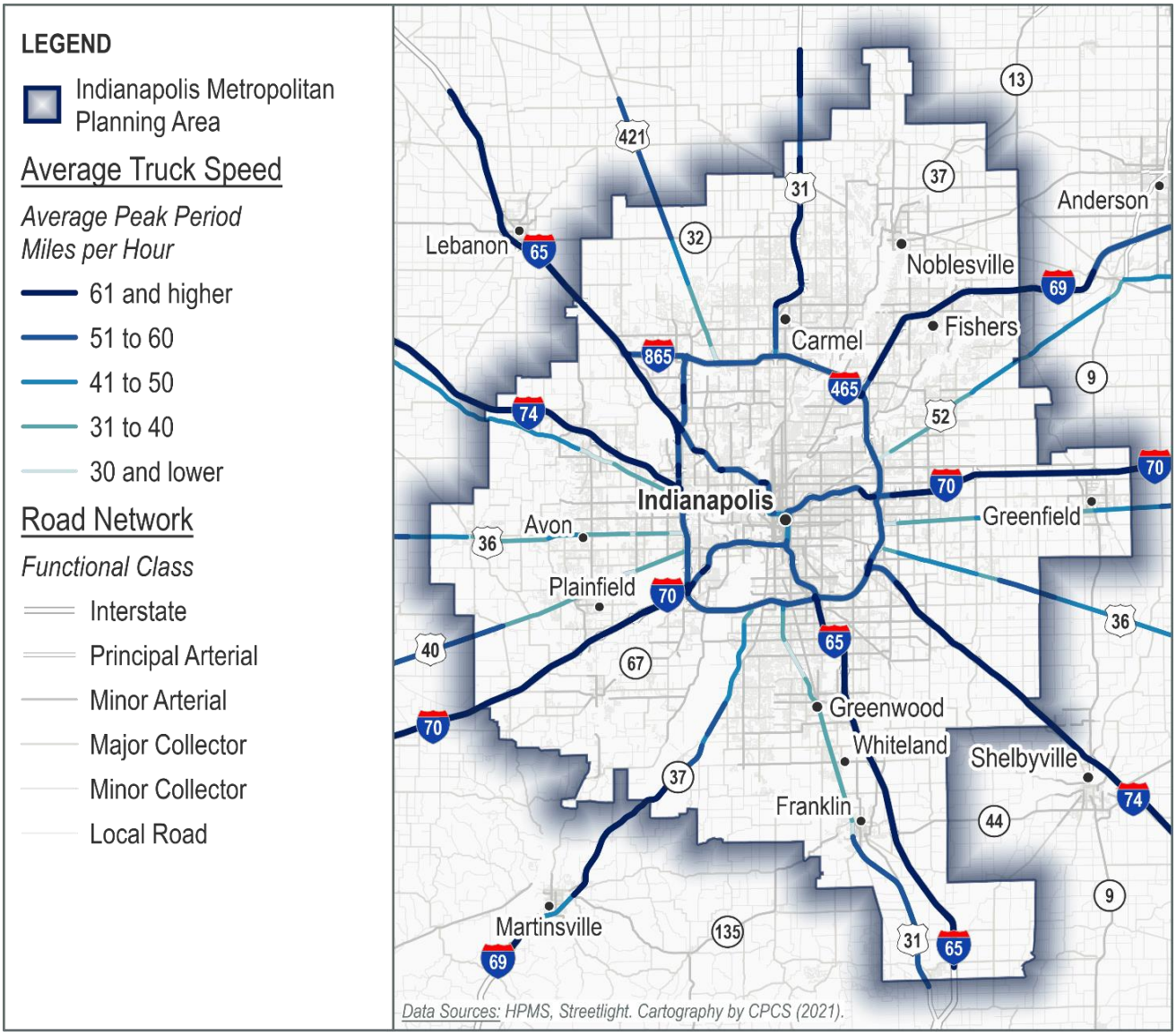


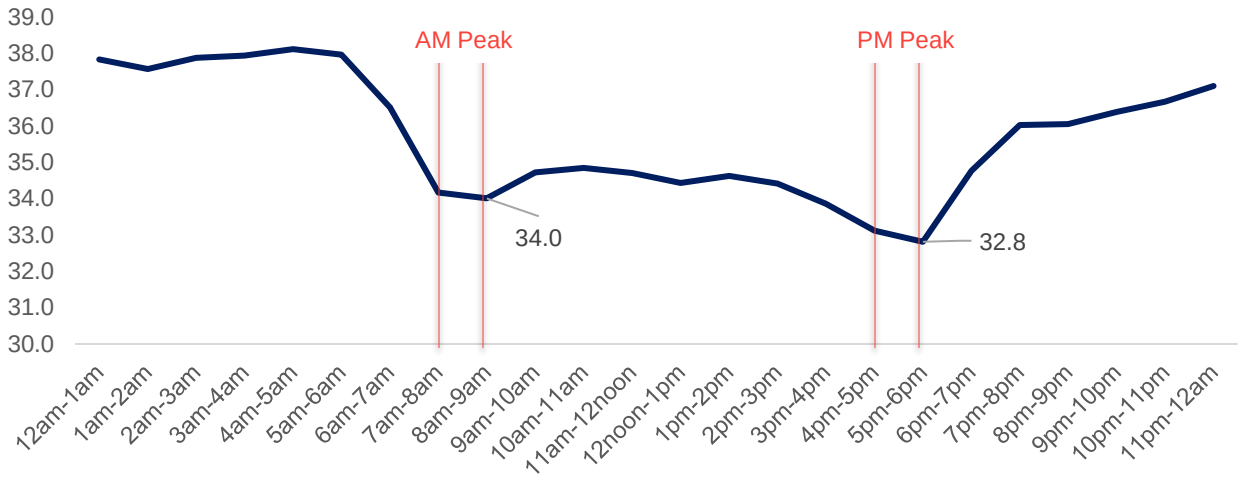
Figure 18 shows the daily[9] profile of average truck travel speeds in the IMPO region. As shown, average truck speeds drop significantly at around 7 AM and generally remain lower than 35 mph until around 6 PM. The sustained period of lower truck travel speeds between AM and PM peak periods indicates that speed reductions are generally due to high volumes of vehicles using the highway system. However, the congestion does not pose a major problem to trucking activities since the average speeds are rarely lower than 30 mph. While the average truck speed for the entire IMPO region may not get significantly low, specific high-volume corridors may still suffer from periodic congestion.

Figure 19 compares the average peak period truck speeds along highly congested corridors in the IMPO region with corridors in the MPO's peer regions that experience similar traffic patterns, growth trends, and investment challenges.[10] Every year, the American Transportation Research Institute

[9] Weekdays, excluding holidays.
[10] Identified by IMPO's staff.

(ATRI) collects and analyzes truck GPS data in support of numerous Federal Highway Administration (FHWA) assessments of traffic performance across the US. ATRI uses this data to monitor congestion along 300 freight-significant highways identified by the FHWA through collaboration with trucking industry stakeholders.[11] ATRI's congestion value is an index calculated based on the average truck speed deviations from the free flow speeds divided by hourly truck volumes. A higher congestion value indicates higher levels of truck congestion. The congestion values calculated for each of the 300 freight-significant highways are used for identifying the nation's top 100 truck bottlenecks.

Figure 18: Average Truck Speeds by Time of the Day in the IMPO Region



Source: CPCS analysis of NPMRDS Data, 2021.

Figure 19: Average Truck Speeds on Truck Bottlenecks in the IMPO and Select Peer Regions

Location	Segment	Peak Average Speed (mph)	National Ranking by Congestion Index
Cincinnati, OH	I-71 at I-75	40.1	2
Nashville, TN	I-24/I-40 at I-440 East	39.9	13
Denver, CO	I-70 at I-25	38.9	20
Cincinnati, OH	I-75/I-71 at I-275	45.3	24
Nashville, TN	I-40 at I-65 East	41.4	35
Indianapolis, IN	I-65 at I-70 North	47	36
Kansas City, MO	I-70 at I-670/US-71	47.7	54
Nashville, TN	I-65 at I-24	47.6	77
Cincinnati, OH	I-75 at I-74	48.7	81
Charlotte, NC	I-85 at I-485 West	50.3	82
Milwaukee, WI	I-94/I-794 at I-43	47.7	83
Nashville, TN	I-65 at SR-386	48.6	88
Indianapolis, IN	I-465 at I-69	50.3	96
Indianapolis, IN	I-65 at I-70 South	49.3	99

Source: ATRI, Top 100 Truck Bottlenecks, 2021.

[11] ATRI, Top 100 Truck Bottlenecks, 2021. https://truckingresearch.org/2021/02/23/2021-top-truck-bottlenecks/ - Note: ATRI average the truck volumes and speeds across all days in a year, including weekends and holidays.

As the above table shows, three of the nation's top 100 truck bottlenecks are located within the IMPO region. These corridors are ranked 36th, 96th, and 99th in terms of truck congestion compared to other highways across the US. However, compared to congested highways in the peer regions, the IMPO's truck bottlenecks generally suffer from less congestion and thus have higher average peak hour truck speeds.

2.4.2 Peak Hour Delay

Truck travel time delay is a performance measure calculated based on the difference between free-flow travel time and observed travel time for particular road segments. We used truck travel speeds provided by the StreetLight platform to calculate travel times and then the Peak Hour Excessive Delay (PHED) for trucks traveling in the IMPO region. As the following formulas summarize, first, the threshold speeds for indicating the observed travel times are defined as 60 percent of the free flow truck speeds (Eq.1). Next, the travel times are calculated using the threshold speeds (Eq.2), which enable us to calculate the delay times for each road segment in the region using the formulas Eq.3 and Eq.4.

$$Threshold\ Speed = Free\ Flow\ Speed \times 0.60 \qquad (Eq.\ 1)$$

$$Excessive\ Delay\ Threshold\ Travel\ Time\ (EDTTT) = \frac{Road\ Segment\ Legnth}{Threshold\ Speed} \qquad (Eq.\ 2)$$

$$Travel\ Time\ Segment\ Delay\ (RSD) = Measured\ Travel\ Time - EDTTT \qquad (Eq.\ 3)$$

$$Peak\ Hour\ Excessive\ Delay\ (PHED) = \begin{cases} RSD\ when\ RSD \geq 0 \\ \\ 0\ when\ RSD < 0 \end{cases} \qquad (Eq.\ 4)$$

Figure 20 shows the peak hour delays in the IMPO region (8 AM – 9 AM and 5 PM – 6 PM, on weekdays). The delay times for all road segments are divided by the length of the segment to show the average delay time per mile. Therefore, total truck delay time per mile would be the product of PHED per mile and total peak hour truck volume (Eq.5).

$$Total\ Daily\ Delay\ per\ Mile = \frac{PHED}{Road\ Segment\ Length\ (miles)} \times Peak\ Hour\ Truck\ AADT \qquad (Eq.5)$$

As shown in Figure 20, peak hour truck delays are generally not a major problem along the interstates. However, segments of I-465 between I-70 and US-31, I-70 and I- 65 highways inside the I-465 loop, North College Ave. and West 86th St. in Indianapolis downtown, and IN-39 between US-40 and I-70 near Center Valley experience an average of 33 to 85 minutes total daily delays for trucks.

Figure 20: Peak Hour Truck Delay – All Roads

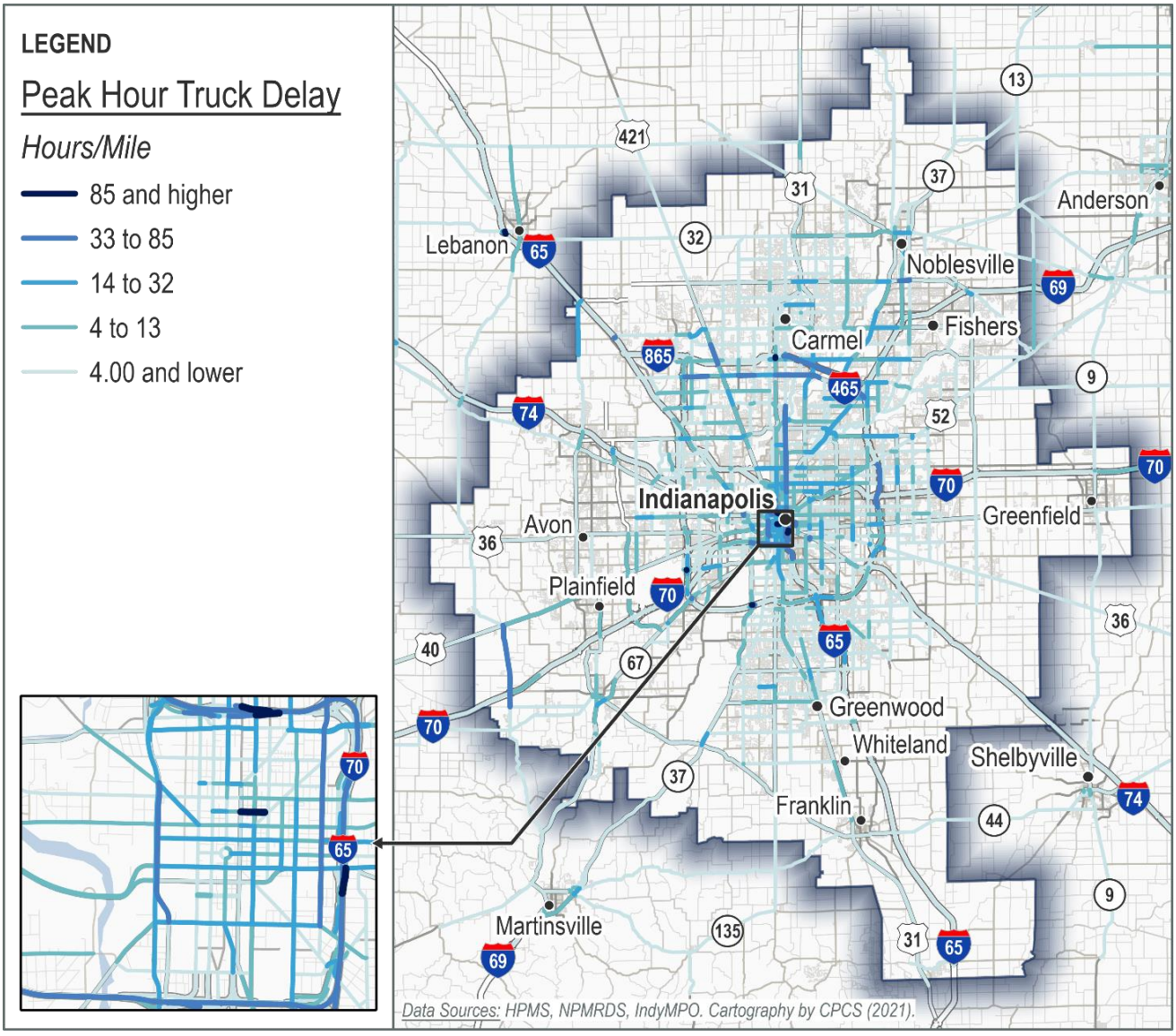
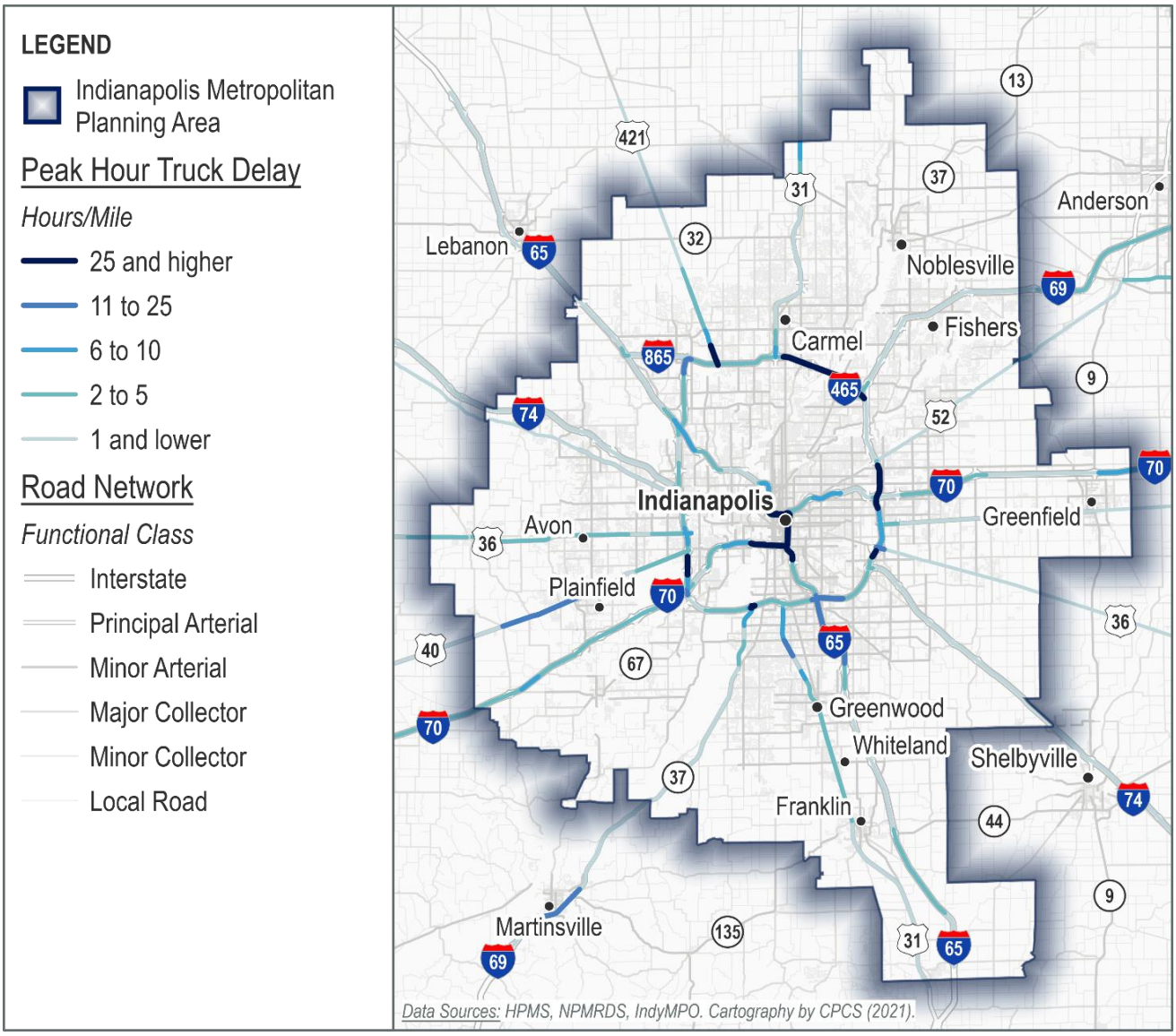


Figure 21 shows the peak hour delays in the IMPO region for the interstate and US highway systems only. As shown, delay-per-miles are relatively higher for:

- Segments of I-465 between US-31 and I-69 near Castleton, US-36 and I-70 in Lawrence, US-52 and I-74 near Raymond Park, and I-70 and US-40 near the Indianapolis International Airport;
- I-65 in downtown Indianapolis between I-69/South West St interchange and I-65/I-70 interchange;
- I-70 in downtown Indianapolis between Pleasant Run River and interchange with Madison Ave.

Figure 21: Peak Hour Delay – Interstates and US Highways



The delay per mile calculated using the above formulas were also used to rank the IMPO region's roadway segments and identify the top 20 regional truck bottlenecks shown in Figure 22. As expected, the corridors with the highest daily truck delays are the ones with the highest daily truck volumes (shown in Figure 15), located generally in Indianapolis and within the I-465 loop. A list of the IMPO's top truck bottlenecks and the delays associated with them is provided in Appendix C.

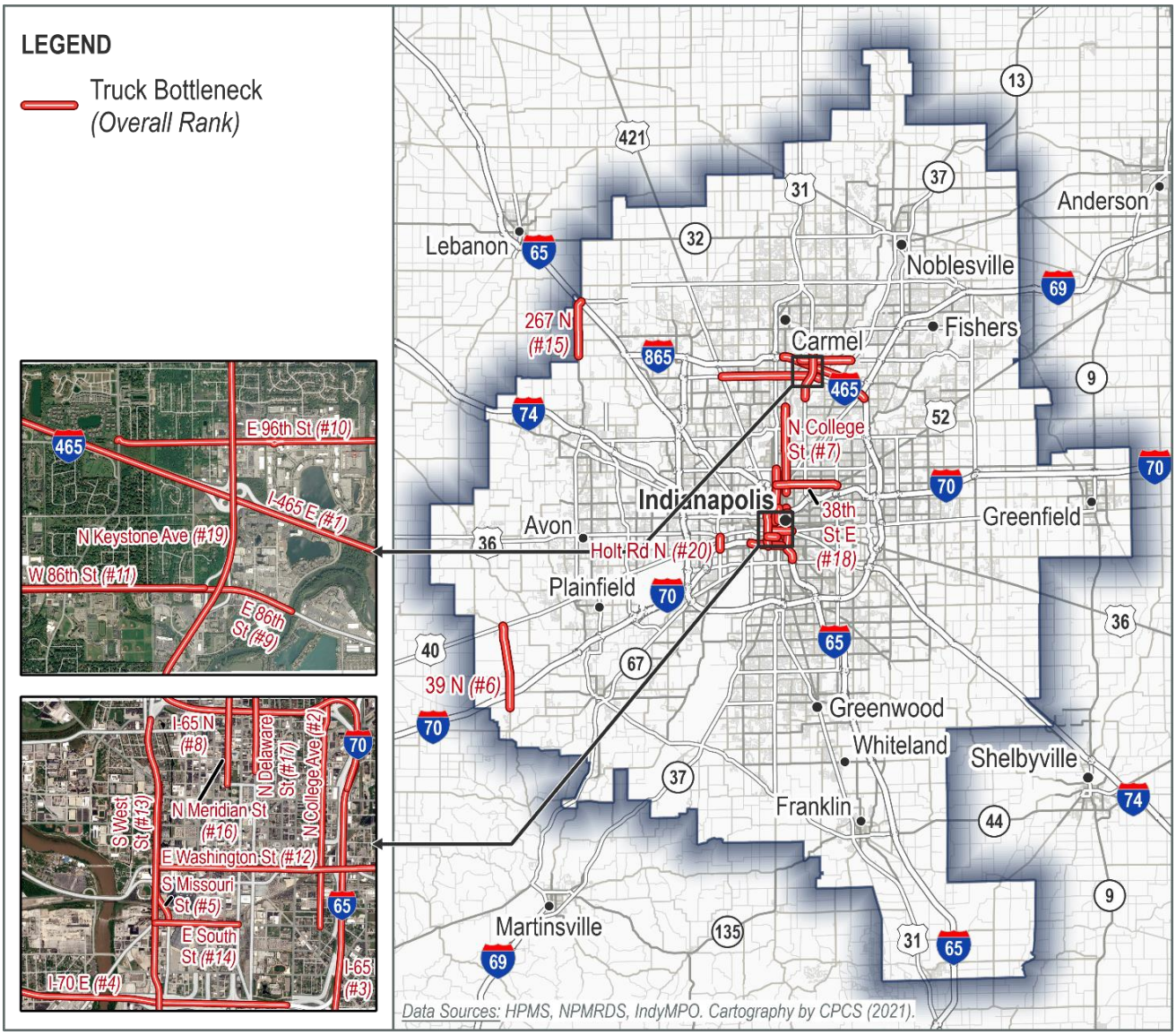
In general, challenges affecting truck movements along the region's bottleneck segments can be categorized into the following:

- Bottlenecks due to heavy all-vehicle **traffic in downtown** Indianapolis: trucks traveling on section of College St between E 16th St. and Fletcher Ave., N West St between Indiana Ave. and W South St, I-65 between and I-70/I-65 interchange and Dr. MLK Jr. St, W Washington St between I-70 and S West St, S West St between I-70 and 11th St, W South St between Madison Ave. and S West St, and N Delaware St between E 16th St. and Fort Wayne Ave experience

relatively higher delays due to the high traffic volumes traveling in the Indianapolis's downtown area.

- **Lack of access to interstates** and US highways: trucks traveling in the areas north of downtown Indianapolis use local streets such as N Meridian St and N College St to access the I-465 highway and points further north as no interstate highway options are not available in this area.
- Barriers to traffic flow due to **lack of river bridges and railroad over/under passes**: trucks traveling on routes such as 86th St, 96th St, Keystone Ave, and Holt Rd experience delays due to the limited number of bridge lanes and having to stop at highway-rail grade crossings.
- Bottlenecks due to heavy all-vehicle **traffic at highway interchanges**: trucks may experience delays due to high volumes of vehicles and weaving maneuvers at interchanges such as I-465/US-37, I-70/I-65, I-70/IN-39, and I-65/IN-267.

Figure 22: Truck Bottlenecks



Since 2019 (which is the analysis base year used in this study), several interchange improvement projects have started in the region that could have contributed to the interchange congestion issues. However, these projects, when completed, would impact the traffic patterns across the region. In addition to the top truck bottlenecks identified through analysis of StreetLight data, the following routes in the IMPO region have been identified by the project stakeholders for carrying relatively high volumes of trucks and suffering from periodic congestion issues:

- E 86th St., between N Keystone Ave. and N Meridian St
- W 86th St., between N Meridian St. and Michigan Rd
- Harding Street between I-70 and Washington St

2.4.3 Travel Time Reliability

Truck Travel Time Reliability (TTTR) is the ratio of average truck travel time in peak hours to free-flow truck travel time and indicates the degree to which travel time delays are unexpected to road users.

The Highway and Freight, Congestion Mitigation and Air Quality (CMAQ) Rule published by The Federal Highway Administration (FHWA) in 2017 established performance tracking requirements for the state DOTs to set targets for and track performance measures concerning highway and freight operation. TTTR is the only freight-related performance measure that the state DOTs are required to monitor and report to FHWA. Therefore, we calculated this index for the IMPO region's highways to help indicate whether the delays on the roadway system are expected (so that shippers, businesses, and commuters can plan trips to accommodate expected delays) or can they disrupt operations. The TTTR calculation also ensures synergy between the statewide and regional freight planning efforts.

We calculated the TTTR ratio using the National Performance Management Research Data Set (NPMRDS) and applying the following formula (Eq.6):

$$Travel\ Time\ Reliability\ Ratio\ = \frac{95th\ Percentile\ Travel\ Time}{50th\ Percentile\ Travel\ Time} \qquad (Eq.6)$$

To calculate the TTTR measure, truck speed data of commercial vehicles was extracted from NPMRDS for the following five periods to follow Federal Highway Administration (FHWA)'s freight reliability measures mandate:

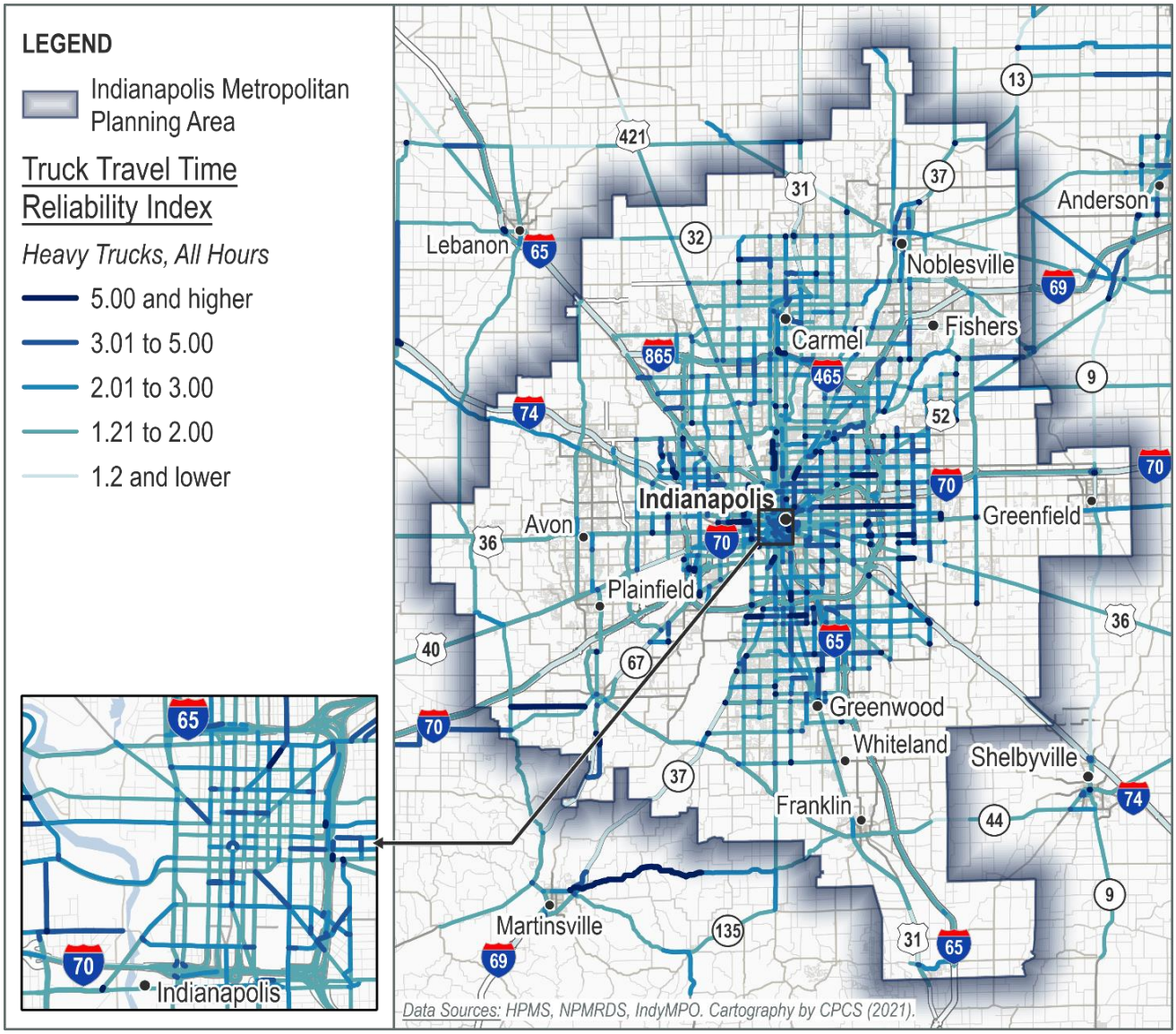
- Morning peak (6 AM – 10 AM, Monday-Friday)
- Midday (10 AM – 4 PM, Monday-Friday)
- Afternoon peak (4 PM – 8 PM, Monday-Friday)
- Weekends (6 AM – 8 PM, Saturday-Sunday)
- Overnight (8 PM – 6 AM, all days)

The largest TTTR of the five periods is selected as the final TTTR for each road segment. Figure 23 shows the TTTR measure for all the road segments in the IMPO region. Lower values (presented with thinner lines and brighter colors) indicate a more reliable travel speed, while higher values (shown with thicker lines and darker colors) represent more variable (or unreliable) travel speeds.

As the maps show, travel times in the region are higher along corridors that carry traffic from outside of the I-465 corridor to downtown Indianapolis, such as E 16th St. which runs parallel to I-70 between I-465 and I-65, W 30th St. running parallel to I-65, and N Capitol Ave. in downtown Indianapolis. Other corridors with high TTR include:

- Keller Hill Rd. in Mooresville
- E Edgewood Ave. between US-31 and I-65
- E Stop 11 Rd. in Greenwood
- IN-234 between US-36 and IN-9
- E 96th St. west of Fortville

Figure 23: Truck Travel Time Reliability Index

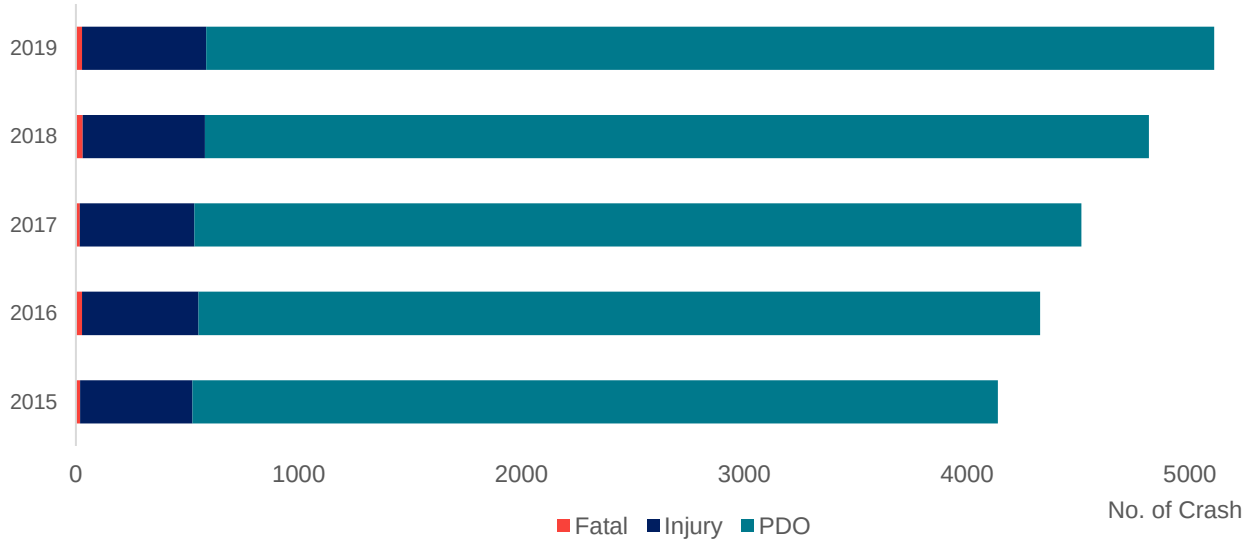


2.5 Truck Safety

This section provides an overview of the IMPO region's truck safety performance, focusing on safety trends between 2015 and 2019. Based on the data provided by the IMPO through the Automated Reporting Information Exchange System (ARIES), which is generated by first responder crash reports, more than 16,900 incapacitating or fatal roadway crashes happened in the region over five years, about 16 percent of which involved trucks.

The 5,110 truck-involved collisions that occurred in the region between 2015 and 2019 led to 121 deaths and near 2,649 injuries with various severity levels (Figure 24). In addition to injury and fatal crashes, over 20,130 Property-Damage-Only (PDO) truck-involved crashes happened in the IMPO region, which did not result in any casualties.

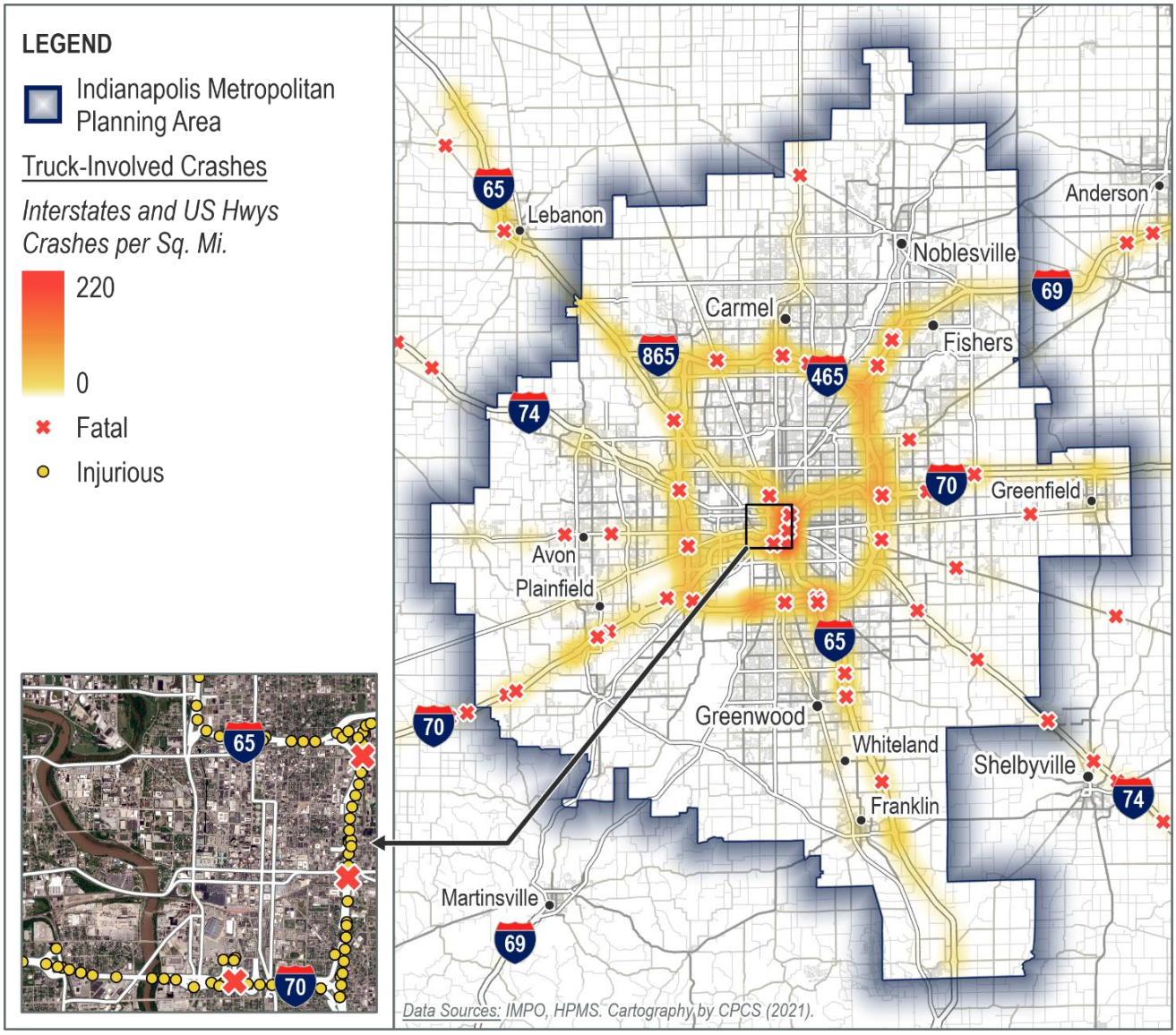
Figure 24: Truck-Involved Crash Trends



Source: CPCS analysis of crash data provided by IMPO, 2021.

Figure 25 provides the region's truck-involved crashes along the interstate and the US highway systems, while Figure 26 presents the truck-involved crashes along the state and local routes. Comparing the five-year truck collisions with the region's truck AADTs (shown in Figure 15) reveals that the majority of truck crashes are clustered along high volume corridors, including I-465, I-70, I-65, and I-74.

Figure 25: Truck Safety Hotspots - Interstate & US Highways



State and local routes that provide access to interstate and US highways also suffer from truck-related safety issues. In particular, injury and fatal truck-involved crashes are clustered near intersections in downtown Indianapolis, along local streets such as Georgetown Rd., Zionsville Rd., Michigan Rd., and East New York St., as well as along state routes including IN-37, IN-67, IN-267, IN-135, and IN-32.

Figure 26: Truck Safety Hotspots - State & Local Routes

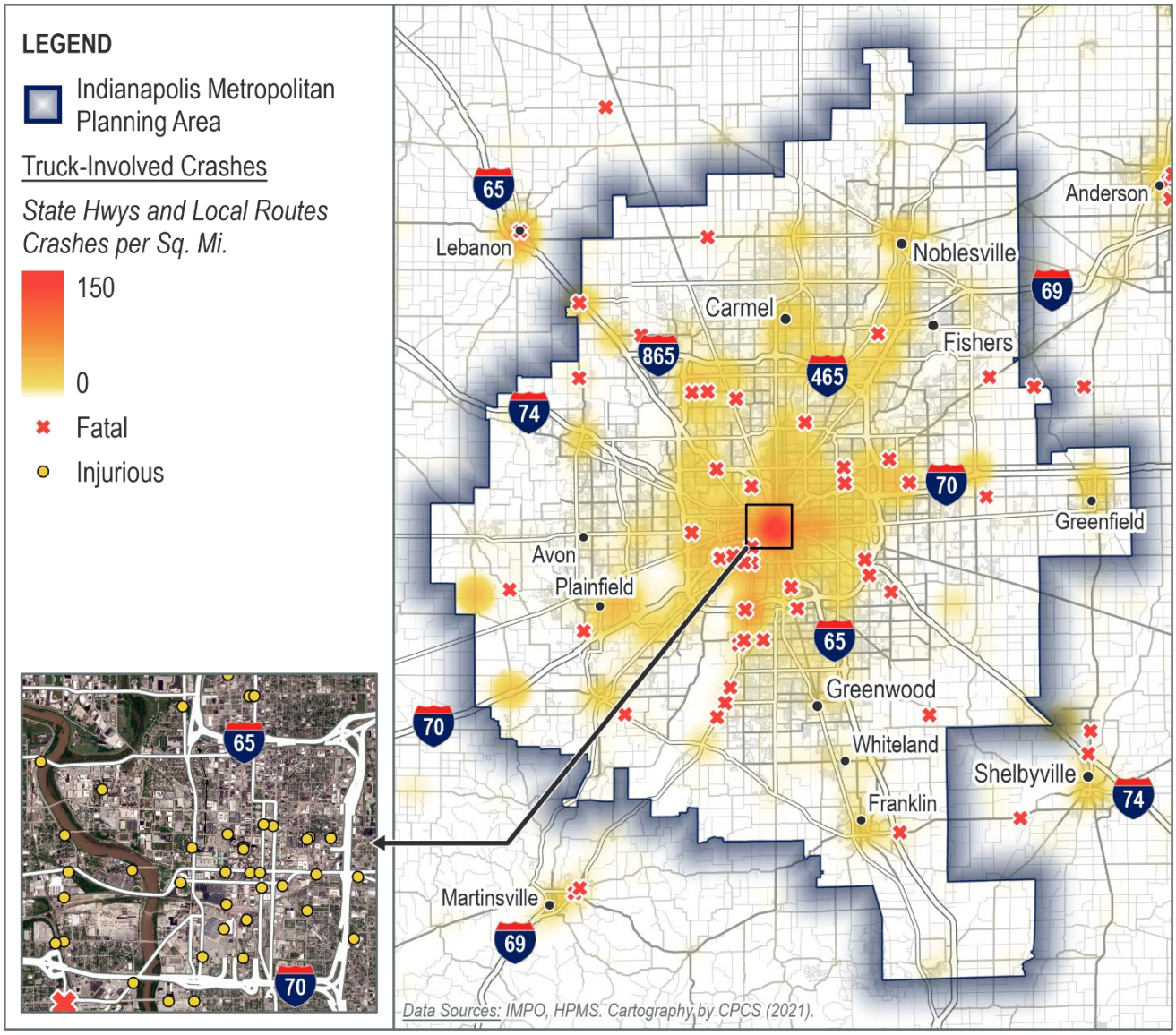


Figure 27 summarizes the truck-involved crash types and their resulting number of injuries and fatalities in the IMPO region. Sideswipe in the same direction collisions are the leading type of truck crashes in the region (32%). Also, rear-end crashes are responsible for about 33 percent of injuries and 29 percent of the truck-involved fatalities in the region. This fatality share is consistent with the overall share of rear-end truck-involved collisions (about 19%). The probability of truck collisions involving a fatality is the highest in head-on (3.9% probability) and right-angle crashes (1.9% probability).

Figure 27: IMPO Truck Crashes and Casualties by Type – 2015-2019

Collision Type	No. of Crashes	percent of Crashes	No. of Injuries	percent of Injuries	No. of Fatalities	percent of Fatalities	Fatality Probability
Same Direction Sideswipe	7397	32.3%	591	22.3%	6	5.0%	0.08%
Rear End	4268	18.6%	876	33.1%	35	28.9%	0.82%

Collision Type	No. of Crashes	percent of Crashes	No. of Injuries	percent of Injuries	No. of Fatalities	percent of Fatalities	Fatality Probability
Left/Right Turn	2037	8.9 %	157	5.9%	5	4.1%	0.3%
Backing Crash	1988	8.7%	32	1.2%	0	-	-
Right Angle	1494	6.5%	413	15.6%	28	23.1%	1.9%
Ran Off Road	1489	6.5%	241	9.1%	15	12.4%	1.0%
Opposite Direction Sideswipe	627	2.7%	56	2.1%	3	2.5%	0.5%
Collision With Object In Road	449	2.0%	14	0.5%	2	1.7%	0.5%
Head On	338	1.5%	94	3.5%	13	10.7%	3.9%
Collision With Animal	127	0.6%	2	0.1%	0	-	-
Rear To Rear	26	0.1%	2	0.1%	0	-	-
Other/Unknown	2667	11.6%	171	6.5%	14	11.6%	0.5%
Total	**22907**	**100%**	**2649**	**100%**	**121**	**100%**	**-**

Source: CPCS analysis of ARIES database provided by IMPO, 2015-2019.

In terms of primary crash factors, unsafe lane changing movements, following too closely, failure to yield the right of way (ROW), unsafe backing and turning, and improper lane usage were ranked highest for truck-involved crashes in the IMPO region. These crashes have resulted in 1,528 injuries and 41 deaths between 2015 and 2019. Crashes due to disregarding traffic signals or regulatory roadway signs have the highest share of truck-related fatalities in the IMPO region (16 deaths in 5 years). However, the probability of truck collisions involving a fatality is the highest for pedestrian-involved crashes and wrong ROW violations (i.e., driving in the wrong direction on one-way routes).

Figure 28: IMPO Truck Crashes by Violation Factor – 2015-2019

Violation Factor	No. of Crashes	percent of Crashes	No. of Injuries	percent of Injuries	No. of Fatalities	percent of Fatalities	Fatality Probability
Unsafe Lane Movement	4640	20.3%	479	18.1%	13	10.7%	0.3%
Following Too Closely	3038	13.3%	540	20.4%	10	8.3%	0.3%
Failure To Yield Right of Way	2376	10.4%	377	14.2%	13	10.7%	0.6%
Unsafe Backing	1958	8.5%	25	0.9%	0	0.0%	n/a
Improper Turning	1651	7.2%	42	1.6%	1	0.8%	0.1%
Improper Lane Usage	1032	4.5%	65	2.5%	4	3.3%	0.4%
Speed Too Fast For Weather Conditions	726	3.2%	140	5.3%	3	2.5%	0.4%
Ran Off Road Right	719	3.1%	105	4.0%	8	6.6%	1.1%
Disregard Signal/Reg Sign	564	2.5%	168	6.3%	16	13.2%	3.0%

Violation Factor	No. of Crashes	percent of Crashes	No. of Injuries	percent of Injuries	No. of Fatalities	percent of Fatalities	Fatality Probability
Overcorrecting/ Oversteering	515	2.2%	60	2.3%	2	1.7%	0.4%
Animal/Object In Roadway	368	1.6%	22	0.8%	0	0.0%	n/a
Improper Passing	364	1.6%	32	1.2%	1	0.8%	0.3%
Unsafe Speed	353	1.5%	112	4.2%	10	8.3%	2.8%
Driver Distracted - Explain In Narrative	335	1.5%	57	2.2%	3	2.5%	0.9%
Left Of Center	307	1.3%	63	2.4%	8	6.6%	2.6%
Insecure/Leaky Load	268	1.2%	7	0.3%	0	0.0%	n/a
Tire Failure Or Defective	216	0.9%	15	0.6%	2	1.7%	0.9%
Oversize/Overweight Load	165	0.7%	3	0.1%	0	0.0%	n/a
Roadway Surface Condition	139	0.6%	19	0.7%	3	2.5%	2.2%
Brake Failure Or Defective	126	0.6%	16	0.6%	0	0.0%	n/a
Driver Asleep Or Fatigued	102	0.4%	25	0.9%	2	1.7%	2.0%
View Obstructed	85	0.4%	9	0.3%	0	0.0%	n/a
Driver Illness	40	0.2%	18	0.7%	2	1.7%	5.0%
Obstruction Not Marked	40	0.2%	1	<0.1%	0	0.0%	n/a
Pedestrian Action	31	0.1%	11	0.4%	10	8.3%	32.3%
Engine Failure Or Defective	24	0.1%	2	0.1%	0	0.0%	n/a
Steering Failure	24	0.1%	3	0.1%	0	0.0%	n/a
Wrong Way On One Way	19	0.1%	6	0.2%	3	2.5%	15.8%
Cell Phone Usage	18	0.1%	5	0.2%	0	0.0%	n/a
Tow Hitch Failure	17	0.1%	0	0.0%	0	0.0%	n/a
Traffic Control Inoperative/Missing/Obsc	12	0.1%	1	<0.1%	0	0.0%	n/a
Severe Crosswinds	9	<0.1%	1	<0.1%	0	0.0%	n/a
Accelerator Failure Or Defective	6	<0.1%	1	<0.1%	0	0.0%	n/a
Lane Marking Obscured	5	<0.1%	1	<0.1%	0	0.0%	n/a
Holes/Ruts In Surface	2	<0.1%	1	<0.1%	0	0.0%	n/a

Violation Factor	No. of Crashes	percent of Crashes	No. of Injuries	percent of Injuries	No. of Fatalities	percent of Fatalities	Fatality Probability
Other/Unknown	2,613	11.4%	217	8.2%	7	5.8%	0.3%
Total	**22,907**	**100%**	**2,649**	**100%**	**121**	**100%**	**n/a**

Source: CPCS analysis of ARIES database provided by IMPO, 2015-2019.

High-Density Crash Locations

This section reviews the locations of high-severity crash concentration along the roadway network of the IMPO region. As shown in the above analysis of truck crash types, head-on crashes have the highest probability of leading to fatalities or serious injuries. Therefore, as the high-density locations were assessed, specific attention was given to the locations at which head-on crashes have repeatedly happened between 2015 and 2019.

1. I-465/IN-37 Interchange, Indianapolis:

The area surrounding the I-465/IN-37 interchange south of Indianapolis has the highest concentration of truck-involved crashes across the IMPO region. Between 2015 and 2019, over 516 truck-involved crashes happened within 1-mile of this interchange, 65 of which were fatal or injury crashes, and the rest were PDO. The area surrounding the interchange is primarily industrial land use, with many freight-related establishments including Harding Street Quarry, several truck stops and fuel providers, truck dealerships, and many distribution facilities.

Figure 29: I-465/IN-37 Interchange

Source: Google Maps, 2021.

Nearly 40 percent of the crashes that happened at this interchange were same direction sideswipe collisions, while head-on, rear-end, and backing crashes were also concentrated at this location. Truck-involved crashes primarily happened at this location due to unsafe lane changing maneuvers (22 percent), following too closely (19 percent), and unsafe backing (10 percent).

2. South Sherman Drive, Indianapolis:

Nineteen truck-involved crashes, including six head-on collisions, happened between 2015 and 2019 on the section of South Sherman Drive between East Washington Street and East Pleasant Run Parkway. CSX rail line also passes under Sherman Drive in this segment. Single unit trucks were involved in all of these head-on crashes, and three of the six crashes happened at Sherman Drive/Moore Ave intersection.

The high concentration of truck-involved crashes in this residential area can be attributed to trucking activities at the storage facility located on Moore Ave, as well as delivery trucks serving the Sherman Commons Shopping Center. The primary crash factor in these truck crashes was drivers failing to yield the right of way (ROW) to other vehicles.

Figure 30: South Sherman Drive, Indianapolis

Source: Google Maps, 2021.

3. East New York Street, Indianapolis:

Thirty-five truck-involved crashes happened at the segment of East New York Street between North Gale Street and North Lasalle Street in Eastern Indianapolis between 2015 and 2019. Seven of these truck-involved crashes were head-on collisions. The primary crash factor for the majority of these single-unit truck and tractor-trailer crashes were disregarding the traffic signal and failure to yield the ROW. Several over-sized, over-weight-related crashes also happened in this area between 2015 and 2019. The high concentration of truck crashes can be attributed to an auto parts dealer and several other heavy industrial facilities existing at this location.

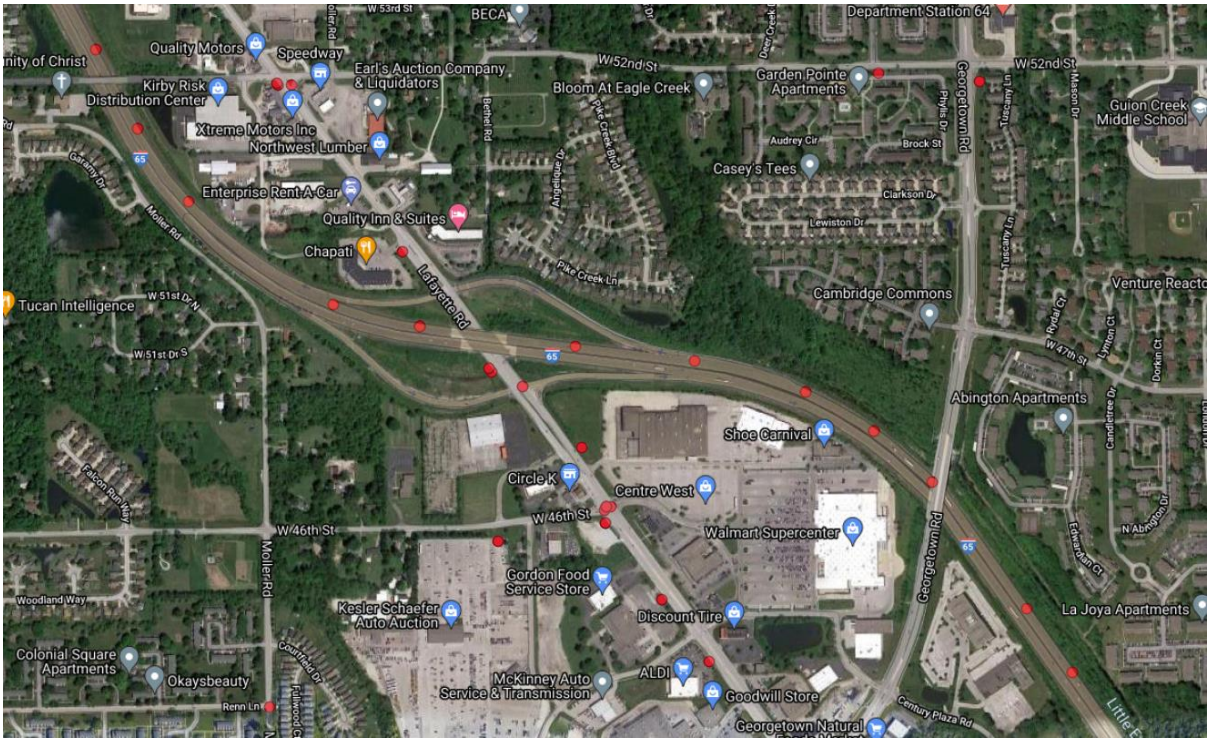
Figure 31: East New York Street

Source: Google Maps, 2021.

4. I-65 Interchanges in North-Western Indianapolis:

About 67 truck-involved crashes happened on the I-65 Interchanges with Lafayette and Georgetown roads between 2015 and 2019, including seven head-on collisions. Crashes at this location were primarily PDO, but ten of them led to serious injuries. Fatigued driving, failure to yield the ROW at on/off ramps, and driving on the wrong side of the way were primary truck crash factors at this location. Several shopping stores and heavy industrial facilities are located north and south of the I-65/Lafayette Road, resulting in high volumes of trucks traveling the roads.

Figure 30: I-65 Interchanges in North-Western Indianapolis



Source: Google Maps, 2021.

In 2019, IMPO sponsored a study of high-crash intersections in the region, using the ARIES database and inputs provided by the local public agencies (LPAs) and emergency services professionals. As a result, 24 intersections were selected for individual safety studies based on their vehicle volumes and the number of crashes. Each individual study included a review of the existing conditions and traffic operations at the intersection, a list of solution alternatives and recommendations, and cost estimates for proposed safety improvements. Figure 31 shows the high-crash intersections with their corresponding AADT, Index of Crash Cost (ICC), and Index of Crash Frequency (ICF). ICC compares the total cost of reported crashes at a location with the average crash cost. ICF is the estimated number of crashes divided by the study period length in years.[12]

Figure 31: High-Crash Intersections in the IMPO Region

Primary Road Name	Intersection AADT	Index of Crash Cost	Index of Crash Frequency
10th St. at Girls School Road	39,496	5.72	14.40
24th St. at Keystone Avenue	34,211	3.93	9.64
38th St. at Commercial Drive/ Industrial Blvd.	39,866	3.79	10.01
38th St. at Franklin Road	29,634	5.35	12.29
38th St. at High School Road	64,663	1.76	1.70
46th St. at Shadeland Avenue	31,965	5.32	11.29
116th St. at Olio Road	40,329	3.70	9.60

[12] IMPO, 2019 Safety Studies. https://d16db69sqbolil.cloudfront.net/mpo-website/downloads/Data/Exec.-Summary_2019-IMPO-Safety-Studies-11-17-19-2.pdf

Primary Road Name	Intersection AADT	Index of Crash Cost	Index of Crash Frequency
146th St. at Carey Road	33,768	4.23	9.26
146th St. at Gray Road	32,529	3.98	9.94
146th St. at Hazel Dell Parkway	38,337	4.45	9.29
146th St. at River Road	34,935	3.38	9.72
Averitt Road (CR 100W) at Smith Valley Rd.	24,672	3.24	7.71
CR 100N (10th Street) at Raceway Rd.	30,448	4.00	9.44
CR 300N at Franklin Street/Fortville Pike	4,774	2.94	5.88
Mount Comfort Rd. (CR 600W) at CR 600N	14,058	2.18	5.44
Crawfordsville Rd. at Cunningham Rd./ Parkwood Dr.	38,492	4.28	11.92
Elmwood Avenue at Emerson Avenue	34,084	3.91	9.12
Emerson Avenue at Victory Drive	44,729	4.21	10.88
Main Street (CR 950N) at Sheek Road/South Park Boulevard	24,778	3.79	8.64
New York Street at University Boulevard	34,527	1.71	1.89
Northfield Drive at Green Street	48,515	4.51	13.77
Ohio St.at Pennsylvania Street	22,798	1.70	2.31
Rural St.at Washington Street	26,897	4.05	9.01
South St./Fletcher Ave. at Virginia Ave. & East St.	17,359	1.48	1.56

Source: IMPO, 2019 Safety Studies.

The high-crash intersections identified in the 2019 study along with the high-truck crash road segments identified in this present study establish a base for analysis of the strength and weaknesses of the freight transportation system of the IMPO region in the upcoming tasks.

3 Overview of Existing Rail Operations

Key chapter takeaway

IMPO region is served by 220 miles of CSX Class I railroad and over 100 miles of regional and short line operations. About 46 percent of the Class I system and nearly 8 percent of the short lines in the region can accommodate double-stacked trains. Also, almost the entire length of the Class I and Class II railroad tracks in the IMPO region can carry 286,000 lbs railcars. However, only about 11 percent of the short line system in the IMPO region is 286,000 capable. The region is also served by two intermodal rail terminals and eight truck/rail transload facilities. Additionally, Central Indiana & Western Railroad serves Industrial Recyclers, a transload facility, in Anderson, which is about 30 miles northeast of Indianapolis.

About 46 percent of the Class I system and nearly 8 percent of Class III system in the IMPO region can accommodate double-stacked trains. Also, almost the entire length of Class I and Class II railroad tracks and about 11 percent of the short line system in the IMPO region can carry 286,000 lbs railcars. IMPO's freight rail system saw 58 incidents in 2019, which led to 8 deaths and 12 person injuries. Trespassing incidents accounted for 62 percent of the 2019 freight rail casualties in the IMPO region.

3.1 Description of Rail Network

The IMPO region is served by 220 miles of CSX Class I railroad and over 100 miles of regional and short line operations. Norfolk Southern (NS) is also a Class I railroad whose trains operate on CSX's tracks through trackage right. The Indiana Rail Road Company (INRD) is the Class II (or regional) railroad operating on a line parallel to IN-135 and connecting with Class I operations at CSX's intermodal facility in Old Southside Indianapolis.

The Class III (short line) operations in the IMPO region are Indiana Southern Railroad (ISRR), Louisville & Indiana Railroad Co (LI), Central Railroad Co. of Indiana (CIND), and Hoosier Heritage Port Authority (HHPA).

In addition to the intermodal facility in Old Southside Indianapolis, CSX has an intermodal facility in Avon. Also, ten rail/truck transload facilities and two grain elevators serve the freight industry in the IMPO region. Figure 32 presents a summary of the freight rail operations in the IMPO region, and Figure 33 illustrates these operations as well as facilities that connect rail to other modes.

Railroad Classes

The US Surface Transportation Board (STB) categorizes railroads based on revenue thresholds:

- *Class I*: annual operating revenue of $447.6 M or more;
- *Class II (Regional)*: annual operating revenue between $35.8 and $447.6 M;
- *Class III (Short Lines – include switching and terminal sections)*: annual operating revenue less than $35.8 M.

(Source: Surface Transportation Board, 2019)

Figure 32: Freight Railroads Serving the IMPO Region

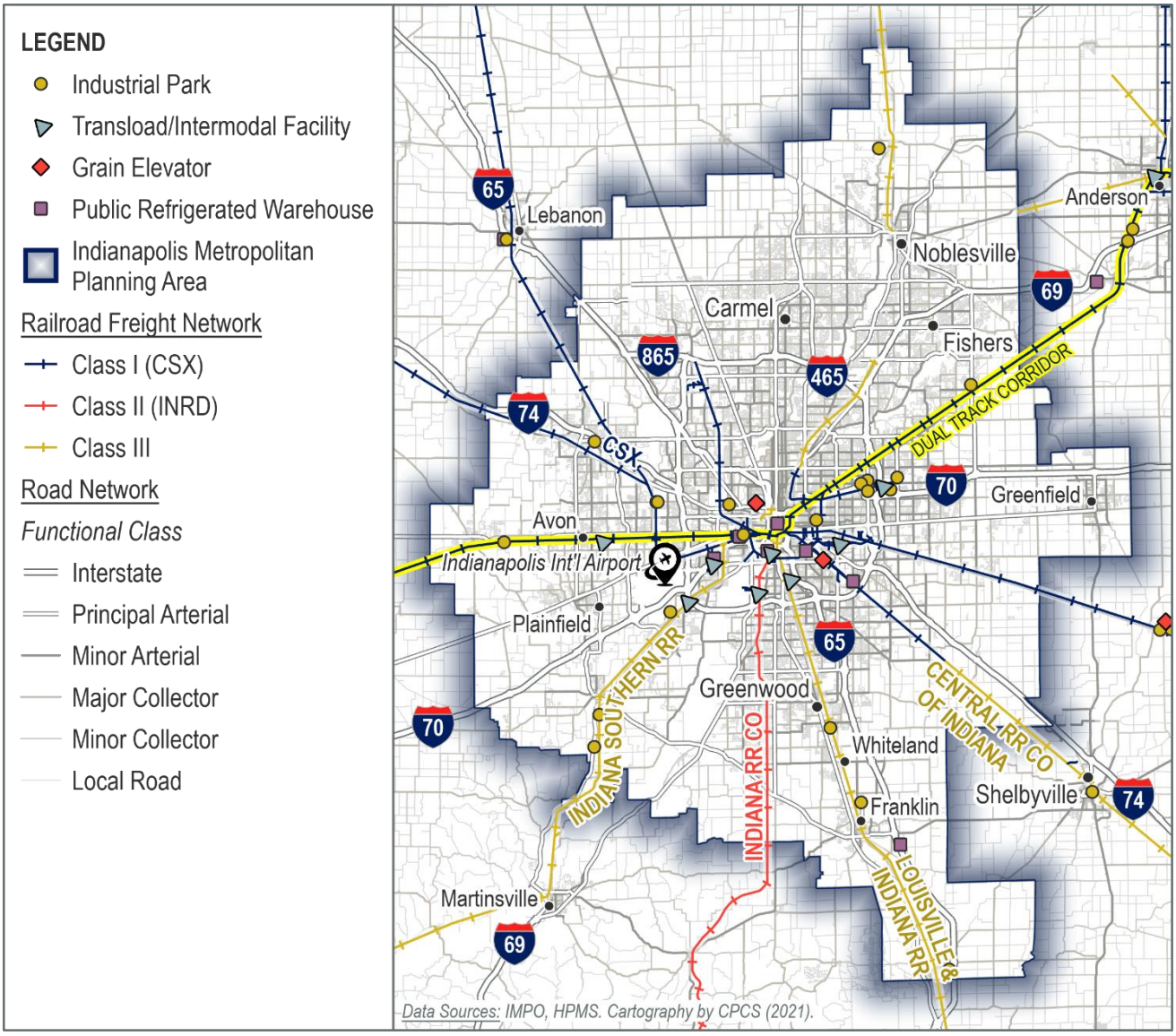
Railroad	Type	Mileage Owned in MPA	Amtrak Mileage
CSX	Class I	220	42.0
NS*	Class I	0	0
INRD	Class II	20	0
ISRR	Short Line	23	0
LI	Short Line	31	0
CIND	Short Line	7	0
HHPA	Short Line	21**	0

Source: CPCS analysis of rail profile data provided by the IMPO, 2021.
*Through trackage right on CSX's line. **Approximately 17 miles of the HHPA line in Indianapolis is abandoned.

As shown in the table above, the CSX tracks in the IMPO region also serve Amtrak trains on the Cardinal route that travels between New York and Chicago through Indianapolis, Crawfordsville, and Lafayette. Four Amtrak trains per week travel on the Cardinal route, serving an average of 107,700 passengers annually. Chicago-Indianapolis are the top origin-destination city pairs on the Cardinal route in terms of the number of passengers. Over 10,680 passengers in Indianapolis and 6,500 passengers in Lafayette boarded and un-boarded the Cardinal trains in 2019.[13]

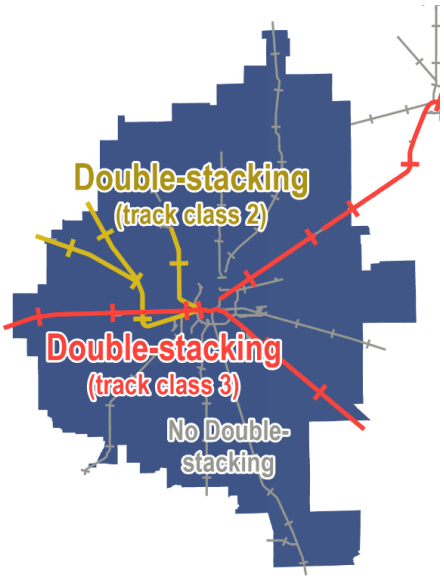
[13] Amtrak Fact Sheet, Cardinal Service & Hoosier State Service, 2019.

Figure 33: IMPO Rail System Map



3.1.1 IMPO's Tiered Rail Freight Corridors

The previous IMPO Freight Plan (2015) established a tiered approach to classify the freight-specific corridors for road and rail freight modes serving the IMPO region. According to this approach, rail corridors serving Class I rail operations (CSX and NS routes) are categorized as Tier I, while Class II and short line routes are Tier 2 railroads. Figure 34 shows the portion of the tiered rail freight network in the IMPO region that has double-stack clearance.



Double-stack rail operations carry two layers of intermodal containers and require a height clearance of 18 feet to 20 feet above the rail tracks.[14] The railroads can increase their operational efficiency and reduce costs, as a freight train can carry roughly twice as many containers in double-stack operations. As shown, about 46 percent of Class I (Tier 1) system and nearly 8 percent of Class III (Tier 2) system in the IMPO region can accommodate double-stacked trains.

Figure 34: Double-stack Status in the IMPO Region

RR Class	Freight Tier	Miles Double-Stack	percent of Total Miles Double-Stack
Class I	Tier 1	102.3	46 percent
Class II	Tier 2	0	0
Short Line	Tier 2	6.5	8 percent
Total	**-**	**108.8**	**34 percent**

Source: CPCS analysis of rail profile data provided by the IMPO, 2021.

Upgrading rail corridors to accommodate railcars weighing up to 286,000 lbs. or 286K is a major factor in helping freight railroads improve their total payload, and therefore productivity. Without the upgrade, the heaviest railcars that can be carried on the rail tracks are about 263,000 lbs.

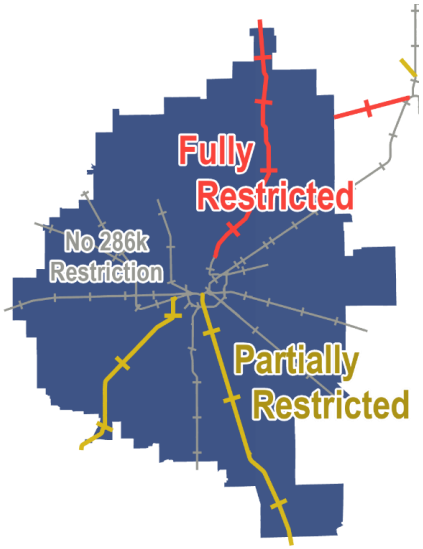


Figure 35 shows the portion of the rail freight system in the IMPO region that can accommodate 286k railcars. As shown, about 77 percent of the rail freight system in the IMPO region is 286k capable. Almost the entire length of Class I and Class II railroad tracks in the IMPO region can carry 286k lbs railcars. However, only about 11 percent of the short line system in the IMPO region is 286k capable.

[14] CSX, Double-stack Clearance Map, 2019. https://www.csx.com/index.cfm/library/files/customers/dimensional-clearance/double-stack-map/

Figure 35: Freight Rail Weight Capacity in the IMPO Region

RR Class	Miles 286k Capable	percent of Total Miles 286k Capable	Miles Restricted	Miles Partially Restricted
Class I	220	99.8 percent	-	0.2
Class II	19.8	100 percent	0	0
Short Line	9	11 percent	21	53.5
Total	249	77 percent	21	53.7

Source: CPCS analysis of rail profile data provided by the IMPO, 2021.

3.1.2 Rail Served Facilities

The rail-served facilities are mainly located within the jurisdiction of Indianapolis. Figure 36 demonstrates the list of rail-served facilities, including intermodal terminals, transload facilities, and grain elevators in the Indianapolis Metropolitan Region. In addition, Central Indiana & Western Railroad serves Industrial Recyclers, a transload facility in Anderson, which is about 30 miles northeast of Indianapolis. As of 2021, there is no future expansion plan for the facilities listed.

Figure 36: Rail Served Facilities

Facility Name	Facility Type	Serving Railroad	Location
CSX Intermodal Terminal	Intermodal Terminal	CSX	Avon, IN
CN/INRD Intermodal Terminal	Intermodal Terminal	INRD	Indianapolis, IN
CSX Transflo Indianapolis	Transload Facility	CSX	Indianapolis.IN
Progressive Logistics LLC	Transload Facility	CSX	Indianapolis.IN
Arrow Reload Systems Inc	Transload Facility	INRD	Indianapolis, IN
Indianapolis Industrial Center	Transload Facility	CSX, INRD	Indianapolis, IN
Venture Logistics	Transload Facility	INRD	Indianapolis, IN
Piper Logistics Warehousing	Transload Facility	CSX	Indianapolis, IN
Venezia Transport Services, Inc.	Transload Facility	INRD	Indianapolis, IN
Kid Glove	Transload Facility	ISRR	Indianapolis, IN

Source: CPCS analysis of information provided in the Indiana State Rail Plan Appendix; Load match website; railroad company websites, 2021.

Intermodal Connectors

As a part of the National Highway System defined by the US Department of Transportation (USDOT) and the Federal Highway Administration (FHWA), Intermodal connectors are public highways that serve as connections between NHS and the Nation's ports, rail, and truck terminals, and airports and passenger transit terminals. The primary criteria for identifying intermodal connectors are freight volumes or daily vehicular traffic on one or more routes that link intermodal facilities and NHS. To be qualified as truck/rail intermodal connectors, the principal roadways serving truck/rail intermodal facilities have to transport at least 50,000 TEUs annually, or 100 trucks daily, in each direction. The

secondary criteria contain factors that weigh the significance of a specific intermodal facility within a state.[15]

Figure 37: CSX Facility Intermodal Connector Route

Source: FHWA, NHS System Website, 2021.

As listed in Figure 38, the segment of US-36 and Dan Jones Road between exit 13 on I-465/I-74 and the CSX Intermodal Facility in Avon is the only truck/rail intermodal connector identified by USDOT and FHWA in the Indianapolis Metropolitan Area. This intermodal connector is the longest in length among the 20 intermodal connectors in the State of Indiana.

Figure 38: Intermodal Connectors in the IMPO Region

Intermodal Connector Route	Segment Length (miles)	Truck AADT (2019)	Facility Served
From I-465/I-74 (exit 13): west on US-36, south on Dan Jones Road to terminal	6.5	490	Avon CSX Intermodal Facility

Source: CPCS analysis of FHWA's Intermodal Connectors List, 2021; IDOT Traffic Count Database System, 2019.

Additional routes may qualify for the FHWA Intermodal Connector designation. These routes are generally selected by the USDOT in consultation with State Departments of Transportation (DOTs) and metropolitan planning organization (MPO) partners. Relevant criteria on routes serving major intermodal rail facilities in the region will be assessed to identify a list of candidate routes for adding to or modifying the NHS Intermodal Connector subsystem.

3.1.3 Rail Crossings

Over 470 active highway-rail grade crossings exist in the IMPO region, over 80 percent of which are public crossings, and the rest are private crossings. In addition to at-grade crossings, 152 railroad crossings exist in the IMPO region that cross over or under the roadway lanes. The majority (98 percent) of these crossings are public, meaning they cross roadways under the jurisdiction of state or local public transportation authorities. Figure 39 lists the number of rail crossings in the IMPO region by position and type

Figure 39: Kansas Railroad Crossings by Position and Type

Crossing Position	Private	Public	Total
At-grade	94	377	471

[15] FHWA, Freight Intermodal Connectors Study. https://ops.fhwa.dot.gov/publications/fhwahop16057/fhwahop16057.pdf

Crossing Position	Private	Public	Total
Railroad over/under the roadway bridge	3	149	152
Total	**97**	**526**	**623**

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

The Federal Highway Administration (FHWA) provides guidance on equipping at-grade crossings with warning devices in the Manual of Uniform Traffic Control Devices (MUTCD).[16] According to the MUTCD, all public grade crossings should at least be equipped with passive warning devices to mitigate conflict between rail and other modes, which will lead to safety incidents. The traffic control devices such as signs and markings located at or in advance of grade crossings to indicate the presence of a rail crossing are known as passive warning devices. In contrast, active warning devices such as flashing lights, and gates change their aspect at the approach or passing of a train. Typically, a combination of passive and active warning devices are installed at grade crossings to improve safety.

Figure 40 summarizes the warning devices that are currently installed at grade crossings across the IMPO region. As the table shows, all of the public grade crossings and a vast majority of the private grade crossings in the region are equipped with traffic signals. Meanwhile, none of the private crossings and only about 41 percent of the public crossings have gates. Five grade crossings in the region are not equipped with any warning devices, all of which cross private roads.

Figure 40: At-Grade Crossing Safety Devices in IMPO Region

	Crossing Safety Device	Private	Percent of Total	Public	Percent of Total
Passive	Cross Bucks	21	22.3%	130	34.5%
	Stop Signs	15	16.0%	85	22.5%
	Pavement Markings	2	2.1%	225	59.7%
Active	Gates	0	0.0%	156	41.4%
	Cantilever Flashing Lights	0	0.0%	130	34.5%
	Standard Flashing Lights	3	3.2%	257	68.2%
	Traffic Signal	89	94.7%	377	100%
	Bells	2	2.1%	176	46.7%
No Safety Device		5	5.3%	0	0.0%

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

3.2 Rail Safety

For the rail safety analysis presented in this section, rail incident reports submitted by railroads to the Federal Railroad Administration (FRA) are used. The Accident Reports Act (ARA), signed into law in 1910, requires the railroads to file monthly reports of “accidents and incidents resulting in injury or death to an individual or damage to equipment or a roadbed arising from the carrier’s operations” with the Secretary of Transportation. ARA’s provisions are also fortified through the provisions and amendments introduced in the 1970 Federal Railroad Safety Act (FRSA). Both ARC and FRSA

[16] FHWA, Manual on Uniform Traffic Control Devices, Online Guide, Accessed July 2021.

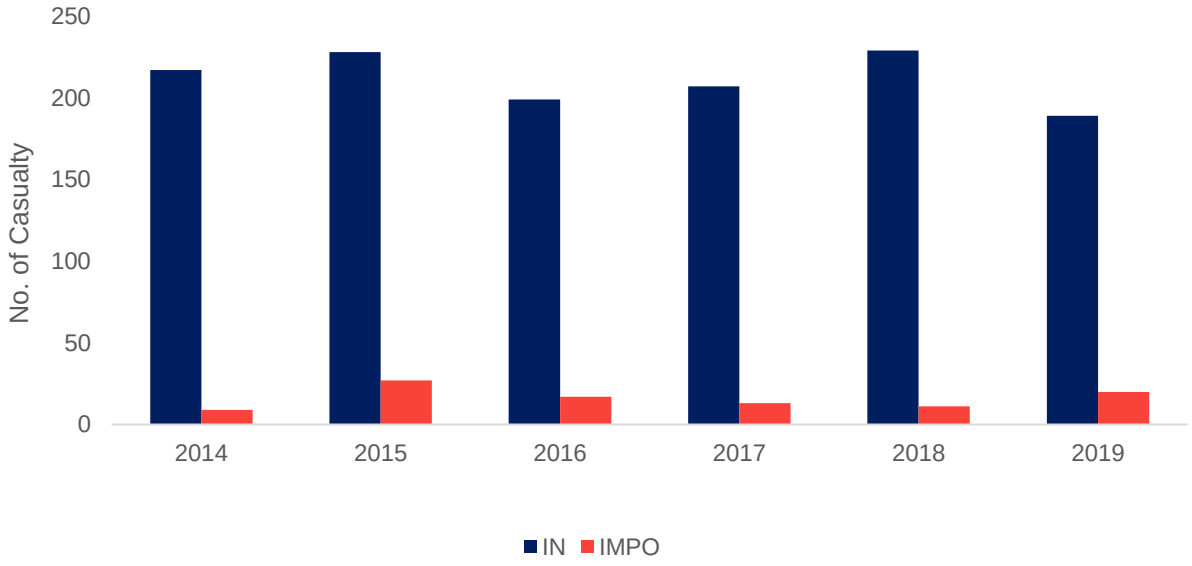
delegate the authority for prescription and enforcement of rail safety standards and regulations to the FRA.[17]

The rail safety incident categories based on railroads' reports to FRA include:

- Highway-rail grade crossing incidents;
- Rail equipment incidents, including train collisions, derailments, fires or explosions, and other events that happen during rail operations and meet the FRA's monetary threshold notice for reporting;[18] and
- Rail-related casualties, which are deaths, injuries, and railroad worker occupational illnesses that results in medical treatment, significant diagnosis by a health professional, or loss of consciousness.[19]

Over 290 freight rail incidents happened in the IMPO region between 2014 and 2019, resulting in 21 deaths and more than 168 person injuries. In 2019, IMPO's freight rail system saw 58 incidents in total, which led to 8 deaths and 12 person injuries. Trespassing incidents accounted for the highest share of the 2019 freight rail casualties in IMPO (6 percent). As Figure 41 shows, since 2014, the total number of rail casualties in IMPO has more than doubled.

Figure 41: Rail Casualty Trend in Indiana and IMPO Region



Source: CPCS analysis of FRA Safety Data, 2021.

3.2.1 Rail Crossing Incidents

Between 2014 and 2019, 90 incidents happened at highway-rail grade crossings in the IMPO region, resulting in 11 deaths and 39 person injuries. In 2019, 21 crossing incidents caused six person injuries and five fatalities in the IMPO region. When comparing 2019 to 2014, IMPO's crossing incidents have increased by about 6 percent.

Single-unit trucks and tractor-trailers were involved in 18 percent of the highway-rail grade crossing incidents that happened over the past five years in the IMPO region. 50 percent of the times, the trucks

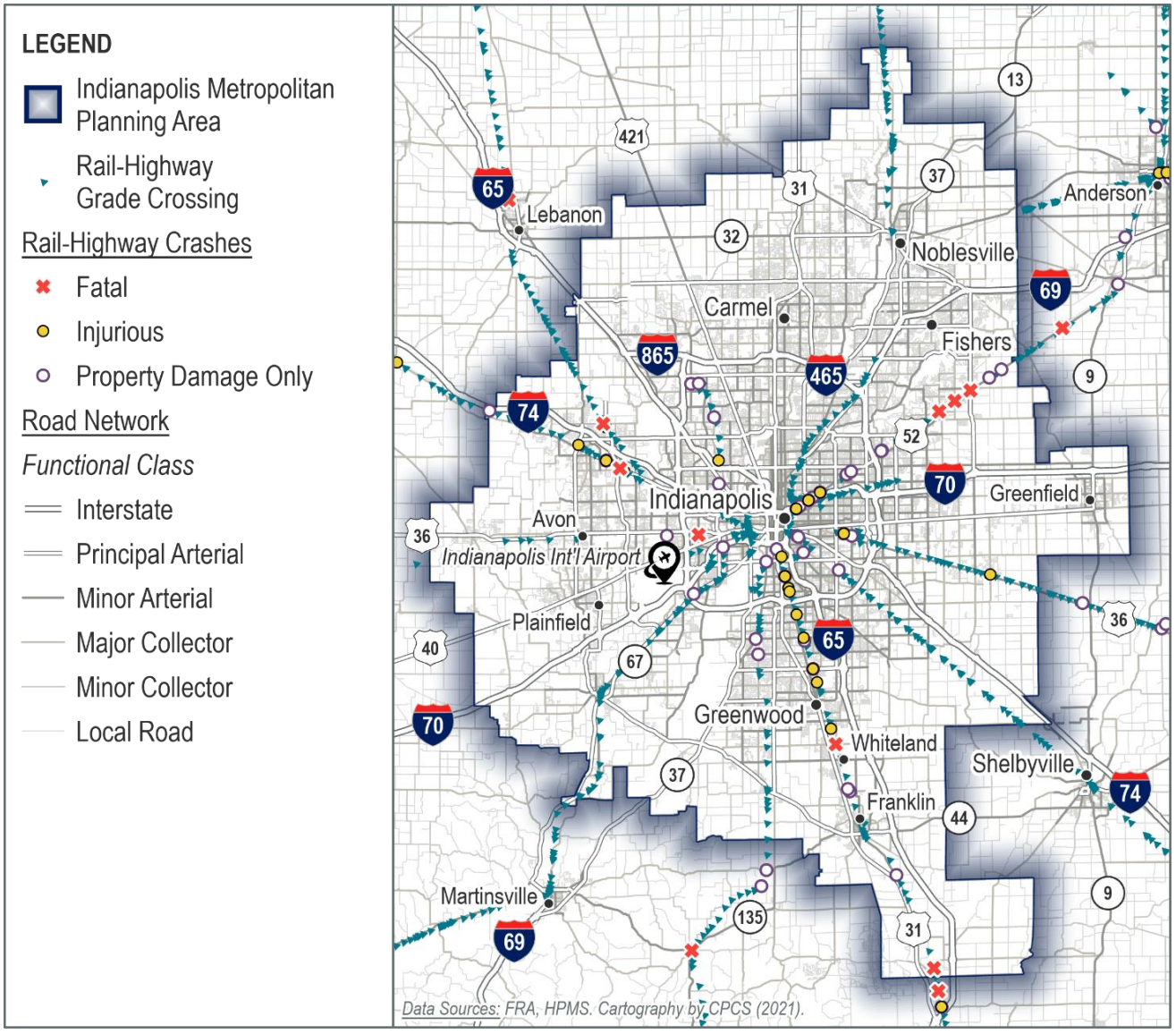
[17] 49 U.S.C. §§ 20901–20903 and 49 CFR Part 225.

[18] FRA's current monetary threshold is $11,200 (effective January 2021). For more information on FRA's monetary threshold see: https://safetydata.fra.dot.gov/officeofsafety/ProcessFile.aspx?doc=Monetary%20Threshold%20Notice.pdf

[19] FRA Guide for Preparing Accident/Incident Reports, 2011.

involved in highway-rail crossing incidents were moving over the crossings while the trains were approaching, and about 40 percent of the times the trucks were stopped on the rail tracks when they were hit by a train.

Figure 42: Rail Crossing Incidents

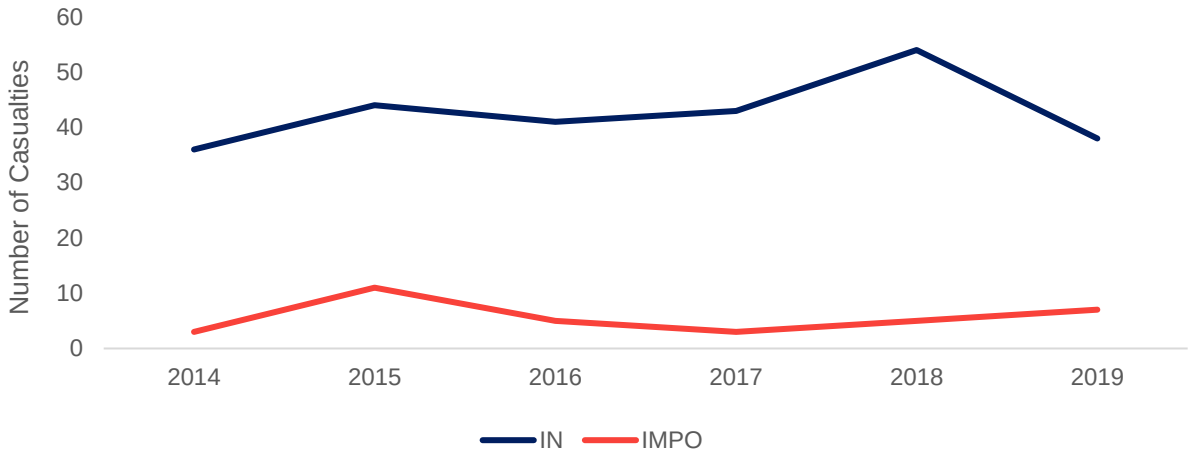


3.2.2 Rail Trespassing Incidents

Between 2014 and 2019, rail trespassing incidents happened in the IMPO region, leading to 14 deaths and 20 person injuries. Over 82 percent of the region's trespassing incidents were along the CSX railroad's lines in Marion County. In 2019, seven trespassing incidents happened in the IMPO region, five of which were fatal. As Figure 43 shows, rail trespassing incidents have increased by about 40 percent between 2018 and 2019 in the IMPO region. In contrast, rail trespassing incidents across Indiana have decreased by about 30 percent between 2018 and 2019, indicating a relatively higher risk of trespassing incidents in the IMPO region compared to the rest of Indiana. This is in line with the

national trends which show that rail trespassing incidents are highly concentrated at densely populated urban areas where pedestrian traffic is relatively higher.[20]

Figure 43: Rail Trespassing Incidents (2014-2019)



Source: CPCS analysis of FRA Safety Data, 2021.

3.2.3 Rail Safety Hotspot

Figure 44 lists the rail segments and at-grade crossings with the highest concentration of rail incidents between 2014 and 2019. These rail safety hotspots will be considered in the assessment of the region's freight-related needs and issues in the next step of this study.

Figure 44: Rail Safety Hotspots

Railroad	Segment/Crossing	No. of Crashes (2014-2019)	Description
CSX	Along Massachusetts Ave. in Indianapolis, between N Sherman drive and Commerce Ave	13 Crossing 5 trespassing	All of the 13 crossing incidents that happened along this segment were injury crashes involving 4 passenger vehicles, 5 tractor-trailers, and 2 other motor vehicles. Crossings on this segment are equipped with pavement markings, signs, and flashing lights 5 trespassing incidents also happened along this segment, all of which were non-fatal.
CSX	McCordsville BMW Branch and Oaklandon Rd. in Lawrence	3 Crossing 3 Trespassing	All the crossing crashes that happened along this segment over the past 6 years have been fatal. Crossings on this segment are equipped with pavement markings, signs, and flashing lights. Additionally, 3 trespassing incidents happened along this segment, 2 of which were fatal.

[20] FRA's Trespasser Incidents Dashboard, accessed August 2021. https://railroads.dot.gov/accident-and-incident-reporting/casualty-reporting/trespasser-incidents

Railroad	Segment/Crossing	No. of Crashes (2014-2019)	Description
CSX	CSX railroad's grade crossing with N Rural St in Indianapolis	5 Crossing	Three trucks, two passenger vehicles, and one other unspecified vehicle were involved in these injury-only crashes. The vehicles involved were passing over the tracks or stopped on the rail track while the train was approaching, and the crossing was equipped with warning devices such as pavement markings, signs, flashing lights, and a traffic light on the approaching road.
Louisville & Indiana Railroad Co	Louisville & Indiana Railroad's crossing with E Troy Ave south of Garfield park in Indianapolis	5 Crossing	This grade crossing is equipped with pavement markings and signs, but no active warning devices such as gates or traffic signals on the approaching road lanes are provided. No single-unit trucks or tractor-trailers were involved in these incidents. The land use in this area is a mix of residential and light industrial, and several car dealerships are located along E Troy St.

Source: CPCS analysis of FRA Safety Data, 2021.

4 Overview of Existing Air Cargo and Pipeline Activity

Key chapter takeaway

This Chapter provides an overview of the existing air cargo and pipeline activity in the Indianapolis Metropolitan Area. Key takeaways include:

- The Indianapolis Metropolitan Area has a robust aviation infrastructure network, which contains one cargo service airport and five reliever airports identified by the Federal Aviation Association.
- Indianapolis International Airport (IND) ranked the eighth largest cargo airport in the U.S., handling almost 2-billion-pound freight in 2019. With the on-going FedEx facility expansion, IND's capacity will continue to increase in the future.
- Multiple natural gas, petroleum products, hydrocarbon gas liquids pipelines go through the Indianapolis Metropolitan Area. 28.5 percent of the gasoline transported through Indiana goes through the Area.

4.1 Description of Air Cargo Network and Operations

Freight transported by air is usually high-value and time-sensitive. Its role in freight movements and the economy has become more important in recent years due to the increase of e-commerce. The centralized location of Indiana situates the state to be the prime site of domestic and international air cargo activities.

The Federal Aviation Association (FAA) identifies three airports in Indiana, with the landed weight of cargo-only aircraft totaling more than 100 million pounds per year, as the cargo service airports.[21] Figure 45 demonstrates the inbound and outbound cargo volumes of the three airports. In 2019, Indianapolis International Airport (IND), located southwest of Downtown Indianapolis in Marion County, handled about 927 million pounds of inbound cargo and 1,019 million pounds outbound freight, ranking the eighth largest cargo airport in the US.[22]

IND is also home to the world's second-largest FedEx facility. Currently, the FedEx facility in IND is undergoing a seven-year, $1.5 billion expansion that will drastically increase the package-handling capacities and expand its footprint in IND. The 320-acre and 2.5 million-square-foot complex is expected to be fully constructed in 2023 and will be able to handle up to 147,000 packages per hour.[23]

[21] Indiana State Freight Plan (2018) https://www.in.gov/indot/files/Indiana%202018%20State%20Freight%20Plan.pdf.
[22] Federal Aviation Administration CY19 All Cargo Landed Weight, Rank Order. https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy19-cargo-airports.pdf
[23] FedEx's $1.5B investment in Indy will expand capacity, add jobs, strengthen airport finances. Oct. 18, 2018. https://www.ibj.com/articles/70951-fedexs-15b-investment-in-indy-will-expand-capacity-add-jobs-strengthen-airport-finances

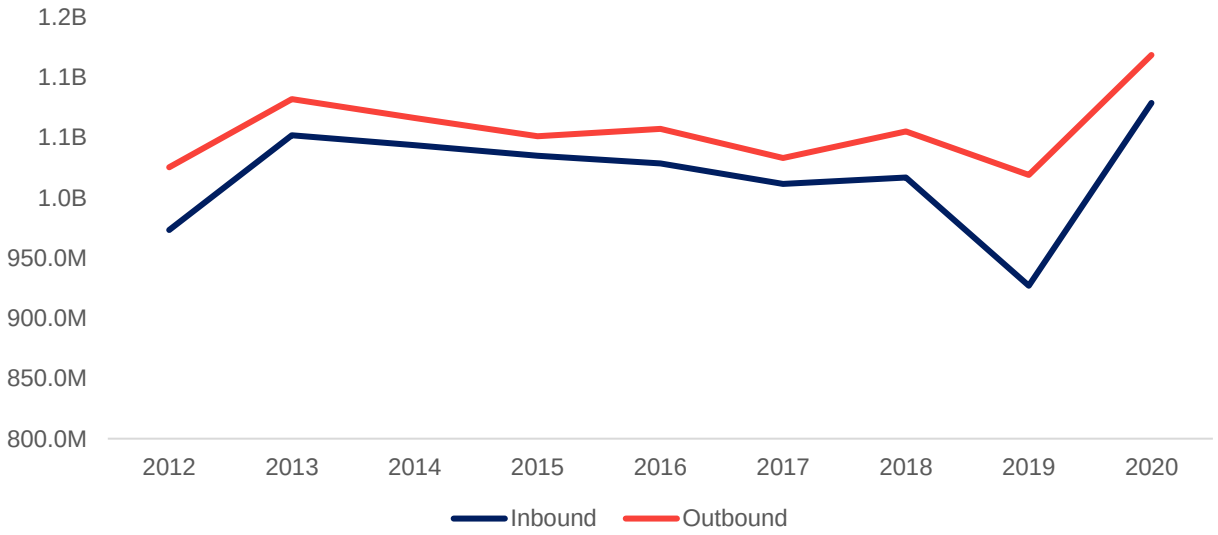
Figure 46 illustrates and compares the cargo volume trends at the three cargo service airports between 2012 and 2020. Looking further into the volume trends of the top ten IND cargo service origins and destinations in 2020, the majority of the cargo services demonstrate upward trends between 2012 and 2020, except for Oakland and Memphis for inbound traffic and Newark for outbound traffic. Although the cargo volumes at IND show downward trends between 2012 and 2019, the air cargo activities increased by 12.9 percent in 2020, possibly due to the growing e-commerce demand.

Figure 45: Cargo Volumes at Indiana Airports (2019 vs. 2020)

Airport	Inbound Cargo (Million Pounds)		Outbound Cargo (Million Pounds)	
	2019	2020	2019	2020
Indianapolis International Airport (IND)	927	1,079	1,019	1,119
Fort Wayne International Airport (FWA)	30	27	25	24
South Bend International Airport (SBN)	14	11	10	9

Note: Cargo includes both freight and mails.
Source: Bureau of Transportation Statistics T-100 Market Data

Figure 46: IND Cargo Volume Trends (2012-2020)



Source: Bureau of Transportation Statistics T-100 Market Data, 2021.

Figure 47 shows the top cargo origins and destinations for the IND. Since 2012, the volumes of cargo shipped between these origins/destinations and the IND has steadily increased.[24]

Figure 47: The Trends of the Top IND Cargo Origins and Destinations

Top Origin	Top Destination
Los Angeles, CA	Memphis, TN
Newark, NJ	Los Angeles, CA
Oakland, CA	Newark, NJ
Memphis, TN	Oakland, CA

[24] Bureau of Transportation Statistics T-100 Market Data, 2021.

Top Origin	Top Destination
Dallas-Fort Worth, TX	Boston, MA
Atlanta, GA	Atlanta, GA
Ontario, Canada	Dallas-Fort Worth, TX
Boston, MA	Ontario, Canada
San Diego, CA	Phoenix, AZ
Anchorage, AK	San Diego, CA

Source: Bureau of Transportation Statistics T-100 Market Data

In addition, there are five reliever airports within the boundary of IMPO, listed in Figure 48.[25] Reliever airports are airports that alleviate the congestion at primary Commercial Service Airports, such as Indianapolis International Airport and provide aviation access to the general public.[26] These airports usually deal with limited amount of cargo service. Yet, they are valuable assets within the Indianapolis aviation network by improving the operational efficiency at the IND and supporting IND's freight movements and local economy.

Figure 48: Reliever Airports within IMPO's Boundary

Airport	Category
Eagle Creek Airpark	Reliever
Hendricks County-Gordon Graham Field	Reliever
Indianapolis Executive	Reliever
Indianapolis Metropolitan	Reliever
Indianapolis Regional	Reliever

Source: Federal Aviation Administration, National Plan of Integrated Airport Systems, 2021.

4.1.1 Intermodal Connectors

Principal routes that experience daily traffic of at least 100 trucks in each direction or transport at least 100,000 tons annually arriving or departing airports are considered to be intermodal connectors.[27] Two federally identified intermodal connectors serve Indianapolis International Airport (IND). As shown in Figure 49 and Figure 50Figure , the two segments both connect IND to I-465/I-74.

Figure 49: Intermodal Connectors in the IMPO Region

Intermodal Connector Route	Segment Length (miles)	Truck AADT (2019)	Facility Served
From I-465/I-74 (exit 11): west 0.3 miles on Airport Expressway to the terminal entrance	0.3	519	IND
From I-465/I-74 (exit 12): west 4.1 mi on US 40 to Six Points Road (CR 1050E)	4.1	1,205	IND

Source: CPCS analysis of FHWA's Intermodal Connectors List, 2021.

[25] National Plan of Integrated Airport Systems (NPIAS), 2021-2025, Appendix A: List of NPIAS Airports with Activity and Development Estimate. Federal Aviation Administration. https://www.faa.gov/airports/planning_capacity/npias/current/media/NPIAS-2021-2025-Appendix-A.pdf

[26] Airport Categories. March 18, 2021. https://www.faa.gov/airports/planning_capacity/categories/

[27] Freight Intermodal Connectors Study. https://ops.fhwa.dot.gov/publications/fhwahop16057/fhwahop16057.pdf

Figure 50: IND Airport's Intermodal Connector Routes

Source: FHWA, NHS System Website, 2021.

4.2 Aviation Planning and Development

Multiple aviation planning and development efforts have been ongoing in the IMPO area. Those plans can provide knowledge and guidance for IMPO to coordinate stakeholders and improve the region's air cargo operations in the future.

In 2011, the Indianapolis Airport Authority approved a 30-year strategic development plan for IND. The Plan evaluated and selected 50 development sites within seven identified development zones. Those developments, expected to be complete by 2040, will generate between $30 and $63 million in revenues annually.[28] IND is also located in the Airport Tax Increment Financing (TIF) district. A TIF district utilizes the incremental tax from sales and property within the district to fund the initial development and redevelopment. During the period between 2007 and 2017, the Airport TIF district created between $11.8 million and $15.7 million in annual revenue. The 2018 West Side Strategic Revitalization and Airport TIF Implementation Plan identified the needs in the TIF district and provided an investment strategy and a schedule for projects that promote the area's economic development and community wellbeing.[29]

Besides efforts in planning around IND, there are two other plans underway for the Indianapolis Regional Airport (MQJ) and Indianapolis Executive Airport (TYQ). The MQJ Sustainable Airport Master Plan, supported by a grant from FAA in 2020, intends to guide the airport development for the next 20 years and beyond.[30] Similarly, entering into its final phase, the TYQ's land-use study investigates the future airport development options and establishes community-friendly development strategies.[31]

[28] Indianapolis Airport Authority approves 30-year strategic development plan. February 18, 2011. https://www.ind.com/about/media/media-releases/indianapolis-airport-authority-approves-30-year-strategic-development-plan

[29] West Side Strategic Revitalization & Airport TIF Implementation Plan. August 23, 2018. https://www.indygateway.org/wp-content/uploads/2020/07/180912_Final-West-Side-Strategic-Plan-and-Airport-TIF-Implementation-Plan_Combined_WebRes.pdf

[30] MQJ Sustainable Airport Master Plan. https://www.ind.com/mqjmasterplan

[31] Indianapolis Executive Airport Study. https://zionsville-in.gov/566/Indianapolis-Executive-Airport-Study

4.3 Description of Pipeline Network and Operations

Pipelines are efficient and cost-effective in transporting liquids, gas, and chemicals in large quantities, playing a crucial role in supporting many freight-related industries. Figure 51 summarizes the major commodities transported by pipeline in Indiana.

Figure 51: Major Commodities Carried through Indiana's Pipeline (2012&2020)

Commodity	2020 Indiana Tonnage*	2020 Indianapolis-Carmel-Muncie Area Tonnage
Crude Petroleum	23,923,103	-
Gasoline	10,377,519	2,940,333
Fuel Oils	15,242,167	1,093,851
Coal-n.e.c.	141,037,873	23,292,514
Others	752,179	95,690

Source: CPCS analysis of FAF 4.5, 2017
Note: The 2020 tonnage is a forecast value based on the 2012 tonnage.

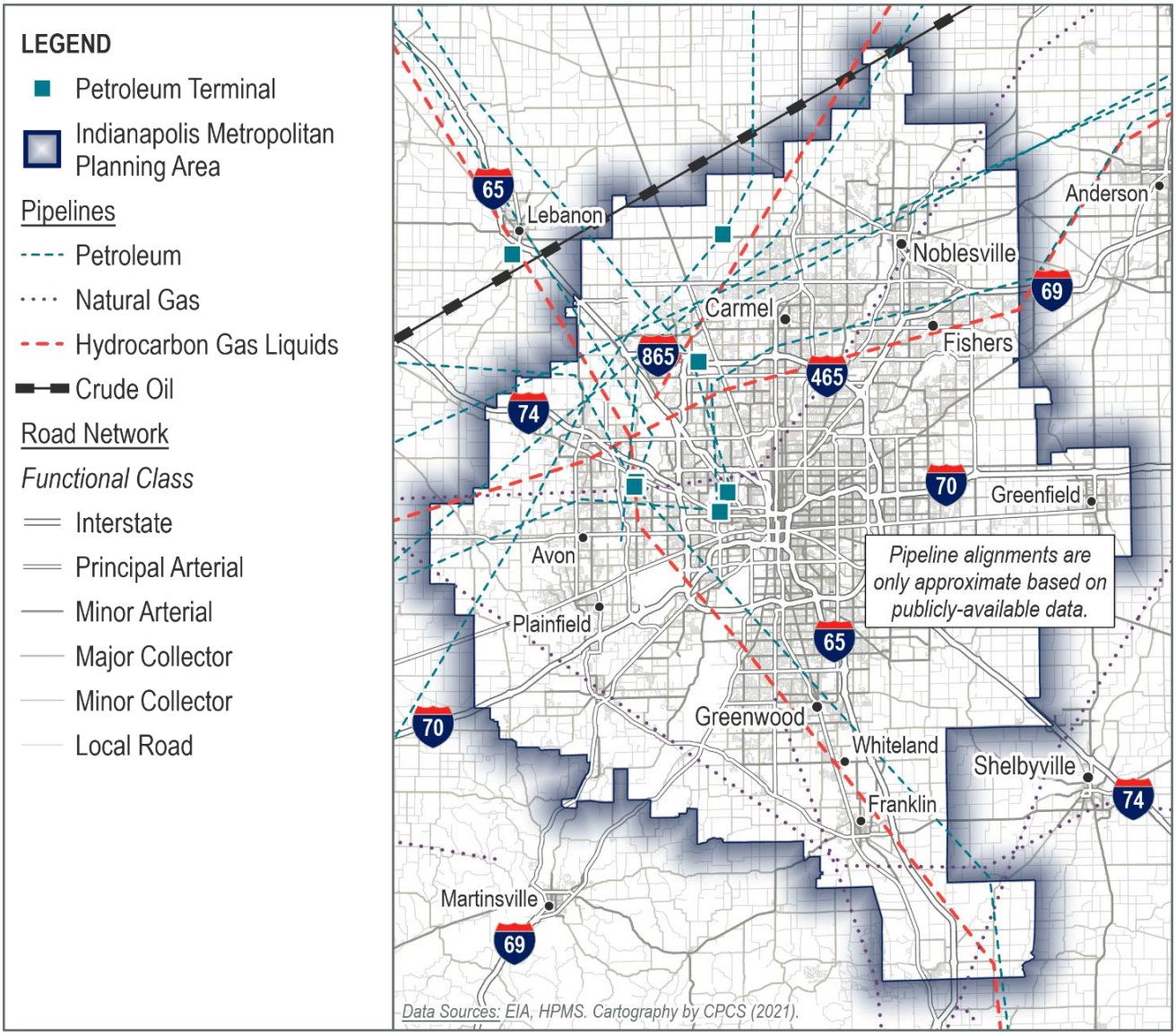
Many major pipelines that transport commodities, including natural gas, and refined products, go through the Indianapolis Metropolitan Planing Area. Figure 53 illustrates the locations of the five petroleum terminals and the pipelines within the IMPO jurisdiction. A crude oil pipeline is located just north of the Indianapolis Metropolitan Planning Area boundary. Figure 52 summarizes the pipelines by transported commodity, owner, and mileage.

Figure 52: Pipelines in the Indianapolis Metropolitan Area

Commodity	Pipeline Owner	Mileage
Crude Oil	Marathon Pipe Line Co.	5.3
Petroleum Products	BP Pipeline	276.8
	Buckeye Partners	
	Countrymark Refining & Logistics	
	Enterprise Products	
	Marathon Pipe Line	
Hydrocarbon Gas Liquids (HGL)	Buckeye Partners	107.6
	Enterprise Products	
	Marathon Pipe Line	
Natural Gas	Tallgrass Energy	103.9 (only includes transmission pipelines)
	Panhandle Eastern Pipeline Co.	
	Texas Gas Transmission Corp.	
	ANR Pipeline Co.	

Source: CPCS analysis of EIA data, 2021

Figure 53: Pipeline System



Even though the state of Indiana does not produce crude oil or natural gas, it is the home to the Nation's largest inland oil refinery, Whiting refinery, which has the capacity of about 430,000 barrels of crude oil per calendar year.[32] The Whiting refinery is located in northwest Indiana just outside of Chicago and approximately 150 miles northwest of Indianapolis. The refinery processes crude coming from Canada, southwest US, and domestic and foreign offshore, connected to the IMPO region by a petroleum products pipeline and a hydrocarbon gas liquids pipeline.[33] Within the jurisdiction of IMPO, there is no presence of refineries or underground natural gas storage. However, a couple of the petroleum product terminals are located in the Indianapolis Metropolitan Planning Area, as listed in Figure 54.

Figure 54: Petroleum Product Terminals in the Indianapolis Metropolitan Area

Terminal Company	Location
U.S. Venture Inc.	Indianapolis

[32] EIA Indiana State Profile and Energy Estimates, June 18, 2020. https://www.eia.gov/state/?sid=IN#tabs-2
[33] BP Whiting Refinery Modernisation, Indiana. https://www.hydrocarbons-technology.com/projects/bt_whiting/

Buckeye Terminals LLC	Zionsville
Buckeye Terminals LLC	Raceway Terminal
Buckeye Terminals LLC	Indianapolis
Countrymark Coop. LLP	Jolietville
Kinder Morgan Liquid Terminals	Indianapolis
Marathon Petroleum Co. LLC	Indianapolis
MPLX Terminals LLC	Indianapolis
MPLX Terminals LLC	Speedway

Source: CPCS analysis of EIA data, 2020

5 Future Freight Conditions

Key chapter takeaway

This chapter provides an overview of the findings from review of the Freight Analysis Framework (FAF) forecasts of the freight activities and commodity flows in the Indianapolis-Carmel-Muncie area which includes the IMPO region.

5.1 Future Freight Traffic Flows

According to Freight Analysis Framework 4.5 (FAF4.5), 2045 commodity flow forecasts provided by the FHWA through a partnership with the BTS the total commodity volumes carried to, from, and through the Indianapolis-Carmel-Muncie area will increase by 43 percent in 2045. As Figure 55 shows, truck tonnages are expected to increase by 40 percent. Meanwhile, commodity volumes carried by rail are expected to increase by 81 percent, and air cargo and pipeline modes are expected to carry 193 percent and 41 percent more commodity volumes, respectively. The high growth rate for air cargo is due to the high expected growth for the commodities that are typically transported by air. The growth rates for the other modes is roughly consistent with underlying economic growth for the Indianapolis region.

Figure 55: 2045 Cargo Tonnage by Mode in the Indianapolis-Carmel-Muncie Area

Mode	2020 Indianapolis-Carmel-Muncie Area Tonnage	2045 Indianapolis-Carmel-Muncie Area Tonnage	Percent of Volume Change
Truck	130,377,736	182,333,087	40%
Rail	10,898,770	19,724,274	81%
Air (include truck-air)	178,620	522,402	193%
Pipeline	27,422,388	38,745,249	41%

Source: CPCS analysis of FAF 4.5, 2045 Forecast, 2021. Note that 2020 values were derived as forecasts from 2012 base. More recent FAF forecasts are not yet available.

5.2 Future Commodity Flows

Figure 56 shows the expected change in the volumes of the commodities carried in the Indianapolis-Carmel-Muncie area, forecasted by FAF 4.5. Coal and petroleum products volumes are expected to significantly grow by 2045. These commodities are generally carried through the pipeline and rail systems. However, the significant volume increase (63 percent) by 2045 is expected to primarily be carried by the rail freight system and, therefore, increase train traffic volumes in the IMPO region, which can lead to safety and environmental impact (due to hazmat spillage) concerns.

Gravel and crushed stone volumes are also expected to increase by more than 40 percent. Several quarries and construction material storage, handling, and distribution establishments are located within the IMPO region, many of which are adjacent to mixed-use areas, densely populated neighborhoods, and high-volume road corridors. The expected growth in the gravel and crushed stone volumes would primarily be reflected in the highway operations in the region, increasing truck volumes along corridors that carry the traffic in and out of the downtown Indianapolis area.

Commodities related to agricultural and food manufacturing industries such as fertilizer production, wood production, cereal grains, and prepared foodstuff are also expected to significantly grow in terms of volumes carried in the region.

Figure 56: Changes in the Top 15 Commodities in the Indianapolis-Carmel-Muncie Area

Commodity Category	2045 Annual Volume (1,000 Tons)	Percent of Volume Change Since 2020
Coal and Petroleum Products	42,853	62.8%
Gravel and Crushed Stone (excludes Dolomite and Slate)	28,543	41.2%
Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene and Fuel Alcohols)	8,062	-3.3%
Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes	16,613	51.4%
Cereal Grains	16,905	56.7%
Non-Metallic Mineral Products	13,935	38.3%
Prepared Foodstuffs, Fats and Oils	15,084	54.9%
Waste and Scrap (excludes of agriculture or food)	8,536	50.4%
Mixed Freight	7,619	35.0%
Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)	7,691	54.5%
Motorized and Other Vehicles (includes parts)	6,641	39.1%
Animal Feed, Eggs, Honey, and Other Products of Animal Origin	6,861	48.8%
Miscellaneous Manufactured Products	7,084	55.2%
Fertilizers	7,084	66.0%
Wood Products	5,269	48.9%

Source: CPCS analysis of FAF 4.5, 2045 Forecast, 2021.

6 Conclusions and Next Steps

6.1 Conclusions

IMPO region's freight system consists primarily of the highway, rail, air cargo, and pipeline assets, which provide an extensive range of freight services and support the continued economic well-being of the region, particularly in manufacturing, retail and wholesale trade, and construction industries.

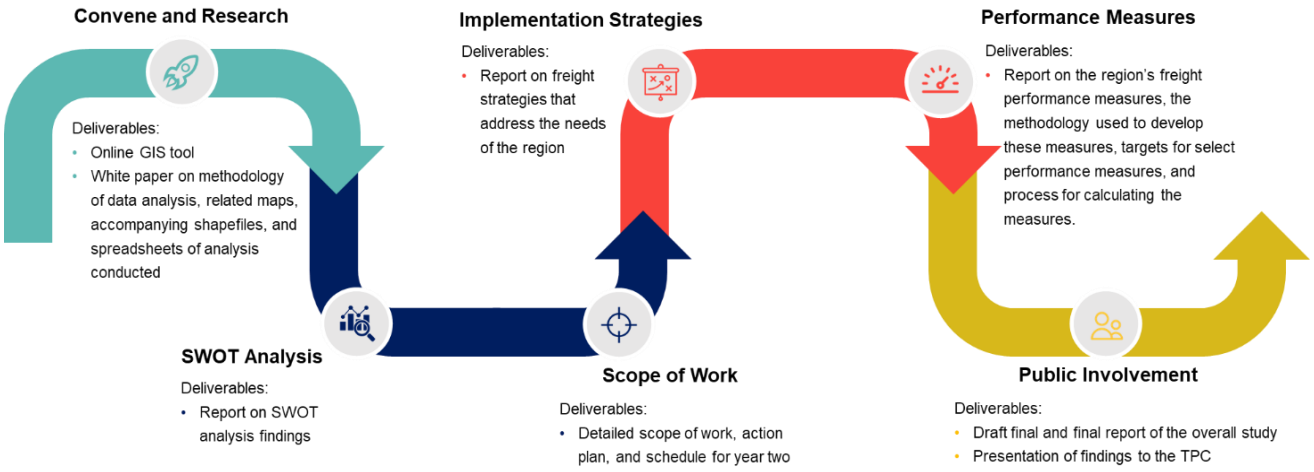
IMPO's freight system performance is mixed. The trucking activities in the region do not experience excessive highway traffic congestion but can be affected by congestion during peak hours. At the same time, road safety and truck-related accidents are a concern, while grade crossing safety is comparatively better.

The freight-related issues and challenges identified in this report through analysis of highway congestion and delay, rail system infrastructure characteristics, and truck and rail safety data will inform the next step of this project which is an assessment of the IMPO region's freight system strengths, weaknesses, threats, and opportunities (SWOT).

6.2 Next Steps

As Figure 57 shows, this Working Paper represents the output of Task 1: Convene and Research and provides a starting point for the remaining project tasks, including SWOT analysis and development of the Scope of Work for Year 2 activities.

Figure 57: Project Work Plan



Source: CPCS.

Appendix A IMPO Region's Top 20 Truck Bottlenecks

This table lists the top 20 bottlenecks in the Indianapolis MPO region based on the delay per mile analysis conducted using truck GPS data provided by StreetLight.

Rank	Category	Road Segment	Length (Miles)	Average Daily Truck Delay (Minutes)	Delay Per Mile (Minutes per Mile)
1	Interchange Traffic	I-465 E, between I-465/US-37 interchange and I-465/I-69 interchange	5.96	26,836	4,503
2	Downtown Traffic	S College St., between E 16th St. and Fletcher Ave.	2.64	9,077	3,438
3	Interchange Traffic	I-70 N, between E Raymond St. and I-70/I-65 interchange	2.71	7,427	2,741
4	Interchange Traffic	I 70 E, between I-70/I-65 interchange and S Harding St.	2.00	5,474	2,737
5	Downtown Traffic	N West St., between Indiana Ave. and W South St.	0.99	2,675	2,702
6	Interchange Traffic	IN-39, between US-40 and I-70/IN-39 interchange	10.65	28,657	2,691
7	Interstate Inaccessibility	N college Ave., between E 71st St. and E 30th St.	11.08	25,378	2,290
8	Downtown Traffic	I-65 N, between and I-70/I-65 interchange and Dr. MLK Jr. St.	2.19	4,893	2,234
9	River Barrier	E 86th St., between N Keystone Ave. and N Meridian St.	2.84	6,303	2,219
10	River Barrier	E 96th St, between Westfield Blvd. and Allisonville Rd.	6.42	12,287	1,914
11	River Barrier	W 86th St., between N Meridian St. and Michigan Rd.	5.66	9,030	1,595
12	Downtown Traffic	W Washington St., between I-70 and S West St.	2.15	2,927	1,361
13	Downtown Traffic	S West St., between I-70 and 11th St.	2.04	2,405	1,179
14	Downtown Traffic	W South St., between Madison Ave. and S West St.	1.15	1,315	1,143
15	Interchange Traffic	IN-267, between 1000 N and I-65/IN-267 interchange	7.16	7,495	1,047
16	Interstate Inaccessibility	N Meridian St., 38th St. and E North St.	6.83	6,260	917

Rank	Category	Road Segment	Length (Miles)	Average Daily Truck Delay (Minutes)	Delay Per Mile (Minutes per Mile)
17	Downtown Traffic	N Delaware St., between E 16th St. and Fort Wayne Ave.	0.81	737	910
18	Interstate Inaccessibility	E 30th St., between Emerson Ave. and N Meridian St.	7.44	6,674	897
19	River Barrier	N Keystone Ave., between E 106th St. and E 71st St.	3.76	3,177	845
20	Interchange Traffic	Holt Rd., between W Washington St. and W Morris St.	0.77	585	761

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