NATIONAL CAPITAL REGION FREIGHT PLAN - DRAFT

2023 Update to the Freight Plan

June 30, 2023

National Capital Region
Transportation Planning Board

NATIONAL CAPITAL REGION FREIGHT PLAN
June 30, 2023

ABOUT THE TPB
The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 23 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

CREDITS
Editor: Andrew Meese
Contributing Editors: Patrick Zilliacus, Janie Nham

ACCOMMODATIONS POLICY
Alternative formats of this document are available upon request. Visit www.mwcog.org/accommodations or call (202) 962-3300 or (202) 962-3213 (TDD).

TABLE OF CONTENTS

FIGURES AND TABLES

ACRONYMS

AADTT	Average Annual Daily Truck Traffic
ACI	Airports Council International
ATRI	American Transportation Research Institute
BIL	Bipartisan Infrastructure Law
BTS	Bureau of Transportation Statistics
BWI	Baltimore Washington International Thurgood Marshall Airport
CASP	Continuous Airport Systems Planning Program
COG	Metropolitan Washington Council of Governments
CRISI	Consolidated Rail Infrastructure and Safety Improvement
CUFC	Critical Urban Freight Corridor
DC	Washington, D.C.
DCA	Ronald Reagan Washington National Airport
DDOT	District of Columbia Department of Transportation
DHS	Department of Homeland Security
DLLR	Department of Labor, Licensing, and Regulation
DOD	Department of Defense
DRPT	Virginia Department of Rail and Public Transportation
EEA	Equity Emphasis Area
EV	Electric Vehicle
FAA	Federal Aviation Administration
FAF	Freight Analysis Framework
FARS	Fatality Analysis Reporting System
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FIRST	Fatality and Injury Reporting System Tool
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GDP	Gross Domestic Product
GIS	Geographic Information Systems
HPMS	Highway Performance Monitoring System
IAD	Washington Dulles International Airport
IIJA	Infrastructure Investment and Jobs Act
INFRA Grant	Nationally Significant Multimodal Freight and Highway Program
IRA	Inflation Reduction Act
LTL	Less Than Truckload
LRTP	Long-Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MARAD	Maritime Administration

Mega Grant	National Infrastructure Project Assistance Program
MD	Maryland
MDOTSHA	Maryland Department of Transportation State Highway Administration
MDTA	Maryland Transportation Authority (toll facilities agency)
MPA	Maryland Port Administration
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MSTM	Maryland Statewide Transportation Model
NCR	National Capital Region
NCRC	National Capital Region Coordination
NHS	National Highway System
NPMRDS	National Performance Management Research Data Set
NSFHP	Nationally Significant Freight and Highway Projects
OFM	Office of Freight and Multimodalism
OIPI	Office of Intermodal Planning and Investment
PA	Pennsylvania
PHFS	Primary Highway Freight System
PHMSA	Pipeline and Hazardous Material Administration
PUDO	Pickups and Drop-offs
RESF	Regional Emergency Support Function
RITIS	Regional Integrated Transportation Information System
RTPP	Regional Transportation Priorities Plan
SCAG	Southern California Association of Governments
STAA	Surface Transportation Assistance Act of 1982
TIH	Toxic Inhalation Hazard
TIP	Transportation Improvement Plan
TPB	National Capital Region Transportation Planning Board
TTI	Travel Time Index
TTR	Travel Time Reliability
TTTR	Truck Travel Time Reliability
UPWP	Unified Planning Work Program
USDOT	United States Department of Transportation
VA	Virginia
VDOT	Virginia Department of Transportation
VPA	Virginia Port Authority

SUMMARY OF KEY POINTS

The National Capital Region Freight Plan (the Plan) describes the role freight transportation plays in the region's economy, provides an overview of the region's multimodal freight transportation system, describes the drivers of freight demand and the freight flows resulting from it, identifies the most significant freight issues and trends impacting the region, and provides recommendations to ensure the multimodal freight transportation system continues to support the economy of the region and the quality of life of its residents and visitors.

The Plan is a technical reference and serves as a foundation for future regional freight planning activities and sets the stage for freight to be considered in the region's federally-recognized metropolitan long-range transportation plan (Visualize 2045 and its successors) and other regional planning activities.

The following are key points from the Plan:

1. Freight movement in the region is shaped by regional policies (such as those articulated in Visualize 2045), state-level policies, and federal priorities and performance measures enacted by the Infrastructure Investment and Jobs Act (2021). See ***Section 1*** for an overview of what these policies and requirements mean for freight planning in the region.

2. Commercial trucking remains the dominant freight transportation mode in the region. In 2020, commercial trucking accounted for 73 percent of the region's freight transported by value and 72 percent of the region's freight transported by weight. See ***Section 2*** for more details.

3. Since the 2016 Freight Plan, technological trends, evolving supply chain and logistics patterns, and impacts from the COVID-19 pandemic have altered how freight is transported. See ***Section 4*** for an overview of how these changes are impacting goods movement in the region.

4. Proactively managing freight movement and delivery at the regional and local levels is critical as the region's population continues to grow and demand for goods increases. COG is committed to better understanding the community impacts of freight movement in the region to help local jurisdictions accommodate freight needs, sustain the health and wellbeing of residents and visitors, and to mitigate negative community impacts from freight movement. See ***Section 5.3*** for more details.

5. Freight movement remains vital to the economy of the National Capital Region and to the quality of life of its residents.

1. INTRODUCTION

The National Capital Region's multimodal transportation system is vital to the economy of the region and to the quality of life of its residents. It connects people and businesses to important regional activity centers and to major domestic and international markets. Each year hundreds of millions of tons of freight valued in billions of dollars move over the Region's roadways and railways and pass through its airports. The region's service-based economy, with its growing employment, population, and wealth will continue to drive demand for freight in the foreseeable future. Economic growth along the eastern seaboard, throughout the nation, and across the world will also result in greater quantities of goods moving into, out of, and through the region–especially along the I-95 corridor. Evolving logistics practices, changes in where goods are produced and how they are distributed, and increasing urbanization are but a few of the factors that will impact how freight will move across the region in the future. The National Capital Region Transportation Planning Board (TPB) as the Metropolitan Planning Organization (MPO) for metropolitan Washington has an important role to play in ensuring that the regional transportation system continues to be responsive to and supportive of the freight demands placed upon it by its residents, businesses, and visitors.

1.1. About the Plan

The National Capital Region Freight Plan (the Plan) describes the role freight transportation plays in the region's economy, provides an overview of the region's multimodal freight transportation system, describes the drivers of freight demand and the freight flows resulting from it, identifies the most significant freight issues in the region, and provides recommendations to ensure the multimodal freight transportation system continues to support the economy of the region and the quality of life of its residents and visitors. The Plan serves as a foundation for future regional freight planning activities and builds on the results of the original National Capital Region Freight Plan adopted in 2010, and the Update adopted in 2016. Much of the content in the Plan has its origins in that previous Plan and in the extensive freight and rail planning efforts of the Federal Highway Administration, the Federal Motor Carrier Safety Administration; the Federal Railroad Administration; a wide range of State and regional freight plans–especially those of the Commonwealth of Virginia, the District of Columbia, and the State of Maryland; and numerous publications of the Transportation Research Board. It provides relevant context and support for the freight element of Visualize 2045. It provides the basis for understanding the goods movement impacts of transportation projects included in the region's Transportation Improvement Program. Because the efficient and safe movement freight is important to the economic health of the region and the quality of life of its residents, this freight plan is intended to be a helpful reference to planners and elected officials in their continuing efforts to make the region a better place to live, work, and visit.

1.1.1. OVERVIEW

The Plan is organized into the following major sections:

Executive Summary – provides highlights of the Plan.

1.0 Introduction – highlights the importance of freight to the region, provides an overview of the Plan and its institutional and regulatory context, and lists planning and data assumptions on which the Plan is formed.

2.0 Multimodal Freight Transportation System - describes the physical infrastructure, including roadways, railways, airports, and intermodal facilities, that comprise the region's freight transportation system.

3.0 Freight Demand - identifies the key commodities transported into, out of, within, and through the region; describes the relative importance of the various transportation modes used to move these commodities; identifies their origins and destinations; and forecasts how these elements are expected to change in the future.

4.0 Key Trends Influencing Freight in the Region – discusses the broad trends, including demographic and economic trends and supply chain and logistics patterns impacting freight, and the impact of COVID-19 on freight transportation within the region.

5.0 Regional Freight Issues, Challenges, and Opportunities – identifies key issues associated with freight transportation in the region.

6.0 Regional Freight Policies - describes the freight-related policies that the Transportation Planning Board promotes. Member jurisdictions are also encouraged to consider these policies within their respective transportation planning processes.

7.0 National Capital Region Projects Important to Freight – lists projects that are important to goods movement within the region.

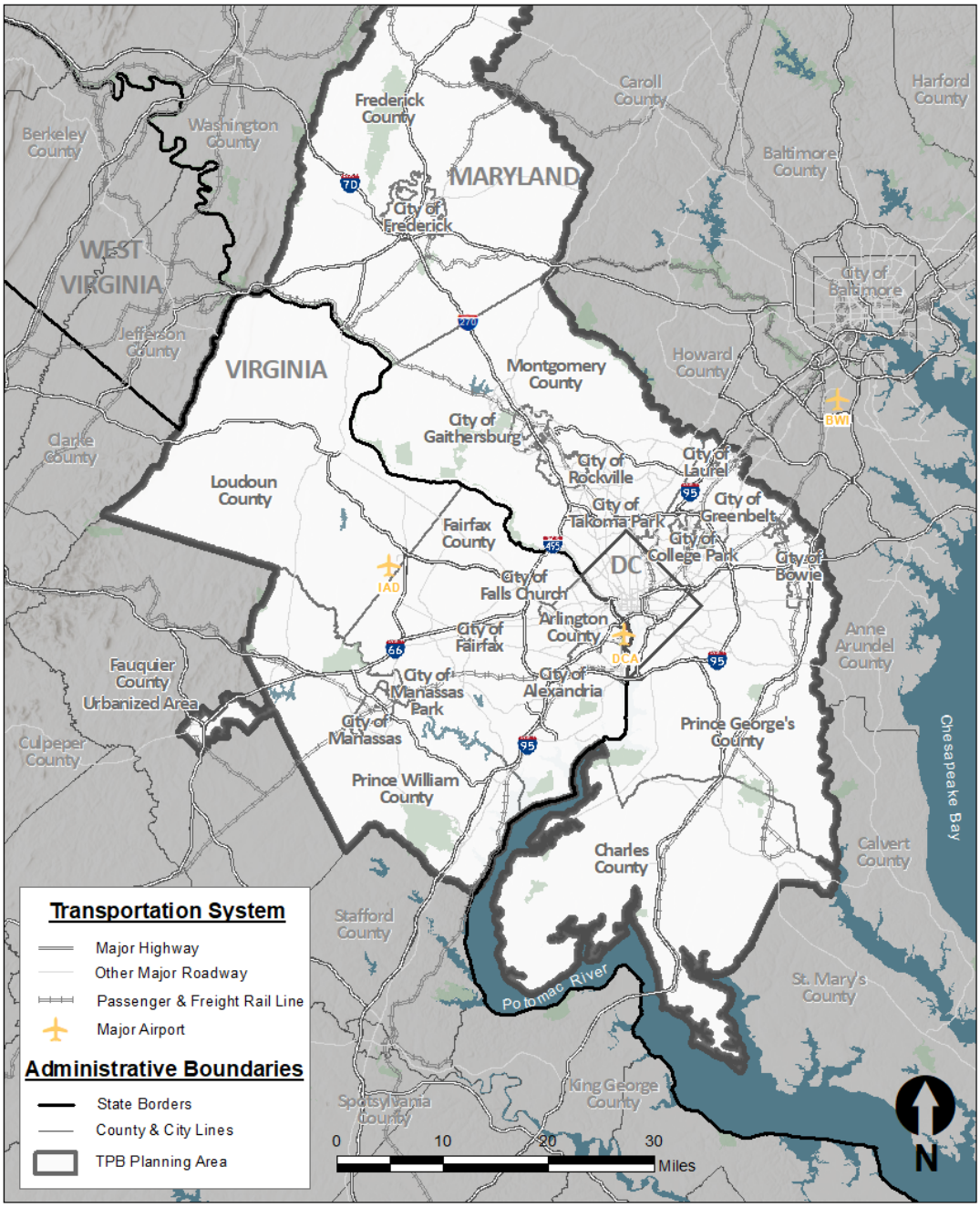
8.0 Recommendations and Next Steps – summarizes recommended actions and activities related to maintaining and strengthening the regional freight planning process.

Appendices – provide additional background and technically detailed materials that support the content within the body of the main document.

1.2. Freight Planning in the National Capital Region

The Transportation Planning Board member jurisdictions can be found in Figure 1 below and includes 23 jurisdictions: District of Columbia, City of Bowie, City of College Park, Charles County, City of Frederick, Frederick County, City of Gaithersburg, City of Greenbelt, City of Laurel, Montgomery County, Prince George's County, City of Rockville, City of Takoma Park, City of Alexandria, Arlington County, City of Fairfax, Fairfax County, City of Falls Church, Loudoun County, City of Manassas, City of Manassas Park, Prince William County, and the urbanized area around Warrenton in Fauquier County.

Figure 1: TPB Member Jurisdictions



Source: Metropolitan Washington Council of Governments GIS Data, 2023.

1.2.1. VISUALIZE 2045 AND THE TRANSPORTATION PLANNING BOARD VISION

The TPB adopted Visualize 2045[1], the National Capital Region's long-range transportation plan (LRTP), in 2022. Visualize 2045 details how the TPB and its members tackle transportation challenges facing the region, gather public input, and advance the most effective strategies to make progress on the region's transportation goals. A key freight policy goal of Visualize 2045 is that by addressing the congestion and mobility challenges forecast for the region, the LRTP's proposed initiatives will improve the ability of the transportation system to respond to the needs of freight

movement. Visualize 2045 identifies two freight-related planning factors and two freight-related planning goals:

- Planning Factors
    - Increase the accessibility and mobility of people and freight.
    - Enhance the integration and connectivity of the transportation system across and between modes for people and freight.
- Planning Goals
    - Promote a strong regional economy, including a healthy regional core and dynamic Activity Centers.
    - Support inter-regional and international travel and commerce.

Visualize 2045 also includes trends and strategies to direct freight planning in the region.

- The impacts of e-commerce may have lasting impacts on long-range regional planning, including addressing changing demands for retail space and freight-related needs. Visualize 2045's public survey determined that one year after the COVID-19 pandemic is over, a majority (58 percent) of respondents expect their online shopping habits to continue. This continued expansion of e-commerce has increased the number of trucks competing for the limited supply of roadway and curbside space, increasing curbside management challenges.
- Equity considerations in distributing the costs and benefits of freight transportation. Noise, vibrations, and air pollution from freight transportation should not be disproportionately concentrated in low-income and minority communities. The region should work to distribute negative externalities and balance benefits of freight innovation, such as low-or zero emission vehicles and the distribution of delivery lockers.

Two documents preceding Visualize 2045 also shape the priorities and goals for freight planning in the National Capital Region. The TPB Transportation Vision, adopted in 1998, provides a framework to guide the region's transportation planning and investment decisions into the 21st Century. The Vision identifies eight broad goals with associated objectives and strategies. Two of the goals are closely tied to freight transportation (see below) and are supported by this Plan:

- Goal 2: The Washington metropolitan region will develop, implement, and maintain an interconnected transportation system that enhances quality of life and promotes a strong and growing economy throughout the region, including a healthy regional core and dynamic regional activity centers with a mix of jobs, housing, and services in a walkable environment.
- Goal 2, Objective 3: A web of multi-modal transportation connections which provide convenient access (including improved mobility with reduced reliance on the automobile) between the regional core and regional activity centers, reinforcing existing transportation connections and creating new connections where appropriate.
- Goal 8, Strategy 5: Develop a regional plan for freight movement.

The second influential document is the Regional Transportation Priorities Plan (RTPP), approved by TPB in January 2014. The RTPP builds on the Vision goals by identifying strategies with the greatest potential to respond to our most significant transportation challenges. The strategies are intended to be complementary, to make better use of existing infrastructure, and to be within reach both financially and politically. The RTPP identifies priorities and strategies that impact freight, including the following:

- Ensure maintenance of roads and bridges;
- Alleviate roadway bottlenecks;
- Concentrate growth in activity centers; and
- Enhance circulation within activity centers.

1.2.2. REGIONAL FREIGHT PLANNING

The Transportation Planning Board (TPB) considers freight in its overall metropolitan transportation planning process and addresses freight issues within its Long-Range Transportation Plan (Visualize 2045) as well as its Transportation Improvement Program (TIP). Federal regulations require that the transportation planning processes of Metropolitan Planning Organizations (MPOs) such as the TPB provide for consideration and implementation of projects, strategies, and services that support economic vitality, increase accessibility and mobility of freight, and enhance the integration and connectivity of the transportation system for freight (among other requirements).[1] To ensure these requirements are met, the TPB has included a regional freight planning task in its Unified Planning Work Program (UPWP) since 2007. Also beginning in 2007, the TPB has funded dedicated freight planning staffing and convened the TPB Freight Subcommittee.

The TPB Freight Subcommittee's mission is to integrate freight matters into the region's transportation planning process. It also aims to raise awareness of freight issues among local elected officials and the public. The subcommittee serves as a forum for discussion and makes recommendations on freight-related action items for consideration by the TPB Technical Committee and the Transportation Planning Board. The subcommittee meets regularly (generally bimonthly), and its meetings are open to the public. A wide range of topics are covered during subcommittee meetings such as: updates on statewide freight planning activities conducted by the Departments of Transportation (DOTs) of Maryland, Virginia, and the District of Columbia; presentations by freight railroads, airports authorities, trucking companies, manufacturers, builders, retailers, and other private- and public-sector entities; analyses of supply chain resiliency; reviews of freight-related research findings, and presentations on local curbside management efforts. Attendees typically include, but are not limited to, state DOT representatives, local jurisdiction officials, Federal Highway Administration officials, private-sector freight firm representatives, and transportation consulting firm staff.

The TPB Freight Subcommittee is one component of a broader regional transportation planning process undertaken by the TPB that aims to serve the mobility needs of residents and freight while balancing those needs with the region's environmental, economic, community, safety, and security goals. MPOs such as the TPB exist as a result of the federal government's recognition of the complexity of urbanized areas. The urban and suburban nature of the National Capital Region, combined with the fact that the region encompasses three states, each with its own governance structure and transportation system, results in unique transportation challenges in the region, including in freight. To address these challenges, the TPB pursues a regional transportation planning process that synchronizes and balances the transportation planning strategies developed by the District, Maryland, and Virginia, documented in this National Capital Region Freight Plan.

[1] 23CFR § 450.306 Scope of the metropolitan transportation planning process.

Key activities and outputs of TPB's regional freight planning efforts not already mentioned have included the incorporation of freight-related content into biennial Congestion Management Process Technical Reports, the development of a regional freight-significant network, the establishment of Critical Urban Freight Corridors, time travel reliability and truck travel time reliability monitoring, the strategic highway network, and the organization and hosting of a regional freight and curbside management forums, among others.

Critical Urban Freight Corridors

Under the 2015 Fixing America's Surface Transportation (FAST) Act, the TPB was called upon to designate public roads within its urbanized areas as Critical Urban Freight Corridors (CUFCs). TPB staff collaborated with officials at the Maryland Department of Transportation (MDOT), the Virginia Department of Transportation (VDOT), and the District Department of Transportation (DDOT) to identify CUFCs that met the criteria for designation as set forth under provisions of the FAST Act.

To be designated as a Critical Urban Freight Corridor, public roadways must be located within an urbanized area and meet at least one of the following criteria:

- Connects an intermodal facility to the Primary Highway Freight System (PHFS), the Interstate System, or an intermodal freight facility;
- Is located within a corridor of a route on the PHFS and provides an alternative option important to goods movement;
- Serves a major freight generator, logistics center, or manufacturing and warehouse industrial land; or
- Is important to the movement of freight within the region, as determined by the MPO or the State.

In 2017, the TPB designated 117.8 miles of roadway in the National Capital Region as a CUFC (via Resolution R6-2018), with later amendments bringing the regional total to about 120 miles of roadway as of 2021.

Further future amendments are anticipated. Section 11114 of the 2021 Infrastructure Investment and Jobs Act (IIJA) increased the maximum number of highway miles a State may designate as critical urban freight corridors from 75 to 150 miles. As of 2023, TPB and COG are coordinating with MDOT, VDOT, and DDOT to designate additional CUFC segments for the National Capital Region.

Travel Time Reliability and Truck Travel Time Reliability

In 2017, the FHWA published the System Performance: Highway and Freight, Congestion Mitigation and Air Quality (CMAQ) rule. The rule requires state DOTs to set targets for performance measures for Interstate Travel Time Reliability (TTR), National Highway System (NHS) TTR, and Freight Reliability, defined as Truck Travel Time Reliability (TTTR).

The Travel Time Reliability (TTR) assesses the reliability of roadways on the Interstate and Non-Interstate (NHS) systems. TTR is defined by the FHWA as the percent of person-miles on the Interstate/NHS that are reliable. Concerning freight, reliability is the ratio of the Interstate System Mileage providing for reliable TTR. Data are derived from the travel time data set found in the National Performance Management Research Data Set (NPMRDS).

TPB adopts four-year targets for Interstates, non-Interstates, and truck travel times. For the period from 2022-2025, the target for TTR Interstate miles was increased from 58.5 percent to 61.1

percent, the target for TTR Non-Interstate miles was increased from 72.7 percent to 78.6 percent, and the target TTTR Index was raised from 2.12 to 2.56.

Strategic Highway Network (STRAHNET)

The Strategic Highway Network (STRAHNET) is a national 64,200-mile system that consists of public highways that provide access, continuity, and emergency transportation of personnel and equipment. STRAHNET includes the Interstate and Defense Highway System, 14,000 miles of non-Interstate public highways that are part of the National Highway System, and 1,800 miles of connector routes linking to 200 military installations.

FHWA encourages MPOs and State DOTs to coordinate with representatives from the Department of Defense (DOD) on transportation planning and the project programming process on infrastructure and connectivity needs for STRAHNET routes and other public roads that connect to DOD facilities. In metropolitan Washington, STRAHNET encompasses all Interstate highways and U.S. Route 301. Multiple DOD facilities are major employers in the region, generating substantial volumes of commuter and freight traffic on the transportation network and around entry points to facilities. As a result, connections to regional DOD installations, such as Joint Base Andrews, Fort Detrick, Fort Belvoir Joint Base Myer-Henderson Hall, and others are critical to defense preparation.

Curbside Management

Curbside management policies and practices are critical to the efficient movement and delivery of freight in the National Capital Region. However, the need for curbside loading, and the availability of those spaces, varies between jurisdictions and urban environments. In the District of Columbia, where curbside parking and loading are in high demand, DDOT has conducted pilots aimed at better managing curbside delivery and parking compliance. In 2017, as part of the parkDC pilot, DDOT raised the hourly parking rate for loading zones in select neighborhoods and extended loading zone hours of operation to improve accessibility for delivery vehicles attempting to access the study area during off-peak hours.[2] In 2019, DDOT conducted a pilot with curbFlow in six locations to manage curbside pickups and drop-offs (PUDO) for commercial delivery vehicles. [3]

1.2.3. FEDERAL CONTEXT FOR TRANSPORTATION PLANNING IN METROPOLITAN AREAS

The federal government, primarily through its legislative and executive branches, establishes the legal framework through which regional transportation planning in general, and freight planning, operates. In addition to this legal function, the federal government also provides funding, technical assistance, data, and data analysis tools to support transportation planning activities at the state, regional, and local levels. The various administrations and offices of the United States Department of Transportation (USDOT) influence the freight transportation planning activities at all levels of government for each mode and vehicle type. USDOT administrations with important roles in freight transportation planning include:

- Federal Highway Administration (FHWA): supports state and local governments in the design, construction, and maintenance of the Nation's highway system and provides financial and technical assistance to state and local governments.
- Federal Motor Carrier Safety Administration (FMCSA): issues and enforces commercial vehicle related safety regulations; works to improve safety information systems and commercial motor vehicle technologies; and works to strengthen vehicle standards and increase safety awareness. FMCSA also funds the Motor Carrier Safety Assistance Program (MCSAP) that provides financial

assistance to states to reduce the number and severity of crashes and hazardous materials incidents involving commercial motor vehicles (CMVs).

- Federal Railroad Administration (FRA): issues, implements, and enforces railroad safety regulations; makes selective investments in rail corridors; conducts research; and develops technology.
- Federal Aviation Administration (FAA): ensures that aircraft and the national airport system is safe, efficient, and environmentally responsible.
- Maritime Administration (MARAD): works in areas involving ships and shipbuilding, port operations, vessel operations, national security, the environment, and safety.
- Pipeline and Hazardous Materials Safety Administration (PHMSA): establishes national policy on pipelines and hazardous materials transport; sets and enforces standards; conducts research to prevent incidents; and prepares first responders.

Among the agencies listed above, the FHWA has the greatest influence on freight transportation planning for the region. By law, every four years the FHWA, together with the FTA, must jointly certify the TPB's transportation planning process. This certification process includes a review of the region's freight transportation planning activities.

TPB Activities to Address Federal Requirements

As the MPO for the National Capital Region, TPB is responsible for coordinating freight related policies, priorities, and improvements with federal transportation agencies, member jurisdictions and state DOTs. As noted in Section 1.2.2., the TPB is required to designate public roads within urbanized areas in the National Capital Region as Critical Urban Freight Corridors (CUFCs). Additional federal requirements are related to travel time reliability; TPB adopts four-year targets for travel time reliability on Interstates, non-Interstates, and for trucks. Other TPB activities than ensure compliance with federal requirements include:

- Addressing freight considerations in the region's long-range plan (Visualize 2045) and Transportation Improvement Program
- Convening public and private freight stakeholders though the TPB Freight Subcommittee
- Developing the National Capital Region Freight Plan.

In November 2021, the President of the United States signed the Infrastructure Investment and Jobs Act (IIJA) into law. Often referred to as the Bipartisan Infrastructure Law (BIL), the IIJA authorizes $1.2 trillion over five federal fiscal years (FY 2022-2026) for surface transportation projects and programs, as well as water, wastewater, energy transmission, resilience, and broadband. IIJA reauthorized the 2015 Fixing America's Surface Transportation Act (FAST Act) while expanding existing grant programs and adding new programs and policies.[4] IIJA builds upon the requirements of the FAST Act as well as the 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21).

Key freight provisions affecting all levels of government, which remain relevant, included the following: [2] establishment of a National Multimodal Freight Policy; development of a National Freight

[2] This list of FAST provisions is adapted from several USDOT and FHWA web pages.

Strategic Plan; establishment of a National Highway Freight Network; establishment of a National Highway Freight Program; establishment of a National Multimodal Freight Network; encouragement of state freight advisory committees: freight conditions and performance report, and continued emphasis on performance measures.

The IIJA established multiple new funding and performance programs relating to freight. Federal freight performance management now requires states and MPOs such as the TPB to develop and track freight performance measures and set freight performance targets. Complying requires coordination with the District Department of Transportation (DDOT), Virginia Department of Transportation (VDOT), and Maryland Department of Transportation (MDOT).

The IIJA also revised guidance for the focus of the National Freight Strategic Plan and State Freight Plans. The National Freight Strategic Plan now must include best practices for reducing environmental impacts, consider potential impacts of the freight system on rural and historically disadvantaged communities, strategies for decarbonization, and the impacts of e-commerce on the national multimodal freight system. State Freight Plans are now required to be completed every four years, and must now include supply chain cargo flows, an inventory of commercial ports, findings and recommendations from any multi-State freight compacts, the impacts of e-commerce on freight infrastructure, the considerations of military freight, and an assessment of truck parking facilities in states.

USDOT will continue to establish national performance goals, measures, and targets in the areas of safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, and environmental sustainability. States will be required to set targets in each of the above areas and MPOs will set targets in some cases as well. To the maximum extent practicable, state and MPO target setting should be coordinated.

1.2.4. STATE AND LOCAL FREIGHT PLANNING

Transportation departments in the District of Columbia (DDOT), Maryland (MDOT), and Virginia (VDOT) sponsor transportation projects for inclusion in the National Capital Region's Transportation Improvement Program (TIP). The Transportation Improvement Program (TIP) is a federally required schedule that programs funding for local, state, and federal transportation projects over a four-year period. Local jurisdictions undertake freight planning within the context of jurisdictional comprehensive planning, in collaborative with their respective state partners.

District of Columbia Freight Planning

The District of Columbia has published four major documents that include freight provisions since the 2016 National Capital Region Freight Plan was published.

- The District of Columbia State Rail Plan:[5] (2017) This long range (20+ year) Plan provided a vision for rail transportation in the District of Columbia. It identified three primary freight issues to address over the next two decades. The Virginia Avenue Tunnel in D.C., which was previously identified as a freight bottleneck, was reconstructed in 2018, and now serves double stack intermodal trains. Two other issues were that seven percent of carloads transported by CSX

containing hazardous chemicals transported via rail using the DC rail network[3], and a lack of freight facilities within the district.

- The DDOT Freight Plan Addendum:[6] (2020) As an update to the 2017 Freight Plan Addendum and the 2019 Freight Investment Plan, this plan includes three types of projects including projects developed and managed directly by the freight program; projects developed by the freight program but implemented by other units; and existing projects that support freight program goals that are managed by other units or agencies. All three projects aim to address freight in the National Capital Region. Examples of the projects included in this addendum are truck safety education and driver outreach campaign; positive truck route signage; delivery demand management program; oversized/overweight tool maintenance and enhancement project; research into innovative freight delivery practices; supporting enforcement of commercial loading zones; and developing a new state freight plan.
- MoveDC:[7] (2021) This Plan establishes goals, policies, strategies, and metrics for the District Department of Transportation to invest in transportation facilities and programs addressing the needs for Washingtonians to guide decisions for the next 25 years.[4] Strategies that are closely related to freight include developing a regional approach to congestion management, implementing a curbside hierarchy, modernizing traffic signals, providing and maintaining safe routes for trucks, updating the State Rail Plan, and studying new vehicle technologies.
- The Comprehensive Plan for the National Capital District Elements:[8] (2021) This Plan serves as a guide for District planning and is the centerpiece of a 'Family of Plans' guiding DC public policy. This provides overall direction, and highlights policy considerations such as balancing goods delivery needs with congestion, safety, security, and quality of life concerns; freight safety; rail and waterways as alternatives to trucking; truck management; enhanced freight routing; management of oversized/overweight trucks; and enforcement of truck routing and parking.

State of Maryland Freight Planning

Most of Maryland's statewide and regional freight planning activities are coordinated through the Maryland Department of Transportation (MDOT) Office of Freight and Multimodalism (OFM). Representatives from MDOT and the Maryland State Highway Administration (SHA) are regular participants in TPB freight planning and coordinating activities. MDOT has published several relevant freight planning documents including:

- Maryland Statewide Truck Parking Study:[9] (2020) This study provided the data, context, and actionable solutions needed to advance priority projects, policies, and partnerships to improve truck parking statewide. Key recommendations included further developing the truck parking program, having a truck parking committee, conducting further outreach on truck parking issues, integrating truck parking into land use, zoning, and planning, and leveraging grants and partnership opportunities.
- Maryland State Freight Plan Update:[10] (2022) The Plan addressed several goals and identified policy positions, strategies, and freight projects to promote these goals and improve freight movement efficiency and safety. Several freight projects identified include improvements to the Maryland Statewide Transportation Model (MSTM) to advance model calibration and freight-

[3] The 2017 District of Columbia State Rail Plan, page 3-56.

[4] Move DC 2021 Update: The District of Columbia's Multimodal Long-Range Transportation Plan

specific enhancements for trucks and freight connected automated vehicles, and advancements in mapping and GIS tools related to the freight network, truck parking, and other freight related data.

- Maryland State Rail Plan Update:[11] (2022) This Plan was an update to the previous Maryland Statewide Rail Plan completed in 2015. The Plan provided an overview of the current and planned rail network and services within Maryland, trends that will impact Maryland's rail network in the future, and included an outline of investments, policies, and strategies to help guide railroad transportation within Maryland[5]. A key part of the plan included a Rail Service and Investment Program, that listed potential capital investments to support plan objectives, including freight projects regarding capacity on Norfolk Southern and CSX railroads, freight projects, Northeast Corridor capacity projects, and MARC capital projects.

Commonwealth of Virginia Freight Planning

The Commonwealth's Office of Intermodal Planning and Investment (OIPI) coordinates freight planning efforts of several state agencies, including the Virginia Department of Transportation (VDOT), the Virginia Department of Rail and Public Transportation (DRPT), and the Virginia Port Authority (VPA). Representatives from both VDOT's Northern Virginia region office and DRPT are regular participants in TPB freight planning and coordinating activities. Since the publication of the 2016 National Capital Region Freight Plan, the Commonwealth has published several freight planning documents that are important to the National Capital Region including:

- Virginia Statewide Rail Plan:[12] (2017) This plan provides a vision for passenger and freight rail transportation in Virginia through 2040. It profiles the Commonwealth's current rail assets, services, and capacity choke points. It includes recommended improvement projects and is part of a multimodal interagency transportation planning effort guided by VTrans, Virginia's statewide long-range multimodal policy plan.
- VTrans 2040: Virginia Freight Element:[13] (2017) This plan supported maintaining and improving the efficiency of the multimodal freight system and aligned itself with the VTrans goals and objectives as well as the National Freight Goals. Key outcomes of the plan included the freight improvement strategies, that lists policies, programs, technologies, and projects needed to find the solutions to freight issues within Virginia. VTrans is now developing VTrans 2045, which will identify mid-term needs within a 10-year planning horizon and longer-term needs.
- VTrans - Virginia Transportation Plan:[14] (2022) This Plan identified transportation needs and associated multimodal infrastructure improvement projects, transportation strategies, and policies to address these needs. The freight element discussed important issues including the designation of critical urban and rural freight corridors, provided an inventory of existing freight facilities, and identified freight issues, and strategic actions relevant to freight[6].
- Virginia Statewide Rail Plan:[15] (2022) This Plan identified projects and provides guidance to ensure that rail transportation meets the needs for the people and communities within the Commonwealth, and that rail transportation continues to be a safe, economical, and

[5] 2022 Maryland State Rail Plan

[6] VTrans: Virginia's Transportation Plan

environmentally friendly mode of transportation. Projects identified in the plan include recommendations on passenger rail, freight rail, and rail crossing project investments.

- Virginia Truck Parking Study:[16] (2022) This study measured and documented the current truck parking supply and demand in Virginia. A key finding of this study was that more truck parking is needed across the state, specifically along I-81 and I-95.

2. THE MULTIMODAL FREIGHT TRANSPORTATION SYSTEM

This section describes the elements that make up the regional freight system. Understanding these elements enables the TPB to better assess the way that freight vehicles use the system and how freight movements contribute to congestion, pavement consumption, bridge stress, economic development, and quality of life.

2.1. Overview

The region's multimodal freight transportation system consists of:

- More than 17,000 lane miles of highways and major roadways[7] carrying more than 160 million tons of goods annually[8].
- Two Class I railroads – CSX Transportation and the Norfolk Southern Corporation – operating over 250 miles[9] of mainline track and carrying more than 6.7 million tons[10] of local freight annually.
- Two major cargo airports – Washington Dulles International Airport and Baltimore Washington International Thurgood Marshall Airport.
- An extensive pipeline network that carries more than 48 million tons[11] of freight per year.
- A number of key intermodal connectors – short roadway segments that tie rail terminal facilities, airports, and pipeline terminal facilities to the National Highway System (NHS).

2.2. Highway Freight

The region's highway system is organized into the following categories:[12]

- Interstate[13] - More than 200 miles that connect the region to the rest of the nation.
- Primary[14] – More than 1,000 miles that connect communities within the Region to each other and to the Interstates.

[7] Visualize 2045: A Long-Range Transportation Plan for the National Capital Region. Page 40.

[8] Federal Highway Administration Freight Analysis Framework for year 2020.

[9] Visualize 2045: A Long-Range Transportation Plan for the National Capital Region. Page 40.

[10] Federal Highway Administration Freight Analysis Framework for year 2020.

[11] Federal Highway Administration Freight Analysis Framework for year 2020.

[12] Facility types 4 (Ramp) and 5 (Non-Mainline) and 6 (Non-Inventory Direction) and 7 (Planned/ Unbuilt) were excluded from Interstate and Primary roadway mileage.

[13] Interstate roadway mileage includes functional system 1 (interstate).

[14] Primary roadway mileage includes functional system 2 (principal arterial-other freeways and expressways), functional system 3 (principal arterial-other) and functional system 4 (minor arterials.

- Secondary[15] – More than 2,000 miles of collector roads that connect local streets to primary roadways.

- Local[16] – More than 100,000 miles of local streets.

Additionally, a number of key intermodal connectors (short roadway segments) tie rail terminal facilities, airports, and pipeline terminal facilities to the National Highway System.

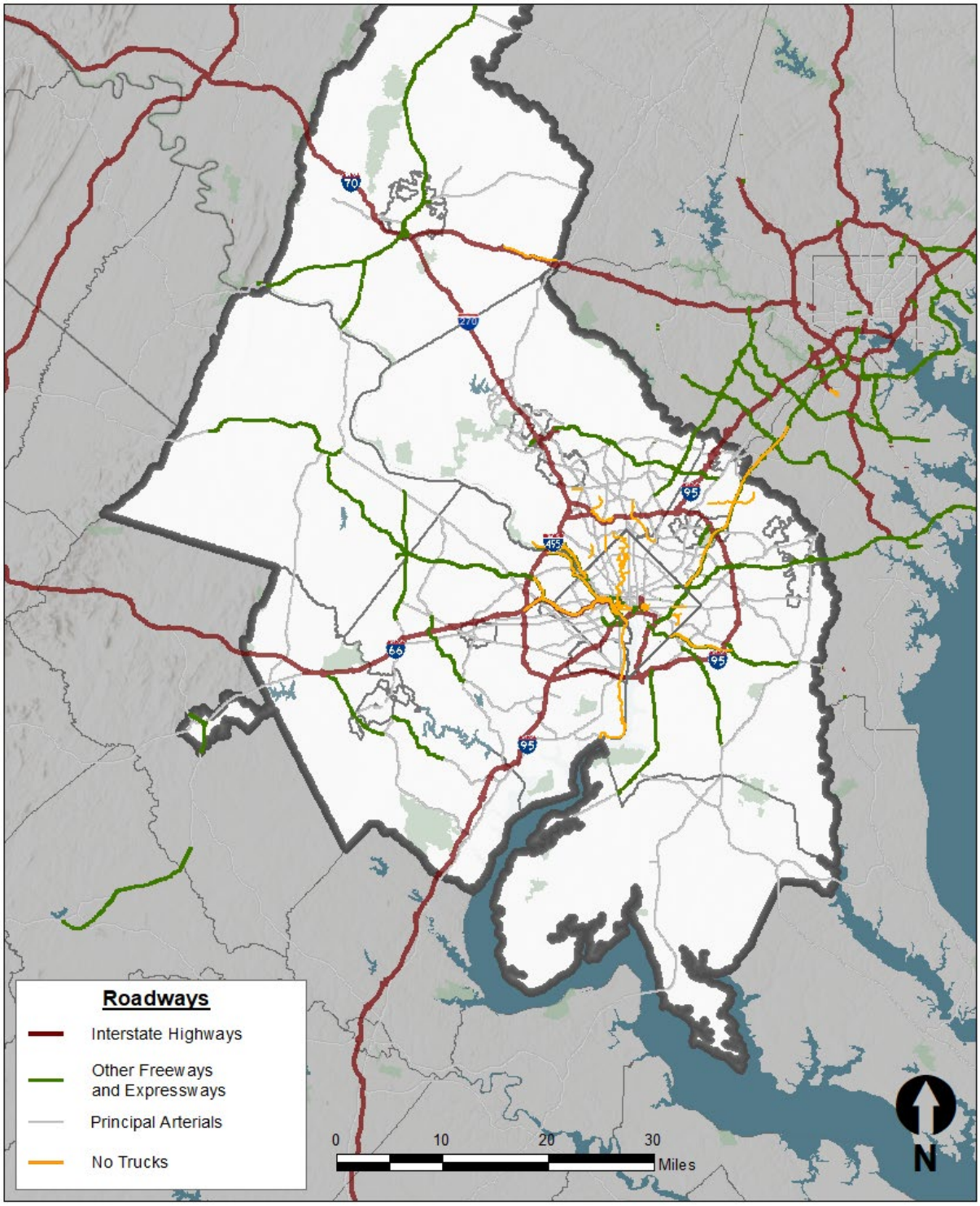
The region's highway network is publicly owned, and the majority of truck freight is moved over the Interstate and primary highway systems. However, the trucks and trailers using that network are privately owned. Different types and sizes of trucks are used to haul certain types of cargo. Trucks vary in size from small delivery vans to medium-size "single-unit" vehicles to large combination tractor-trailer vehicles. Cargo can be carried in a "dry van", on a flatbed trailer, on a specialized "auto rack", in a hopper or a liquid bulk tank, or in an intermodal shipping container designed for direct transfer between truck, ship, and train using specialized overhead lift equipment. There may be a refrigerator unit for keeping the cargo at a suitably cool temperature[17]. Figure 2 below illustrates the locations of the National Capital Region's major highways.

[15] Secondary roadway mileage includes functional system 5 (major collectors) and functional system 6 (major collectors).

[16] Local street mileage includes functional system 7 (local).

[17] Virginia Intermodal Freight Study, Phase 1

Figure 2: Interstate and Primary Highway Systems in the Region



Source: Metropolitan Washington Council of Governments GIS Data, 2023.

Table 1 below highlights the Interstate and non-Interstate NHS mileage by county within the region. Note that some National Capital Region jurisdictions, such as the City of Fairfax and the City of Falls Church, do not have any Interstate mileage within their boundaries.

Table 1. Interstate and Non-Interstate NHS Mileage by County

County/City Name	Interstate Mileage	Non-Interstate Mileage
Arlington County	11.1	42.1
Charles County	0	57.2
City of Alexandria	4.6	18.2
City of Fairfax	0	9.4
City of Falls Church	0	3.5
City of Manassas	0	5.5
City of Manassas Park	0	0.3
District of Columbia	11.8	122.2
Fairfax County	53.5	175.1
Fauquier County Urban	0	12.2
Frederick County	39.3	60.4
Loudoun County	0	77.6
Montgomery County	41.4	186
Prince George's County	46.6	212.5
Prince William County	25.4	92.2

Source: 2019 Highway Performance Monitoring System Public Release Data from USDOT GIS Server; for planning purposes only.

2.2.1. REGIONALLY SIGNIFICANT HIGHWAY FREIGHT NETWORK

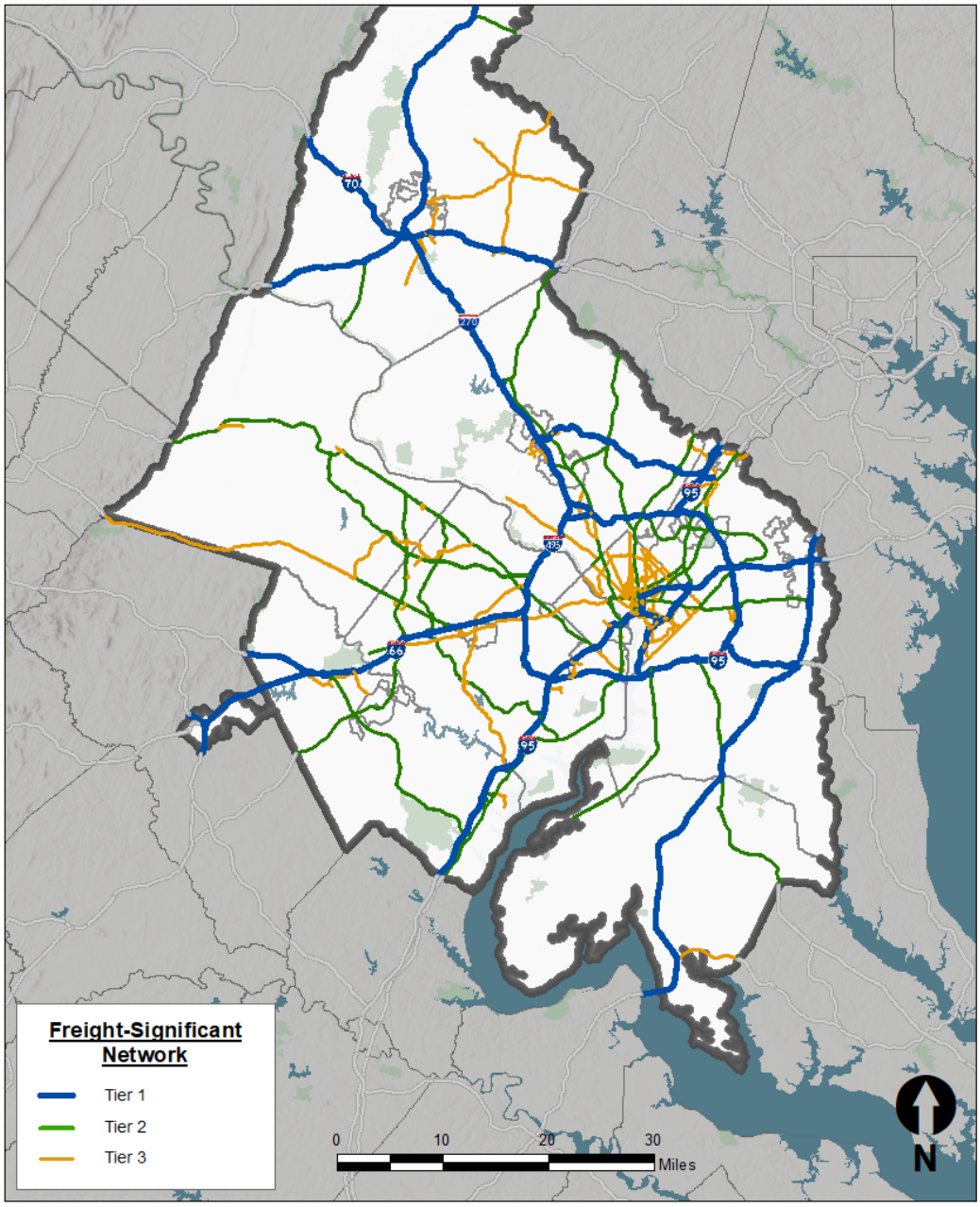
Certain components of the region's highway system are particularly important for goods' movement. Each of the region's member states, Maryland, Virginia, and the District of Columbia have identified a designated truck network linking major freight shipping and receiving areas and accommodating through-state freight movement. Within the region, most of these state-designated truck routes are represented by Interstate highways and major arterials. At the regional level, the importance of roadways other than state designated truck routes is also recognized. These regionally freight-significant roadways function as important connectors between retail establishments, warehouse and distribution centers, and state-designated truck routes.

TPB staff, in consultation with the TPB Freight Subcommittee, identified a network of these freight-important roadways using a combination of data analysis and collective expertise. The Freight Significant Network identified below represents the 2023 update of the network, superseding the network published in the 2016 National Capital Region Freight Plan. The resulting regional freight significant network is organized into three tiers.

- Tier 1: Roadways in this tier include state-designated truck routes, Interstates, and other high-volume roadways. These roads are how most freight enters and leaves the region and are typically used by pass-through trucks.
- Tier 2: Roadways in this tier allow trucks to permeate the region and provide access to important freight generators and attractors.
- Tier 3: Roadways in this tier provide last mile connectivity.

The regional freight significant network includes truck-allowed routes that are important for the movement of goods. The freight significant network is intended for regional data analysis and is not promoted as truck routes in the same way that officially state-designated truck routes are. The primary purpose of developing the regional freight-significant network is to facilitate performance monitoring. For example, congestion can be measured on the freight significant network and compared to that of the overall region. Similar comparisons can be made for pavement condition, bridge condition, or safety. The regional freight-significant network is shown in Figure 3.

Figure 3: Regionally Significant Highway Freight Network



Source: Metropolitan Washington Council of Governments GIS Data, 2023

Detailed information on the components of the regional freight-significant network are provided in Table 2. Detailed maps highlighting portions of the freight significant network can be found in Appendix A.

Table 2: Components of the Regionally Significant Highway Freight Network

Route Name	Tier	From	To	Comments
Frederick County, MD				
I-70	Tier 1	Washington-Frederick County line	Frederick-Carroll County line	Part of Maryland Truck Route System
I-270	Tier 1	Montgomery-Frederick County line	I-70	Part of Maryland Truck Route System
US 15	Tier 1	US 340	Maryland-Pennsylvania line	Provides truck access from Frederick to Harpers Ferry, WV, and points south and west
MD 140	Tier 2	US 15	Frederick-Carroll County line	Provides truck access to various facilities in northern Frederick and Carroll Counties and to Pennsylvania
MD 26	Tier 3	US 15	Frederick-Carroll County line	Provides access to commercial and industrial areas including MD 75 and to Carroll County and beyond
MD 75	Tier 3	W. Baldwin Road	Frederick-Carroll County line	South of I-70: provides truck access to W. Baldwin Road / Intercoastal Drive and on to Costco distribution facility – note vehicle height restrictions south of W. Baldwin Road North of I-70: provides truck access to cement plant in Carroll County
MD 85	Tier 3	I-70	Manor Woods Road	Provides truck access to industrial areas
MD 355	Tier 3	MD 85	New Technology Way	Provides truck access to commercial and industrial areas – note trucks are not encouraged beyond New Technology Way
MD 550	Tier 3	MD 194	MD 26	Provides truck access to Woodsboro Mining and connection to MD 75 via MD 26
Monocacy Boulevard	Tier 3	South Street / Reichs Ford Road	MD 26	Provides truck access to industrial areas in and around Frederick
Reichs Ford Road	Tier 3	I-70	Ray Smith Road	Provides truck access to industrial and commercial areas
W. Baldwin Road & Intercoastal Drive	Tier 3	MD 75	Costco distribution facility	Provides truck access to Costco distribution facility
Montgomery County, MD				

Route Name	Tier	From	To	Comments
I-270	Tier 1	I-495	Montgomery-Frederick County line	Part of Maryland Truck Route System
I-270 SPUR	Tier 1	I-495	I-270	Part of Maryland Truck Route System
I-370	Tier 1	I-270	MD 200	Provides truck connection between I-270 and I-95
I-495	Tier 1	Virginia – Maryland line	Montgomery-Prince George's County line	Part of Maryland Truck Route System
MD 200	Tier 1	I-370	Montgomery-Prince George's County line	Provides truck connection between I-270 and I-95
US 29	Tier 2	DC-Maryland line	Montgomery-Howard County line	Connects to DC Truck Route (Georgia Avenue) and provides truck access to a variety of commercial areas in Silver Spring, White Oak, and Columbia
MD 27	Tier 2	MD 355	Montgomery-Howard County line	Provides truck access to northern Montgomery County
MD 28	Tier 2	I-270	MD 97	Provides truck access to commercial areas in central Montgomery County
MD 97	Tier 2	US 29	Montgomery-Howard County line	Connects to DC Truck Route (Georgia Avenue) via US 29 and provides access to commercial areas of Silver Spring, Wheaton and points north
MD 355	Tier 2	I-495	MD 27	Provides truck access to commercial areas of Rockville and Gaithersburg
MD 355	Tier 2	MD 410 / MD 187	DC-Maryland line	Connects to DC Truck Route (Wisconsin Ave., N.W.) and provides truck access to a variety of commercial areas in the District of Columbia and Bethesda
MD 193	Tier 2	I-495	Montgomery-Prince George's County line	Provides truck access to commercial areas in southern Montgomery and western Prince George's Counties
Father Hurley Boulevard & Ridge Road	Tier 2	I-270	MD 27 / MD 355	Provides truck access to commercial areas in Germantown and connects I-270 to MD 27 and MD 355
MD 28	Tier 3	I-270	Darnestown Road	Provides truck access to Shady Grove Life Sciences Center, Shady Grove Adventist Hospital, the Universities at Shady Grove and Aggregate Industries mining operation
MD 119	Tier 3	Sam Eig Highway	MD 28	Provides truck access to Shady Grove Life Sciences Center, Shady Grove

Route Name	Tier	From	To	Comments
				Adventist Hospital, the Universities at Shady Grove and Aggregate Industries mining operation
MD 187	Tier 3	MD 355 (in Bethesda)	MD 355 (north of I-495)	Provides truck access to commercial and medical facilities including the National Institutes of Health, Montgomery Mall, and Bethesda
MD 198	Tier 3	US 29	Montgomery-Prince George's County line	Provides truck access from US 29 to industrial areas along Sweitzer Lane – also provides truck access to Laurel and Fort Meade.
Sam Eig Highway	Tier 3	I-270 / I-370	MD 119	Provides truck access to Shady Grove Life Sciences Center, Shady Grove Adventist Hospital, the Universities at Shady Grove and Aggregate Industries mining operation
Prince George's County, MD				
I-95	Tier 1	Virginia – Maryland line	Prince George's-Howard County line	Part of Maryland Truck Route System
I-295	Tier 1	I-495	Maryland-DC line	Part of Maryland Truck Route System
I-495	Tier 1	Montgomery-Prince George's County line	I-95	Part of Maryland Truck Route System
US 50	Tier 1	DC-Maryland line	Prince George's-Anne Arundel County line	Part of Maryland Truck Route System – provides connectivity to DC Truck route System (New York Avenue)
US 301	Tier 1	Charles-Prince George's County line	Prince George's-Anne Arundel County line	Part of Maryland Truck Route System
MD 3	Tier 1	US 50	Prince George's-Anne Arundel County line	Part of Maryland Truck Route System
MD 4	Tier 1	I-95	US 301	Part of Maryland Truck Route System
MD 200	Tier 1	Montgomery-Prince George's County line	US 1	Provides truck connection between I-270 and I-95 / US 1

Route Name	Tier	From	To	Comments
MD 201	Tier 1	US 50	Maryland-DC line	Provides critical truck connection between US 50 and DC 295 (DC Truck Route) and for trucks leaving DC to reach US 50 and I-95 / I-495
US 1	Tier 2	DC-Maryland line	Prince George's-Howard County line	Provides truck access to a variety of commercial and industrial areas along the entire length of the corridor. Connects to DC Truck Route (Rhode Island Avenue)
US 1 ALT	Tier 2	DC-Maryland line	US 1	Connects to DC Truck Route (Bladensburg Road) – provides access to commercial and industrial areas in and around Hyattsville
MD 4	Tier 2	US 301	Prince George's-Anne Arundel County line	Provides truck access from US 301 to points east and south and to commercial areas of Calvert County
MD 5	Tier 2	I-95	Prince George's-Charles County line	Provides truck connection between Southern Maryland and the National Capital Region - connects Southern Maryland to the National Freight Network – and access to U.S. activities in St. Mary's County, MD
MD 193	Tier 2	Montgomery-Prince George's County line	MD 450	Provides truck access to commercial areas in Langley Park, College Park, Greenbelt, and Bowie
MD 201	Tier 2	US 50	MD 212	Provides truck access to commercial and industrial areas of Greenbelt, Bladensburg, Cheverly, and Hyattsville – including the Pepsi bottling plant in Cheverly and the Tuxedo Road industrial area in Hyattsville
MD 210	Tier 2	I-95	Prince George's-Charles County line	Provides truck access to U.S. Navy Activities at Indian Head from I-95 / I-495
MD 214	Tier 2	DC-Maryland line	US 301	Provides truck connection to East Capitol St. (DC Truck Route) – provides truck access to and from the industrial areas off Ritchie Road and Hampton Park Boulevard
MD 450	Tier 2	MD 193	MD 704	Links MD 193 to MD 704
MD 704	Tier 2	DC-Maryland line	MD 450	Connects DC Truck Route system (East Capitol St. via 63rd Street) to commercial areas in central Prince George's County and to US 50

Route Name	Tier	From	To	Comments
MD 198	Tier 3	Montgomery-Prince George's County line	Prince George's-Anne Arundel County line	Provides access from I-95 and US 29 to industrial areas along Sweitzer Lane – also provides truck access to Laurel and Fort Meade
MD 212	Tier 3	US 1	MD 201	Connects the industrial areas in Beltsville (east of the CSX Capital Subdivision) to US 1 – note: the portion of MD 212 (Powder Mill Road) between Ammendale Road and US 1 is "not" part of the Regional Freight-Significant Network
MD 212 – Ammendale Road – Virginia Manor Road	Tier 3	I-95	Konterra Dr – Muirkirk Rd	Provides truck access between I-95 and the commercial and industrial areas along Virginia Manor Road and Konterra Drive, including the FedEx and Frito Lay facilities along Trolley Lane - the portion of MD 212 (Powder Mill Road) between Ammendale Road and US 1 is "not" part of the Regional Freight-Significant Network
Edmonston Road – Old Baltimore Pike	Tier 3	MD 201 / MD 212	Muirkirk Rd	Provides truck access to industrial areas in and around Beltsville and the U.S. Department of Agriculture's research facilities in this area.'
Leeland Road	Tier 3	Target distribution center entrance	US 301	Provides truck access to and from major Target distribution center – note: Leeland Road east of the Target distribution center is not recommended for trucks
Muirkirk Road	Tier 3	Virginia Manor Road / Konterra Drive	Old Baltimore Pike	Provides truck access from MD 200 and I-95 to Beltsville industrial areas (via Konterra Drive and Virginia Manor Road / MD 212 – note: Bridge over CSX on Muirkirk Road is weight restricted – 56,000 lbs for single unit trucks and 54,000 lbs for combinations
Ritz Way	Tier 3	Virginia Manor Road	US 1	Provides access to US 1 in Beltsville from MD 200 via Konterra Drive and Virginia Manor Road and from I-95 via MD 212 and Virginia Manor Road
Sweitzer Lane – Konterra Drive	Tier 3	MD 198	Virginia Manor Road / Muirkirk Road	Provides truck access to industrial areas including a major UPS facility and a WSSC Filtration Plant
Charles County, MD				

Route Name	Tier	From	To	Comments
US 301	Tier 1	Virginia-Maryland line	Charles-Prince George's County line	Part of Maryland Truck Route System
MD 5	Tier 2	US 301	Charles-St. Mary's County line	Provides truck connection between Southern Maryland and the National Capital Region – connects Southern Maryland to the National Freight Network
MD 210	Tier 2	Prince George's-Charles County line	Naval Support Facility Indian Head	Provides truck access to Indian Head from I-95 / I-495
MD 234	Tier 3	US 301	Charles-St. Mary's County line	Provides a connection (in combination with MD 236, MD 5, and MD 235) between industrial and commercial areas of St. Mary's County and US 301
District of Columbia				
I-295	Tier 1	Maryland-DC line	I-695 / DC 295	Provides truck access to the District of Columbia from I-95 / I-495 and points south
I-395	Tier 1	Virginia – DC line	New York Avenue	Provides truck access to the District of Columbia from I-95 / I-495 and points south
I-695	Tier 1	I-395	I-295 / DC 295	Major east-west Interstate connection through the District of Columbia
DC 295	Tier 1	I-295 / I-695	DC-Maryland line	Provides truck access to the District of Colombia from Maryland and points east
New York Avenue (US 50)	Tier 1	Maryland-DC line	I-395	Provides truck access to the District of Colombia from Maryland and points east
Benning Road	Tier 2	Bladensburg Road	East Capitol Street	Provides truck connections between commercial areas in the District and Maryland
Bladensburg Road	Tier 2	Benning Road	DC-Maryland line	Provides truck connections between commercial areas in the District and Maryland
East Capitol Street	Tier 2	Benning Road	DC-Maryland line	Provides truck connections between commercial areas in the District and Maryland
Georgia Avenue	Tier 2	7th Street NW	DC-Maryland line	Provides truck connections between commercial areas in the District and Maryland
Independence Avenue	Tier 2	14th Street NW	7th Street NW	Provides truck connections between 7th Street NW and access points to I-395 via 12th and 14th Streets NW

Route Name	Tier	From	To	Comments
Rhode Island Avenue	Tier 2	7th Street NW	DC-Maryland line	Provides truck connections between commercial areas in the District and Maryland
Western Avenue	Tier 2	Wisconsin Avenue	Massachusetts Avenue	Provides truck connection between Wisconsin and Massachusetts Avenues
Whitehurst Freeway	Tier 2	M Street NW	K Street NW	Links Key Bridge and Virginia to the central business district
Wisconsin Avenue	Tier 2	Maryland-DC line	K Street NW	Provides truck connections between commercial areas in the District and Maryland
H Street (NW and NE)	Tier 2	Massachusetts Avenue	Benning Road	Provides truck connections from the central business district to DC 295 and points east
K Street NW	Tier 2	Georgetown	12th Street NW	Provides truck connections between the central business district, Georgetown, the Whitehurst Freeway, Virginia and points south
M Street NW	Tier 2	Wisconsin Avenue	US-29	Provides truck connection between Wisconsin Avenue, Virginia, and points south
7th Street NW	Tier 2	Independence Avenue	Georgia Avenue	Provides truck connections from the central business district to Maryland
9th Street NW	Tier 2	I-395	Massachusetts Avenue	Provides truck access from I-395 to the central business district – Southbound only
12th Street NW	Tier 2	I-395	Massachusetts Avenue	Provides truck access from I-395 to the central business district – Northbound only
63rd Street NE	Tier 3	East Capitol Street SE	Eastern Avenue NE	Provides truck connections between commercial areas in the District and Maryland
Connecticut Avenue	Tier 3	K Street NW	DC-Maryland line	Provides truck access to commercial areas along Connecticut Avenue
Florida Avenue	Tier 3	Benning Road	Massachusetts Avenue	Provides truck access to commercial areas in the District
Massachusetts Avenue	Tier 3	H Street NW	DC-Maryland line	Provides truck access to commercial areas along Massachusetts Avenue
14th Street NW	Tier 3	I-395	Upshur Street NW	Provides truck access to commercial areas along 14th Street NW
Loudoun County, VA				
US 50	Tier 2	VA 606	Loudoun-Fairfax County line	Provides truck access to Dulles Airport and to Arcola and Chantilly industrial areas
VA 7	Tier 2	Loudoun-Clarke County line	Loudoun-Fairfax County line	Provides truck access to Purcellville, Leesburg, and the commercial areas along VA 7 in eastern Loudoun County

Route Name	Tier	From	To	Comments
				– STAA National Network (western Loudoun County), STAA Virginia Qualifying Highway (eastern Loudoun County)
VA 28	Tier 2	VA 7	Loudoun-Fairfax County line	Provides truck access to commercial and industrial areas in Loudoun, Fairfax, and Prince William Counties and the Cities of Manassas and Manassas Park, as well as Dulles International Airport – STAA Virginia Qualifying Highway
VA 267	Tier 2	VA 7	Loudoun-Fairfax County line	Provides truck connections to Leesburg, Dulles Airport, Reston/Herndon, and I-495 – STAA Virginia Access Route
VA 606	Tier 3	VA 28	US 50	Links warehouse area north of Dulles Airport to VA-28, VA-267, and US-50
Cascades Parkway – Bartholomew Fair Drive	Tier 3	VA 7	Price Cascades Plaza	Provides truck access to Costco and Potomac Run Plaza retail areas – STAA Virginia Access Route
E. Market Street	Tier 3	VA 7	Catoctin Circle	Provides truck access to commercial areas of Leesburg – STAA Virginia Access Route
W. Main Street	Tier 3	VA 7	N. 23rd St	Provides truck access to downtown Purcellville – STAA Virginia Access Route
Fairfax County, VA				
I-66	Tier 1	Prince William-Fairfax County line	I-495	STAA National Network
I-95	Tier 1	Prince William-Fairfax County line	Fairfax County-City of Alexandria line	STAA National Network
I-395	Tier 1	I-95 / I-495	Fairfax County-City of Alexandria line	STAA National Network
I-495	Tier 1	I-95 / I-395	Virginia-Maryland line	STAA National Network
US 1	Tier 2	Prince William-Fairfax County line	Fairfax County-City of Alexandria line	Provides truck access to Fort Belvoir, Marine Corps Base Quantico, and an assortment of businesses in Stafford, Prince William, and Fairfax Counties as well as the City of Alexandria

Route Name	Tier	From	To	Comments
US 29	Tier 2	Luck Stone quarry just east of the Manassas National Battlefield Park	I-66	Provides truck access to Luck Stone quarry (US 29 is not a truck route across Manassas National Battlefield Park)
US 50	Tier 2	Loudoun-Fairfax County line	I-66	Provides access to Dulles Airport and to Arcola and Chantilly industrial areas - STAA Virginia Access Route between Lee Road and I-66
VA 7	Tier 2	Loudoun-Fairfax County line	Fairfax County-City of Falls Church line	Provides truck access to commercial areas along VA 7 in Fairfax County
VA 7	Tier 2	City of Falls Church-Fairfax County line	Fairfax County-City of Alexandria line	Provides truck access to commercial areas along VA 7 in Fairfax County
VA 28	Tier 2	Loudoun-Fairfax County line	Fairfax-Prince William County line	Provides truck access to commercial and industrial areas
VA 267	Tier 2	Loudoun-Fairfax County line	I-495	Provides truck connections to Dulles Airport, Reston/Herndon, and I-495 - STAA Virginia Access Route
VA 286	Tier 2	VA 7	US 1	Provides truck connections between VA 7, I-66, and I-95 and access to Fort Belvoir, and pipeline terminals off of Terminal Road
Braddock Road – Port Royal Road	Tier 3	I-495	Terminus of Port Royal Road	Provides truck access to industrial areas along Port Royal Road - STAA Virginia Access Route
Centreville Road	Tier 3	VA 267	Coppermine Road	Provides truck access to commercial areas along Centreville Road - STAA Virginia Access Route
Franconia Road – Fleet Road	Tier 3	I-95	Fleet Industrial Park	Provides truck access to commercial and industrial areas including Springfield Town Center and Fleet Industrial Park - STAA Virginia Access Route
Lee Road	Tier 3	US 50	Flint Lee Road	Provides truck access to industrial areas along Lee Road and to the Chantilly Crossing Shopping Center (Costco) - STAA Virginia Access Route
Lorton Road	Tier 3	I-95	US 1	Provides a truck connection between I-95 and US 1 in Lorton - STAA Virginia Access Route

Route Name	Tier	From	To	Comments
McLearen Road – Towerview Road – Park Center Road	Tier 3	VA 28	Terminus of Park Center Road	Provides truck access to industrial areas along Park Center and Towerview Roads - STAA Virginia Access Route
Terminal Road	Tier 3	VA-286	Terminus	Provides truck access to Plantation and Colonial Pipeline Terminal facilities and other industrial areas - STAA Virginia Access Route
Walney Road – Willard Road	Tier 3	US-50	Brookfield Corporate Drive	Provides truck access to the Dulles Expo Center and other commercial areas - STAA Virginia Access Route
City of Falls Church, VA				
VA 7	Tier 2	Fairfax County-City of Falls Church line	City of Falls Church-Fairfax County line	Provides truck access to commercial areas along VA 7 in Falls Church and connects to VA 7 on either side of Falls Church
Prince William County, VA				
I-66	Tier 1	Fauquier-Prince William County line	Prince William-Fairfax County line	STAA National Network
I-95	Tier 1	Stafford-Prince William County line	Prince William-Fairfax County line	STAA National Network
US 29	Tier 1	Fauquier-Prince William County line	I-66	STAA National Network between the Fauquier-Prince William County Line and I-66 at Gainesville
US 1	Tier 2	Stafford-Prince William County line	Prince William-Fairfax County line	Provides truck access to Fort Belvoir, Marine Corps Base Quantico, and an assortment of businesses in Stafford, Prince William, and Fairfax Counties
VA 28	Tier 2	Fairfax-Prince William County line	Prince William County-City of Manassas Park line	Provides truck access to commercial and industrial areas in Loudoun, Fairfax, and Prince William Counties and the Cities of Manassas and Manassas Park
VA 28	Tier 2	City of Manassas-Prince William County line	Prince William-Fauquier County line	Provides truck access to commercial and industrial areas in Loudoun, Fairfax, and Prince William Counties and the Cities of Manassas and Manassas Park
VA 234	Tier 2	I-66	City of Manassas-Prince	Provides truck connection through Prince William County between US 1, I-95, City of Manassas, I-66, and the Balls Ford Road industrial area

Route Name	Tier	From	To	Comments
			William County line	
VA 234	Tier 2	City of Manassas-Prince William County line	US 1	Provides truck connection through Prince William County between US 1, I-95, City of Manassas, I-66, and the Balls Ford Road industrial area
Balls Ford Road	Tier 3	Wellington Road	Terminus of Balls Ford Road	Provides truck access to industrial areas and pipeline terminals along the length of Balls Ford Road – provides truck connection to Wellington Rd industrial and commercial areas - STAA Virginia Access Route
Dale Boulevard – Neabsco Mills Road	Tier 3	I-95	US 1	Provides truck connection between I-95 and US 1 - STAA Virginia Access Route
Featherstone Road – Farm Creek Drive	Tier 3	US 1	Terminus of Farm Creek Drive	Provides truck access to industrial areas along Farm Creek Drive - STAA Virginia Access Route
Opitz Boulevard	Tier 3	I-95	US 1	Provides truck connection between I-95 and US 1 - STAA Virginia Access Route
Sudley Road	Tier 3	I-66	Godwin Drive	Provides truck access to industrial and commercial areas, including Costco, Westgate Plaza Shopping Center, and Manassas Mall - STAA Virginia Access Route
Wellington Road	Tier 3	Limestone Drive	Livingston Road	Provides truck access to industrial areas - STAA Virginia Access Route
City of Manassas Park, VA				
VA 28	Tier 2	Prince William County-City of Manassas Park line	City of Manassas Park– City of Manassas line	Provides truck access to commercial and industrial areas in Loudoun, Fairfax, and Prince William Counties and the Cities of Manassas and Manassas Park
Fauquier County, VA (Urbanized Area)				
US 29	Tier 1	Through urbanized area	STAA National Network	US 29
US 17	Tier 1	Through urbanized area	STAA National Network – trucks prohibited on US-17 between I-66 and US-50	US 17

Route Name	Tier	From	To	Comments
Arlington County, VA				
I-395	Tier 1	City of Alexandria-Arlington County line	Virginia-DC line	STAA National Network
US 1	Tier 2	City of Alexandria-Arlington County line	Virginia-DC line	Provides truck access to an assortment of businesses in Arlington County and the City of Alexandria, including the Pentagon
VA 110	Tier 2	I-395	Rosslyn	Provides a truck connection between I-395 and US 29 / Key Bridge
Lynn Street – Fort Meyer Drive	Tier 2	VA 110	Virginia-DC line – Key Bridge	Provides truck connection between the Key Bridge and VA 110
VA 27	Tier 3	I-395	2nd Street S.	Provides truck access Fort Myer - STAA Virginia Access Route
VA 233	Tier 3	US 1	Washington Reagan National Airport	Provides truck access to Washington Reagan National Airport
City of Alexandria, VA				
I-95	Tier 1	Fairfax County-City of Alexandria line	Virginia-Maryland line	STAA National Network
I-395	Tier 1	Fairfax County-City of Alexandria line	City of Alexandria-Arlington County line	STAA National Network
US 1	Tier 2	Fairfax County-City of Alexandria line	City of Alexandria-Arlington County line	Provides truck access to Arlington and Fairfax Counties as well as the City of Alexandria
VA 7	Tier 2	Arlington County-City of Alexandria line	I-395	Provides truck access to the commercial areas along VA 7 in Fairfax County
Duke Street	Tier 3	I-395	S. Pickett Street	Provides truck access to the Landmark Mall and other commercial areas - STAA Virginia Access Route
Van Dorn Street – Metro Road	Tier 3	I-95 / I-495	Edsall Road	Provides truck access to industrial areas and CSX intermodal facility - STAA Virginia Access Route and FHWA Intermodal Connector

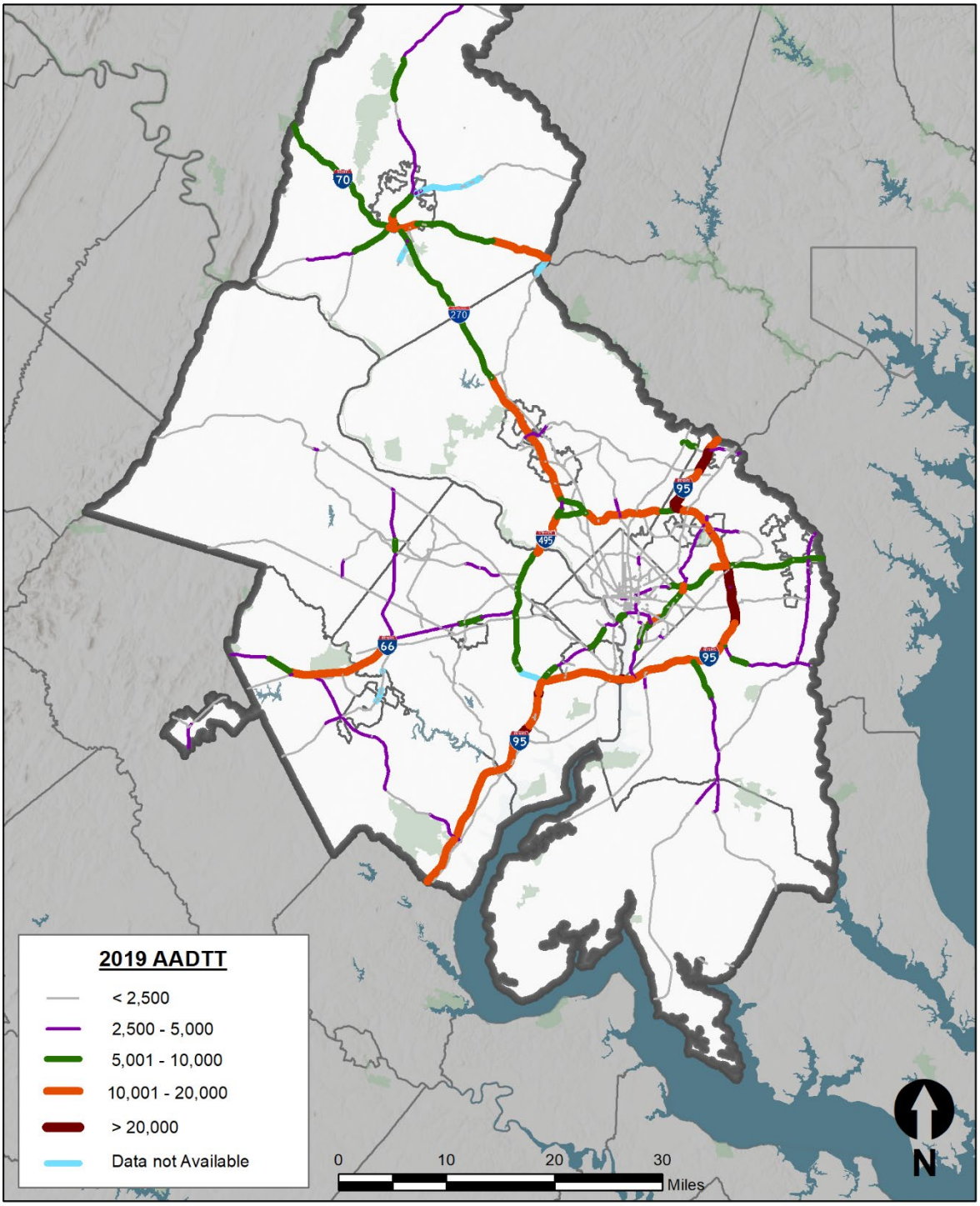
Source: Metropolitan Washington Council of Governments, 2023

2.2.2. TRUCK TRAFFIC

Performing an analysis on the Federal Highway Administration's (FHWA) Highway Performance Monitoring (HPMS) data provides the average annual daily truck traffic (AADTT) and truck percentage data by roadway segment. Figure 4 shows the AADTT in the region, with a dark red representing roadways with the most significant truck volume (AADTT exceeding 20,000), including I-95 and portions of I-495 in Prince George's County. All sections of I-95 in the region exceed 10,000 AADTT, as does the majority of I-495; segments of I-270 in Montgomery County, I-66 in Prince William County, I-70 near Frederick, and U.S. Route 50 in Prince George's County average between 10,000 and 20,000 AADTT, as indicated in Figure 4.

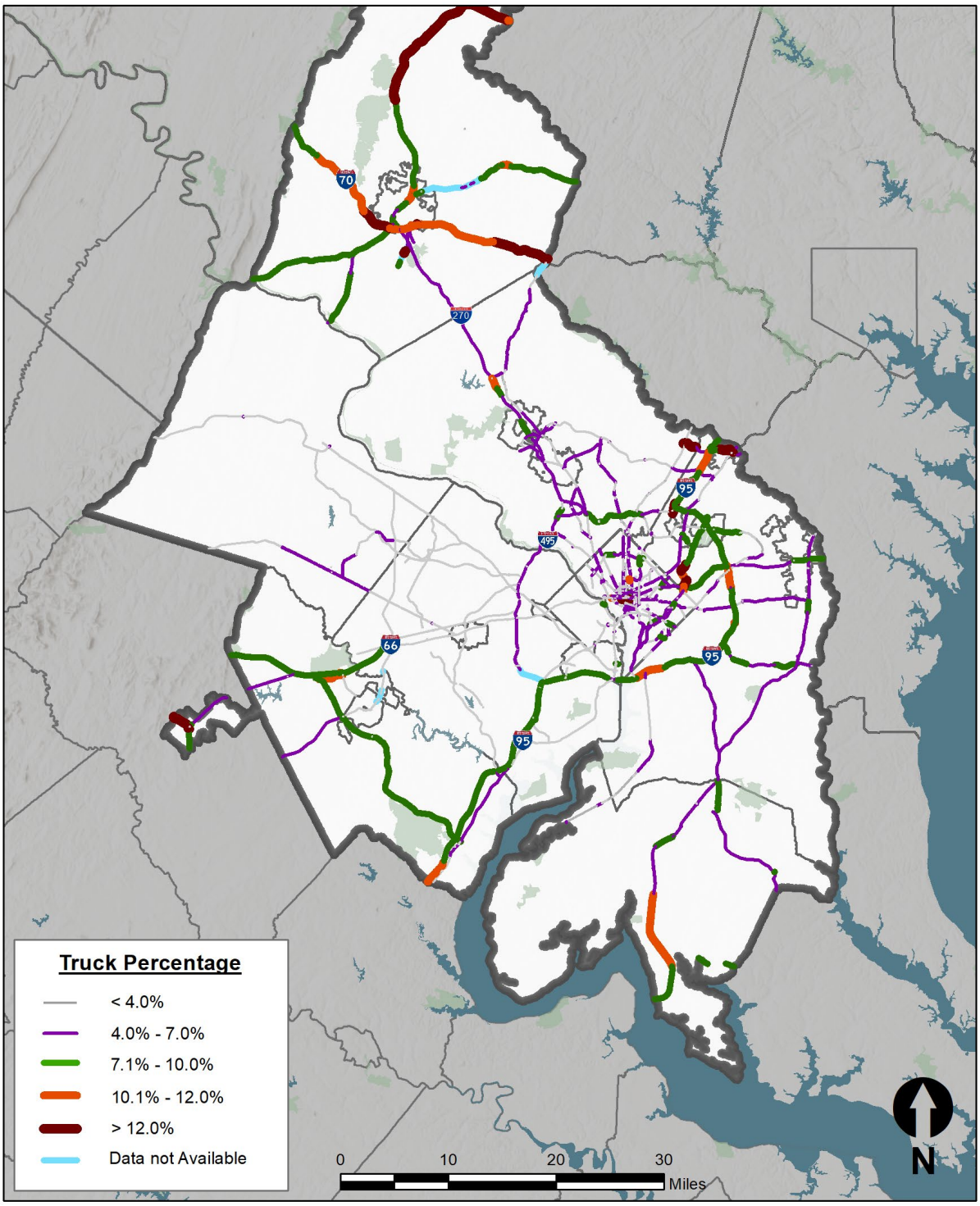
Figure 5 shows the truck percentage data by roadway segment in the region. Several highways located further from the region's core feature the highest percentages of trucks by volume, exceeding 12 percent of total roadway volumes. This includes sections of I-70 in Frederick County and portions of U.S. 301 in Charles County. East and north of the District of Columbia, sections of I-95 and I-495 feature truck percentages greater than 12 percent. The majority of I-495 in Prince George's County averages truck volumes between 10 and 12 percent, along with sections of I-95 in Prince William County.

Figure 4: Average Annual Daily Truck Traffic



Source: 2019 Highway Performance Monitoring System Public Release Data from USDOT GIS Server – for planning purposes only

Figure 5: Average Annual Daily Truck Percentage



Source: 2019 Highway Performance Monitoring System Public Release Data from USDOT GIS Server – for planning purposes only

2.2.3. TRUCK PARKING

Accessible, safe, and public parking for commercial truckers is essential to enable the movement of goods and freight in the National Capital Region. As noted in both the 2015 Virginia Truck Parking Study[17] and the 2020 Maryland Statewide Truck Parking Study[18], there is a lack of truck parking in the vicinity of the National Capital Region.

The Federal Highway Administration (FHWA) notes that the projected growth of truck traffic is expected to outpace the supply of public and private parking facilities. A lack of dedicated commercial truck parking can result in truck drivers resorting to parking at unsafe locations, such as highway shoulders or exit ramps, imperiling other roadway users and truck drivers' safety.

Designated public parking for commercial trucks provides the following benefits:

- Allows long-haul drivers areas to safely sleep and refuel.
- Enables staging near warehouses and distribution centers.
- Provides refuge during emergencies.
- Provides locations for federally mandated 30-minute breaks and off-duty truckers.

In the National Capital Region, the highest availability of truck parking correlates with existing truck traffic, concentrated along the I-95 and I-70 corridors. Within the TPB region, along the I-95 corridor, there are limited truck parking spots, including at the College Park weigh station (I-95 Exit 27), the Hyattstown weigh stations on I-270 (northbound and southbound), I-70 New Market weigh station (eastbound only east of MD-75), the truck-only rest area on I-70 eastbound approaching Mount Airy, and on I-70 eastbound and westbound near the crest of South Mountain west of Myersville and the rest area southbound on US-15 at Emmitsburg immediately south of the Maryland/Pennsylvania border. The closest truck parking spots to the north of the TPB region are in Howard County, Maryland, and south are in Dale City, Prince William County and Caroline County, Virginia. Additionally, there are notably fewer truck parking locations along I-66, I-495, US-50 in Prince George's County and MD-295 in Anne Arundel County, where many warehouses and distribution centers are located.

In a survey conducted for the Virginia Truck Parking Study, over 70 percent of truckers surveyed reported that overnight truck parking is a personal safety concern. Additionally, over 85 percent of truck drivers surveyed believed that there are areas at public and private parking facilities that are not accessible to them.[18] In the Maryland Statewide Truck Parking Study, on top of safety concerns, stakeholders involved indicated that there were other related issues including insufficient parking capacity, land-use conflicts, lack of amenities at truck parking facilities, and environmental costs of parking facilities[19].

Figure 6 illustrates public truck parking locations in the National Capital Region, excluding private truck parking locations. This includes public truck parking locations along the following highways:

- **I-95:** Dale City (121 combined RV/bus/truck spaces), College Park (17 spaces)

[18] Virginia Truck Parking Study, 2015.

[19] Maryland Statewide Truck Parking Study, 2020.

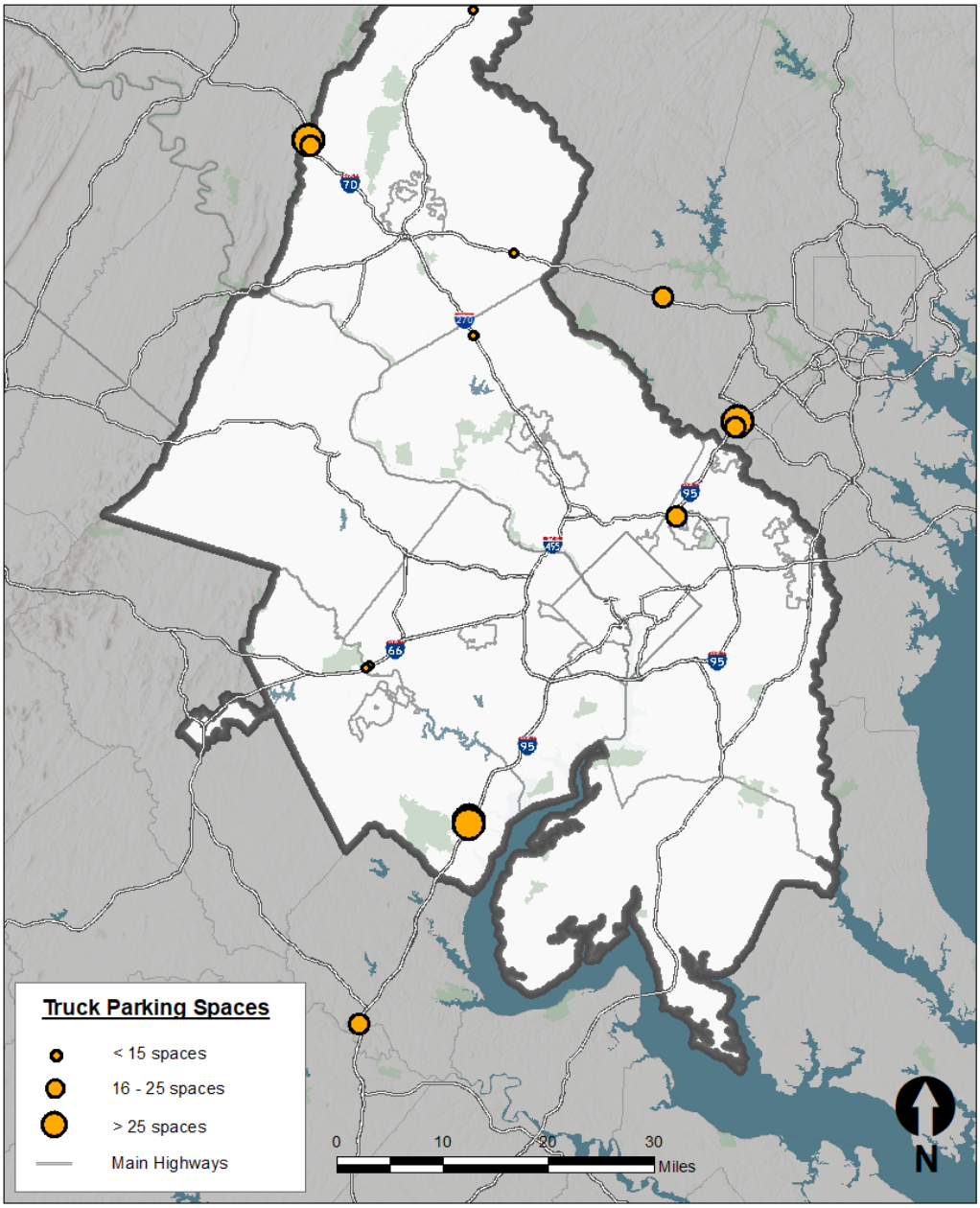
- **I-66:** Manassas (9 spaces)
- **I-70:** New Market (15 spaces), South Mountain Rest Area-Myersville (49 spaces)
- **I-270:** Hyattstown (24 spaces)

Several public truck parking locations are just outside of the TPB region:

- In Maryland, on I-70 near West Friendship (18 spaces), and on I-95 near North Laurel (67 spaces)
- In Virginia, on I-95 near Fredericksburg (21 combined RV/bus/truck spaces)

The Freight Plan Update assesses data that is required as part of the Jason's Law Truck Parking Survey. Jason's Law is a requirement of MAP-21 and was established to provide a "national priority on addressing the shortage of long-term parking for commercial motor vehicles on the National Highway System (NHS) to improve the safety of motorized and non-motorized users and for commercial motor vehicle operators." For additional information on the shortage of truck parking within the National Capital Region and proposed solutions to the challenges associated with truck parking, see the 2015 Virginia Truck Parking Study[19] and the 2020 Maryland Statewide Truck Parking Study[20].

Figure 6: Public Truck Parking Areas

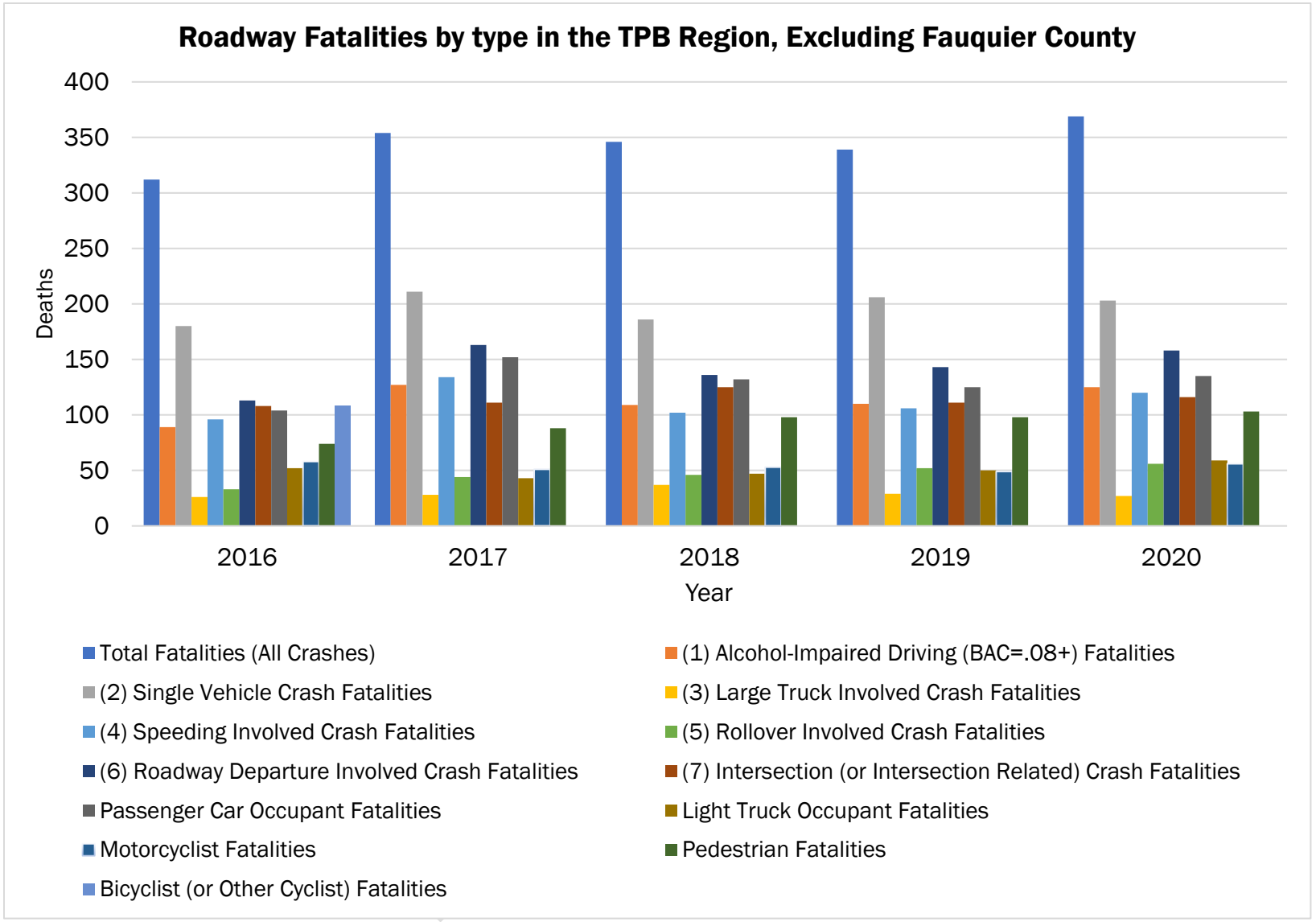


Source: Facilities and spaces shape file from FHWA Office of Operations (2019); number of truck parking spaces gathered from MDOT (2020) and VDOT (2015).

2.2.4. TRUCK SAFETY

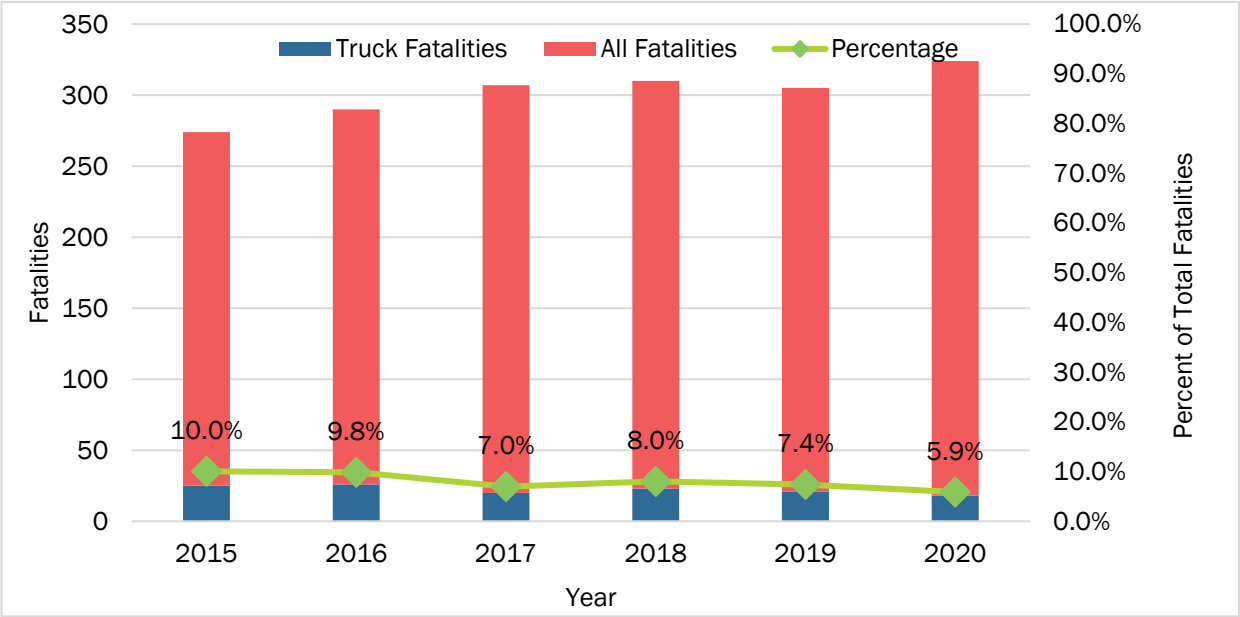
The involvement of large trucks is less of a contributing factor in fatal crashes in the National Capital Region than roadway departure, pedestrian involvement, speeding, motorcycle involvement, rollovers, and distracted drivers, as seen in Figure 7. However, crashes involving trucks are generally more severe than other types of crashes due to the significant size and weight of trucks. As shown in Figure 8, the proportion of total roadway fatalities represented by truck-involved crashes in the region during the period 2015 to 2020 ranged from 5.9 percent to 10 percent. The percent of fatalities in truck-involved crashes was significantly lower in 2020 potentially due to the decrease in overall travel as a result of the Coronavirus pandemic (COVID-19).

Figure 7. Roadway Fatalities in the Region by Emphasis Area



Source: COG analysis of National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS) using the Fatality and Injury Reporting System Tool (FIRST), 2016-2020. Numbers may not be additive. Fatal crashes may be attributed to multiple factors, and crashes may have resulted in more than one fatality.

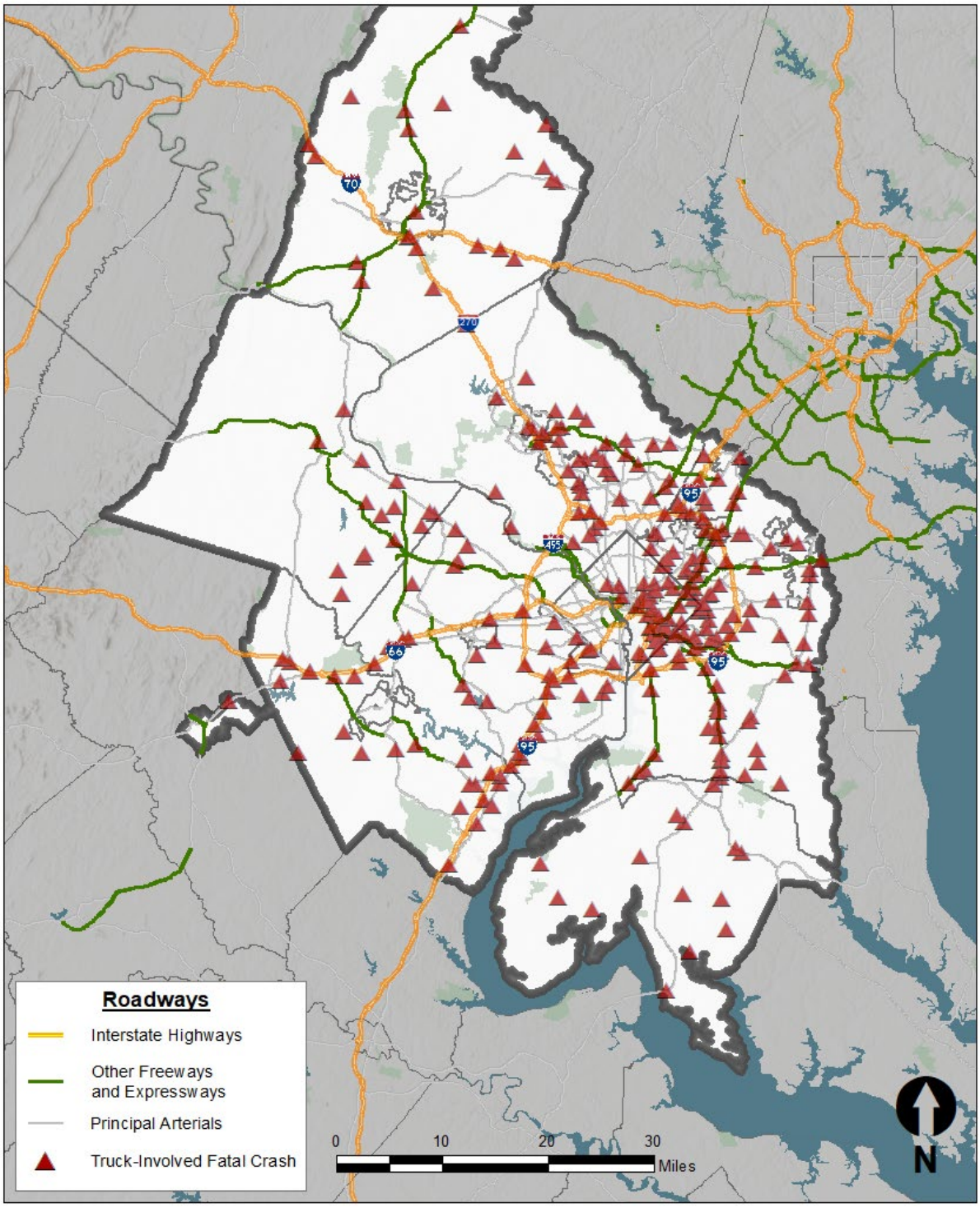
Figure 8: National Capital Region Truck-Related Fatalities



Source: COG analysis of National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS) using the Fatality and Injury Reporting System Tool (FIRST), 2015-2020.

As seen below in Figure 9, between 2015 and 2020, fatal truck-involved crashes in the region were clustered along the I-95 corridor, I-495, and along the U.S. 301/MD-5 corridor.

Figure 9: Fatal Truck Crashes in the Region, 2015-2020



Source: COG analysis of National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS), 2015-2020.

2.3. Rail Freight

The region's rail system consists of more than 300 miles of mainline track, most of which are operated by two railroads – CSX (approximately 209.5 miles), and the Norfolk Southern Corporation (approximately 50 miles). Additionally, the region is served by Maryland Midland Railway, a short line operating in Frederick County, Maryland. Three passenger systems – Amtrak, Virginia Railway Express, and the Maryland Area Regional Commuter (MARC) – also operate over the region's freight rail system.

Table 3 provides information about each of the railroads operating in the region by class and miles of mainline track owned. Figure 10 shows the rail system by ownership. Total rail mileage in the region is approximately 307 miles, but the rail lines operating through the City of Alexandria and Arlington, Fairfax, and Prince William Counties, are shared by CSX Transportation and the Commonwealth of Virginia.

Table 3: National Capital Region Railroads

Railroad	Class I Freight	Class III Freight	Passenger	Miles Operated in the Region
CSX Transportation	✓			209.5
Norfolk Southern Corporation	✓			50
Maryland Midland Railway[20]		✓		27
Amtrak			✓	19
Commonwealth of Virginia			✓	33

Source: Metropolitan Washington Council of Governments, 2023.

The many types of services offered by freight railroads fall into three main categories: bulk, intermodal, and carload or "mixed service".[21]

- Bulk services utilize liquid or dry-bulk carrying railcars, often assembled in long "unit trains" consisting of a single commodity and railcar type. Unit trains offer economies of scale because they involve long trains made up of a single railcar type, moving between major origins and destinations. Coal and grain are often moved in unit trains.
- Intermodal services involve transporting containers (single-stacked or double-stacked), truck trailers (on flat cars), entire trucks (known as "piggyback" service), and sometimes "autoracks"

[20] Maryland Midland Railroad is a subsidiary of Genesee & Wyoming Inc.

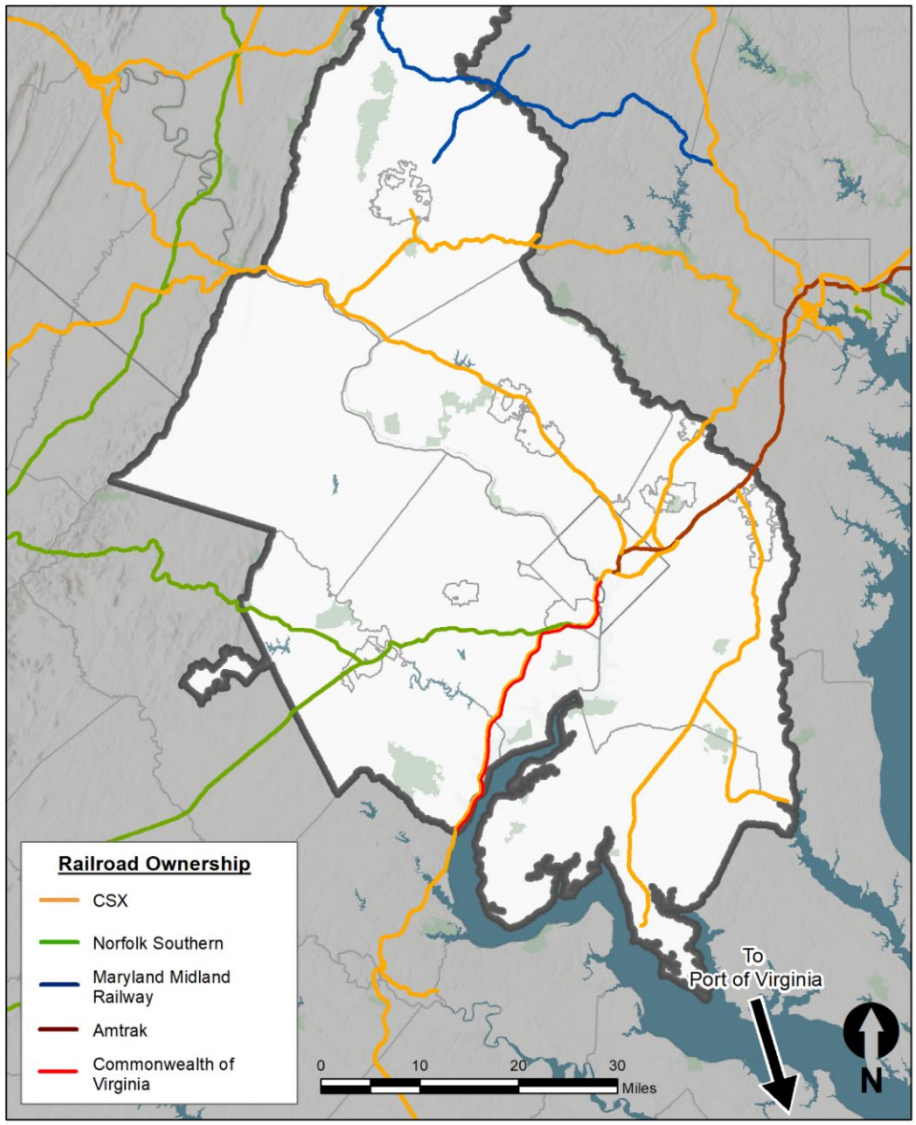
[21] This section is adapted from the Virginia Multimodal Freight Study – Phase 1.

(specialized two-level or three-level railcars carrying automobiles). Intermodal trains aim to provide a level of service comparable to trucking, with scheduled high-speed service. Figure 11 shows where the major rail-intermodal terminals within and near the region are located.

- Carload services: Carload trains carry a mix of different types of railcars and commodities, coming from different origins and moving to different destinations. Smaller shippers and receivers who might use a few railcars per day or per week, or larger shippers and receivers who handle multiple types of commodities, are typical carload customers.

Much of the National Capital Region's freight rail network is owned by CSX, which operates railways in multiple jurisdictions in the region. Norfolk Southern operates railways in Alexandria, Fairfax County, and Prince William County; the Maryland Midland Railway operates two rail lines in Frederick County. Amtrak owns rail lines from Union Station in the District of Columbia through Prince George's County and north.

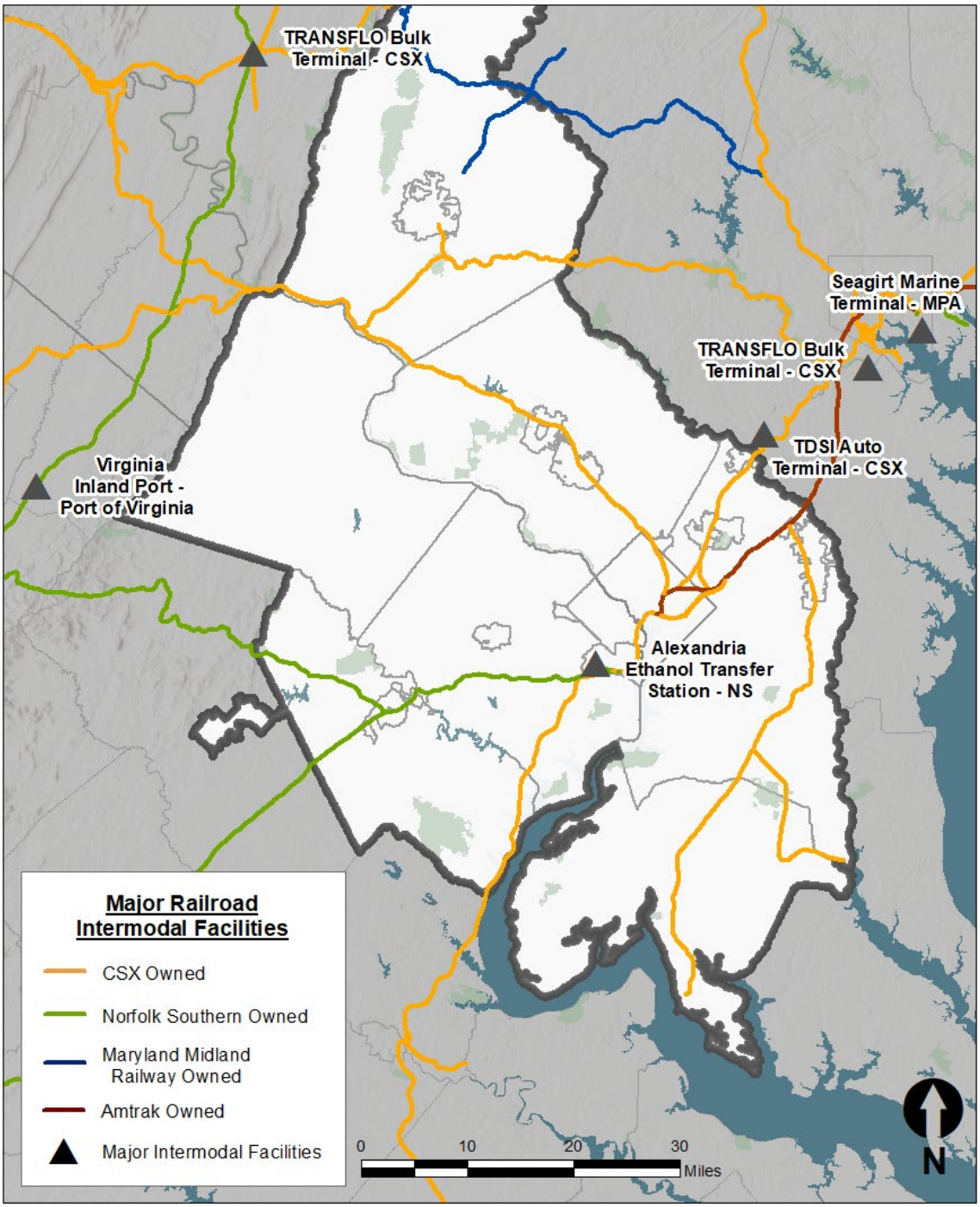
Figure 10: Regional Freight Rail Network



Source: Metropolitan Washington Council of Governments, 2023

The Alexandria Ethanol Transfer Station is the only major intermodal facility on a railroad within the National Capital Region (Figure 11). Several intermodal facilities are located just outside the region, including the Virginia Inland Port in Front Royal, three CSX terminals in Maryland, and the Seagirt Marine Terminal in Baltimore.

Figure 11: Major Intermodal Facilities Served by Rail



Source: FHWA National Highway System (NHS) Intermodal Connectors (2022)

2.3.1. RAIL SAFETY

As shown in Table 4, rail crash locations can be identified at the City and County level, based on data gathered from the Federal Railroad Administration (FRA).

Table 4: Rail Crash Locations

County/City Name	2017	2018	2019	2020	2021	2022
Arlington County	0	0	0	0	0	0
Charles County	0	0	0	1	0	0
City of Alexandria	0	0	0	0	0	0
City of Fairfax	0	0	0	0	0	0
City of Manassas	2	1	1	0	0	0
City of Manassas Park	0	0	0	0	0	0
District of Columbia	0	1	0	0	0	1
Fairfax County	2	0	1	1	0	3
Frederick County	0	1	0	2	0	1
Loudoun County	0	0	0	0	0	0
Montgomery County	2	1	3	2	0	0
Prince George's County	2	2	0	3	2	2
Prince William County	0	2	1	4	1	0

Source: Highway-Rail Grade Crossing Incident Data from FRA

2.4. Air Cargo

Air cargo refers to the shipment of commercial freight in either dedicated cargo aircraft or passenger aircraft. Because size and weight in an aircraft is at a premium, air cargo typically consists of high value and/or time sensitive goods. While large and heavy materials are sometimes shipped as air cargo, especially if they are time sensitive, more typical examples include pharmaceuticals, computer chips and electronic components, medical supplies, automotive parts, documents, and perishable commodities such as flowers, fresh fruits, and fish.

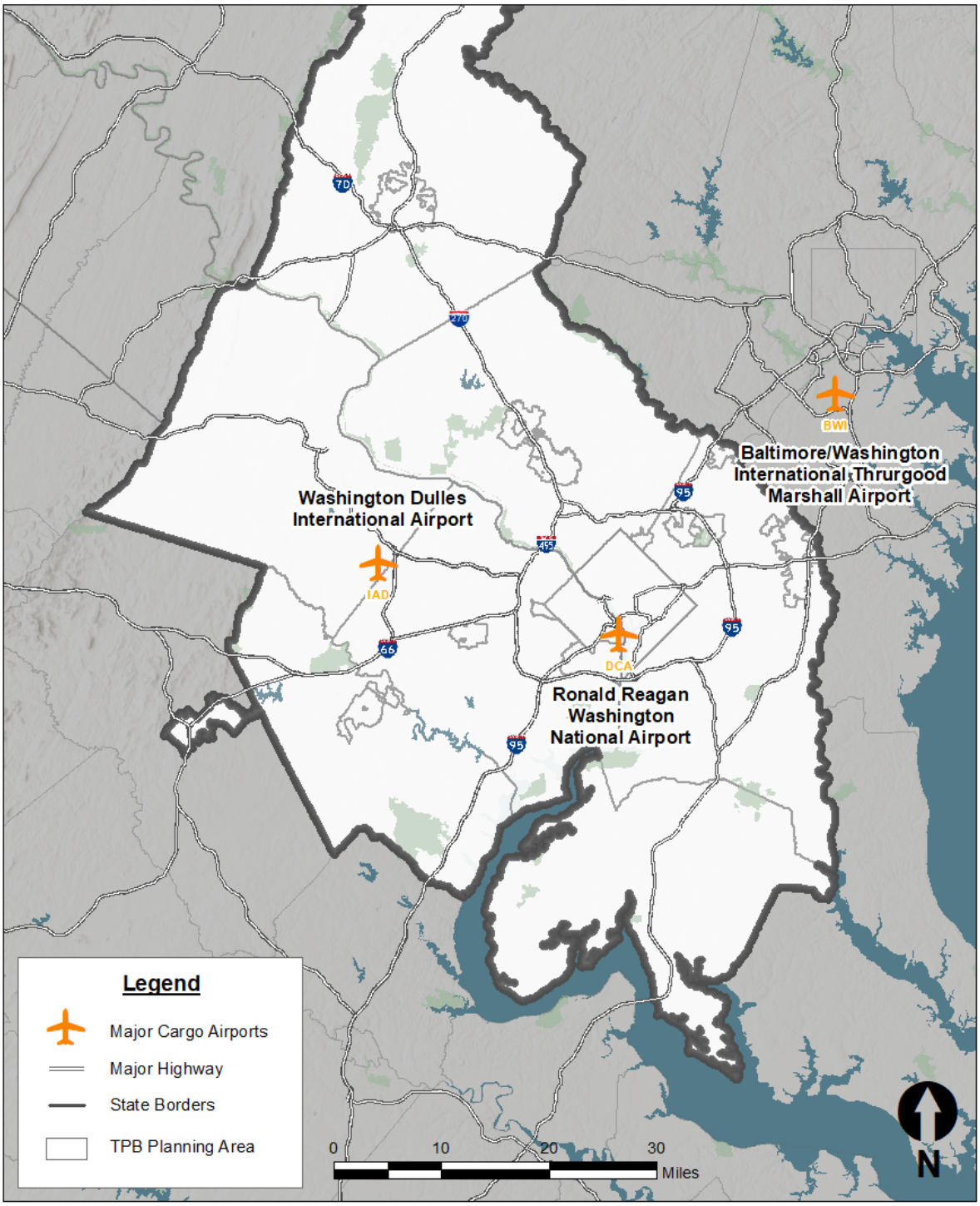
Air cargo is handled on pallets or in small, specialized containers called unit load devices that are shaped to fit different aircraft types. These can be loaded on dedicated all-cargo planes (like those operated by UPS and FedEx), or as belly cargo on passenger planes.

2.4.1. AIR CARGO NETWORK

Figure 12 shows the major cargo airports serving the region, as well as Ronald Reagan Washington National Airport (DCA). It is important to note that although Ronald Reagan Washington National Airport does handle small amounts of air cargo, the vast majority in the region are handled at Washington Dulles International Airport (Dulles), and Baltimore/Washington Thurgood Marshall International Airport (BWI). Because of DCA's smaller size compared to Dulles and BWI, and its limited capacity for expansion, its share of the air cargo market has substantially declined since 1990.[22] Today, the airport is primarily focused on passenger air travel, and therefore is excluded from much of the air cargo analysis in this Plan.

[22] 2008 Washington-Baltimore Regional Air Cargo Study

Figure 12: Major Cargo Airports Serving the Region



Source: Metropolitan Washington Council of Governments, 2023

2.4.2. AIR CARGO OPERATIONS

Of the National Capital Region's three commercial airports, as of the most recent data, BWI currently processes the greatest amount of air cargo, which represents a shift in recent years. Between 2005 (the earliest year for which the TPB has air freight activity data) and 2014, Dulles handled a greater volume of air cargo tonnage compared to BWI. Although total air cargo declined at both airports over this time period, Dulles was able to offset some of its declines with international freight tonnage. Beginning in 2017, however, BWI began serving Amazon Air as a regional hub, which has amplified the volume of air cargo tonnage handled by the airport. In 2019, BWI expanded its Midfield Cargo complex to support additional air cargo from the retailer, creating new storage, rehabilitating taxiways, and constructing a new runway connector. In 2021, BWI processed more than 276,000 metric-tons of freight, an increase attributed to an uptick in online shopping due to the COVID-19 pandemic. Amazon is responsible for a significant portion of freight processed at BWI, accounting for 52 percent of total air cargo processed in 2021. In 2022, total freight processed at BWI decreased by 8.5 percent (to approximately 253,000 metric-tons), yet within this period Amazon's air cargo processed at BWI increased by 10 percent, representing 62 percent of total air cargo.

Table 5 shows the Airports Council International (ACI) 2020 rankings of the top 50 North American airports for total air cargo. BWI is ranked 26th and Dulles is ranked 33rd. In the previous National Capital Region Freight Plan, published in 2016, Dulles was ranked 23rd and BWI was 36th. DCA did not rank within the top 50.

Table 5: Top 50 North American Airports for Air Cargo (Metric Tons)

Rank	City (Airport Code)	Total Cargo
1	Memphis TN (MEM)	4,613,431
2	Anchorage AK (ANC)	3,157,682
3	Louisville KY (SDF)	2,917,243
4	Los Angeles CA (LAX)	2,229,476
5	Miami FL (MIA)	2,137,699
6	Chicago IL (ORD)	2,002,671
7	Cincinnati OH (CVG)	1,300,758
8	New York NY (JFK)	1,104,480
9	Indianapolis IN (IND)	1,013,054
10	Ontario CA (ONT)	843,852
11	Dallas/Fort Worth TX (DFW)	790,696
12	Newark NJ (EWR)	672,471
13	Atlanta GA (ATL)	599,180
14	Oakland CA (OAK)	583,911
15	Philadelphia PA (PHL)	565,289
16	Honolulu HI (HNL)	457,695
17	Seattle WA (SEA)	454,584
18	Houston TX (IAH)	453,043
19	San Francisco CA (SFO)	439,358
20	Toronto ON (YYZ)	391,492
21	Phoenix AZ (PHX)	381,319
22	Rockford IL (RFD)	378,790
23	Portland OR (PDX)	312,713
24	Denver CO (DEN)	299,816
25	Boston MA (BOS)	272,302
26	**Baltimore MD (BWI)**	**269,976**

27	Fort Worth TX (AFW)	242,218
28	Vancouver BC (YVR)	241,895
29	Tampa FL (TPA)	230,757
30	Salt Lake City UT (SLC)	214,891
31	Minneapolis MN (MSP)	203,882
32	Orlando FL (MCO)	202,416
33	**Washington DC (IAD)**	**197,917**
34	Hartford CT (BDL)	175,301
35	Charlotte NC (CLT)	174,913
36	Calgary AB (YYC)	172,756
37	Detroit MI (DTW)	171,171
38	Sacramento CA (SMF)	147,883
39	San Diego CA (SAN)	136,697
40	San Antonio TX (SAT)	120,077
41	Columbus OH (LCK)	119,976
42	Las Vegas NV (LAS)	109,051
43	Montreal QC (YUL)	107,389
44	Raleigh-Durham NC (RDU)	101,473
45	Austin TX (AUS)	99,830
46	Manchester NH (MHT)	95,914
47	Greensboro NC (GSO)	95,780
48	Allentown PA (ABE)	95,361
49	Montreal QC (YMX)	94,694
50	Kansas City MO (MCI)	89,930

Source: Airports Council International 2020

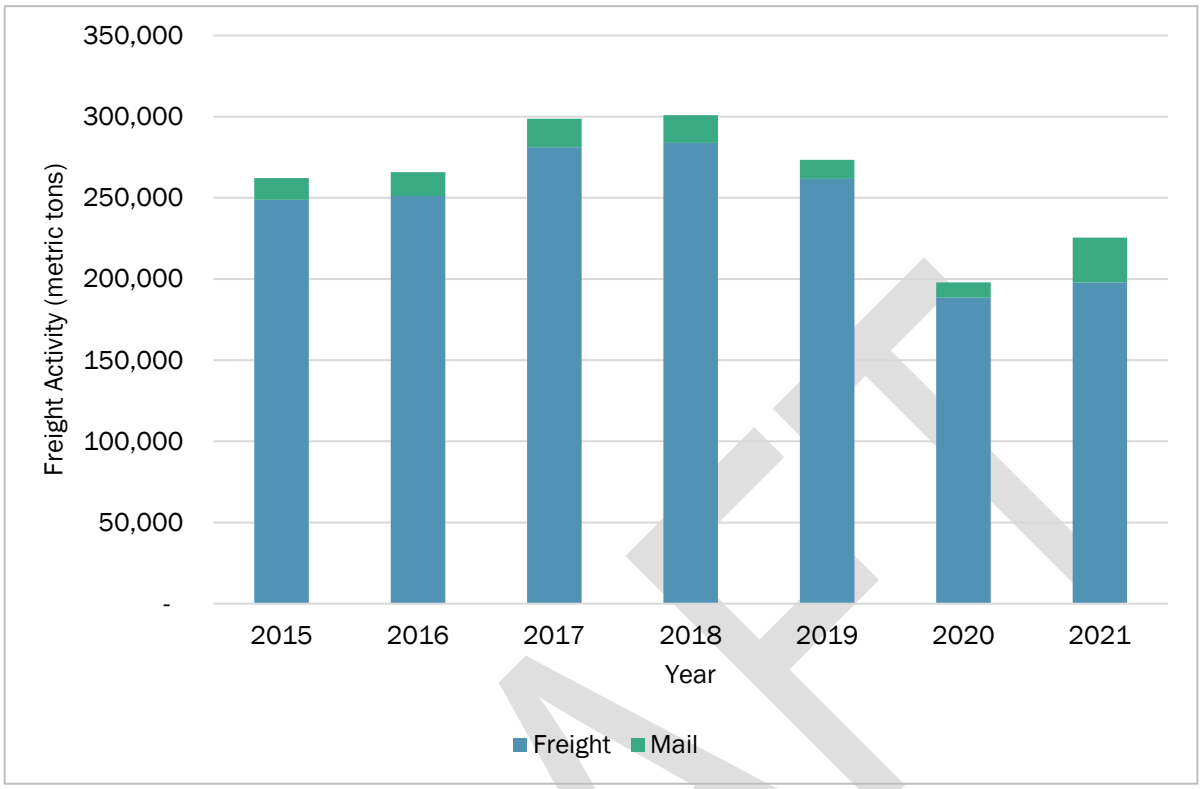
Table 6 shows historical air cargo tonnage handled at Dulles and BWI airports. Figure 13 and Figure 14 display these tonnages for Dulles and BWI respectively. While the tonnage for freight activity transportation at Dulles International Airport fluctuated over time, there was a clear increasing trend in the tons of freight transported at BWI.

Table 6: Freight Activity at Cargo Airports Serving the Region

Year	IAD-Freight (metric tons)	IAD-Mail (metric tons)	**IAD-Total (metric tons)**	BWI-Freight (metric tons)	BWI-Mail (metric tons)	**BWI-Total (metric tons)**
2014	257,317	11,396	268,713	100,507	4,665	105,172
2015	248,724	13,434	**262,158**	111,104	5,579	**116,684**
2016	251,130	14,688	**266,067**	113,699	4,376	**118,076**
2017	281,160	17,523	**298,683**	162,588	5,287	**167,875**
2018	283,822	17,114	**300,936**	194,281	5,267	**199,548**
2019	261,707	11,678	**273,385**	222,803	4,151	**226,954**
2020	188,626	9,290	**197,916**	266,460	3,519	**269,979**
2021	197,843	27,607	**225,450**	276,512	4,178	**280,690**

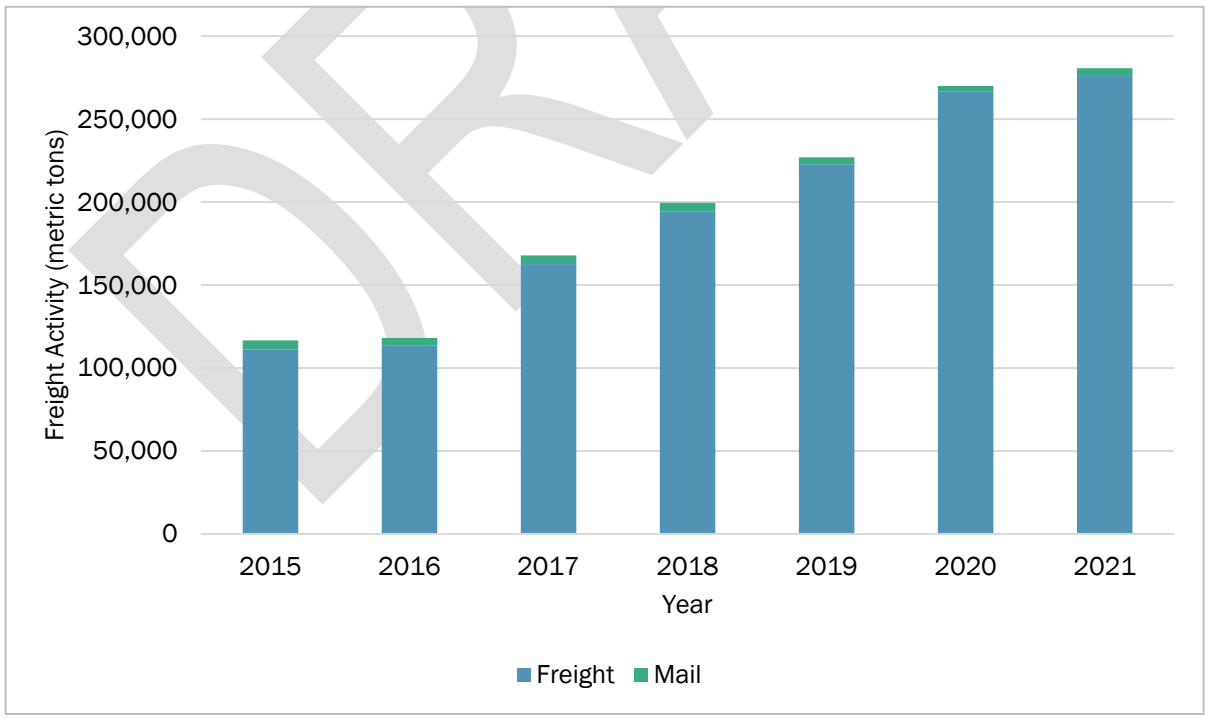
Source: BWI and IAD Airport websites, 2014-2021.

Figure 13: Freight Activity at Dulles International Airport



Source: Dulles Airport Website, 2015-2021

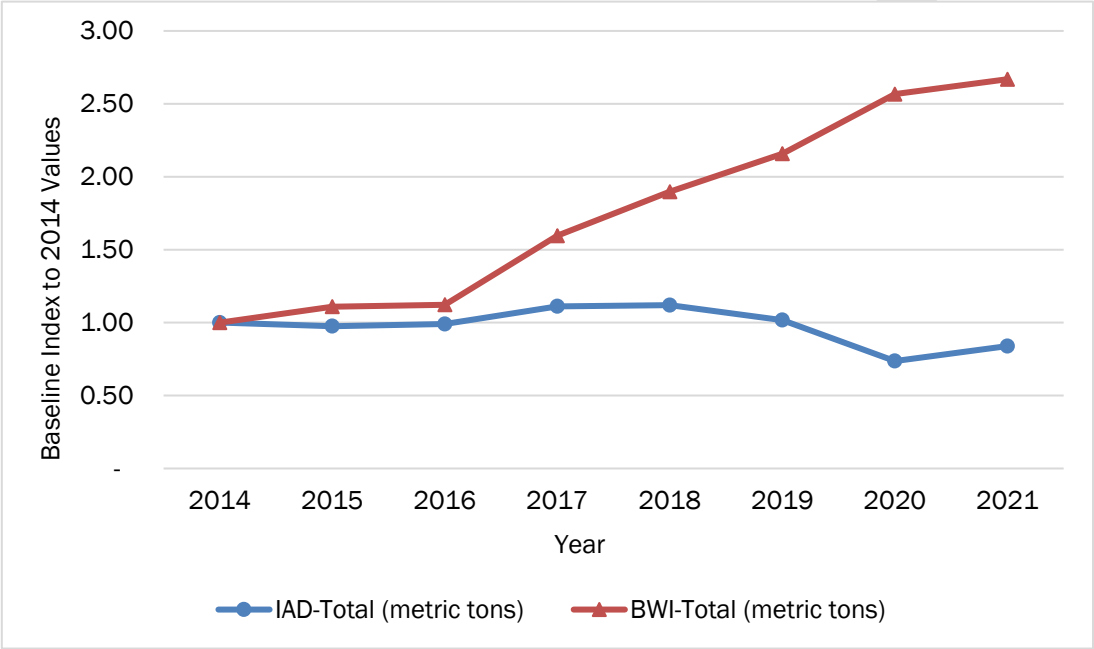
Figure 14: Freight Activity at BWI Airport



Source: BWI Airport Website, 2015-2021

Figure 15 shows air cargo trends for Dulles and BWI from 2014-2021, indexed to the baseline air cargo volumes handled by both airports in 2014. As illustrated, air cargo processed at BWI, which is a regional hub for Amazon, increased significantly from 2014-2021. In 2022, Amazon accounted for 62 percent of total air cargo processed at BWI. Concurrently, air cargo processed at Dulles has remained relatively constant since 2014. Factors that contribute to the differences in air cargo volumes include e-commerce (high demand during the COVID-19 pandemic) and a decrease in international flights into both airports in 2020 and 2021.

Figure 15: Historic Air Cargo Trends for Dulles and BWI



Source: IAD and BWI Airport Websites, 2014-2021

2.5. Intermodal Connectors

Intermodal connectors are short, public roadway segments that link airports, marine ports, and rail terminal facilities to the National Highway System (NHS). For freight purposes, intermodal connectors are roadways that tend to carry lower volumes of traffic at slower speeds than typical NHS routes. As large and heavy trucks use these critical roadways segments to carry the full range of commodities essential to the nation's economy, ensuring that these connectors are designed properly and kept in good condition helps avoid slowing freight movement or damaging goods in transit. Intermodal connectors are critical to connect trucks with major intermodal facilities, including airports, rail terminals, and pipeline terminals.

The FHWA identifies one freight related intermodal facility within the National Capital Region:

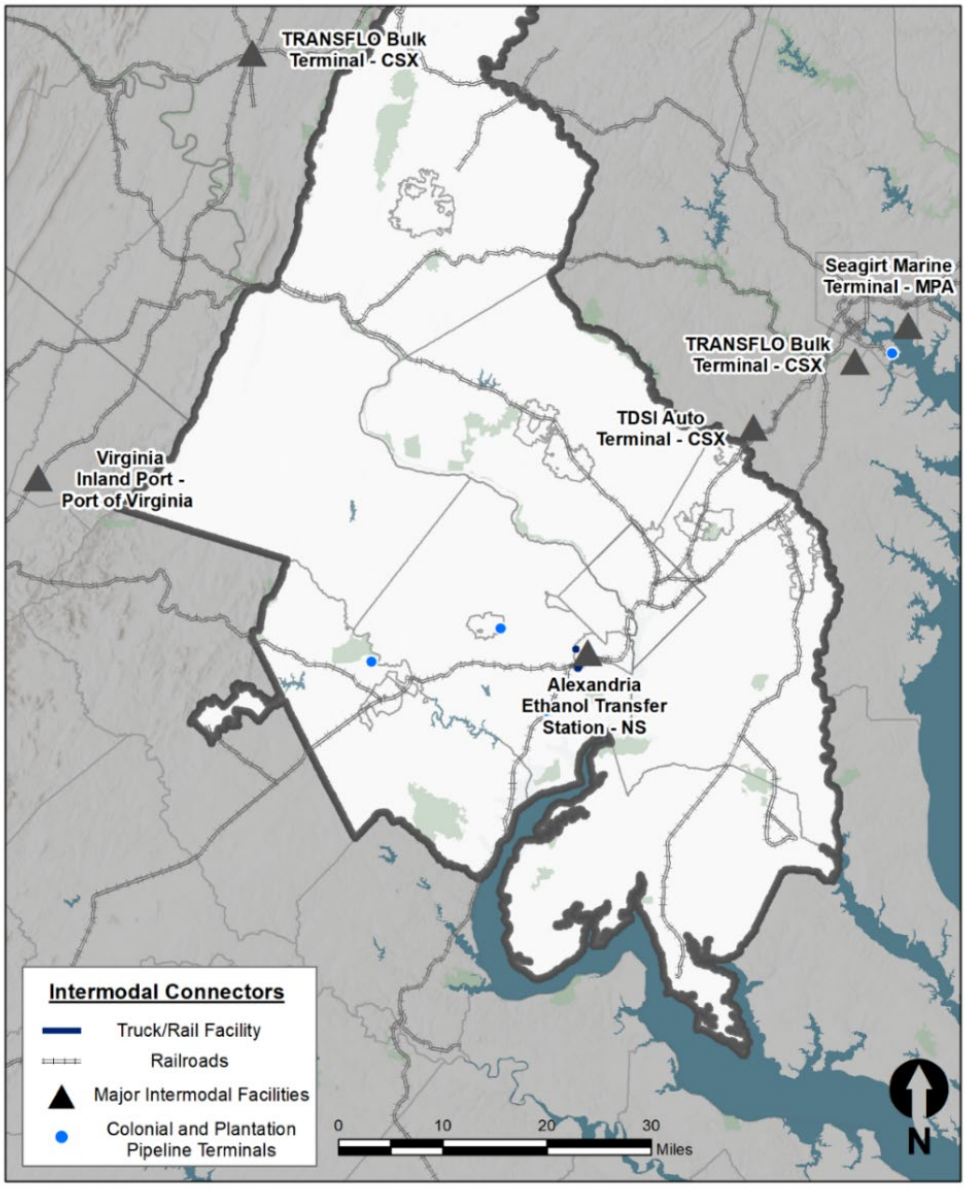
- Alexandria Intermodal (Ethanol Transfer Station) – Norfolk Southern - Van Dorn Street (I-95 to Metro Road) and Metro Road (Van Dorn Street to facility entrance).

Two intermodal connectors to major freight intermodal facilities are located just outside the National Capital Region:

- Virginia Inland Port – Port of Virginia / Norfolk Southern – U.S. Route 340 (I-66 to facility entrance)
- Jessup TDSI Auto Terminal – CSX – MD 175 (I-95 to Dorsey Run Road), Dorsey Run Road (MD 175 to MD 32)

Additionally, FHWA designates Amtrak stations, Virginia Railway Express stations, Metrorail stations, and commercial airports (BWI, DCA, IAD) as intermodal connectors in the National Capital Region (Figure 16).

Figure 16: Intermodal Connectors



Source: National Highway System Intermodal Connectors

In the National Capital Region, the Potomac River is designated as the "M-495" Marine Highway by the U.S. Maritime Administration (MARAD). MARAD's Marine Highway system encompasses 29 "Marine Highway Routes" that serve as extensions of the nation's surface transportation system,

with the goal of expanding the use of America's navigable waters.[23] Although limited amounts of freight are currently transported on M-495, the Northern Virginia Regional Commission has evaluated the feasibility of operating commercial ferry service on M-495 between Woodbridge, Virginia, and multiple locations further north on the Potomac and Anacostia Rivers.[21]

3. FREIGHT DEMAND

3.1. Freight Analysis Framework

The freight demand analysis presented in this report relies on the Federal Highway Administration's Freight Analysis Framework (FAF). The current FAF dataset analyzed in this report is from the 2020 calendar year. The FAF data provides estimates of the quantity of freight by weight (in tons) and by value (in 2020 dollars) moving between different geographic areas, by the various transportation modes seen in Table 7. Note that the geography of FAF data (zones) does not quite match the geography of the TPB membership area, so some interpretations and assumptions have been made in the following analyses. The FAF also provides a breakdown of the commodity type.

Table 7: FAF Modes

Mode	Description
Truck	Includes private and for-hire trucks. Does not include truck that is part of Multiple Modes and Mail or truck moves in conjunction with domestic air cargo.
Rail	Includes any common carrier or private railroad. Does not include rail that is part of Multiple Modes and Mail.
Water	Includes shallow draft, deep draft, Great Lakes, and intra-port shipments. Does not include water that is part of Multiple Modes and Mail.
Air (includes truck-air)	Includes shipments move by air or a combination of truck and air in commercial or private aircraft. Includes air freight and air express. In the case of imports and exports by air, domestic moves by ground to and from the port of entry or exit are categorized with Truck.
Multiple Modes and Mail	Includes shipments by multiple modes and by parcel delivery services, U.S. Postal Service, or couriers (capped at 150 pounds). This category is not limited to containerized or trailer-on-flatcar shipments.
Pipeline	Includes crude petroleum, natural gas, and product pipelines. Note: It also includes pipeline flows from offshore wells to land, which are counted as Water moves by the U.S. Army Corps of Engineers. Does not include pipeline that is part of Multiple Modes and Mail.
Other and Unknown	Includes movements not elsewhere classified such as flyaway aircraft, and shipments for which the mode cannot be determined.

[23] United States Marine Highway Program: https://www.maritime.dot.gov/grants/marine-highways/marine-highway

No Domestic Mode	Includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry. This classification enables a proper accounting of flows that do not utilize any domestic transportation network.

Source: Federal Highway Administration Freight Analysis Framework, 2020

3.2. National Capital Region Commodity Flows

Through the analysis of the commodities that are most critical and most prevalently moving into, out of, and within the region, links between economic activity and freight movement become apparent. In the following analysis of commodities, movement of commodities through the region is not included unless specifically noted. For more information on the commodity classes and their definitions, please refer to the Appendix.

3.2.1. WEIGHT AND VALUE SERVED BY THE REGIONAL FREIGHT NETWORK

There are two primary measures of freight activity within a region: weight and value. Weight is an indicator of the demand that freight has on transportation infrastructure. In this report, weight is measured in tons and value in 2020 dollars.

Inbound, outbound, and intraregional (but not through) commodities total nearly 219 million tons and with an equivalent value of more than $261 billion moved over the region's multimodal transportation system in 2020. These figures include both domestic trade (within the region or between the region and other areas of the United States) as well as international trade (between the region and other countries).

Considering weight and looking at Table 8, three major commodity groups are responsible for more than 50 percent of the region's tonnage – petroleum products, gravel and crushed stone, and non-metallic mineral products. Other important commodity groups by weight include waste and scrap, mixed freight, wood products, other prepared foodstuffs, coal, and natural sands. Comparing this to the 2016 Plan results for weight, petroleum products has taken over as the top commodity by weight instead of gravel and crushed stone.

Table 8: Top Commodity Types by Weight, 2020

Rank	Commodity Class	Total (thousands of tons)	Cumulative Share	Share of Total
1	Other petroleum products	52,427	24%	24%
2	Gravel and crushed stone	36,903	41%	17%
3	Non-metallic mineral products	29,172	54%	13%
4	Waste and scrap	13,965	60%	6%
5	Mixed freight	10,125	65%	5%
6	Wood products	8,255	69%	4%
7	Other prepared foodstuffs	8,010	72%	4%
8	Coal	7,636	76%	3%
9	Natural sands	6,242	79%	3%
10	Gasoline, aviation fuel, ethanol	5,620	81%	3%
11	Animal feed, eggs, honey & other animal products	3,846	83%	2%

12	Other non-metallic minerals	2,953	84%	1%
13	Other agricultural products	2,552	85%	1%
14	Fuel oils	2,308	87%	1%
15	Milled grain & bakery products	2,262	88%	1%
16	Base metal	1,918	88%	1%
17	Plastics & rubber	1,853	89%	1%
18	Basic chemicals	1,835	90%	1%
19	Furniture, mattresses, lamps, signs	1,698	91%	1%
	All other commodities	19,971	100%	9%
	Total	**219,550**		

Source: Federal Highway Administration Freight Analysis Framework

Considering value and looking at Table 9, there are four commodity groups that account for over 40 percent of the total value of commodities moved within the region- mixed freight (mixed freight includes items for grocery and convenience stores, supplies and food for restaurants and fast food chains, hardware or plumbing supplies and office supplies), electronic and electrical equipment, pharmaceutical products, and motorized and other vehicles. Comparing the top four commodity types by value in this and the 2016 Plan, electronic and electrical equipment moved from first place to second place, mixed freight moved from the third spot to the top commodity type.

Table 9: Top Commodity Types by Value, 2020

Rank	Commodity Class	Total (millions of $)	Cumulative Share	Share of Total
1	Mixed freight	43,596	17%	17%
2	Electronic & electrical equipment	36,846	31%	14%
3	Pharmaceutical products	23,286	40%	9%
4	Motorized and other vehicles	16,207	46%	6%
5	Miscellaneous manufactured products	14,877	52%	6%
6	Machinery	11,231	56%	4%
7	Other petroleum products	11,094	60%	4%
8	Precision instruments and apparatus	9,041	64%	3%
9	Other prepared foodstuffs	8,867	67%	3%
10	Textiles, leather, & their articles	8,792	70%	3%
11	Plastics & rubber	8,262	73%	3%
12	Meat, poultry, fish, seafood	6,692	76%	3%
13	Furniture, mattresses, lamps, signs	6,403	78%	2%
14	Other chemical products	5,473	81%	2%
15	Articles of base metal	5,453	83%	2%
16	Non-metallic mineral products	5,025	85%	2%
17	Wood products	4,668	86%	2%
18	Alcoholic beverages	4,274	88%	2%
19	Base metal	3,394	89%	1%
	All other commodities	28,102	100%	11%
	Total	**261,582**		

Source: Federal Highway Administration Freight Analysis Framework

3.2.2. WEIGHT AND VALUE SERVED BY FREIGHT MODE

Freight movement uses either a single mode or a combination of more than one mode of transportation. The FAF categories for each type of freight movement include the following:

- Truck;
- Rail;
- Water;
- Air (includes truck-air);[24]
- Pipeline; and
- Other/unknown

More information on the FAF mode categories can be found in Table 7, including a description of what the parameters are for transportation within that mode.

In the National Capital Region, trucking accounts for 73 percent of total freight transported by weight, followed by 22 percent transported by pipeline, three percent transported by rail, and two percent transported by multiple modes (Table 10). This represents a shift from the 2016 National Capital Region Freight Plan. From 2016, the proportion of freight transported by truck in the NCR decreased by 13 percent (from 86 percent to 73 percent); the percentage of freight transported by pipeline significantly increased (from four percent to 22 percent[25]); and the percentage of freight transported by rail slightly decreased (from five percent to three percent). No significant number of commodities (by weight or value) are transported by water or "other and unknown" modes in the National Capital Region.

Compared to freight movement nationally, the National Capital Region transports a greater proportion of freight by truck and by pipeline. Nationally, 65 percent of freight by weight is transported by truck, 19 percent by pipeline, eight percent by rail, four percent by water, and three percent by multiple modes (Table 10).

Table 10: Commodities Share of Tonnage by Mode, 2020

Commodity Class	Truck	Rail	Air	Multiple Modes & Mail	Pipeline
Other petroleum products	11%	1%	0%	0%	89%
Gravel and crushed stone	100%	0%	0%	0%	0%
Non-metallic mineral products	92%	7%	0%	0%	0%
Waste and scrap	88%	5%	0%	6%	0%
Mixed freight	98%	1%	0%	1%	0%
Wood products	95%	3%	0%	2%	0%
Other prepared foodstuffs	95%	3%	0%	2%	0%

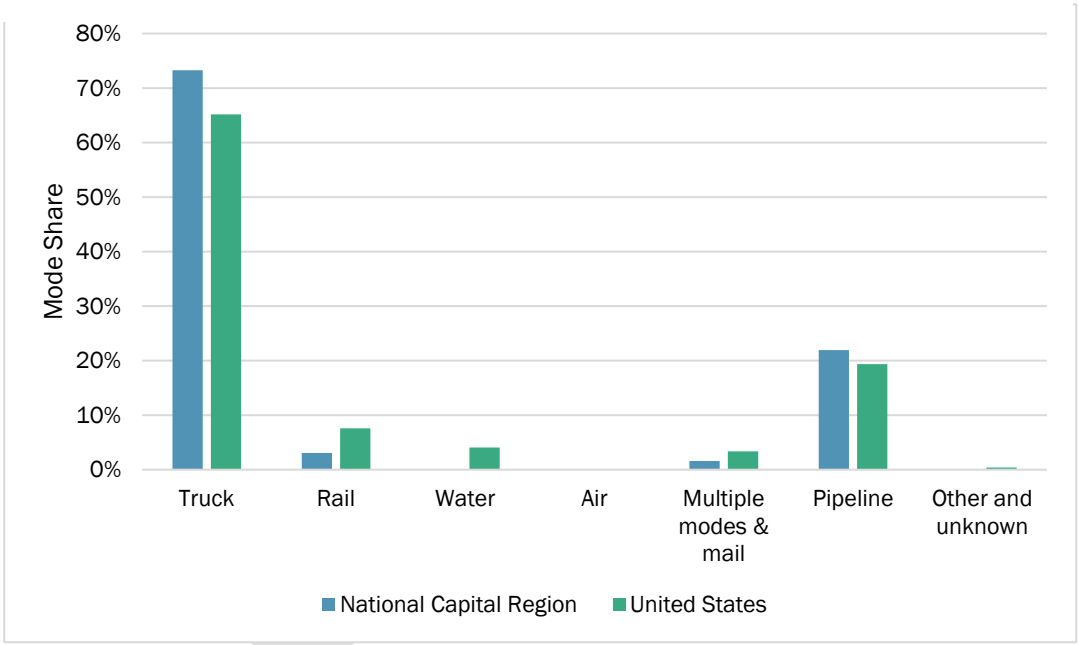
[24] Includes shipments moved by air or a combination of truck and air in commercial or private aircraft. Includes air freight and air express. In the case of imports and exports by air, domestic freight moved by ground to and from the port of entry or exit are categorized with Truck.

25 This significant increase in pipeline share may be explained by inclusion in the data set of the Cove Point Liquefied Natural Gas export facility in Calvert County, Maryland, as well as national FAF methodology changes.

Coal	85%	12%	0%	3%	0%
Natural sands	100%	0%	0%	0%	0%
Gasoline, aviation fuel, ethanol	63%	0%	0%	7%	29%
Animal feed, eggs, honey & other animal products	95%	3%	0%	2%	0%
Other non-metallic minerals	97%	1%	0%	2%	0%
Other agricultural products	93%	2%	0%	4%	0%
Fuel oils	96%	0%	0%	0%	4%
Milled grain & bakery products	98%	2%	0%	0%	0%
Base metal	94%	3%	1%	2%	0%
Plastics & rubber	83%	8%	2%	7%	0%
Basic chemicals	82%	10%	2%	6%	0%
Furniture, mattresses, lamps, signs	96%	2%	0%	2%	0%
All other commodities	89%	6%	1%	4%	0%
Total	**73%**	**3%**	**0%**	**2%**	**22%**

Source: Federal Highway Administration Freight Analysis Framework

Figure 17: Transportation Modes Used (by Weight) – National Capital Region and the United States, 2020



Source: Federal Highway Administration Freight Analysis Framework

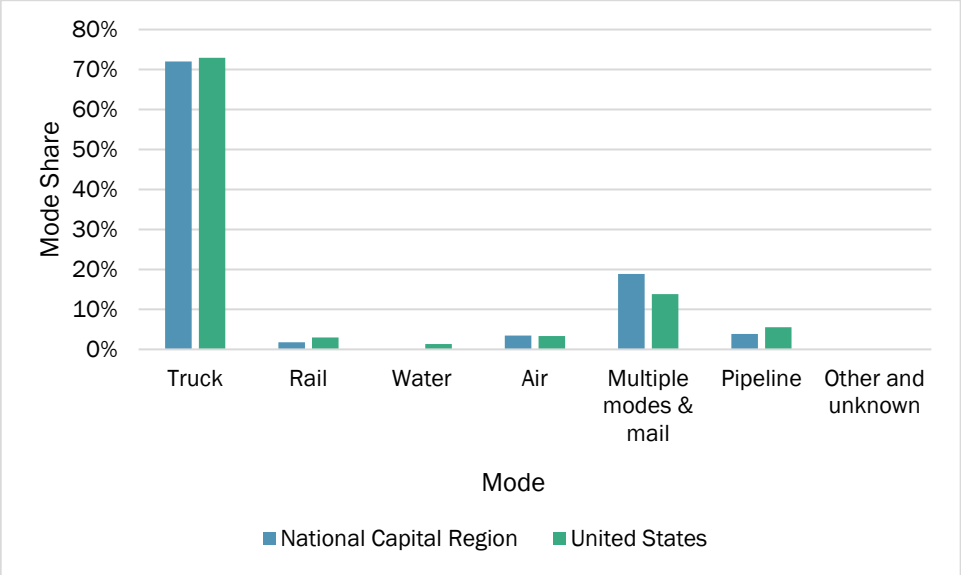
Within the region, 72 percent of total freight (by value) is transported by truck, followed by 19 percent transported by multiple modes and mail (Table 11). These figures are comparable to national data: 73 percent of total freight is moved by truck, 14 percent is transported by multiple modes and mail, and six percent is moved by pipeline (Figure 17.). A greater proportion of total freight (by value) in the region is hauled via truck or multiple modes and mail than in the nation overall. Relatively less freight is hauled by rail, water, or pipeline in the region than in the broader nation.

Table 11: Commodities Share of Tonnage by Value, 2020

Commodity Class	Truck	Rail	Air	Multiple Modes & Mail	Pipeline
Mixed freight	95%	1%	0%	4%	0%
Electronic & electrical equipment	59%	1%	7%	33%	0%
Pharmaceutical products	44%	0%	5%	51%	0%
Motorized and other vehicles	82%	2%	2%	13%	0%
Miscellaneous manufactured products	52%	4%	3%	41%	0%
Machinery	79%	3%	6%	12%	0%
Other petroleum products	16%	1%	0%	0%	83%
Precision instruments and apparatus	46%	1%	11%	43%	0%
Other prepared foodstuffs	95%	1%	0%	4%	0%
Textiles, leather, & their articles	56%	3%	2%	39%	0%
Plastics & rubber	81%	3%	4%	12%	0%
Meat, poultry, fish, seafood	97%	2%	0%	1%	0%
Furniture, mattresses, lamps, signs	92%	1%	0%	6%	0%
Other chemical products	74%	2%	7%	17%	0%
Articles of base metal	84%	2%	5%	9%	0%
Non-metallic mineral products	91%	4%	2%	3%	0%
Wood products	94%	3%	0%	3%	0%
Alcoholic beverages	95%	1%	0%	4%	0%
Base metal	90%	2%	4%	4%	0%
All other commodities	79%	3%	5%	11%	3%
Total	**72%**	**2%**	**3%**	**19%**	**4%**

Source: Federal Highway Administration Freight Analysis Framework. No data available for commodities transported by water or other and unknown modes.

Figure 18: Transportation Modes Used (by Value) – National Capital Region and the United States, 2020



Source: Federal Highway Administration Freight Analysis Framework

Trucking

Trucks are essential to freight transportation in the National Capital Region. Nationally, trucks are responsible for the most tonnage handled, the largest number of trips, and the largest number of ton-miles. Trucks are flexible. They can accommodate a broad range of commodities, from raw materials to semi-finished goods to consumer goods to post-consumer products, and unlike other transportation modes, can access virtually any origin or destination.

Trucks often serve as critical transportation links between other modes within complex, multimodal supply chains. Every freight shipper or receiver that is not located on an active rail line, next to a navigable waterway, or inside the gates of an airport, is dependent on trucking. The continued growth and evolution of e-commerce systems, reliance on just-in-time inventory practices, and expansion of expedited small package home delivery services, points to the growing significance of the role that trucks will play in the future.

By tonnage, the leading truck-hauled commodities in the region are gravel and crushed stone; nonmetallic mineral products; and waste and scrap (Table 12). By value, mixed freight; electronic and electrical equipment; and motorized and other vehicles are the leading commodities, followed by pharmaceutical products; machinery; and other prepared foodstuffs.

Table 12: Commodity Types Handled by Truck, Value and Weight, 2020

Top Tonnage Commodities	Thousands of Tons	Top Value Commodities	Millions of Dollars
Gravel and crushed stone	36,798	Mixed freight	41,212
Non-metallic mineral products	26,946	Electronic & electrical equipment	21,848
Waste and scrap	12,345	Motorized and other vehicles	13,341
Mixed freight	9,886	Pharmaceutical products	10,159
Wood products	7,834	Machinery	8,864
Other prepared foodstuffs	7,592	Other prepared foodstuffs	8,435

Coal	6,506	Miscellaneous manufactured products	7,746
Natural sands	6,236	Plastics & rubber	6,665
Other petroleum products	5,580	Meat, poultry, fish, seafood	6,496
Animal feed, eggs, honey & other animal products	3,649	Furniture, mattresses, lamps, signs	5,921

Source: Federal Highway Administration Freight Analysis Framework

Rail

Rail operations specialize in long-haul transportation of high-value containerized goods; transportation of bulk goods (e.g., coal); and long-haul transportation of mixed car types (known as carload service). The availability of rail service can reduce the dependence on trucking, which is particularly important for heavy commodities that damage pavement and roadways if hauled by truck.

By weight, the leading commodity moved by rail in the region is non-metallic mineral products, followed by coal, and waste and scrap (Table 13). By value, the leading rail commodities are miscellaneous manufactured products; electronic and electrical equipment; and mixed freight.

Table 13: Commodity Types Handled by Rail, Value and Weight, 2020

Top Tonnage Commodities	Thousands of Tons	Top Value Commodities	Millions of Dollars
Non-metallic mineral products	2,114	Miscellaneous manufactured products	584
Coal	910	Electronic & electrical equipment	533
Waste and scrap	722	Mixed freight	408
Other petroleum products	364	Motorized and other vehicles	383
Cereal grains	257	Machinery	347
Miscellaneous manufactured products	234	Transportation equipment	321
Wood products	233	Textiles, leather, & their articles	251
Other prepared foodstuffs	221	Plastics & rubber	246
Basic chemicals	182	Non-metallic mineral products	225
Textiles, leather, & their articles	151	Meat, poultry, fish, seafood	139

Source: Federal Highway Administration Freight Analysis Framework

Multiple Modes and Mail

Due to the existing data, not all freight flows can be assigned to a specific mode. These flows are reported as multiple modes and mail in FAF and include truck-rail, truck-water, and rail-water intermodal shipments involving one or more end-to-end transfers of cargo between two different modes. It also includes parcel delivery service shipments weighing 100 pounds or less (because shippers that use such services do not typically know what modes are involved in the actual shipping process).

By tonnage, the leading multiple modes and mail commodity is waste and scrap; gasoline, aviation fuel, ethanol; and coal (Table 14). By value, the leading multiple modes and mail commodities are electronic and electrical equipment, pharmaceutical products, miscellaneous manufactured products, precision instruments, and textile and leather products.

Table 14: Commodity Types Handled by Multiple Modes and Mail, Value and Weight, 2020

Top Tonnage Commodities	Thousands of Tons	Top Value Commodities	Millions of Dollars
Waste and scrap	891	Electronic & electrical equipment	12,060
Gasoline, aviation fuel, ethanol	398	Pharmaceutical products	11,919
Coal	219	Miscellaneous manufactured products	6,049
Other prepared foodstuffs	194	Precision instruments and apparatus	3,852
Wood products	184	Textiles, leather, & their articles	3,414
Plastics & rubber	132	Motorized and other vehicles	2,101
Textiles, leather, & their articles	116	Mixed freight	1,818
Basic chemicals	114	Machinery	1,387
Other agricultural products	112	Printed products	1,374
Miscellaneous manufactured products	111	Plastics & rubber	1,007

Source: Federal Highway Administration Freight Analysis Framework

Air

Air cargo enables fast, reliable, just-in-time delivery service that integrated carriers such as UPS and FedEx have perfected. Air freight is more expensive than other modes and is therefore typically used for transport of high value, time-sensitive goods such as mail and express packages, perishable products, specialized machinery, and consumer goods. Commodities moved by air in the National Capital Region account for three percent of the total value of all commodities transported within the region.

The leading air freight commodities in the region by weight are plastics and rubbers, basic chemicals, and pharmaceutical products (Table 15). By value, the leading air freight commodities are electronic and electrical equipment, pharmaceutical products, and transportation equipment.

Table 15: Commodity Types Handled by Air, Value and Weight, 2020

Top Tonnage Commodities	Thousands of Tons	Top Value Commodities	Millions of Dollars
Plastics & rubber	44	Electronic & electrical equipment	2,404
Basic chemicals	39	Pharmaceutical products	1,170
Pharmaceutical products	24	Transportation equipment	977
Base metal	22	Precision instruments and apparatus	951
Electronic & electrical equipment	20	Machinery	633
Machinery	17	Miscellaneous manufactured products	497
Articles of base metal	15	Other chemical products	399
Motorized and other vehicles	14	Motorized and other vehicles	382
Mixed freight	13	Plastics & rubber	344
Other chemical products	13	Articles of base metal	282

Source: Federal Highway Administration Freight Analysis Framework

3.2.3. DIRECTION OF TRADE

The region's freight moves in different directions, depending on the commodity:

- Inbound freight is moved from other states, or other countries, to the region.
- Outbound freight is moved from the region to other areas of the United States, or to other countries.
- Intraregional freight is moved from one point in the region to another point in the region.
- Through freight is moved from a location outside of the region to another location outside of the region, via transportation infrastructure within the region. Through freight is not included in the tabulation of commodities.

As shown in Table 16, the direction of travel for the region's top commodities based on weight are:

- Approximately 33 percent of total freight by weight is inbound, 25 percent is outbound, and 42 percent is intraregional. This represents an increase in outbound freight and a decrease in intraregional freight movement from the 2016 Freight Plan.
- Commodities that are primarily inbound include: petroleum products and fuels (gasoline, aviation fuel, ethanol); milled grain and bakery products; and base metal.
- Commodities that are primarily outbound include: coal; and animal feed, eggs, honey & other animal products.
- Commodities that are primarily intraregional include: gravel and crushed stone; waste and scrap; nonmetallic mineral products; natural sands; nonmetallic minerals; and fuel oils.
- The region's inbound freight by weight is eight percent higher than outbound freight, indicating that the region's economy consumes more goods than it produces.

Table 16: Direction of Travel for Top Commodities by Weight, 2020

Rank	Commodity Class	Inbound	Outbound	Intraregional
1	Other petroleum products	50%	25%	25%
2	Gravel and crushed stone	11%	6%	83%
3	Non-metallic mineral products	16%	26%	58%
4	Waste and scrap	6%	35%	59%
5	Mixed freight	39%	31%	30%
6	Wood products	52%	20%	28%
7	Other prepared foodstuffs	50%	21%	29%
8	Coal	11%	89%	0%
9	Natural sands	20%	4%	76%
10	Gasoline, aviation fuel, ethanol	74%	2%	24%
11	Animal feed, eggs, honey & other animal products	15%	68%	17%
12	Other non-metallic minerals	30%	27%	43%
13	Other agricultural products	42%	45%	13%
14	Fuel oils	25%	15%	60%
15	Milled grain & bakery products	74%	17%	8%
16	Base metal	65%	15%	20%
17	Plastics & rubber	48%	25%	27%

18	Basic chemicals	51%	41%	7%
19	Furniture, mattresses, lamps, signs	55%	19%	26%
	All other commodities	48%	27%	26%
	Total	**33%**	**25%**	**42%**

Source: Federal Highway Administration Freight Analysis Framework

As shown in Table 17, the direction of travel for the region's top commodities based on value are:

- Approximately 53 percent of total freight by value is inbound, 26 percent is outbound, and 21 percent is intraregional.
- Commodities by value that are primarily inbound include: motorized and other vehicles, textiles and leathers; meat, poultry, fish, and seafood; other prepared foodstuffs; and articles of base metal.
- Outbound and intraregional commodities by value are limited, with no commodity representing value greater than 50 percent (by direction of travel).

Table 17: Direction of Travel for Top Commodities by Value, 2020

Rank	Commodity Class	Inbound	Outbound	Intraregional
1	Mixed freight	33%	29%	38%
2	Electronic & electrical equipment	51%	35%	14%
3	Pharmaceutical products	47%	42%	11%
4	Motorized and other vehicles	87%	8%	5%
5	Miscellaneous manufactured products	57%	27%	15%
6	Machinery	57%	18%	24%
7	Other petroleum products	49%	27%	24%
8	Precision instruments and apparatus	58%	36%	7%
9	Other prepared foodstuffs	66%	17%	17%
10	Textiles, leather, & their articles	80%	11%	9%
11	Plastics & rubber	52%	19%	29%
12	Meat, poultry, fish, seafood	64%	13%	23%
13	Furniture, mattresses, lamps, signs	51%	19%	30%
14	Other chemical products	57%	34%	9%
15	Articles of base metal	63%	16%	20%
16	Non-metallic mineral products	37%	27%	23%
17	Wood products	58%	17%	41%
18	Alcoholic beverages	51%	5%	8%
19	Base metal	81%	8%	25%
	All other commodities	50%	31%	19%
	Total	**53%**	**26%**	**21%**

Source: Federal Highway Administration Freight Analysis Framework

3.2.4. KEY TRADING PARTNERS

By weight, the region's three largest trading partners are the Baltimore region, Virginia (excluding the Richmond and Virginia Beach-Norfolk regions), and the Virginia Beach-Norfolk region (Table 18). These were the same trends as in the 2016 Freight Plan, except that in 2016, West Virginia was identified as the second-largest trading partner by weight.

Table 18: Top Trading Partner Regions by Weight, 2020

Rank	Partner Region	Thousands of Tons	Percentage	Cumulative Percentage
1	Baltimore MD	27,691	22%	22%
2	Remainder of Virginia	24,914	20%	42%
3	Virginia Beach-Norfolk VA-NC (VA Part)	15,029	12%	53%
4	Remainder of Pennsylvania	9,733	8%	61%
5	Richmond VA	8,459	7%	68%
6	West Virginia	8,209	6%	74%
7	Remainder of Maryland	5,461	4%	79%
8	Pittsburgh PA-OH-WV (PA Part)	2,951	2%	81%
9	Baton Rouge LA	1,604	1%	82%
10	Remainder of North Carolina	1,270	1%	83%
11	Philadelphia PA-NJ-DE-MD (PA Part)	1,242	1%	84%
12	New York NY-NJ-CT-PA (NJ Part)	1,199	1%	85%

Source: Federal Highway Administration Freight Analysis Framework

By value, the region's three most valuable trading partners are the Baltimore region, Virginia (excluding the Richmond and Virginia Beach-Norfolk regions), and Pennsylvania (excluding the Philadelphia region) Table 19. One noted difference from the 2016 Freight Plan was that in 2016, the New York NY CSA was identified as the region's second most-valuable trading partner.

Table 19: Top Trading Partner Regions by Value, 2020

Rank	Partner Region	Millions of Dollars	Percentage	Cumulative Percentage
1	Baltimore MD	37,391	18%	18%
2	Rest of VA	12,477	6%	24%
3	Rest of PA	11,811	6%	30%
4	Virginia Beach-Norfolk VA-NC (VA Part)	11,366	5%	35%
5	Richmond VA	7,278	4%	39%
6	New York NY-NJ-CT-PA (NJ Part)	7,272	3%	42%
7	Los Angeles CA	6,385	3%	45%
8	Philadelphia PA-NJ-DE-MD (PA Part)	5,072	2%	48%
9	Chicago IL-IN-WI (IL Part)	5,032	2%	50%
10	New York NY-NJ-CT-PA (NY Part)	4,567	2%	52%
11	Mississippi	4,465	2%	54%
12	Rest of MD	4,245	2%	56%

Source: Federal Highway Administration Freight Analysis Framework

3.2.5. TOTAL WEIGHT AND VALUE SERVED

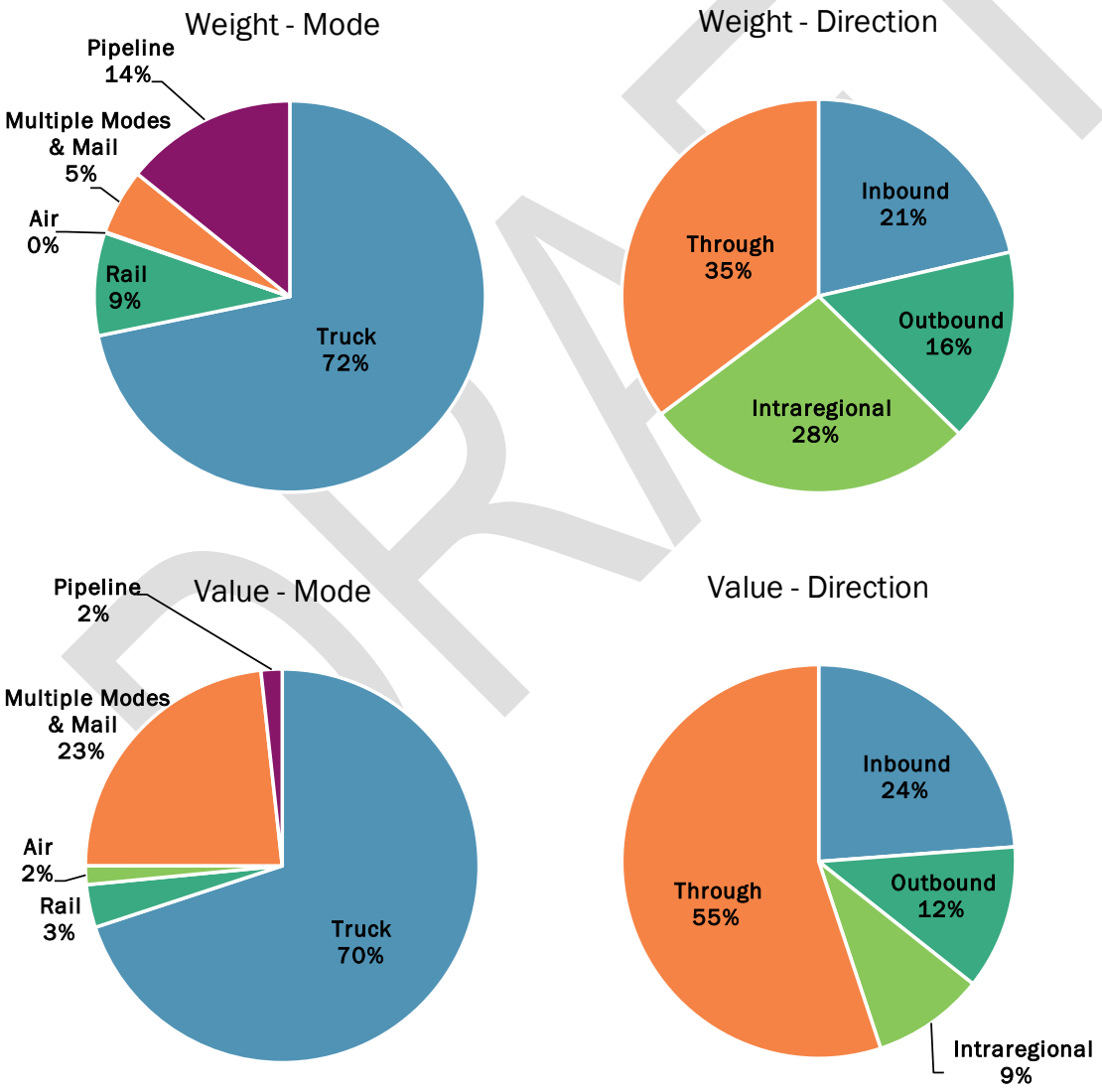
In looking at the total impact of freight weight and value transported within the region, across the various modes, Figure 19 summarizes the key trends. Though information on through-freight is not available for the analyses above, this section provides overall shares by weight and value including a TPB-estimated share of through freight.[22] In terms of weight, the predominant mode is truck transportation, comprising 72 percent of the weight of freight in the region. In terms of value, truck is also the dominant form of transportation, transporting 70 percent of the value within the region.

Transportation via water is negligible; the Port of Baltimore and the Port of Virginia, the two closest large ports to the National Capital Region, both lie outside of the FAF region.

Based on directionality, through freight accounts for the most freight activity in the National Capital Region. The second highest direction for freight travel is intraregional, where 28 percent of the freight by weight originates and is transported within the National Capital Region, with gravel and crushed stone and natural sand representing the top intraregional commodities. Inbound freight by weight accounts for 21 percent of the region's total while outbound freight by weight represents 16 percent.

Based on value, over half of the region's freight by value passes through the National Capital Region. The next highest value of freight moves into the region, with approximately 24 percent of freight value coming in from other areas.

Figure 19. Total Freight Weight and Value by Mode and Direction, 2020



Source: Federal Highway Administration Freight Analysis Framework

Table 20 and Table 21 show the breakdown of the freight modes and the direction of transportation, via weight and value. The region is reliant on higher-valued commodities produced outside the NCR, 69 percent of which are transported by truck; the region's total inbound freight value is more than outbound and intraregional freight values combined but the largest value is of the freight going through the NCR, with over 55 percent of the freight value traveling through the region.

Based on weight-to-value ratio, higher priced commodities are disproportionately shipped by pipeline and air. More freight by both weight and value is transported inbound by pipeline than the combined amounts and values shipped outbound or intraregionally. Air freight accounts for less than one percent of total freight by weight (inbound and outbound) but represents nearly two percent of freight by value.

Table 20: National Capital Region Freight Modes – Weight (thousands of tons), 2020

Mode	Inbound	Outbound	Intraregional	Through	Total
Truck	40,989	38,552	81,328	82,431	160,870
Rail	2,658	2,817	1,234	22,154	28,863
Water	-	-	-	-	-
Air	62	226	-	-	288
Multiple modes & mail	2,019	1,444	27	14,864	18,354
Pipeline	26,841	10,937	10,414	-	48,192
Other and unknown	0	0	1	-	1
Total	**72,569**	**53,976**	**93,004**	**119,449**	**338,998**

Source: COG analysis of Federal Highway Administration Freight Analysis Framework

Table 21: National Capital Region Freight Modes – Value (millions of dollars), 2020

Mode	Inbound	Outbound	Intraregional	Through	Total
Truck	95,089	44,938	48,361	219,050	407,438
Rail	2,345	2,263	68	15,850	20,526
Water	-	-	-	-	-
Air	3,889	5,148	-	-	9,037
Multiple modes & mail	31,732	14,471	3,167	86,077	135,447
Pipeline	5,647	2,286	2,176	-	10,109
Other and unknown	0	0	1	-	1
Total	**138,702**	**69,106**	**53,773**	**320,977**	**582,558**

Source: COG analysis of Federal Highway Administration Freight Analysis Framework

3.3. Freight Transportation Forecasts

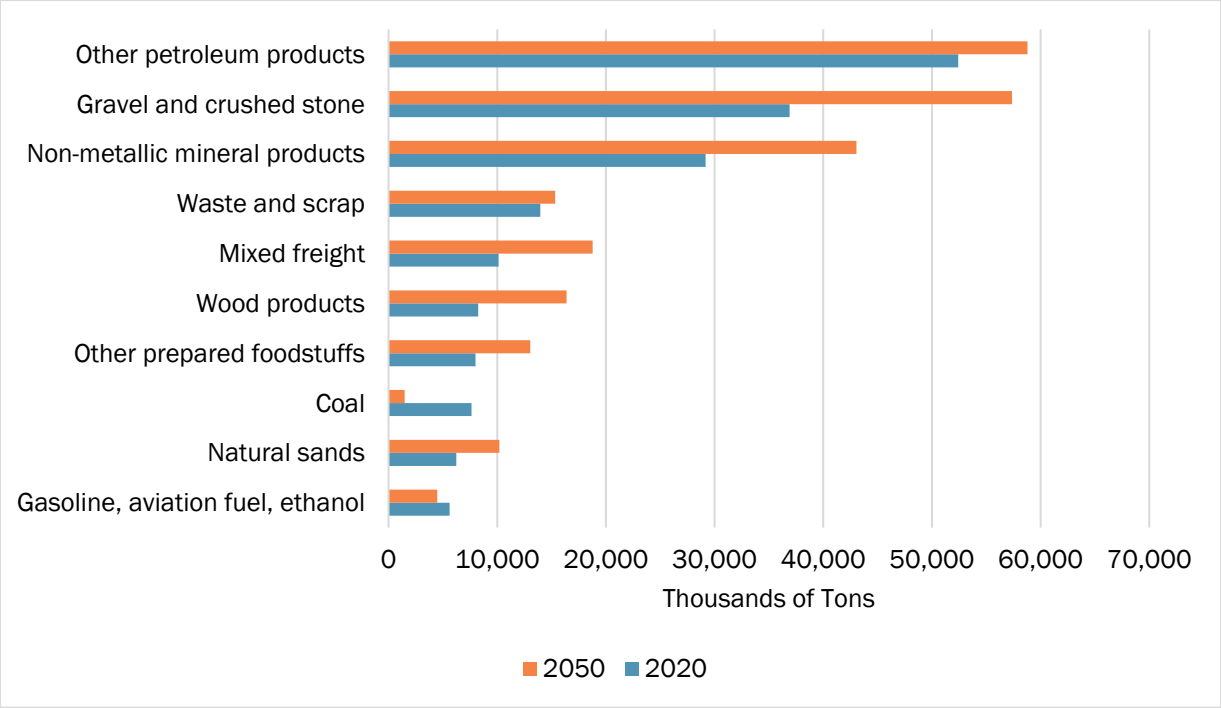
3.3.1. FORECAST GROWTH IN REGIONAL COMMODITIES

Freight data for the National Capital Region, gathered from the FHWA's Freight Analysis Framework, includes a set of forecasts for the growth in freight tonnage and value, by mode, commodity, and origin-destination pair. These forecasts are derived from broader forecasts for the national economy, representing a best-case scenario for the nation and the region respectively. As with most forecasts, significant changes to factors such as economic activity, fuel prices, climate, and logistics practices may produce different outcomes.

National Capital Region Commodities

Growth in output and consumption are direct indicators of growth in freight demand and increased tonnage moving across the region's transportation infrastructure. Growth in some types of commodities will be greater than others and will change the relative proportions of commodity types transported within the region. The volume of other petroleum products is set to grow slightly and remain the top commodity type in 2050. Similarly, gravel and crushed stone, non-metallic mineral products are forecast to grow and retain their 2nd and 3rd rankings in 2050. Mixed freight is expected to overtake waste and scrap as the 4th most in-demand commodity by weight in the region by 2050.

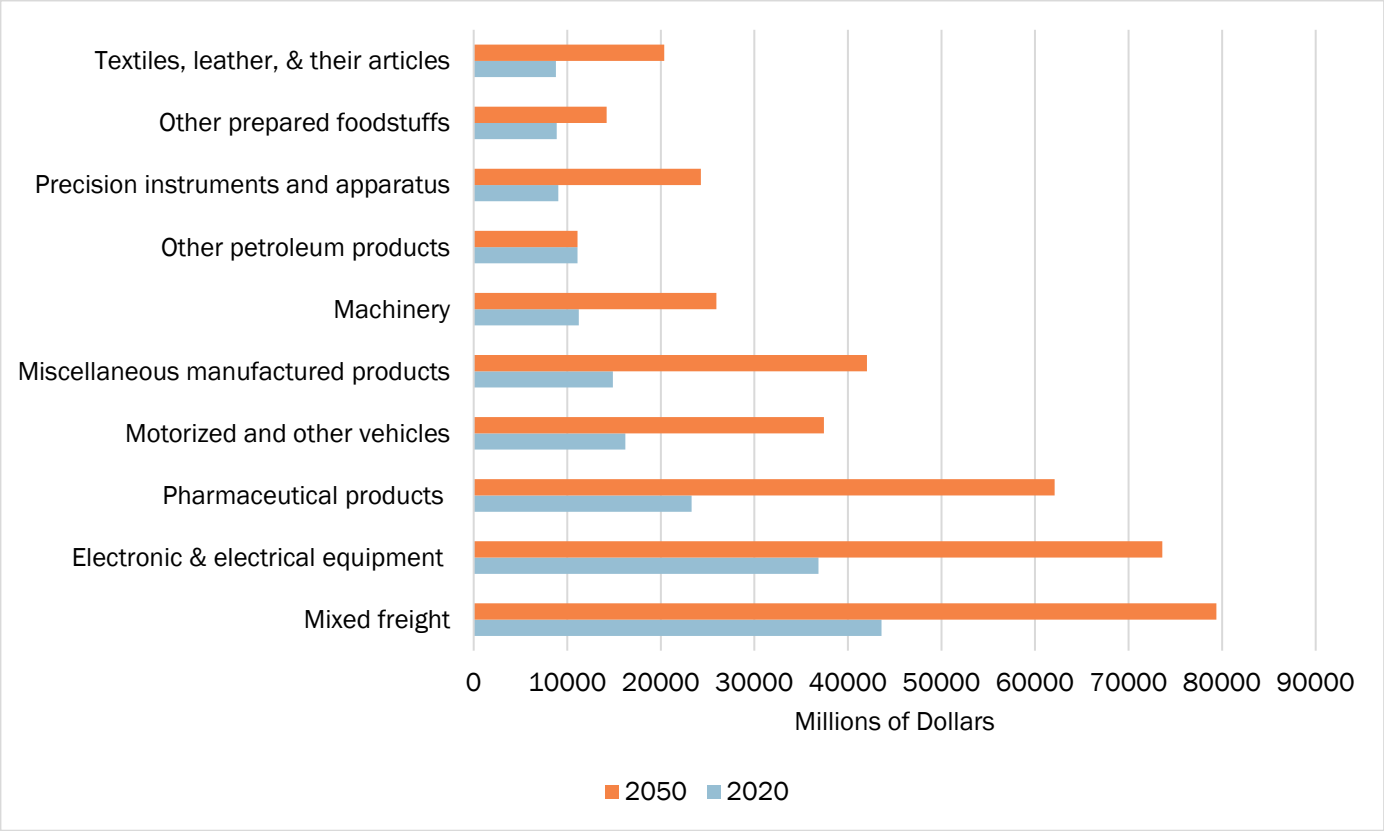
Figure 19: Forecast Growth in Regional Commodities by Weight from 2020 to 2050



Source: Federal Highway Administration Freight Analysis Framework

On the basis of values (see Figure 20), the top regional commodity mixed freight is expected to show an increase in the value of trade by 2050. The other petroleum products commodity class is the only one forecast to show a small decline in value of trade by 2050. The top commodity by value will still be mixed freight in the year 2050.

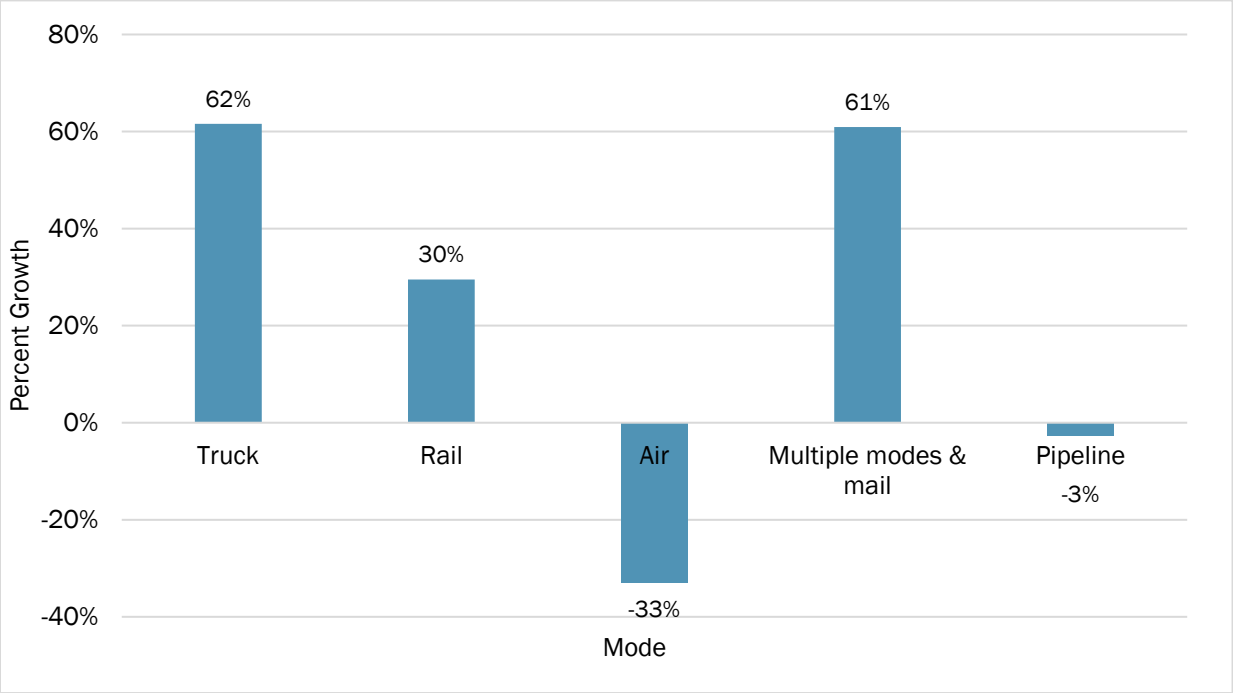
Figure 20: Forecast Growth in Regional Commodities by Value from 2020 to 2050



Source: Federal Highway Administration Freight Analysis Framework

Different transportation modes will experience different growth rates. Modes forecast to grow the fastest are for the fastest-growing commodities. The fastest growth is for trucks followed closely by multiple modes and mail which is anticipated to increase by 62 and 61 percent respectively by 2050. Rail is anticipated to increase whereas air is expected to decline over the same period. Pipeline is also anticipated to decline by three percent in 2050.

Figure 21: Forecast Growth in Tonnage by Mode from 2020 to 2050



Source: Federal Highway Administration Freight Analysis Framework

4. KEY TRENDS INFLUENCING FREIGHT IN THE REGION

While the freight transportation system is currently performing at a level that supports the region's economy and quality of life, recurring bottlenecks or recurring congestion on some roadways and railways negatively affect the reliability of freight deliveries. The growth in freight volumes forecast for the region is a result of an increasing demand for goods – demand driven by the region's expanding economy, growing population, and high median household income levels. To fully realize the benefits associated with the forecast growth in freight traffic, the region will need to address the challenges to the multimodal transportation system considering that growth. These challenges include more trucks sharing the roadways with passenger vehicles, bicycles, and pedestrians; more freight trains sharing the railways with commuter and intercity passenger trains; and increased wear and tear on pavements, bridges, and rail infrastructure. As trucks are the primary means by which goods are delivered to stores, restaurants, businesses, and residences, the denser and more vibrant a neighborhood becomes, the more that trucks must share the streets in proximity to pedestrians, bicyclists, and other vulnerable road users. Addressing the challenges associated with truck deliveries in dense and vibrant regional activity centers is a key planning issue. Additionally, the freight transportation system continues to be affected by lingering effects from the COVID-19 pandemic and associated impacts on economic and transportation activity.

4.1. Demographic and Economic Trends

The physical movement of freight is of critical importance to any region's economy. Consumers rely on efficient and reliable freight transportation for shipments of consumer products to homes and retail establishments and for product returns and trash removal. Commercial enterprises rely on efficient and reliable freight transportation for inbound shipments of raw materials, intermediate goods, and other supplies required to produce finished goods as well as outbound shipments of intermediate goods and finished products to regional, national, and global markets. Commercial enterprises in the service sector stimulate freight demand by providing income to their employees, who in turn use that income to purchase goods and services.

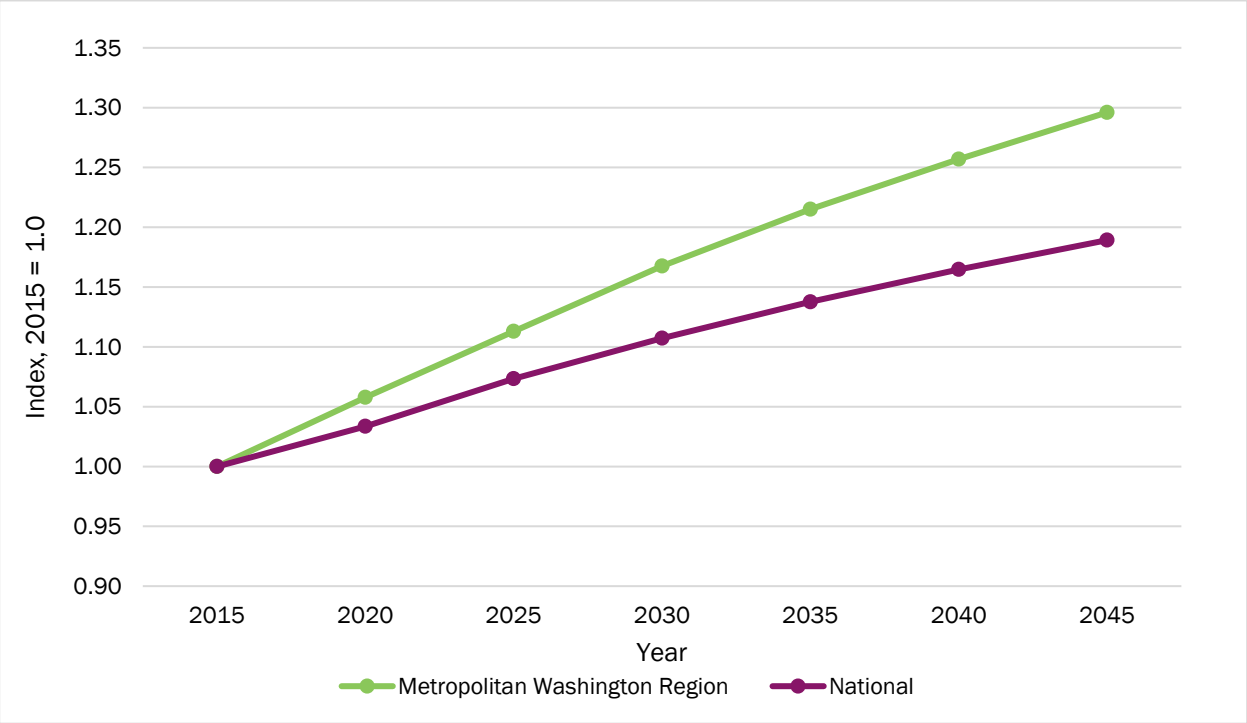
All commercial enterprises depend on freight, but those that are directly involved in activities such as transporting goods, farming, mining, manufacturing, construction, and managing retail operations depend on it more strongly than others. These freight-dependent industries account for 17 percent of the region's gross domestic product (GDP) and 18 percent of its total employment.[26] To understand freight movement in the region, it is therefore useful to examine the key economic and demographic drivers of freight demand, including overall employment, GDP, economic structure, population, and wealth.

[26] Freight-dependent industries are defined as four subsectors: Private Goods Producing Industries, Retail, Transportation & Warehousing, and Other.

4.1.1. POPULATION

As of 2020 the Washington-Arlington-Alexandria Metropolitan Statistical Area (MSA) was home to 5.7 million people, making it the sixth most populous MSA in the nation. The region is adding population at a faster pace than the nation as a whole (Figure 22). Expanding employment in the business and professional service- and government-sectors attracts highly educated people from throughout the United States and the world. The region's population is expected to grow by an additional 22.5 percent by the year 2045. Each new resident creates additional demand for consumer goods – residents with higher disposable income generate greater demand for material goods and correspondingly greater overall demand for freight transportation.

Figure 22: Population Growth Trends - National Capital Region and the United States



Sources: U.S. Census Bureau[27]; Metropolitan Washington Council of Governments[28] Round 9.2 Growth Trends to 2045 Cooperative Forecasting in Metropolitan Washington, June 2022 and U.S. Census Bureau

4.1.2. INCOME

The Region ranks second in the nation for median household income ($110,355 in 2021), 58 percent above the national average.[29] This means that the median regional household earns approximately $40,638 more per year than the median American household. The combination of a growing population and rising consumer affluence generates high demand for consumer goods, which translates into high demand for freight transportation services. A comparison of the median

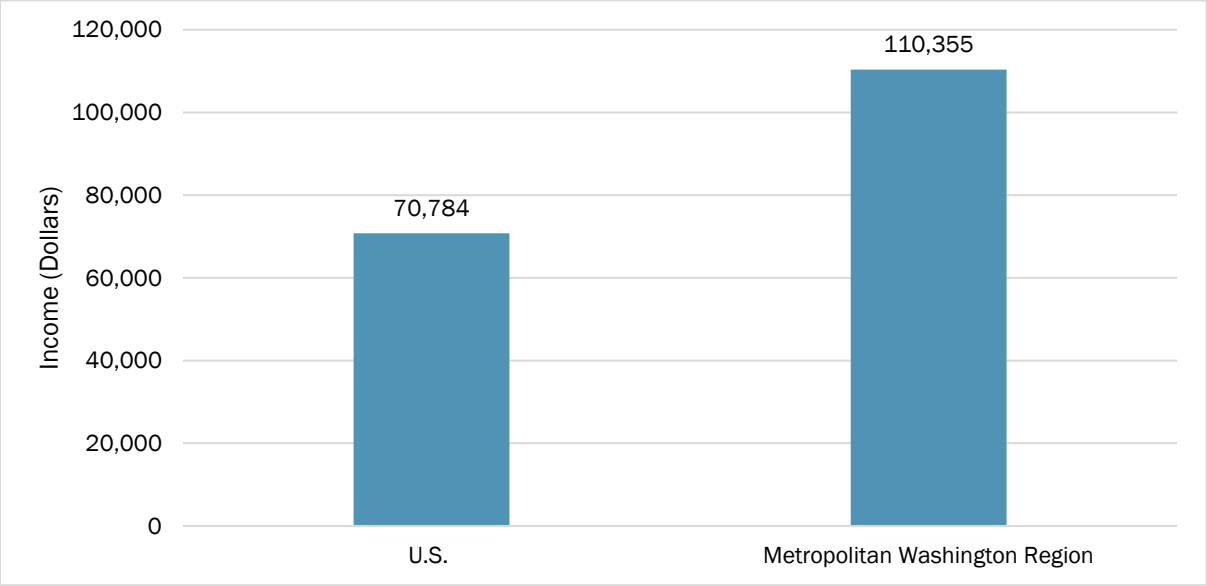
[27] For all historical data points; 1990 – 2020 and United States population projections; 2020 – 2045.

[28] For TPB Planning Area and District of Columbia population projections; 2015 – 2045.

[29] U.S. Census Bureau, Household Income: 2021, American Community Survey Briefs

household income in the United States and the Washington-Arlington-Alexandria MSA can be seen in Figure 23 below.

Figure 23: Median Household Income in the Washington-Arlington-Alexandria MSA Compared to U.S. Median Household Income



Source: U.S. Census Bureau, Household Income: 2021, American Community Survey Briefs

4.1.3. EMPLOYMENT AND GROSS DOMESTIC PRODUCT

The region's economy employed 2.8 million people in 2021[30], roughly 1.8 percent of all U.S. jobs. Between 2001 and 2021, total employment in the region increased by 299,829 or 11.8 percent, compared to a U.S. growth rate of 7.9 percent (see Figure 24). Employment growth in the region's economy has generally exceeded the rate of growth of employment in the national economy, with the exception of 2021, where the region did not have as rapid growth as the national economy in recovering from the downturn in economic activity in 2020.

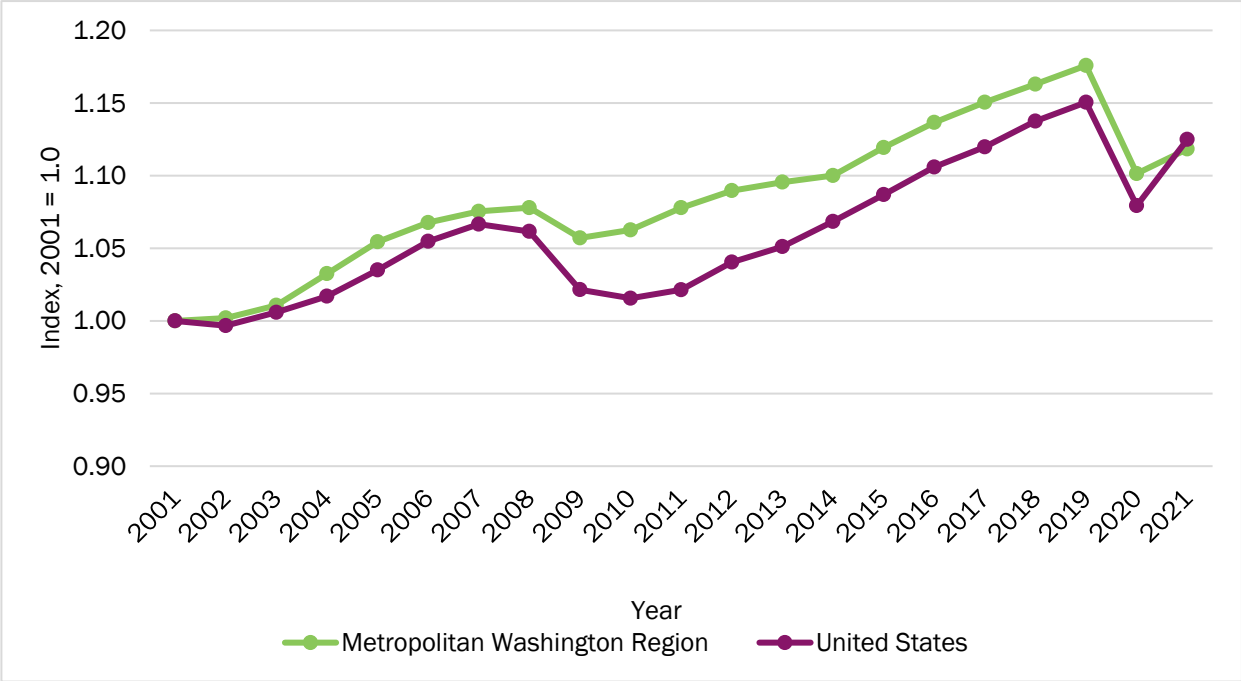
In 2020, the region's gross domestic product (or GDP) was $561 billion. GDP is a measure of the total value added to goods and services due to economic activity in the region. As with employment, the region has been surpassing the United States as a whole in terms of GDP growth. In nominal terms, the region's GDP grew by 46 percent between 2001 and 2020, compared to 40 percent for the United States overall (see Figure 25). There is a direct relationship between the growth in economic activity, as measured by GDP, and the demand for freight transportation. The United States Bureau of Transportation Statistics (BTS) defines this relationship as the ratio of total ton-miles[31] of freight to total GDP. In 2002 this freight transportation intensity ratio was 0.38 ton-miles

[30] Data for the TPB region from "New Preliminary 2021 QCEW Quarter Data and Annual Average, Prepared by Greg Goodwin, MWCOG, Cooperative Forecasting and Data Subcommittee, July 12, 2022

[31] A ton-mile is defined as one ton of freight carried one mile.

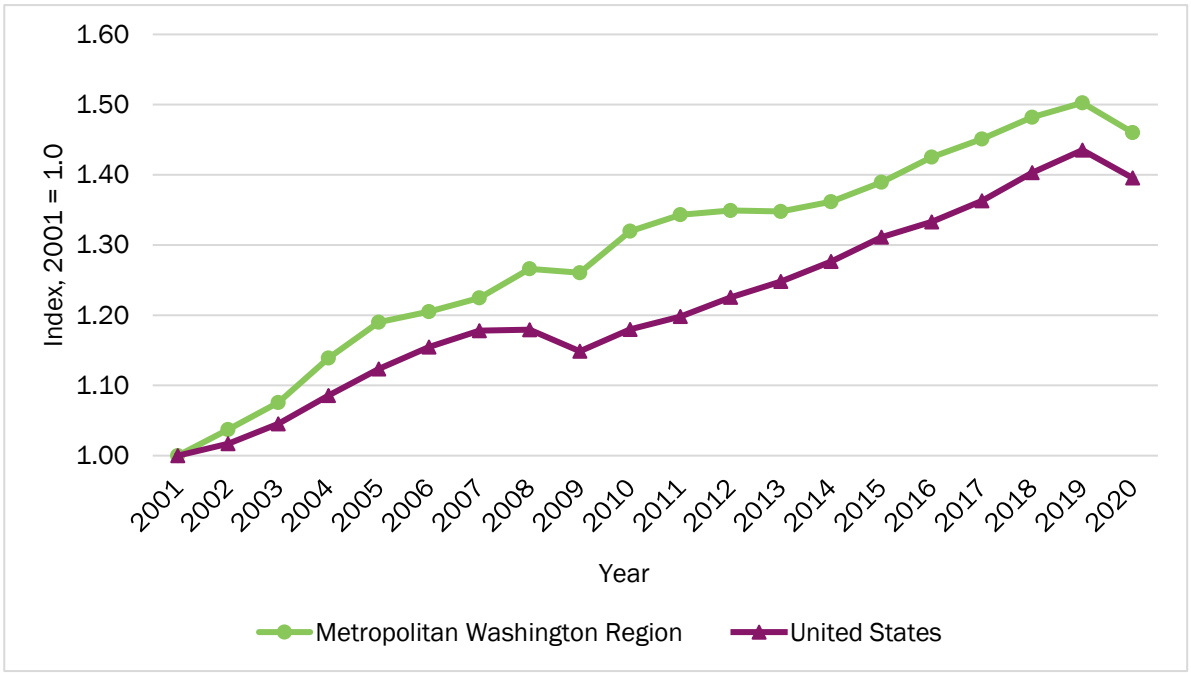
per dollar, indicating that every marginal dollar of GDP would be expected to generate an additional 0.38 ton-miles of freight activity.[23]

Figure 24: Historic Employment Trends - National Capital Region and the United States



Sources: U.S. Bureau of Labor Statistics and Metropolitan Washington Council of Governments compilation of Quarterly Census of Employment and Work (QCEW) summaries for TPB Planning Area jurisdictions, 2001-2021

Figure 25: Regional and U.S. Gross Domestic Product (GDP)



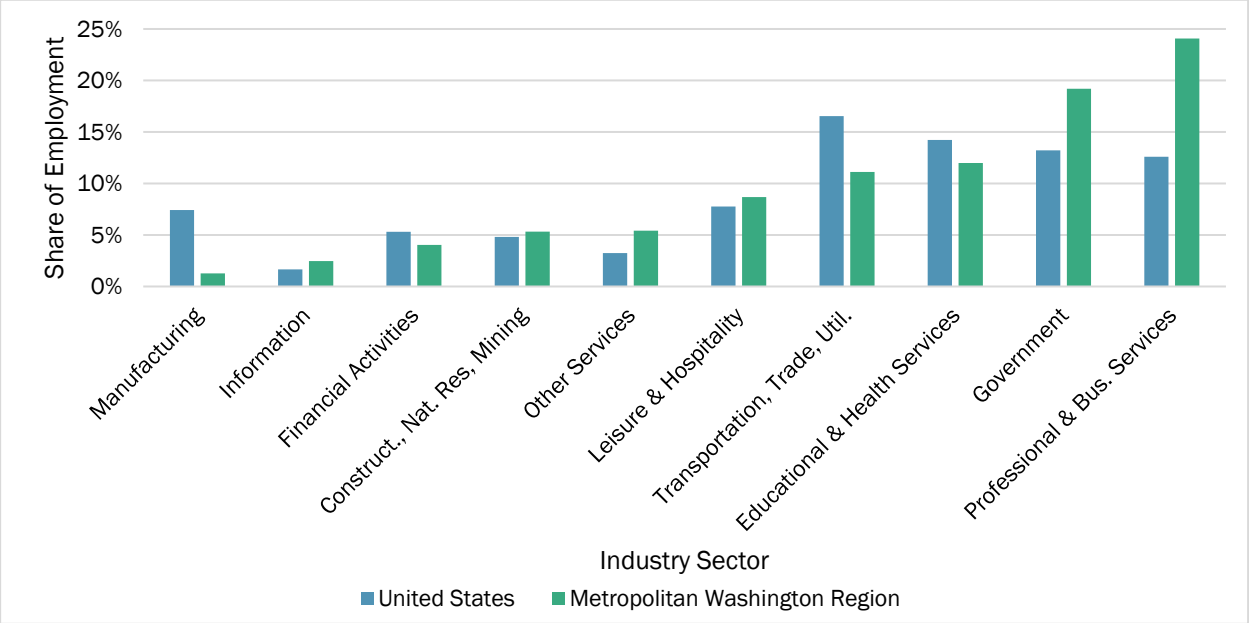
Source: U.S. Bureau of Economic Analysis, 2001-2020

4.1.4. STRUCTURE OF THE ECONOMY

The structure of the region's economy is significantly different than that of the United States as a whole. The proportion of total employment in the government sector and in the professional and business services sector is higher in the region than it is nationwide. Conversely, the proportion of total employment in the manufacturing; trade, transportation, and utilities; and natural resources and mining sectors is lower in the region than it is nationwide. The region's other sectors: information, construction, financial activities, leisure and hospitality, and educational and health services, are roughly equivalent to that of the United States as a whole (see Figure 26 in terms of employment proportions.

This relatively high representation of government and professional and business services employment and relatively low representation of manufacturing, mining, and trade, transportation and utilities employment is consistent with a service-based regional economy that demands more goods than it produces.

Figure 26: Economic Structure – Share of Employment by Industry Sector, National Capital Region and the United States



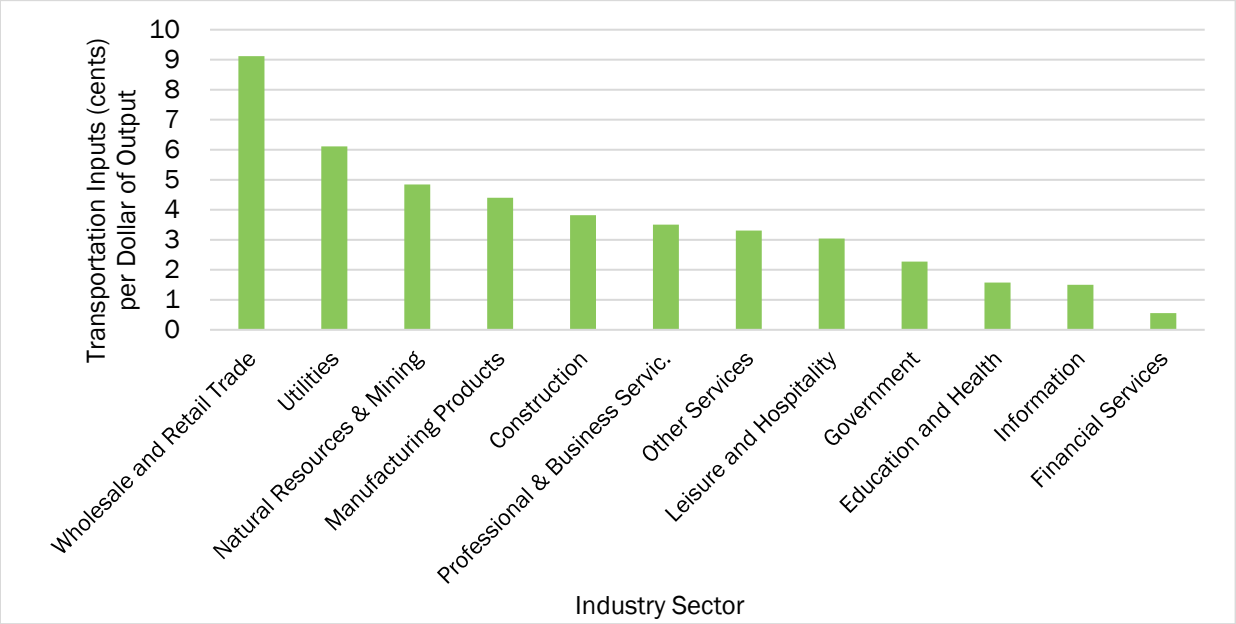
Source: Consultant analysis of the U.S. Bureau of Labor Statistics data, 2020

4.1.5. FREIGHT DEMAND BY INDUSTRY

Transportation is a cost of doing business and an important input for major sectors of the region's economy. The impact of transportation costs on a given business depends in large part upon the type of industry the business is in. By examining the transportation inputs required to produce a given output by industry sector, it is possible to identify which sectors are particularly dependent on freight transportation.

Figure 27 shows the relative use of freight and passenger transportation services by industry and illustrates the industry sectors that are most dependent on transportation services. In order, the most transportation dependent industries are construction, transportation and warehousing, utilities, wholesale and retail trade, leisure and hospitality, and manufacturing. Except for leisure and hospitality, these sectors are primarily dependent on freight transportation, rather than passenger transportation.

Figure 27: Transportation Reliance by Industry



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Satellite Accounts, March 2022

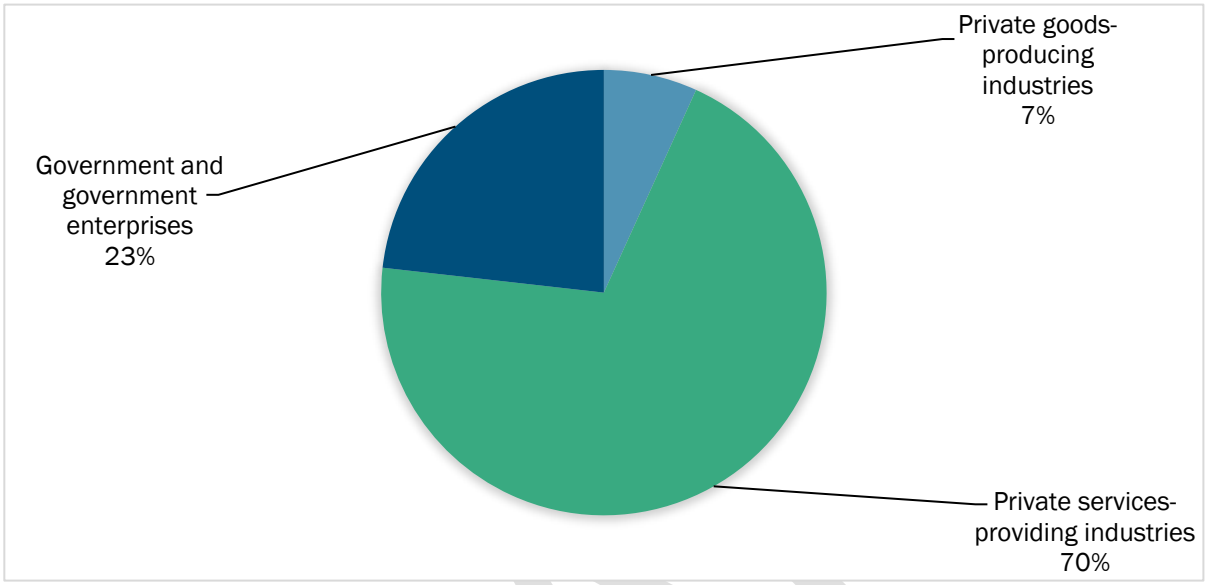
4.1.6. REGIONAL FREIGHT DEPENDENT INDUSTRIES

Regional businesses, such as farms that grow crops or raise animals, and quarries that extract gravel for use in construction, depend on freight movement to move the products they produce to processing plants, wholesalers, and retail outlets. Other producing businesses, like manufacturers and construction firms, also depend on freight transportation to bring them the intermediate products–fabricated steel, component parts, concrete, etc.–needed to manufacture finished products or construct buildings and infrastructure. Businesses in the transportation, warehousing and logistics, and wholesale trade industries connect producers and consumers; ensuring that needed goods are transported where and when they are needed. Finally, consumers such as retail establishments, residents, and utilities rely on freight movement to deliver goods and materials to the final point-of-sale or point-of-use. These freight dependent industries can be organized into three categories or clusters:

- The goods movement cluster is composed of businesses that provide freight transportation services, such as trucking companies, logistics firms, railroads, air cargo firms, wholesalers, and warehouse / distribution / fulfillment center operators. Overall, the goods movement cluster represents approximately seven percent of the region's GDP.
- The freight intensive industry cluster is composed of industries where the transportation of raw materials, intermediate products, and finished goods accounts for a significant share of their cost of doing business such as natural resources, mining, manufacturing, construction, and utilities. The freight intensive industry cluster represents approximately seven percent of the region's GDP.
- The retail cluster is composed of consumer outlets – such as supermarkets, auto dealers, and apparel stores – that require freight transportation services to stock and replenish their inventory. The retail cluster represents approximately four percent of the region's GDP.

While other industries depend on freight movement to some extent, they are not considered freight dependent in this analysis. These non-freight dependent industries include government, financial services, information, education and health services, professional and business services, and leisure and hospitality and represent approximately 83 percent of the region's GDP.

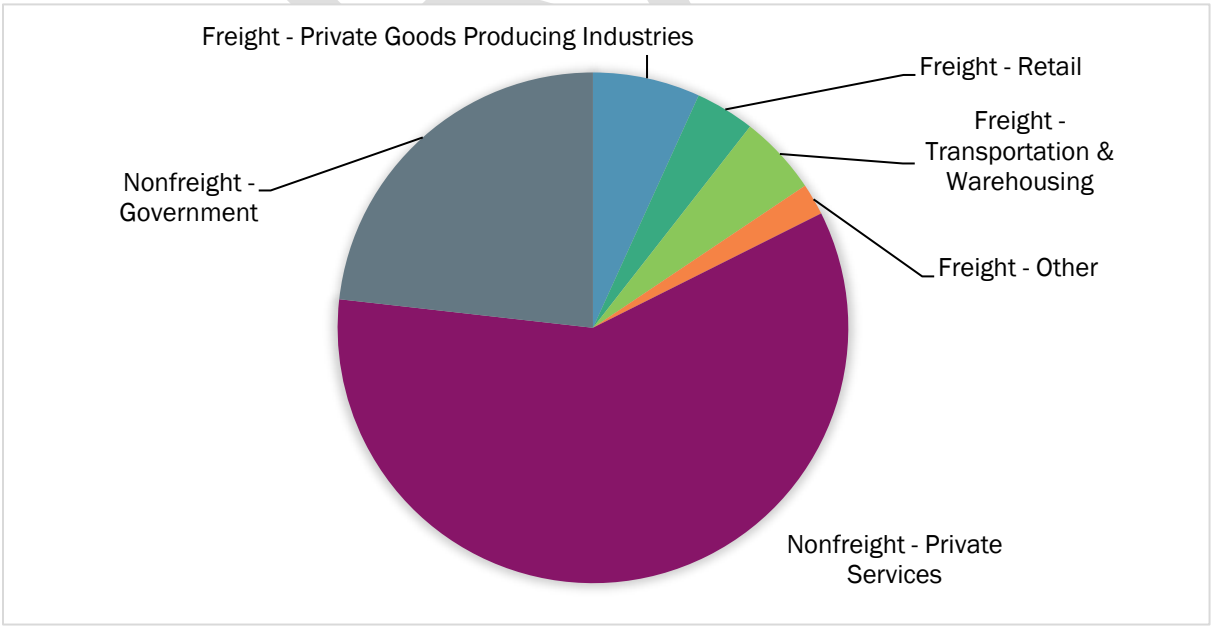
Figure 28: Private Goods Producing Industry Share of GDP



Source: U.S. Bureau of Economic Analysis, 2020

Figure 28 above shows that the private goods producing share of the economy represents seven percent of GDP. Goods producing industries include agriculture, forestry, fishing, and hunting; mining, quarrying, and oil and gas extraction; construction; and manufacturing.

Figure 29: National Capital Region Freight and Non-Freight-Related Industry Sectors



Source: U.S. Bureau of Economic Analysis, 2020

Figure 29 shows that the freight related share of the economy is more than twice as big as this when including other freight intensive industries and industry segments in the goods movement cluster and retail sector as described above.

4.1.7. POPULATION AND EMPLOYMENT FORECASTS

Population and employment forecasts for the region indicate that demand for goods, along with the associated demand for freight transportation services, will continue to grow in the future (Table 22).

Table 22: National Capital Region Population and Employment Growth Projections

	2020 (thousands)	2045 (thousands)	Growth (absolute)	Growth (percentage)
Population	5,700	6,984	1,284	22.5%
Employment	3,391	4,166	776	22.9%

Source: Metropolitan Washington Council of Governments, ROUND 9.2 GROWTH TRENDS TO 2045, Cooperative Forecasting in Metropolitan Washington [32]

4.2. Evolving Supply Chains and Logistics Patterns

Beginning in 2020, the COVID-19 pandemic disrupted supply chain logistics globally and placed pressure on the "just-in-time" inventory model. In the National Capital Region, the supply chain crisis caused by the COVID-19 pandemic raised awareness among consumers and businesses of supply chain risks and may prompt modifications to use of "just-in-time" inventories to incorporate more consideration of resilience to unexpected events. Still, the business objective of minimizing inventories within this context remains and will likely continue to drive business strategy and investment in many freight industry sectors.

In the National Capital Region, the current supply chain paradigm resulted in retail businesses locating distribution centers at the periphery of the region. The location of distribution and fulfillment centers is also impacted by consumer spending increasingly shifting from retail stores to online retailers, a significant trend affecting the supply chain nationally and in the National Capital Region. As a share of retail sales, e-commerce increased from a 4.2 percent share of total U.S. retail sales in 2010 to 16.4 percent in 2020, and 14.8 percent in 2022. These large distribution centers are strategically placed near Interstate highways to serve retail establishments in one or more metropolitan areas and by allowing trucks to serve distribution centers and deliver goods in a single shift. As e-commerce alters the future retail landscape, new transportation providers and new modes of freight delivery (e.g., smaller commercial trucks and freight bicycles in urban areas) will likely be required. Should this trend continue, demand for fulfillment centers, and truck volumes traveling to and from fulfillment centers, may increase, while truck volumes to retail stores may decrease.

E-commerce has required an increase in the size of some warehouses to stock a larger selection of items, and the placement of warehouses or distribution centers in urban areas. Warehouse automation continues to be implemented and requires additional space for the technology and equipment facilitating high-speed processes to speed orders to customers. Advances in robotics that allow for effective automation of order picking will likely accelerate further the automation of warehouses for online commerce in the near future. For the National Capital Region, this may result

[32] Note: Cooperative Forecast numbers include military employees and the self-employed – people that are not included in the Quarterly Census of Employment and Work (QCEW) figures used in the review of historical employment shown in Figure 25

in increased efficiency of fulfillment centers, enabling higher volumes of goods to be transported. Conversely, it may also result in more distribution centers located in urban areas, and greater number of trucks needed to service fulfillment centers and may impact employment opportunities for residents.

EVOLVING DISTRIBUTION CENTER DESIGN AND LOCATIONS

A typical distribution center is roughly rectangular in shape and features many loading docks. Traditional distribution centers typically employ about 0.3 workers per thousand square feet whose primary work tasks involve shipping and receiving activities. The rise in e-commerce is resulting in a transformation of the typical distribution center into an e-commerce fulfillment center. An e-commerce fulfillment center typically employs about 1.0 workers per thousand square feet whose primary work tasks include picking and packing in addition to shipping and receiving activities. These additional workers require places to park, so fulfillment centers have larger employee parking lots. While traditional distribution centers are typically not located to maximize transit options, newer fulfillment centers are better able to attract the work force needed if they have robust transit options available. Fulfillment centers also require more secured truck parking, typically two or three trailer locations per loading dock. This allows truck drivers to drop off and pick up trailers during off-peak hours thereby enabling full use of the available loading docks.

Since the 2016 Freight Plan Update, several large retailers have relocated fulfillment or distribution centers within the National Capital Region: Giant Food relocated from the Landover area of Prince George's County to Jessup in Howard County; Safeway closed a distribution center in Upper Marlboro and relocated operations to Denver (Lancaster County), Pennsylvania, which has since been converted into a Target warehouse; and a former Toys R Us distribution center in Frederick County was converted into a Kroger fulfillment warehouse.

LEVERAGING TECHNOLOGY

Intelligent freight technologies can be employed to increase awareness and understanding of the region's transportation system. Intelligent freight technologies include asset tracking (via mobile communications), on-board status monitoring (e.g., sensors), and network status information, such as using "computer vision" systems that utilize and integrate data or video feeds from public sensors or traffic cameras.[24] In the region, these emerging technologies can be especially helpful to assess last-mile connectivity, as jurisdictions seek to understand the shifting needs and patterns of commercial trucks.

To increase speed to market, traditional retailers are converting their brick-and-mortar stores into centrally located urban distribution centers. This enables same day fulfillment of a customer's online order from the urban department store. Amazon has installed lockers across the region in locations such as supermarkets, doughnut shops, and convenience stores to enable secure delivery of packages while customers are away from home. If the emphasis of last mile logistics continues to shift towards personalized delivery services, the number of trucks on the region's streets and roadways will grow. However, these additional trucks are likely to be smaller on average. For instance, Amazon has supported the creation of small, dedicated contractor fleets that use vans and other small trucks to deliver online orders in the last mile.

The timeline for the deployment of automated trucks, drone deliveries, and other disruptive technologies is undefined, but there is potential for freight (or small deliveries) to be delivered using these modes. Note that due to federal airspace restrictions in or near the monumental core area of Washington, D.C., drone deliveries may not be permitted in specific areas of the region. While challenging to plan for, developments related to these technologies will be critical for transportation

officials and elected officials at the jurisdictional levels to monitor, especially jurisdictions with a high density of distribution centers and warehouses.

4.3. Key Trends by Freight Mode

The freight transportation industry is dynamic and continues to evolve with large firms making strategic investments in infrastructure and technology.

4.3.1. TRUCKING

Over the past 40 years the trucking industry has undergone a series of consolidations and restructurings. In 2021, 95.7 percent of trucking companies operated ten or fewer trucks and 99.7 percent operated fewer than 100 trucks[33]. Larger trucking firms are making significant investments in fleet telematics to help track and manage shipments, while smaller trucking firms often lack the expertise and capital required to implement tracking technology to the same degree as the larger firms.

New fleet telematic technologies and software have provided opportunities for firms to reduce empty truck miles (when trucks travel with empty loads), increase truck loading, and efficiently convert less-than-truckload (LTL) shipments to truckload shipments through load consolidation. Combined, these efficiencies can result in fewer commercial trucks traveling on regional roadways, less congestion, and reduced highway wear on Interstates.

Technological advancements have also created opportunities for co-loading, where freight companies share space within a truck or shipping container, and the creation of multi-stop truckload movements that allow for efficient consolidation of multiple customer orders within a particular load. In addition, visibility into inbound and outbound freight movements can create opportunities for firms to do “continuous moves planning” to match outbound loads to vehicles that have delivered freight to the same facility and would otherwise leave empty. Companies like Uber Freight and Convoy have worked to create a digital freight market that will efficiently match trucks with loads more generally and digitize manual processes for billing.[25]

Small trucking firms often contract with larger carriers and utilize third-party logistics (3PLs) and load matching services to maximize their return on capital. Trucking firms that effectively utilize information technology are likely to prosper relative to firms that are less technology-adept. This trend favors larger firms. Driver shortages have been a longstanding problem for the industry, particularly for long-haul routes. As the economy continues to generate high value time sensitive goods, demand for trucking services will continue to be high.

Truck electrification is expected to become an increasingly important trend, as more medium- and heavy-duty electrified truck models are produced. Multiple federal programs in the IIJA and the Inflation Reduction Act (IRA) provide incentives for the freight industry to electrify, such as the Qualified Commercial Clean Vehicle tax credit, which provides up to a $40,000 tax credit to incentivize purchase of electric commercial vehicles, which will likely have impacts on adoption of medium-duty and heavy-duty electric trucks.

[33] “Economics and Industry Data”. American Trucking Association

4.3.2. RAIL

Deregulation of the railroad industry in the 1980s enabled railroads to steadily increase productivity by restructuring the rail system, shedding unprofitable lines, creating new business opportunities through long-haul intermodal service, and by transporting coal from mines in the Appalachian Mountains and Wyoming's Powder River Basin. Overall, rail plays a relatively small role in freight transportation in the Washington Metropolitan area, moving five percent of traffic to, from, and within the area.[34] Rail tends to have a higher modal share for heavy bulk materials, such as coal, metallic ores, and plastics. An exception is motorized vehicles, which have a high value per ton. More than three-quarters of the automobiles moved by rail or multiple modes (truck and rail) to or from Maryland are imports or exports moving through the Port of Baltimore.

The two Class I railroads operating in the National Capital Region, Norfolk Southern and CSX Transportation, also have worked to expand their intermodal business through major initiatives to add additional track, straighten curves, increase clearances, and add intermodal terminals on key rail corridors to clear the way for trains hauling double stack container cars moving between Mid-Atlantic ports and the Midwestern markets (CSX National Gateway) and between the Southeast and the Northeast (Norfolk Southern Crescent Corridor).

Multiple bridges and tunnels that serve freight rail in the National Capital Region have been recently upgraded or are being expanded. In the District of Columbia, CSX's Virginia Avenue Tunnel was reconstructed in 2018 to accommodate two tracks and allow double-stack trains. MDOT continues to seek opportunities to improve rail access to the Port of Baltimore. The project to reconstruct the Howard Street Tunnel to allow double-stack intermodal containers into the Port of Baltimore is scheduled to be completed by 2024. Additionally, a new two-track railroad bridge is being constructed adjacent to the Long Bridge, a CSX-owned rail bridge that connects the District of Columbia and Virginia and carries both freight and passenger rail. This bridge is expected to be completed in 2030 and will create a four-track rail corridor across the Potomac River.

4.3.3. AIR CARGO

As noted in Section 2.4, BWI and IAD manage the highest volumes of air cargo in and near the National Capital Region. In 2019, BWI significantly enhanced its air cargo capacity with the opening of a 200,000 square foot cargo building to handle Amazon deliveries. As of 2021, this facility at BWI was among the top five busiest Amazon Air facilities in the world.[35]

Several air cargo trends have impacted the volumes of freight handled at IAD and BWI in recent years. In the air cargo industry, freight forwarder and air carrier networks route freight through operationally efficient, cost-effective airports that provide the highest level of customer service. To realize the benefits of these efficient and cost-effective airports, cargo is sometimes trucked many hundreds of miles before being loaded onto an aircraft. The leading factors that determine how attractive a particular airport is to air cargo shippers, receivers, and forwarders include the following:

- Local and regional air cargo demand patterns, including a rough balance of inbound and outbound freight opportunities.

[34] Maryland State Rail Plan. December 2022.

[35] Air Cargo from an Airport Planning Perspective, Presentation to the MWCOG Transportation Planning Board – Freight Subcommittee, Kevin Clarke, October 21, 2021

- Available aircraft cargo capacity, including international and wide body flights.
- Sufficient airport cargo infrastructure such as runway length, aircraft parking ramps, air cargo warehouse space, and truck maneuvering and parking space.
- Connectivity to the Interstate highway system.
- A critical mass of logistics and freight forwarding companies to support cargo consolidations.

Air cargo is, in most cases, fluid and has many airport options. This means that, unless an airport meets almost all of the above key factors, it may capture only a lesser share of the cargo market. The ultimate efficiency of airport cargo facilities depends largely on the degree of connectivity among freight forwarders, cross-dock and warehouse facilities, and off airport properties. Access in and out of the airport is important to air cargo businesses, and truck transportation is the critical link to the end-user.

The region's cargo airports play an important role in supporting the regional economy, enabling businesses and residents to conveniently ship and receive high-value, time-sensitive goods and materials. The region's economic structure features a higher proportion of government and professional services employment and a lower proportion of manufacturing employment than occurs in the nation overall. This, coupled with the relative affluence of the region's residents, creates demand for more inbound air cargo than outbound. Despite this imbalance, the region's cargo airports have been, and are continuing to, invest in the infrastructure needed to support cargo operations and are aggressively marketing their individual strengths. Dulles for example, is leveraging their frequent service to the Middle East and Europe to attract air cargo from states like Georgia, Tennessee, and North Carolina. These goods are trucked via regularly scheduled shuttles from Charlotte-Douglas and Atlanta-Hartsfield to Dulles for departure. However, the structural imbalance between inbound and outbound air cargo opportunities is a headwind that Dulles and BWI have to contend with as they compete with other, larger cargo airports such as New York (JFK) and Atlanta.

The information in Table 23 below correlates each of the region's primary cargo airports with the key factors listed above.

Table 23. Key Factors Impacting the National Capital Region Cargo Airports

Key Factor	Regional Cargo Airports
Local and regional air cargo demand patterns, including a rough balance of inbound and outbound freight opportunities	The imbalance between inbound and outbound demand is a headwind that both Dulles and BWI airports face in the effort to grow their respective air cargo volumes. This is an issue of cost and efficiency because carriers want to fill their cargo holds for outbound as well as inbound flights.
Available aircraft cargo capacity, including international and wide body flights	The strength of Dulles Airport with respect to this factor is its robust international connections to the Middle East and Europe. In terms of air cargo, the surge in online e-commerce sales has meant a surge in international air cargo at BWI's new Amazon facility built in 2019. Historically BWI was primarily a domestic freight facility.

Key Factor	Regional Cargo Airports
Sufficient airport cargo infrastructure such as runway length, aircraft parking ramps, air cargo warehouse space, and truck maneuvering and parking space	Both Dulles and BWI meet the requirements of this key factor.
Connectivity to the Interstate highway system	Both Dulles and BWI meet the requirements of this key factor.
A critical mass of logistics and freight forwarding companies to support cargo consolidations	Compared to their larger competitors (JFK, Atlanta, Miami, Chicago O'Hare) Dulles and BWI are supported by a significantly smaller set of logistics and freight forwarding companies.

Cargo operations at Dulles and BWI are well adapted to the structure of the region's economy. Illustrative examples include:

- Vaccines, pharmaceuticals, and medical devices produced by the region's biotechnology sector rely on air transportation, primarily out of Dulles airport, to meet the time-sensitive medical needs of people across the globe. Dulles is a key gateway for military support exports to Europe, the Middle East, and beyond due to its international network.
- BWI airport provides a key supply chain link to seafood, fresh produce, and other wholesale food products distributed out of Maryland Food Center Authority facilities in Jessup, a major distribution center that serves Maryland, the District of Columbia, Virginia, and other mid-Atlantic states. BWI airport has the only United States Fish and Wildlife Service inspection gateway in the Mid-Atlantic region.

One important trend for BWI is the change in the types of aircraft moving freight. In 1994 passenger and all-cargo carriers handled approximately equal amounts of air freight at BWI. Since then, freight on all-cargo aircraft has grown 64 percent, while air freight on passenger carriers has declined. Increased passenger load factors (i.e., the percentage of seats filled with passengers) and reduced domestic widebody aircraft, which contain more space for freight, have resulted in less capacity for freight. Freight and mail shifted to the integrated express carriers, and U.S. Postal Service demand declined.

COMPETITION FROM OTHER MODES

Advances, such as faster container ships and refrigeration for containers on ocean going vessels, have enabled some perishable commodities, including flowers and foodstuffs, to be transported by sea rather than air. This has enabled shippers to realize significant transport cost savings for some perishable but not otherwise time sensitive commodities, thus diverting some portion of global cargo shipments out of airplanes and onto ships.

ROLE OF OUT-OF-REGION AIRPORTS

A significant portion of the region's air cargo demand is handled by major cargo hub airports located outside of the National Capital Region. Trucking is approximately five to ten times cheaper than air transportation for typical cargo. Much of the National Capital Region is within a one-day drive of a larger cargo airport, such as JFK (located in the Queens borough of New York City), Atlanta, or Philadelphia. Many air cargo shippers, receivers, and forwarders select the lower costs and better schedules offered by these major hubs. Even airports as far away as Miami and Chicago are strong cargo competitors to Dulles and BWI. The additional truck haul required to transport cargo to and

from large cargo gateway airports is often accepted by forwarders and shippers as part of the cost of doing business.

4.3.4. PORTS

Although the Port of Baltimore and the Port of Virginia are not located in the National Capital Region, they are vital East Coast entry points for marine freight, are equipped to handle "post-Panamax" or "megaship" sized container ships and provide goods to the region via multiple rail and roadway connections. In recent years, the freight transportation system in the United States experienced supply chain challenges due to the COVID-19 pandemic. As noted by the Bureau of Transportation Statistics, demand for ocean shipping resulted in shortages of intermodal shipping containers and truck chassis.[26] While these effects may be short-term, the availability of critical operational elements such as truck chassis impacts the movement of goods from the Port of Baltimore and the Port of Virginia.

The Port of Baltimore handled the highest volumes of automobiles in the United States in 2020, and processes high volumes of light trucks and farm and construction machinery. Recent investments at the Port of Baltimore enhance the port's ability to handle intermodal containers. In November 2021, Maryland broke ground on the Howard Street Tunnel expansion project, which includes the reconstruction of the rail tunnel to accommodate double-stacked container trains to and from the port. Tradepoint Atlantic has entered a partnership with Terminal Investment for the construction of an on-site 165-acre rail-served container terminal at Coke Point in the Port of Baltimore. Baltimore has begun the operation of four additional supersized, Neo-Panamax cranes, as part of an investment by Ports America Chesapeake (PAC) at the Seagirt Marine Terminal, to serve a second deepwater berth. The new berth and cranes will complement CSX's Howard Street Tunnel expansion project that will allow double-stacked container rail cars to use the tunnel. The tunnel expansion is scheduled for completion in 2025.

The Port of Virginia, which includes four terminals in the Hampton Roads region, processed a record volume of approximately 180,000 containers in December 2021. To accommodate future growth, the Port is investing in critical infrastructure needs, including $350 million for channel deepening and widening, and $90 million to increase rail capacity at Norfolk International Terminals.[27]

4.4. Impacts of COVID-19

COVID-19 had significant impacts on the economy, employment, and freight movement more generally. Some of the most important impacts for freight transportation are summarized below. Because of ongoing changeability in post-pandemic trends as of the writing of this plan, the following sections discuss recent trends that may be subject to further changes in the coming years.

COVID-19 AND EMPLOYMENT

Numerous actions were taken to contain the spread of COVID-19 that have restricted socio-economic activities throughout the country, including the metropolitan Washington region. Between March and April 2020, the COVID-19 pandemic contributed to a loss of 371,000 jobs.[28] When comparing March 2020 to March 2021, employment data for the Metropolitan Washington region indicated the most significant job losses to be in hospitality, retail, and several service-related sectors. By December of

2021, the region had recovered approximately 86 percent of the jobs lost between March 2020 and April 2020, with growth in nearly every sector.[36]

TELEWORKING

The metropolitan Washington region economy is highly reliant on government and professional business services sectors, which enabled a fast transition to remote work during the COVID-19 pandemic. According to the Regional Travel Survey (RTS) conducted in 2017-2018, since 2007-2008 the share of workers who are eligible to telecommute increased from 26 percent to 43 percent in the TPB region; the share of workers teleworking one or two days per week also increased.[29] As more and more workers have the option to work from home, teleworking has reduced the total number of people commuting to work. The long-term impacts of the pandemic on telework are not yet known, and the region's transportation system may continue to adapt to a "post-COVID" environment. Many government and professional services employees are continuing to work remotely multiple days per week. Weekday commuting patterns continue to evolve.

ONLINE SHOPPING

During the COVID-19 pandemic, people increasingly turned to e-commerce to get needed goods delivered to their homes, accelerating a trend that was already well-established. This continued expansion of e-commerce has increased the number of trucks competing for the limited supply of roadway and curbside space, increasing curbside management challenges. Street design features common in more densely populated areas, such as bike lanes and narrower intersections with tighter turning radii, make it more difficult for trucks to navigate turns, and trucks making deliveries can block access for pedestrians and cyclists. One year after the pandemic is over, a majority (58 percent) say that they expect their online shopping habits to continue. This could have lasting impacts on long-range regional planning, including addressing changing demands for retail space and freight-related needs.[30] [37]

AIR TRAVEL

Commercial air travel at the National Capital Region's three major airports reached an all-time high in 2019 with approximately 36.8 million airplane boardings (enplanements) reported, up from 32 million in 2007. From 2019 to 2020, enplanements plummeted 65 percent, decreasing from 36.8 million to 12.9 million, at Baltimore/Washington International Thurgood Marshall Airport (BWI), Ronald Reagan Washington National Airport (DCA), and Washington Dulles International Airport (IAD), collectively. As the region continues to recover from the COVID-19 pandemic, enplanements are recovering at all three airports but are still well below pre-pandemic levels.[38] Regional air travel continues to increase. Enplanements were over 80 percent of 2019 levels in November and December of 2021. Enplanements were back to greater than 90 percent of 2019 levels by the summer of 2022.[39] A fraction of air freight moves in the belly of passenger airplanes. Reductions in the number of enplanements is predictive of a smaller number of aircraft and less belly freight capacity being available at Washington area airports.

---

[36] COVID-19 Impacts in Metropolitan Washington. Metropolitan Washington Council of Governments, March 18, 2022

[37] Visualize 2045: A Long Range Transportation Plan for the National Capital Region. MWCOG p.151

[38] Visualize 2045: A Long Range Transportation Plan for the National Capital Region. MWCOG p.46

[39] COVID-19 Travel Monitoring Snapshot an Analysis of Monthly Traffic and Enplanement Data, Pre-Pandemic - October 2022, National Capital Region, Transportation Planning Board, published November 2022

5. REGIONAL FREIGHT ISSUES, CHALLENGES, AND OPPORTUNITIES

5.1. Roadway Congestion and the Cost of Delay

Congestion on the nation's roadways is a significant cost to shippers and to the economy overall. In 2016, the American Transportation Research Institute (ATRI) estimated that nationally, congestion added over $74.5 billion in operational costs and resulted in 1.2 billion hours of delay on the NHS. This is the equivalent of over 425,533 truck drivers sitting idle for a working year.[40] Freight congestion is concentrated in urban areas and is most apparent at bottlenecks on highways, especially those serving major international gateways, major domestic freight hubs, and in major urban areas where important national truck flows intersect congested urban areas. In 2016, ATRI ranked congestion in the Washington, D.C., metropolitan area as sixth worst in the nation in terms of its contribution to increased operating costs for the trucking industry (Table 24).

Table 24: Top Ten Metropolitan Areas by Total Cost of Congestion, 2016

Rank	Metropolitan Area	Total Cost
1	New York/ Newark/ Jersey City, NY/NJ/PA	$4,932,953,308
2	Chicago/ Naperville-Elgin, IL/IN/WI	$2,277,859,370
3	Miami/ Fort Lauderdale/ West Palm Beach, FL	$2,242,273,959
4	Philadelphia/ Camden/ Wilmington, PA/NJ/DE/MD	$1,662,591,597
5	Los Angeles/ Long Beach/ Anaheim, CA	$1,634,100,369
6	**Washington/ Arlington/ Alexandria, DC/VA/MD/WV**	**$1,408,773,540**
7	Dallas/ Fort Worth/ Arlington, TX	$1,381,875,845
8	Houston/ The Woodlands/ Sugar Land, TX	$1,359,055,852
9	Atlanta-Sandy Springs-Roswell, GA	$1,114,969,029
10	Nashville/ Davidson/ Murfreesboro/ Franklin, TN	$1,105,626,725

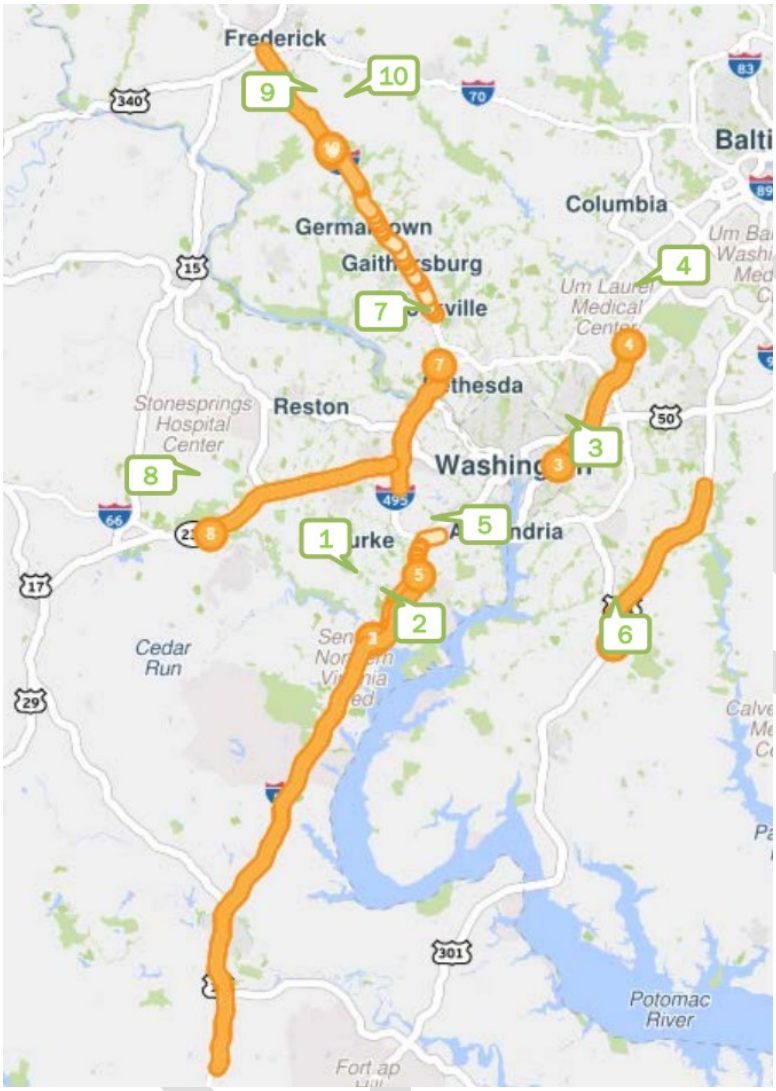
In 2023, ATRI identified the nation's 100 most congested truck bottlenecks, providing a national perspective on truck congestion and comparison points for bottlenecks in the National Capital Region.[31] This analysis was quantified by analyzing truck volumes, free flow speed, and average truck speed and deviation from free flow. Three bottlenecks in the top 100 were identified in the National Capital Region: I-95 at I-495 in Springfield (#79), I-495 at I-66 in Vienna (#89), and I-495 at I-270 in Rockville (#92).

The Transportation Planning Board has been monitoring congestion in the Region for many years. Table 25 identifies the 'all time' i.e., 24/7/365, 10 most significant bottlenecks on the Region's network as of 2021. This table, as seen in the 2022 Congestion Management Process (CMP) Technical Report, was developed using the Bottleneck Ranking tool in the Probe Data Analytics Suite of the Regional Integrated Transportation Information System (RITIS) provided by the University of Maryland Center for Advanced Transportation Technology (CATT) Lab. As this analysis was conducted on the Region's entire network instead of only the regionally significant freight network, several

[40] ATRI Cost of Congestion to the Trucking Industry: 2018 Update

bottlenecks listed in Table 25 are on truck-restricted roadways. A map of the regional bottlenecks from the 2022 CMP Technical Report is included below in Figure 30. The numbers identified within Figure 30 correspond to the rankings in Table 25.

Figure 30: Regional Bottlenecks in the National Capital Region



Source: C0G 2022 Congestion Management Process (CMP) Technical Report.

To be consistent with the ranking method in National Capital Congestion Reports since 2019, a measure of "Base Impact" in the tool was chosen to rank the bottlenecks for the 2022 CMP Technical Report. According to RITIS, the "Base Impact" measure was defined as the sum of queue lengths over the duration. More information about bottleneck ranking methodology is available in the 2022 CMP Technical Report.

Table 25. Regional Bottlenecks

Rank	Location	Average duration	Average max length (miles)	Total duration	Impact factor
1	I-95 S @ VA-123/EXIT 160	8h 9m	4.01	124d 4h 5m	530,457
2	I-95 N @ VA-123/EXIT 160	4h 11m	4.45	63d 19h 32m	386,481
3	DC-295 S @ CAPITOL ST	9h 4m	1.51	137d 22h 41m	278,813
4	MD-295 N @ POWDER MILL RD	5h 11m	2.92	78d 19h 59m	255,314
5	I-95 N @ VA-617/BACKLICK RD/EXIT 167	2h 33m	4.02	38d 22h 50m	216,574
6	US-301 S @ MCKENDREE RD/CEDARVILLE RD	3h 51m	2.45	58d 14h 43m	196,300
7	I-495 CW @ I-270-SPUR	1h 21m	5.92	20d 17h 56m	176,892
8	I-66 W @ VA-234/VA-234-BR/EXIT 47	1h 15m	6.21	19d 3h 24m	159,189
9	I-270 S @ MD-109/EXIT 22	1h 54m	3.89	29d 2h 53m	153,541
10	I-270 N @ MD-109/EXIT 22	1h 30 m	4.73	22d 23h 44m	146,933

Source: 2022 Congestion Management Process (CMP) Technical Report, page 48.

In addition to negative impacts to the transportation system and the economy, vehicular congestion contributes to emissions, impacting residents in proximity to Interstates and highways, as well as contributing to greenhouse gas emissions. To curb greenhouse gas emissions from the transportation sector and encourage the use of electric vehicles (EV) throughout the country, the FHWA established a national network of alternative fuel corridors (AFCs). Supported by funding from the National Electric Vehicle Infrastructure Formula Program and the Charging and Fueling Infrastructure Discretionary Grant Program, AFCs support the installation of EV charging, hydrogen, propane, and natural gas fueling infrastructure at strategic locations along major highways. The District of Columbia, Maryland, and Virginia each have several designated AFCs in the National Capital Region. In Table 26 below, the designated AFCs for D.C., Maryland, and Virginia are listed, including Interstates, US routes, and state highways.

Table 26. Designated Alternative Fuel Corridors by State – Interstates, US Routes, and State Highways

State	Interstates, US Routes, and State Highways
District of Columbia	I-95, I-195, I-295, I-395, DC 295, US 1, US 50
Maryland	I-70, I-95, I-270, I-495, SR 4, SR 5, SR 32, SR 295, ICC-MD 200, US 1, US 15, US 50, US 301
Virginia	I-66, I-95, I-495

Source: FHWA All Designated Alternative Fuel Corridors by State, Updated July 5, 2022.[32]

The list of AFCs is updated on an annual basis, through the process of soliciting nominations from State and local officials. The recurring process of updating the AFC list supports the rapidly evolving state of electric vehicle technology in the United States, increased market adoption, and installation of infrastructure related to the use of alternative fuels.

5.2. Rail Congestion and Safety

The Transportation Planning Board (TPB) is particularly interested in and concerned about the safety and security of the region's freight rail system. Rail incidents around the nation have highlighted the need for continual improvement of freight rail preventative safety and security measures. The addition of a new two-track railroad bridge adjacent to Long Bridge, a CSX-owned rail bridge over the Potomac River that carries both freight and passenger rail, is expected to increase throughput and enhance resiliency once it opens in 2030.

Major concerns include the operational handling and tracking of railcars that carry Toxic Inhalation Hazard (TIH) materials, which can cause fatalities if released into the atmosphere. Safety on the nation's railroads is regulated by the Federal Railroad Administration (FRA). It enforces regulations for hazardous materials, highway-rail crossings, track conditions, rail motive power and equipment, operating practices, and train control and signaling. Federal rail safety regulations preempt state rail safety laws, and the FRA maintains direct oversight of railroad practices relevant to safety. States can participate in railroad-related investigative and surveillance activities through FRA's State Safety Participation Program. To participate in the Program, states must have an agreement with the FRA to enable the delegation of some federal investigative and surveillance authority to the State. State agency personnel involved in investigative and surveillance activities must be qualified in one or more of the following FRA safety disciplines: track, signal and train controls, motive power and equipment, operating practices, hazardous materials, and highway-rail grade crossings.

The FRA reserves exclusive authority to assess penalties, issue emergency orders, and undertake any other enforcement actions under federal railroad safety laws. Maryland's rail safety authority is under the jurisdiction of the Department of Labor, Licensing, and Regulation (DLLR). Virginia's rail safety authority is under the Virginia State Corporation Commission Division of Utility and Railroad Safety. In the District of Columbia, the District Department of Energy & Environment (DOEE) is charged with implementing the City's rail safety program.

Because the District houses institutions, individuals, and buildings of national significance, in addition to being home to over 700,000 residents, unique rail safety policies and regulations have been adopted to safeguard the city. According to the 2017 DC State Rail Plan, certain categories of highly hazardous materials are not transported through the District by rail, including toxic by inhalation/poison by inhalation products, certain explosives, and spent nuclear fuel. However, empty rail cars that previously contained high-hazard materials are permitted to travel through the District.

The 2017 DC State Rail Plan also outlines actions undertaken by CSX, either voluntarily or in accordance with federal regulation, to support homeland security officials and local first responders, including:

- Providing a list of the top 25 hazardous materials by rail car count shipped through Virginia, Maryland, the District to their respective state emergency organizations
- Granting members of the Transportation Security Administration (TSA) and the U.S. Department of Transportation Crisis Management Center access to real-time information regarding the location and contents of rail cars
- Participating in urban rail safety programs and providing specialized training to first responders

Additional information about the District's rail safety program can be found in the DC State Rail Plan.

Fatalities and injuries on the region's freight rail system have remained roughly constant since 2009. Table 27 shows rail fatalities by category which peaked in 2016 and 2017 but has decreased since then.

Table 27: Rail Accident/Incident Fatalities by Category

Category	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Employee On Duty Fatalities	0	0	0	0	0	0	0	0	2	1	0	0	0
Trespasser deaths, not at Highway-Rail Crossing	5	7	6	2	5	6	5	10	8	4	2	4	2
Passengers killed in train accidents or crossing incidents	0	0	0	0	0	0	0	0	0	0	0	0	0
Passengers killed in other incidents	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**5**	**7**	**6**	**2**	**5**	**6**	**5**	**10**	**10**	**5**	**2**	**4**	**2**

Source: FRA Safety Database, 2009-2021

Table 28 shows the non-fatal injuries associated with rail accidents and incidents within the region. It is notable that non-fatal injuries from rail accidents/incidents have decreased in 2020 and 2021.

Table 28: Non-Fatal Injuries from Rail Accidents/Incidents

Category	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
Employee On Duty Injuries	38	55	50	59	75	60	61	63	70	76	50	34	46
Trespasser injuries, not at Highway-Rail Crossing	4	4	3	7	2	4	4	3	6	6	4	5	4
Passengers injured in train accidents or crossing incidents	0	1	0	0	0	0	1	0	1	2	0	0	0
Passengers injured in other incidents	51	54	47	43	59	49	51	45	60	49	47	14	16
Total	**93**	**114**	**100**	**109**	**136**	**113**	**117**	**111**	**137**	**133**	**101**	**53**	**66**

Source: FRA Safety Database, 2009-2021

The U.S. Department of Homeland Security (DHS) is the primary federal agency responsible for security of the transportation sector. The DHS National Infrastructure Protection Plan (2013) includes the Transportation Systems Sector-Specific Plan, which is focused on developing strategies to reduce the risks to critical transportation infrastructure from terrorism threats. The leadership of the District of Columbia, the State of Maryland, the Commonwealth of Virginia, area local governments, and the Department of Homeland Security's Office for National Capital Region Coordination (NCRC) are working in partnership with non-profit organizations and private sector interests to reduce the vulnerability of the National Capital Region from terrorist attacks. The Metropolitan Washington Council of Governments (COG) coordinates and hosts many of the regional emergency support function (RESF) committees that are working together to advance preparedness in the region. The RESF-1 Transportation Committee addresses the role of transportation (including freight rail) in the NCR Homeland Security Program. The committee has representation at the local,

state, regional, and federal levels and provides a forum for regional transportation officials to exchange information and discuss emergency response, coordination, and recovery requirements.

5.3. Freight Equity Analysis

As noted in Visualize 2045, the costs and benefits of freight transportation should be distributed equitably within the region. Freight-related environmental justice issues arise when the impacts and externalities of freight, such as noise and air pollution, are unfairly concentrated in low-income and minority communities. Conversely, it is also unfair for the benefits of freight innovations, such as low- or zero emission freight vehicles and delivery lockers, to be concentrated in higher income neighborhoods.

The TPB adopted Equity Emphasis Areas (EEAs) in 2017 to examine demographic patterns in the region and to analyze Visualize 2045. EEAs represent the region's Census tracts with high concentrations of low-income individuals and/or traditionally disadvantaged racial and ethnic population groups. There are 364 EEAs regionwide, representing approximately 26 percent of the total population in the NCR. Shifting heavy-duty trucks to electric vehicles will help reduce externalities produced by trucks powered by diesel engines, such as air pollution and GHG emissions. Visualize 2045 recommends locating jobs in Activity Centers and EEAs. However, locating freight-related jobs in Activity Centers and EEAs is not always feasible or advisable.

To better understand if freight has a disproportionate impact on communities within the National Capital Region, this Plan conducted a preliminary analysis of roadway and rail mileage within EEAs. Leveraging the 2022 EEAs published by COG, an analysis was performed to examine the percent of trucks on roadways within EEAs, outside of EEAs, and the regional totals.[33] An additional analysis was performed to review interaction between EEAs and the major roadways and railroads within the NCR.

5.3.1. TRUCK PERCENTAGE VOLUMES IN EQUITY EMPHASIS AREAS

COG's EEAs were overlayed with major roads in the region and the FHWA Highway Performance Monitoring System (HPMS) truck percentage volumes to compare the percent of trucks on roadways within EEAs, outside of EEAs, and to determine the regional totals. For this analysis, major roadways in the region are defined as Interstates, Principal Arterials-Freeway/Expressways, and Principal Arterials-Other.

Table 29 shows the mileage of major roadways within the National Capital Region, what percent of major roads in the region they comprise, and what the average truck percentages are on these roadways. This data was used as a baseline comparison when evaluating the mileage of the major roadways within EEAs, what percent of the EEAs they encompass, and the average truck percentages on these roadways. Comparing this with Table 30, the truck percentages on major roadways within the EEAs are similar to the NCR: EEAs feature a lower percentage of Interstate roadway miles, but greater percentages of Principal Arterial-Freeway/Expressway and Principal Arterial-Other truck percentages. The region also features higher truck percentages along Interstates and Principal Arterial-Freeway/Expressway, than are reported along roadway segments within EEAs. With similar percentages of each major roadway type within the region and similar truck percents on these routes, this indicates that EEAs are not disproportionately exposed to these major roadways or commercial truck volumes, when compared to the remainder of the NCR.

Table 29: Truck Percentages on Major Roadways in the National Capital Region

NCR Roadways	NCR Roadway Truck Percentage	EEA Roadway Truck Percentage	Outside EEA Roadway Truck Percentage
Interstate	6.5%	6.0%	6.7%
Principal Arterial-Freeway/Expressway	4.2%	5.3%	3.9%
Principal Arterial-Other	3.6%	3.7%	3.5%
Average Percent	5.0%	5.0%	5.0%

Source: COG (2022 EEA data), HPMS (2019 data)

Table 30: Truck Percentages on Major Roadways in Equity Emphasis Areas

EEA Roadways	Major Roadway Miles	% of Major Roadway Classification in EEAs	% Truck
Interstate	52	17%	5.9%
Principal Arterial-Freeway/Expressway	51	17%	5.2%
Principal Arterial-Other	203	66%	3.7%
Total/Average Percent	306	100%	4.9%

Source: COG (2022 EEA data), HPMS (2019 data)

5.3.2. FREIGHT MILEAGE WITHIN EQUITY EMPHASIS AREAS

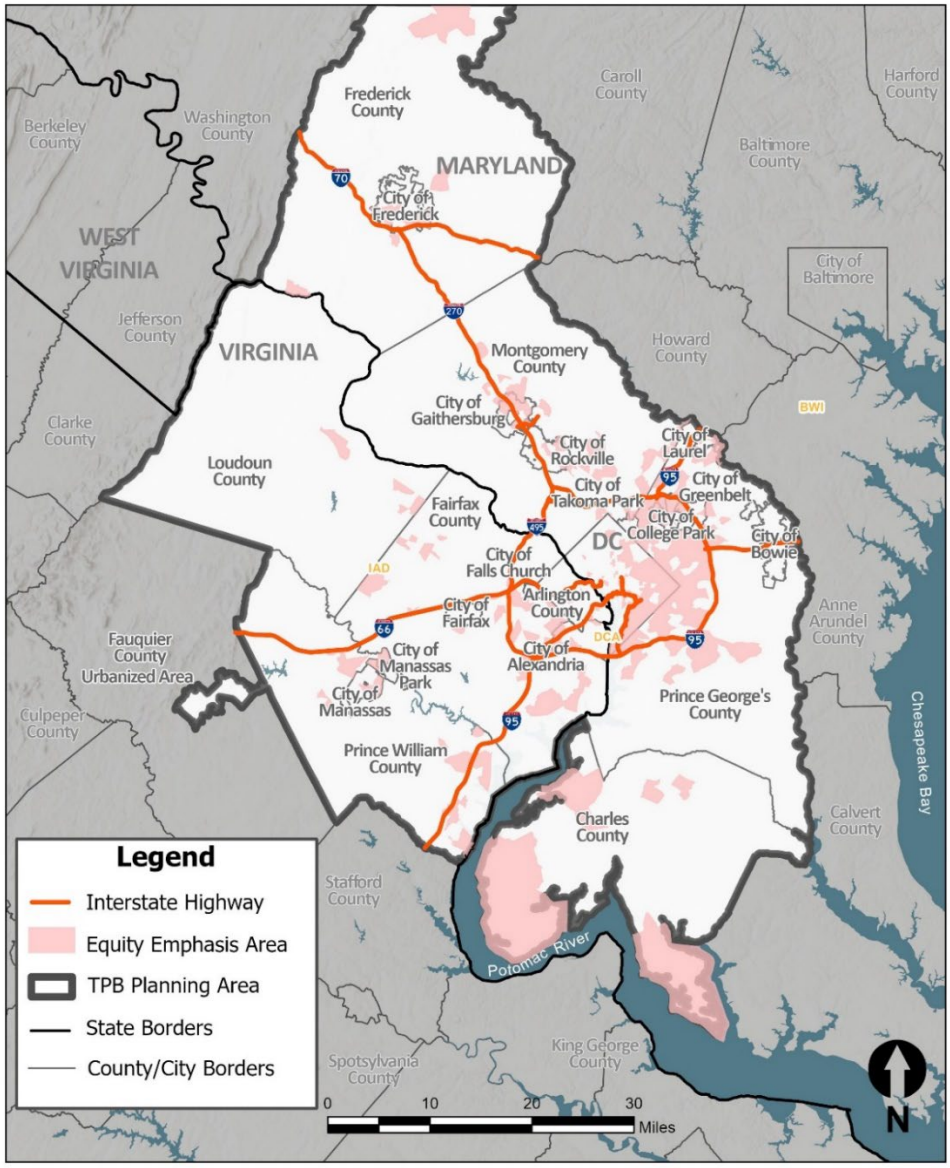
The second part of the equity analysis examined the impact that freight, in terms of major roadways and railroads, has on EEAs compared to the remainder of the National Capital Region. Table 31 shows the total major roadway mileage within EEAs, outside of EEAs, and the total mileage within the National Capital Region. This indicates that the major roadway mileage within EEAs accounts for 22 percent of the total major roadway mileage within the region. Figure 31 provides a visual representation of how EEAs interact with major roadways in the region.

Table 31: Mileage of Major Roadways in EEAs, Outside of EEAs, and in the National Capital Region

Roadways	Major Roadway Miles in the NCR	Major Roadway Miles within EEAs	Major Roadway Percentage within EEAs	Major Roadway Percentage outside EEAs
Interstate	234	52	22%	78%
Principal Arterial-Freeway/Expressway	271	51	19%	81%
Principal Arterial-Other	802	203	25%	75%
Total/Average Percent	1,307	306	23%	77%

Source: COG (2022 EEA data), HPMS (2019 data)

Figure 31: Major Roadways and Equity Emphasis Areas in the National Capital Region



Source: COG (2022 EEA data), HPMS (2019 data)

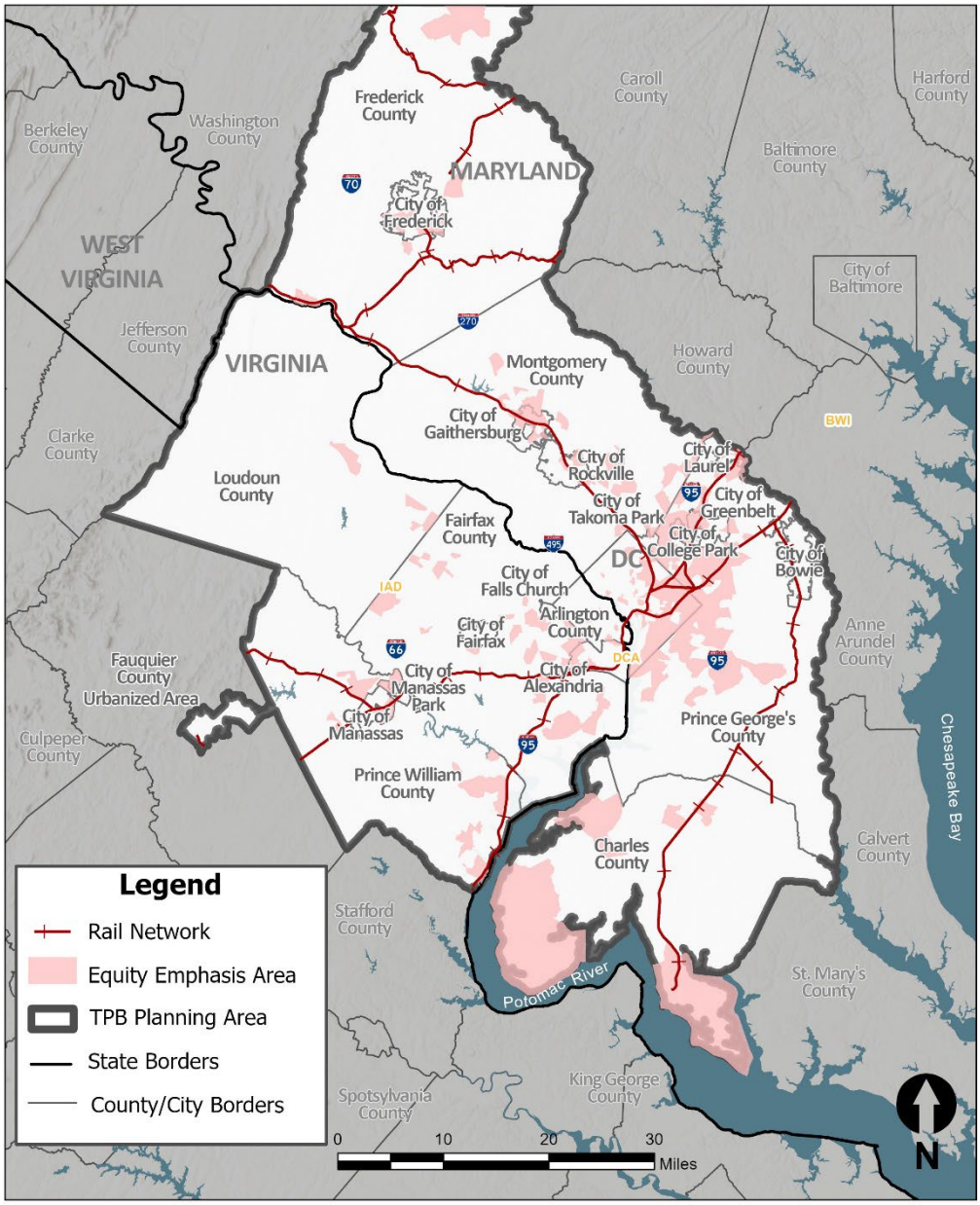
A similar evaluation was conducted for freight railroads within the region and their relationship to the EEAs. The total railroad mileage within EEAs represents 22 percent of the total railroad mileage in the National Capital Region (Table 32), which is visually represented in Figure 31.

Table 32: Railroad Miles in EEAs, Outside of EEAs, and in the National Capital Region

	Mileage within EEAs	Mileage outside EEAs	Approximate Total Mileage in Region
Miles	67	240	307
Percentage	22%	78%	100%

Source: COG (2022 EEA data), Federal Railroad Administration, Bureau of Transportation Statistics (2023)

Figure 32: Railroads and Equity Emphasis Areas in the National Capital Region



Source: COG (2022 EEA data), Federal Railroad Administration, Bureau of Transportation Statistics (2023)

Future equity-focused analysis between the interface of freight and the region's EEAs is needed. The impact of air pollution and excessive noise and vibrations should be evaluated for EEAs and densely populated communities located near (or bisected by) state-designated truck routes and Interstates, such as I-295 in Washington, D.C.

5.4. Freight as an Enabler of Livability

The National Capital Region's population is expected to increase to over seven million by 2045. As the region's population grows, so will the demand for freight. Proactively managing freight movement and delivery at both the regional and local levels is critical. Regionally, COG hosts events such as a 2017 "Freight Forum" which promoted best practices for integrating freight into the region's

transportation network. At the jurisdictional level, this may involve coordinating with trucking companies to establish commercial loading zone programs that promote overnight delivery/loading in commercial business districts; designing mixed-use buildings to accommodate off-street delivery/loading; and working with trucking companies to train drivers on best ways to safely operate their vehicles in urban environments to prioritize safety for people walking and biking.

FWHA promotes integration of freight planning and land-use decision making, which if aligned can help reduce congestion, improve air quality, and enhance community livability. FHWA's Freight and Land Use Handbook highlights four high-level areas to align regional planning with freight planning: appropriate and coordinated land use policies, effective transportation systems and services, effective operations and management policies, and education and outreach. Within these areas, tools and strategies are provided to ensure freight land uses interact positively with surrounding land uses (Table 33).[34]

Table 33: Freight and Land Use Integration Strategies and Tools

Policy Area	Strategy/Tool	Goals
Appropriate and Coordinated Land Use Policies	Regional visioning and scenario planning	Sets regional stakeholder goals and gain common understanding between different levels of government
	Incentives to reinvest in existing industrial space – e.g., tax credits	Offers tax credits as an incentive to (re)develop in urban and industrial areas, provided performance criteria are met
	Creating buffers around freight	Provides safe means for residents to traverse a freight facility
	Using zoning tools to preserve industry and limit freight impacts	Provides space for manufacturing where appropriate infrastructure and adjacent land uses exist, and protect industry from pressures to change use
	Promote context-sensitive site and building design features	Reduces the noise and vibration, light, aesthetic, and local air quality impacts of freight facilities on neighboring land uses
Effective Transportation Systems and Services	Freight-exclusive facilities	Reduces the noise and vibration, light, aesthetic, and local air quality impacts of freight facilities on neighboring land uses
	Effective truck route networks	Ensures truck routes avoid sensitive areas and link with truck routes in neighboring jurisdictions.
Effective Freight Operations and Management	Offering incentives for off-peak delivery	Spreads truck traffic times across a wider timeframe, as well as increase their efficiency because of decreased road congestion
Education and Outreach	Technical assistance to local jurisdictions	Ensures that local land use policy-makers are informed of freight needs and can help codify freight and land use integration best practices

Source: FHWA Freight and Land Use Handbook, June 2020

Commercial trucking is the dominant form of freight transportation in metropolitan Washington, transporting 73 percent of freight by weight in 2020. Planning for how trucking-related facilities and infrastructure coexists with and impacts nearby communities is especially critical for jurisdictions with access to regional highways with high volumes of commercial trucks, such as I-95, I-495, I-270, and I-70. Constructing additional public and private truck parking along these highways will allow commercial truck drivers to safely rest and refuel and benefit freight movement in the region.

For the freight industry to meet the demands of the expected population growth in the National Capital Region, there may be the need for additional warehouse workers, truck drivers, and other roles that enable freight delivery to function seamlessly. Commercial trucking is one of the nation's

largest industries, yet in 2022 the American Trucking Association reported a national shortage of 80,000 drivers. To meet this need for skilled freight employees, programs like VDOT's Workforce Development program help train and prepare future generations of employees to participate in the freight industry. The Workforce Development Program was created to address an expected workforce shortage and meet future employment demands and is designed to expose high school students to careers in transportation.

5.4.1 COMMUNITY IMPACTS OF FREIGHT

The movement of goods is essential to ensure and maintain a high quality of life in the region. Each day, residents, businesses, and visitors rely on timely freight deliveries, especially for goods transported by commercial trucks. Better understanding the community impacts of freight movement in the region will help local jurisdictions accommodate freight needs while sustaining the health and wellbeing of residents and visitors. Community impacts from freight movement include land use considerations, negative externalities, and developing a workforce to support the freight industry.

Transporting goods to and through communities in metropolitan Washington results in multiple negative externalities in the region. Where freight facilities are located and how they freight logistics operate affects nearby residents and has impacts on the surrounding transportation network. These negative externalities include pavement and roadway damage from commercial trucks, especially along local and arterial streets that are predominantly used by personal vehicles, and excessive noise from commercial trucks while unloading and making deliveries. Local streets and roads are often not designed to accommodate commercial trucks, which creates conflicts with people walking and biking. At-grade railroad crossings are also a conflict point between freight rail and people walking, biking, and driving.

While freight facilities such as rail lines and highways are necessary to efficiently move goods, this infrastructure simultaneously limits and impedes transportation access in many communities. As part of the IIJA, USDOT established the Reconnecting Communities Pilot Program, with $1 billion in funding. This program is dedicated to reconnecting communities that were previously cut off from economic opportunities by transportation infrastructure. Planned freight infrastructure should comprehensively review mobility, access, and safety impacts on adjacent communities. Modifying existing infrastructure, such as removing at-grade rail crossings, will also allow freight to travel faster and create a safer environment for residents.

Workforce development strategies could be considered to better train and equip employees in the region to join the freight and goods movement industry. In 2021-2022, the Southern California Association of Governments (SCAG) implemented the Southern California Goods Movement Communities Opportunities Assessment.[35] The assessment identified local opportunities within the freight and goods movement industry within 6-8 communities disproportionately impacted by the freight industry, to connect individuals in these communities with training and workforce development programs.

6. REGIONAL FREIGHT POLICIES

The regional freight policies described in this section are intended to provide a framework for transportation planning activities conducted by the Transportation Planning Board (TPB). TPB member jurisdictions are encouraged to consider these freight policies as they conduct their transportation planning functions.

6.1 TPB Freight Policies

The Transportation Planning Board (TPB) developed the following freight policy statements to guide implementation of freight infrastructure in the National Capital Region. Table 34 illustrates how the TPB policies correlate with goals identified in Visualize 2045 and national freight goals. The TPB:

1. encourages that freight related projects, programs, and activities in the region support or bolster TPB's plans, programs, and policies, such as the TPB Vision, Visualize 2050 (including its Connected and Automated Vehicle policies), Complete Streets policy, Equity and Safety policy.

2. supports the prioritized advancement of freight-related transportation projects that provide maximum value, efficiency, and safety with particular emphasis on those that improve freight access to activity centers.

3. supports investments that maintain a state of good repair for the region's freight transportation system.

4. supports freight investments that bolster the region's environmental objectives and resiliency.

5. supports the use of best practices for safety, engineering, and maintenance, of freight-related transportation infrastructure.

6. supports the alleviation of roadway bottlenecks where feasible to improve travel times and reliability for trucks and passenger vehicles.

7. supports maximizing opportunities to expand transportation options, address roadway congestion, and reduce pollution by increasing the use of passenger and freight rail.

8. encourages that freight related projects, programs, and activities provide benefits equitably to all people in the region and avoid disproportionate negative impacts to any group or community.

9. recognizes freight's role in economic development and supports efforts to maximize the use of important economic drivers, including airports, ports, and intermodal facilities serving the region's residents and businesses.

10. encourages that freight and goods are moved in ways that help minimize disruptions and facilitate livability of the region's communities.

11. encourages that freight related projects, programs, and activities in the region ensure security (including cybersecurity) and privacy, and prevention of risks to people and infrastructure.

12. supports improvements in truck safety using education, enforcement, and engineering strategies.

13. supports efforts to route hazardous materials away from the National Capital Region; for hazardous materials that must be transported to, from, within, and through the region, the TPB supports the selection of the safest and most secure modes and routes.

14. encourages information sharing on explosive, toxic by inhalation, and radioactive materials being shipped to, from, within, and through the region, including real-time notifications and long-term planning information.

15. supports robust first responder training and exercise activities regarding freight in general and hazardous materials transport in particular.

16. supports collaboration among agencies and with the private sector on freight planning and operations concerns to support mutual goals.

17. supports the proactive analysis of freight-related performance measures and data in the context of overall regional performance measurement to identify lessons learned and promote regional goals.

18. promotes sustainable methods of freight operations that are sensitive to environmental, cultural, and community resources.

19. encourages collaboration among transportation planners, land use planners, private railroads, elected officials, and other stakeholders to find creative ways to facilitate community-beneficial land use development (residential, commercial, or industrial as appropriate) while providing space for necessary future rail expansion along key rail corridors.

20. supports the review and study of new freight-related technologies, emerging business practices, and evolving commodity mixes and mode shares to advance regional goals.

Table 34. Correlation of Freight Policies to Visualize 2045 Goals and National Freight Goals[41]

No.	Freight Policy	Accessibility / Connectivity	Environment (Air Quality / Climate Change)	Economic Growth	Comprehensive Multimodal System	Emerging Mobility and Technology	Climate / Resiliency / Sustainability	Equity	Land Use	Mobility / Reliability	Operational Efficiency	Safety
1	Support projects, programs, and activities that bolster the TPB's plans, programs, and policies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Support efforts that improve freight access to activity centers	✓	✓	✓	✓				✓	✓	✓	✓
3	Support projects, programs, and activities that maintain a state of good repair									✓	✓	
4	Support investments that bolster the region's environmental objectives and resiliency		✓				✓					
5	Support the use of best practices for safety, engineering, and maintenance									✓	✓	✓
6	Support the alleviation of roadway bottlenecks		✓	✓						✓	✓	

[41] TPB Planning Policy Focus Areas are adapted from the FY 2023 Unified Planning Work Program (UPWP)

No.	Freight Policy	Accessibility / Connectivity	Environment (Air Quality / Climate Change)	Economic Growth	Comprehensive Multimodal System	Emerging Mobility and Technology	Climate / Resiliency / Sustainability	Equity	Land Use	Mobility / Reliability	Operational Efficiency	Safety
7	Support opportunities to increase the use of passenger and freight rail	✓	✓	✓	✓					✓	✓	
8	Encourage equitable distribution of freight benefits and avoid disproportionate negative impacts							✓				
9	Recognize freight's role in economic development; support efforts to maximize the use of important economic drivers	✓		✓	✓					✓	✓	
10	Encourage freight movement that minimizes disruptions and facilitates regional livability	✓		✓				✓		✓	✓	
11	Encourage projects, programs, and activities that ensure security (including cybersecurity)											✓
12	Support improvements in truck safety											✓
13	Support efforts to safely route hazardous materials											✓

No.	Freight Policy	Accessibility / Connectivity	Environment (Air Quality / Climate Change)	Economic Growth	Comprehensive Multimodal System	Emerging Mobility and Technology	Climate / Resiliency / Sustainability	Equity	Land Use	Mobility / Reliability	Operational Efficiency	Safety
14	Encourage information sharing on the transport of hazardous materials											✓
15	Support robust first responder training											✓
16	Support collaboration among agencies and with the private sector on freight planning and operations	✓		✓						✓	✓	
17	Support the proactive analysis of freight-related performance measures and data			✓						✓	✓	
18	Promote sustainable methods of freight operations	✓	✓				✓	✓	✓			
19	Encourage collaboration among transportation professionals, private railroads, elected officials, and other stakeholders	✓		✓				✓	✓	✓	✓	
20	Support the review and study of new freight-related technologies	✓	✓	✓	✓	✓				✓	✓	

7. NATIONAL CAPITAL REGION PROJECTS IMPORTANT TO FREIGHT

The Transportation Improvement Program (TIP) for Visualize 2045 (FY 2023-2026) includes numerous projects that will improve freight movement in the National Capital Region–two railway projects and three highway projects. Table 35 provides details on the two railway improvements; Table 36 provides details on the highway improvements.

Table 35: Rail Projects Included in Agency/Jurisdictional/Private Railroad Plans Important to Freight, 2022

TIP ID	Title	Description	Jurisdiction	Lead Agency	Completion Date
T6673	Alexandria 4th Track	Construct six miles of fourth track from Alexandria to the south bank of the Potomac River in Arlington.	Alexandria and Arlington	VDOT	2028
T6727	Long Bridge VA - DC [immediately downstream from I-395 (14th Street Bridge) crossing the Potomac River]	Design and construct four railroad tracks, a rail and pedestrian-bicycle bridge, and related land and Potomac River crossing from Arlington, VA to Washington, DC	Arlington County	VDOT	2030

Source: Visualize 2045 Transportation Improvement Program. Additional project details can be accessed at: https://visualize2045.org/plan-update/approved-2022-plan/ .
Note: The District of Columbia, Maryland, and Virginia state rail and freight plans may include additional projects that impact freight rail in the National Capital Region.

Table 36: Highway Projects included in Visualize 2045 that are Important to Freight, 2022

TIP ID	Title	Description	Jurisdiction	Lead Agency	Completion Date
T5337	Kenilworth Ave NE Pedestrian Bridges Replacement	Complete removal and replacement of the Douglas Street, NE Pedestrian Bridge	District of Columbia	DDOT	2024
T6039	H Street Bridge over Railroad	Replace and rehabilitate H Street NE bridge from North Capitol to 3rd Street NE	District of Columbia	DDOT	2028
T6240	Safety and Geometric Improvements	Implement various safety and geometry improvements along I-295/DC 295 from	District of Columbia	DDOT	2028

	of I-295 and DC 295	Chesapeake Street SW to Eastern Avenue NE			
T3547	MD 4 at Suitland Parkway Interchange Construction	Construct new MD 4 interchange at Suitland Parkway	Prince George's County	MDOT SHA	2022[36]
T6411	I-70/US 40 at MD 144, Meadow Road, and Old National Pike Interchange Construction	Construct two missing I-70/US 40 ramp movements	Frederick County	MDOT SHA	2023
T6483	MD 85 Phase 1 Highway Reconstruction	Widen MD 85 from Crestwood Boulevard / Shockey Drive to Spectrum Drive	Frederick County	MDOT SHA	2023
T6071	MD 185 at Jones Bridge Road and Kensington Parkway Phase 3 BRAC Intersection Improvements	Implement intersection improvements at Jones Bridge Road and Kensington Parkway to improve access to Naval Support Activity Bethesda	Montgomery County	MDOT SHA	2024
T11579	I-70 Eastbound at East Welcome Center	Add 25 new truck parking spaces	Frederick County	MDOT SHA	2025
T6690	MD 75 over I-70 Bridge Rehabilitation	Rehabilitate MD 75 bridge 105600 over I-70	Frederick County	MDOT SHA	2025
T6431	US 15/US 40 Frederick Freeway Highway Reconstruction	Widen US 15/US 40 from I-270 to north of Biggs Ford Road to improve safety and operations	Frederick County	MDOT SHA	2030
T6525	US 301 Highway Reconstruction	Upgrade and widen US 301 (from Mount Oak Road to US 50) and MD 197 (from US 301 to Mitchellville Road), to include bicyclist and pedestrian	Prince George's County	MDOT SHA	2030

		accommodation where appropriate			
T6450	VA 28 Widening (Prince William County Line to US 29)	Widen VA 28 from 4 to 6 lanes, with intersection improvements and added pedestrian and bicycle facilities	Fairfax County	VDOT	2023
T6618	VA 7/VA 690 Interchange	Design and construct new interchange at VA 7 and VA 690, with a shared use path and 4 ramps	Loudoun County	VDOT	2025
T6693	US 15 Improvement with Railroad Overpass	Design and construct a 4-lane section along US 15 between Somerset Crossing Drive and VA 55, with a median and asphalt shared use path connecting the sections north and south of the tracks	Prince William County	VDOT	2026
T6520	Fairfax County Parkway (VA 286) widen from 4 to 6 lanes	Widen Fairfax County Parkway (VA 286) between VA 123 / Ox Road and US 29 (2,000 ft. north of US 29), from 4 to 6 lanes	Fairfax County	VDOT	2027
T6604	US 29 Widening Phase 2	Widen US 29 from 4 to 6 lanes from Union Mill Road to Buckley's Gate Drive, with geometry improvements and added pedestrian and bicycle facilities	Fairfax County	VDOT	2027
T6443	Richmond Highway Corridor Improvements	Reconstruct and widen Richmond Highway (US 1) from 4 to 6 lanes and add bicycle and pedestrian facilities between the Mount Vernon Memorial Highway and Napper Road	Fairfax County	VDOT	2028

T11602	Richmond Highway Corridor Improvements, Phase 2	Widen Richmond Highway (US 1) from 4 to 6 lanes and add bicycle and pedestrian facilities from 0.13 miles north of Frye Road to Sherwood Hall Lane	Fairfax County	VDOT	2028

Source: Visualize 2045 Transportation Improvement Program. Additional project details can be accessed at: https://visualize2045.org/plan-update/approved-2022-plan/ .
Note: Projects that involve roads where most trucks are banned were not considered for this list, including Federal Lands and Transurban toll lane projects.

8. RECOMMENDATIONS AND NEXT STEPS

The efficient movement of goods is vital to the economy of the National Capital Region and is necessary to support the growth of local businesses and promote a high quality of life for the region's residents and visitors. The TPB is responsible for addressing congestion and mobility limitations that delay or impede freight movements, which ensures that the region's interconnected transportation system can accommodate the movement of goods by truck, rail, air, and other modes.

Building on existing data, trends, and findings documented in the Freight Plan, this section identifies recommendations and next steps that will help the region achieve its freight goals. Recommendations will also support planning factors identified in Visualize 2045: increase the accessibility and mobility of people and freight; and enhance the integration and connectivity of the transportation system across and between modes for people and freight.

The following recommended actions, which can be accomplished with resources that are already in place, are organized into two categories; those related to maintaining and strengthening the existing regional freight planning process and longer-term, strategic actions.

8.1. Actions Related to Maintaining and Strengthening the Regional Freight Planning Process

- Continue to support the TPB Freight Subcommittee.
- Continue to maintain and strengthen private-sector participation in the TPB Freight Subcommittee.
- Continue to create opportunities to hold joint meetings with other TPB Subcommittees.
- Continue to host periodic regional freight forums.
- Continue to collect and analyze freight data and make data available to member jurisdictions and the public.
- Continue to facilitate coordination with federal, state, local, and private-sector freight partners.
- Coordinate TPB's IIJA freight-related activities.
- Support TPB's Continuous Airport System Planning (CASP) program, which includes forecasting future air cargo needs.
- Continue to identify and communicate freight-related infrastructure issues to member agencies to address in their planning and programming activities.
- Strengthen relationships with local jurisdiction planners.
- Highlight economic development aspects of freight with local jurisdiction planners.

8.2. Strategic Regional Freight Planning Activities

- Continue to monitor key economic and industry trends impacting goods movement.
- Monitor the impact of freight movement within Equity Emphasis Areas.
- Continue to monitor technological developments in freight movement, such as autonomous and connected freight vehicles and unmanned aerial systems (drones).
- Monitor policies and efforts related to truck electrification and decarbonization of the freight industry in the National Capital Region.
- Advance policies and projects to convert commercial trucks to clean fuels in accordance with adopted TPB and COG goals.
- Deploy a regionwide robust electric vehicle charging network (or refueling stations for alternate fuels).
- Ensure consideration of freight movement issues in regional curbside management planning.
- Continue to monitor the development of new and emerging freight-relevant data sources and incorporate them into transportation planning activities as appropriate.
- Provide information to the TPB and freight stakeholders on the status or progress on this Plan's identified freight policies when such information becomes available.

APPENDIX A: INFASTRUCTURE INVESTMENT AND JOBS ACT – FREIGHT RELATED PROGRAMS

Significant freight-related programs and policies included in the IIJA are:

- National Infrastructure Project Assistance Program (Mega Grants)37: This program provides single- or multiyear grants to projects generating national or regional economic, mobility, or safety benefits for large and smaller-scale projects. Eligible projects include highway or bridge projects, freight intermodal or freight rail projects, railway-highway grade separation or elimination projects, intercity passenger rail projects, and certain public transportation projects.
- Nationally Significant Multimodal Freight and Highway Program (INFRA Grants)38: Awards competitive grants for multimodal freight and highway projects of national or regional significance to improve the safety, efficiency, and reliability of the movement of freight and people in and across rural and urban areas. Formerly referred to as the Nationally Significant Freight and Highway Projects (NSFHP) program.
- Office of Multimodal Freight Infrastructure and Policy: This Office was established to administer and oversee certain multimodal freight grant programs within USDOT, promote and facilitate the sharing of information between the private and public sectors with respect to freight issues, conduct research on improving multimodal freight mobility, oversee the freight research activities of the various agencies within USDOT, and to assist cities and States in developing freight mobility and supply chain expertise.
- Port Infrastructure Development Program: This program was established in the FAST Act and is expanded under the IIJA to increase investment in coastal ports and inland waterways, helping to improve the supply chain and enhancing the resilience of our shipping industry.
- Consolidated Rail Infrastructure and Safety Improvement (CRISI): Funds projects that improve the safety, efficiency, and reliability of intercity passenger and freight rail. This program leverages private, state, and local investments to support safety enhancements and general improvements to infrastructure for both intercity passenger and freight railroads.
- Railroad Crossing Elimination Grant Program: Provides funding for highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods.

APPENDIX B: REGIONAL FREIGHT-SIGNIFICANT NETWORK

This appendix contains a series of detailed maps describing the region's Freight Significant Network.

Figure 33: Regional Freight-Significant Network - Frederick County Area

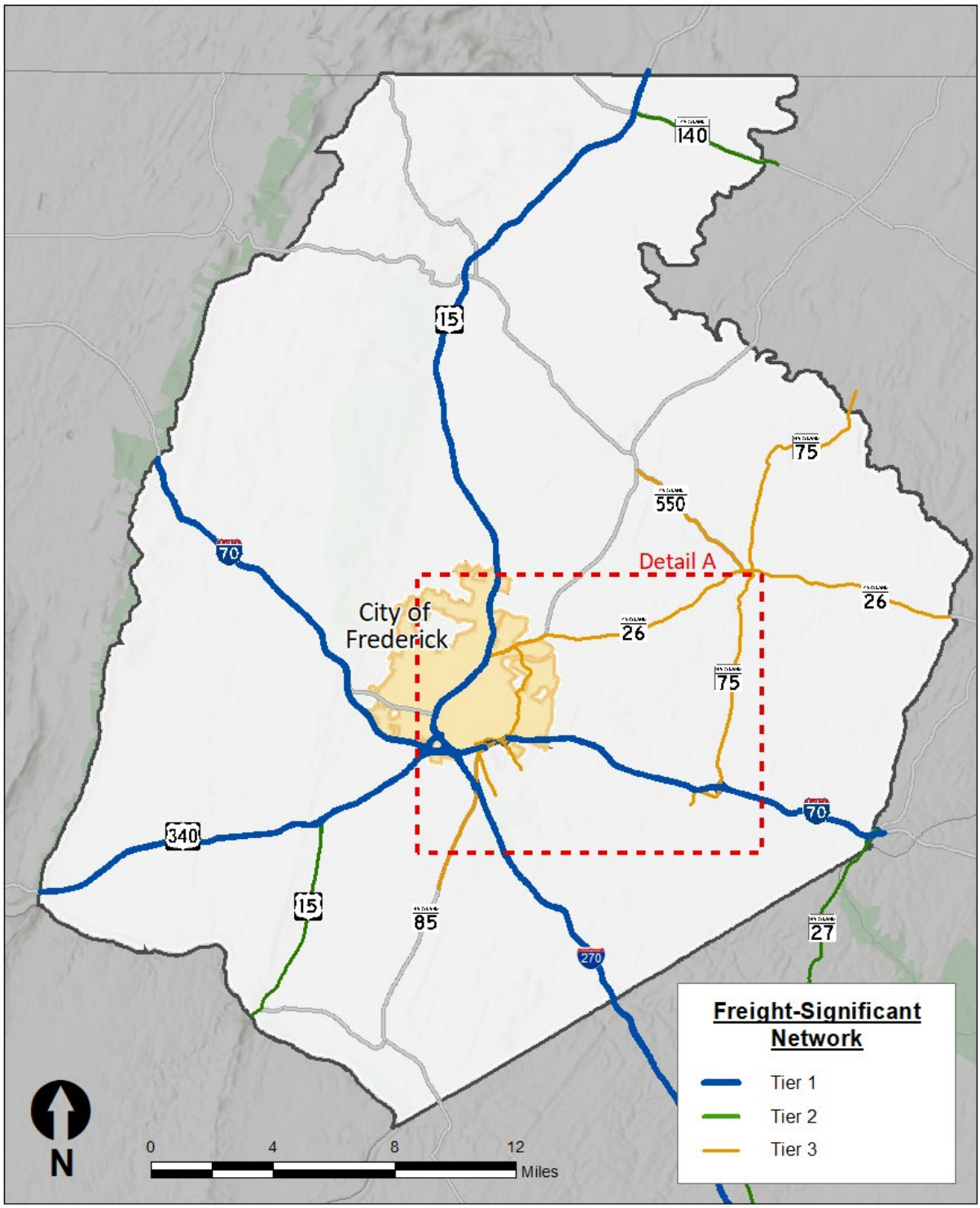


Figure 34: Frederick County Detail A

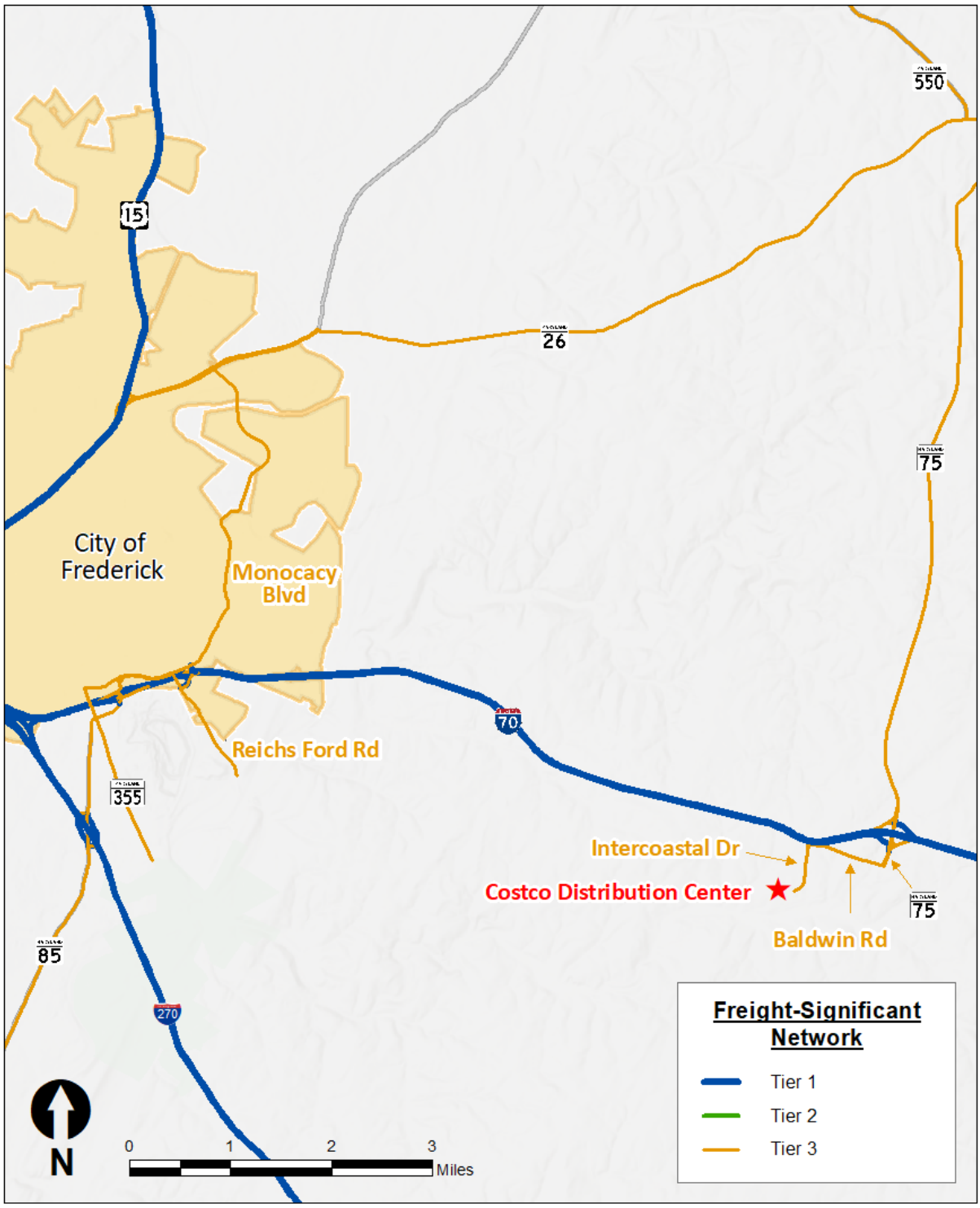


Figure 35: Regional Freight-Significant Network - Montgomery County Area

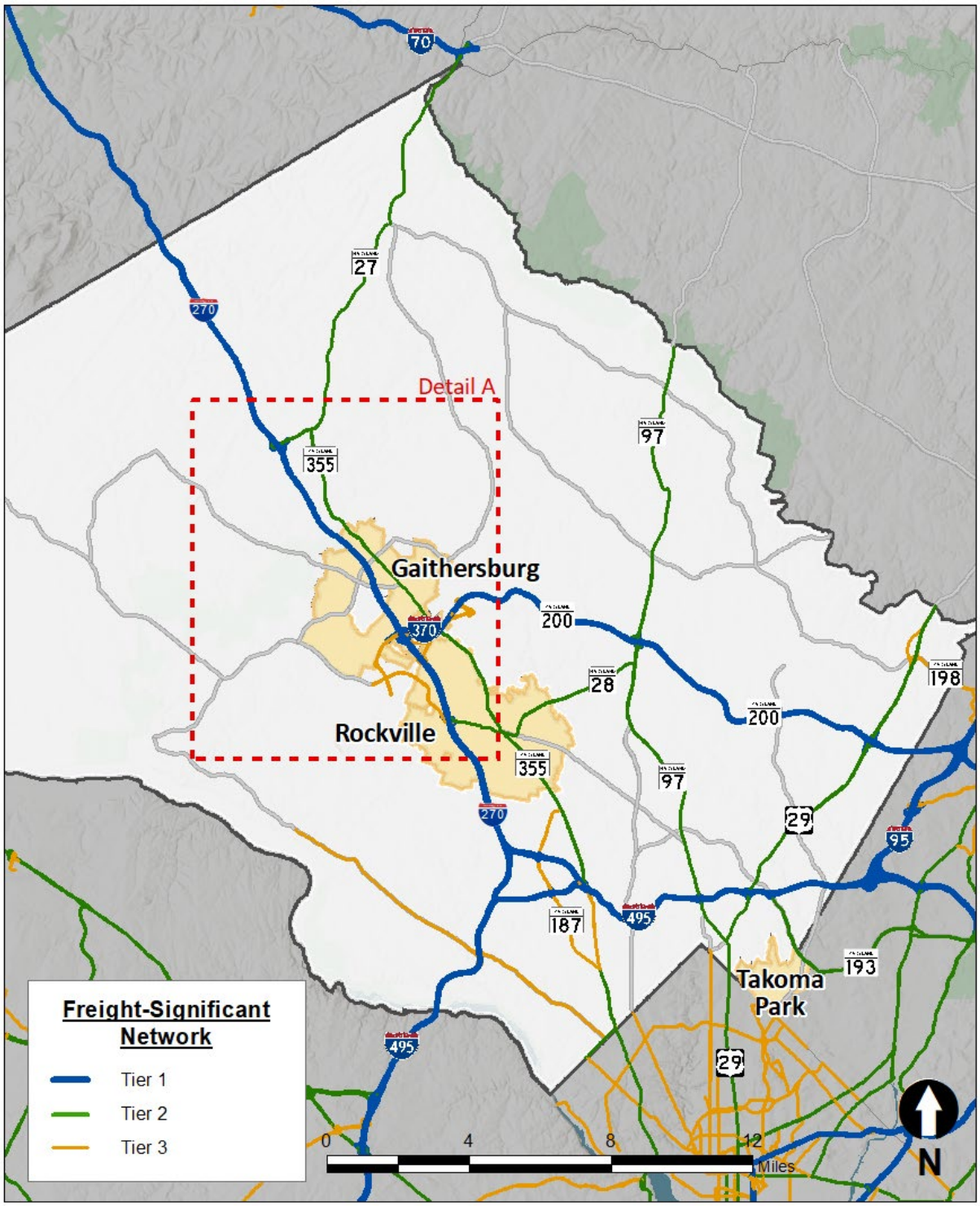


Figure 36: Montgomery County Detail A

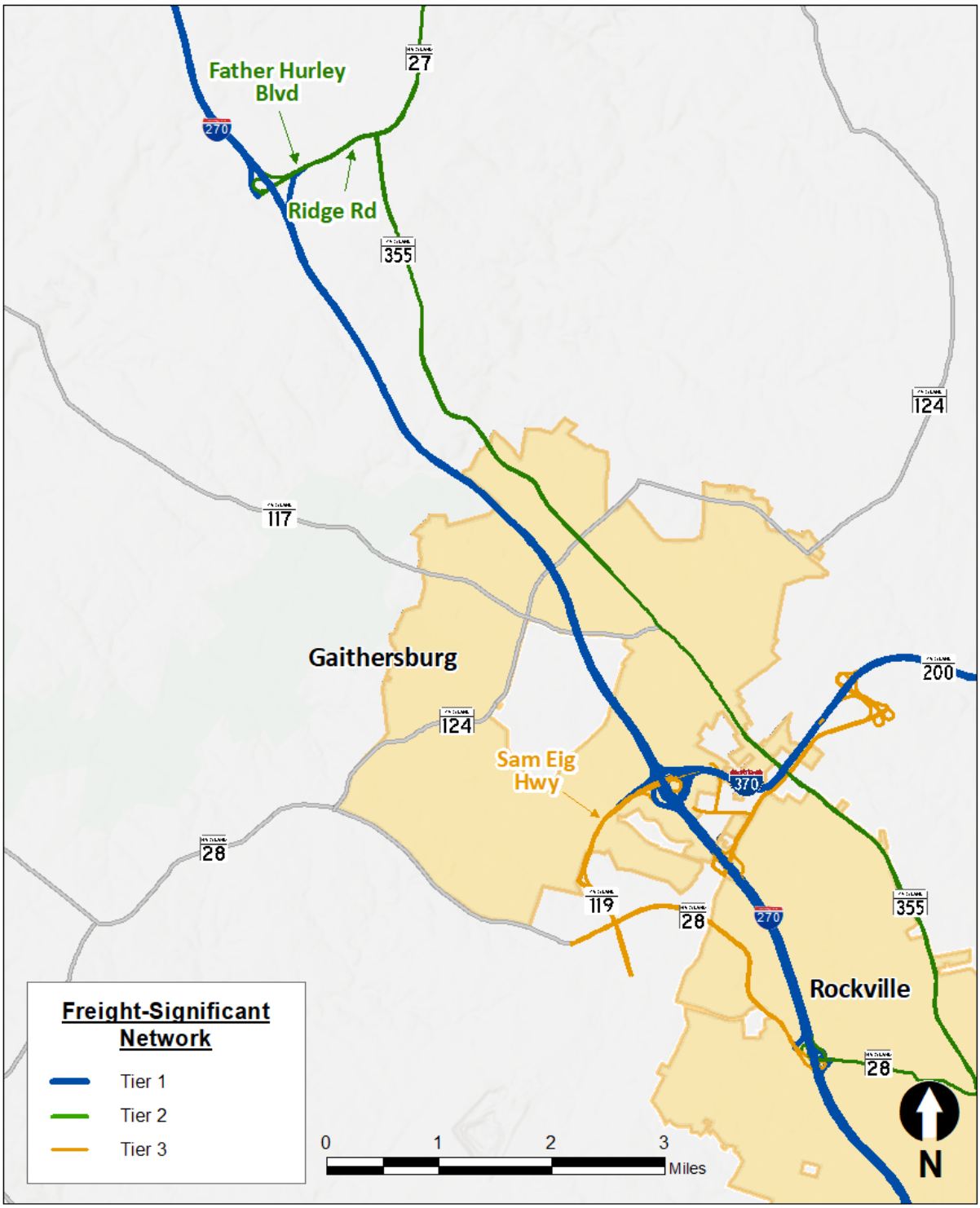


Figure 37: Regional Freight-Significant Network - Prince George's County Area

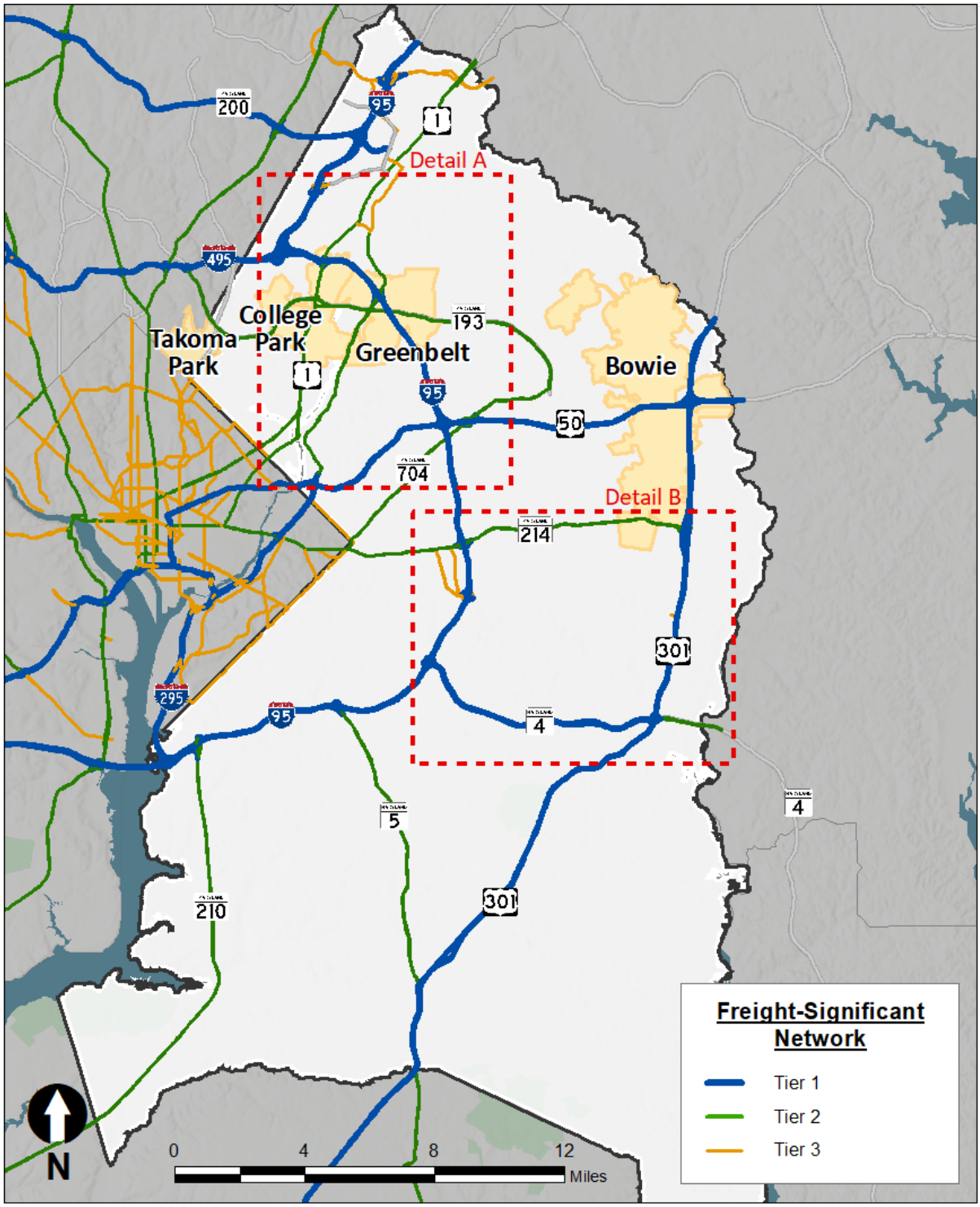


Figure 38: Prince George's County Detail A

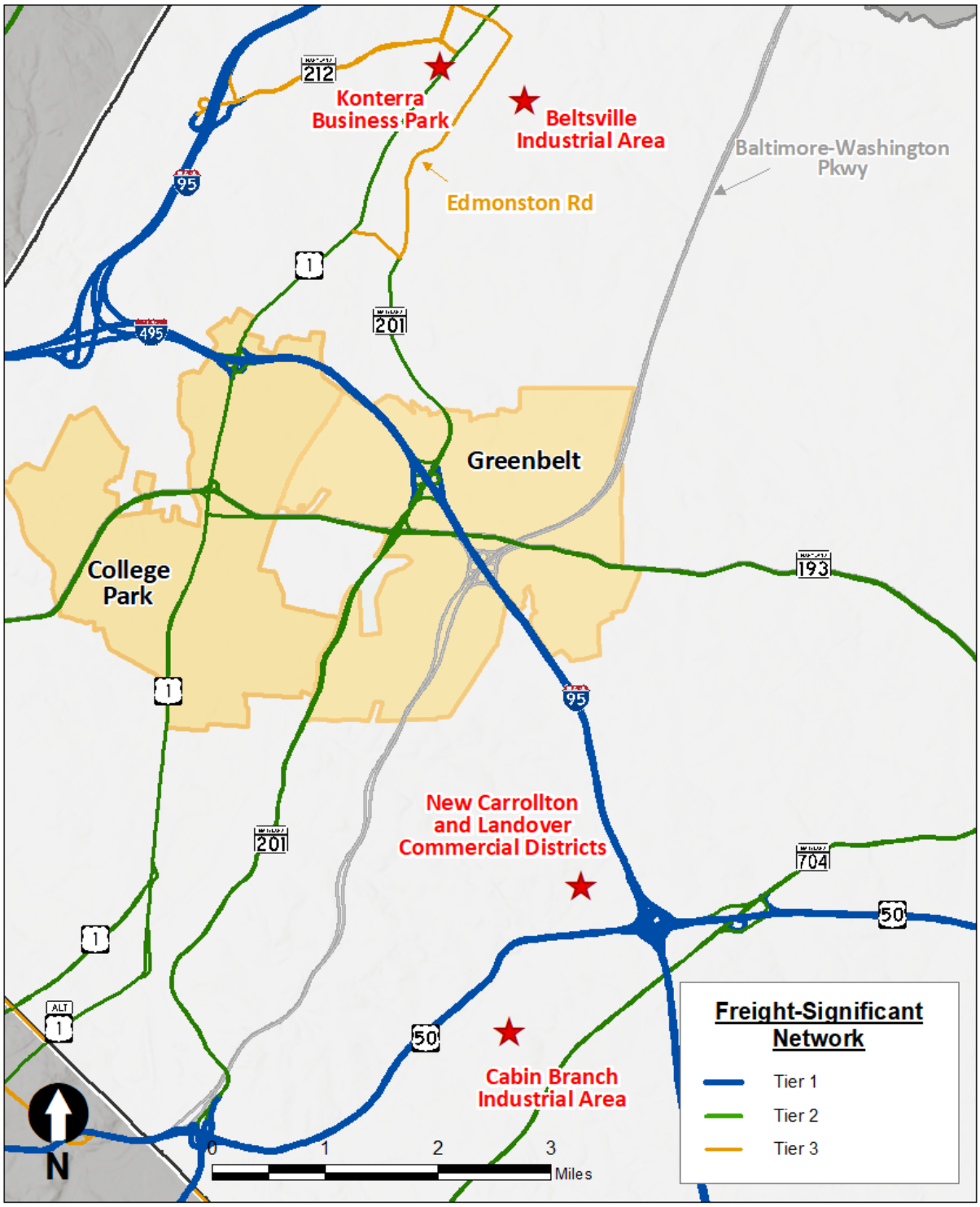


Figure 39: Prince George's County Detail B

Figure 40: Regional Freight-Significant Network - Charles County

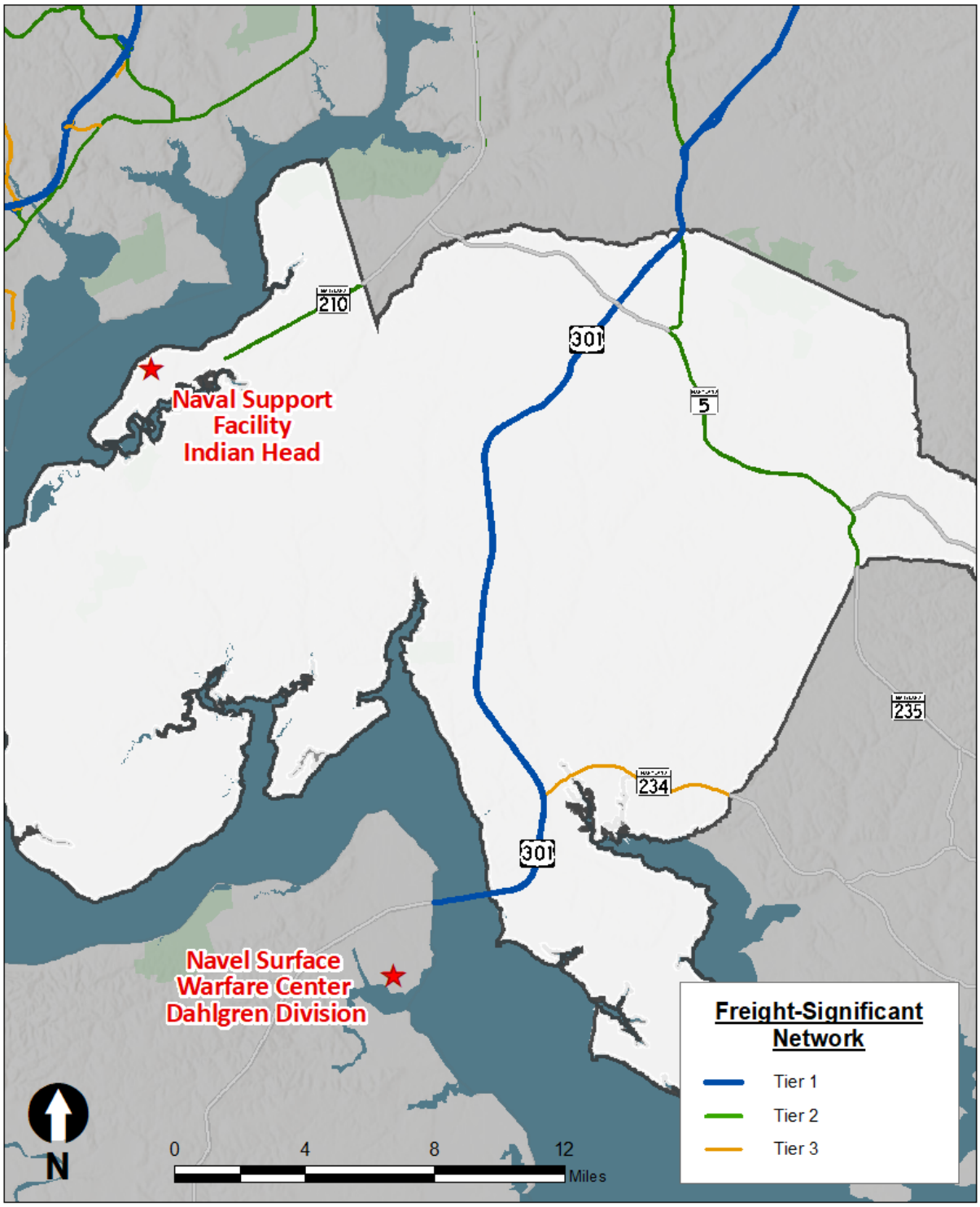


Figure 41: Regional Freight-Significant Network - District of Columbia

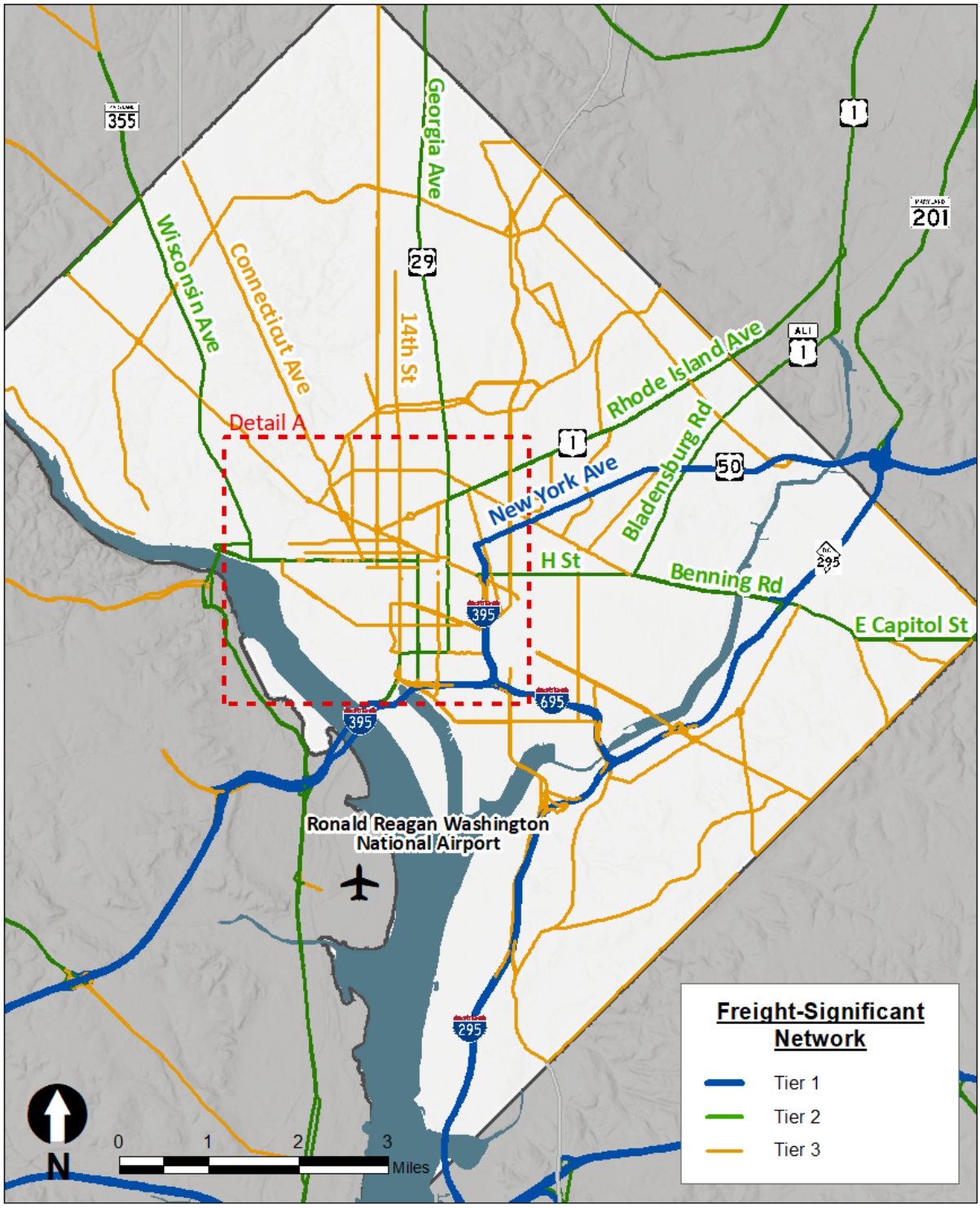


Figure 42: District of Columbia Detail A

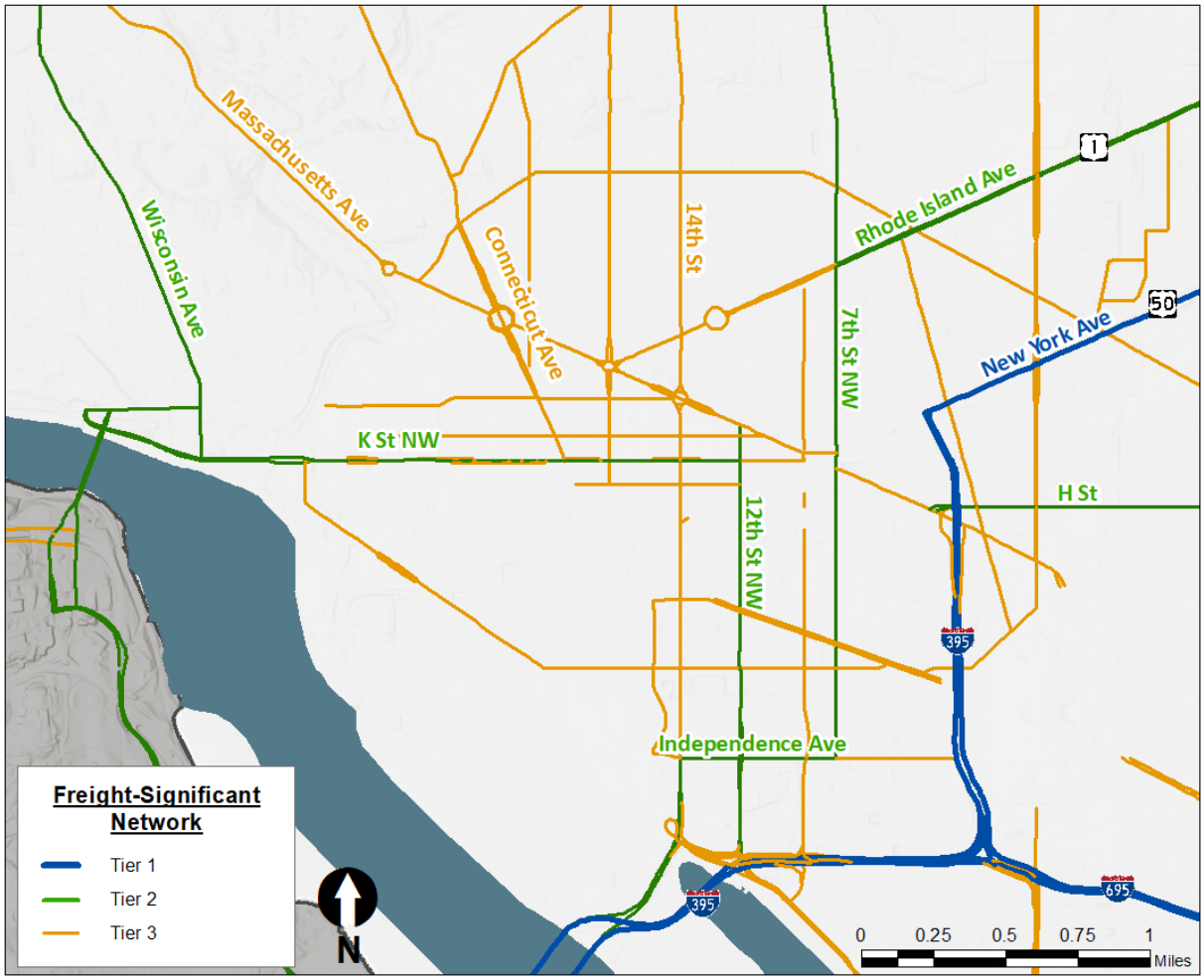


Figure 43: Regional Freight-Significant Network - Loudoun County Area

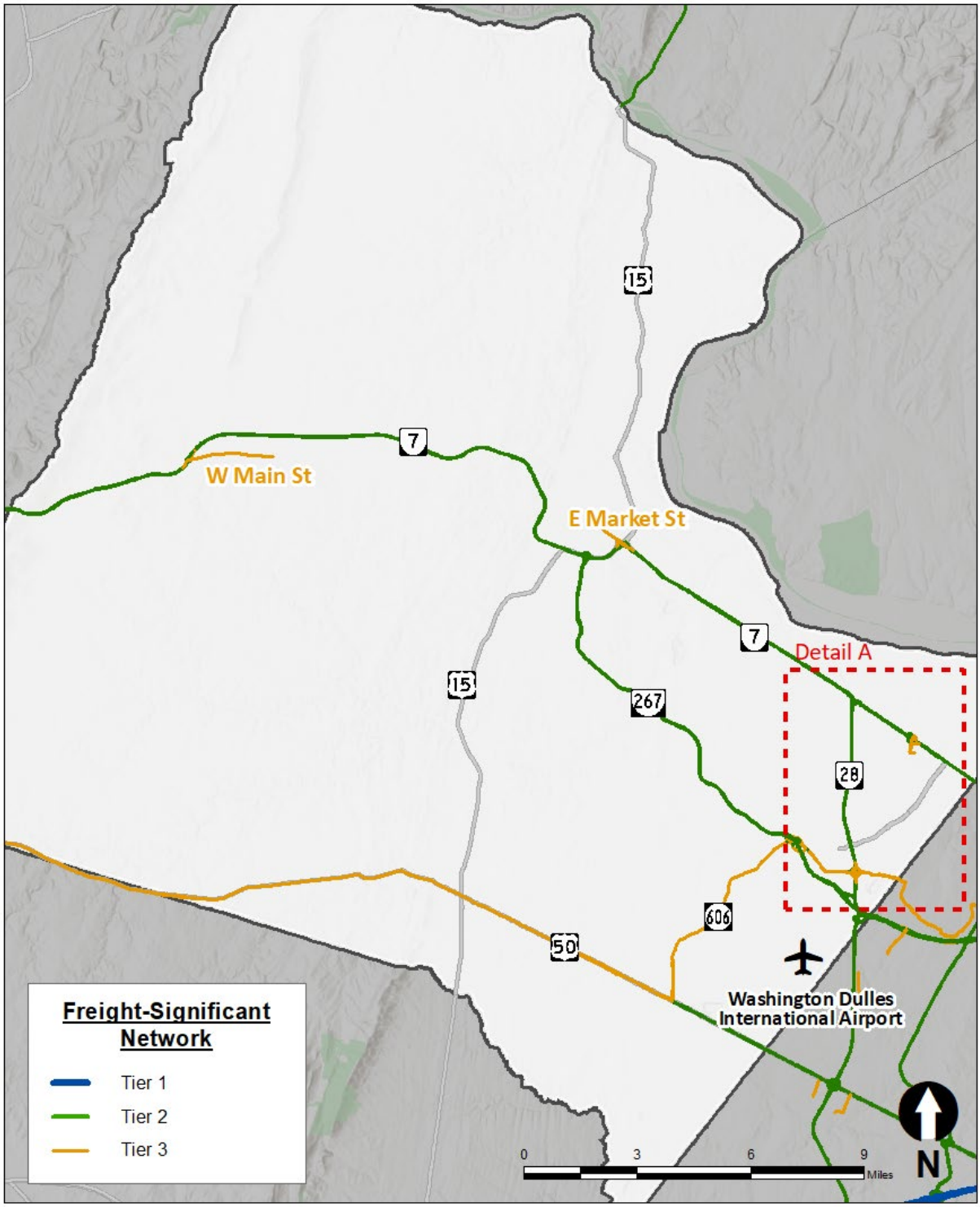


Figure 44: Loudoun County Detail A

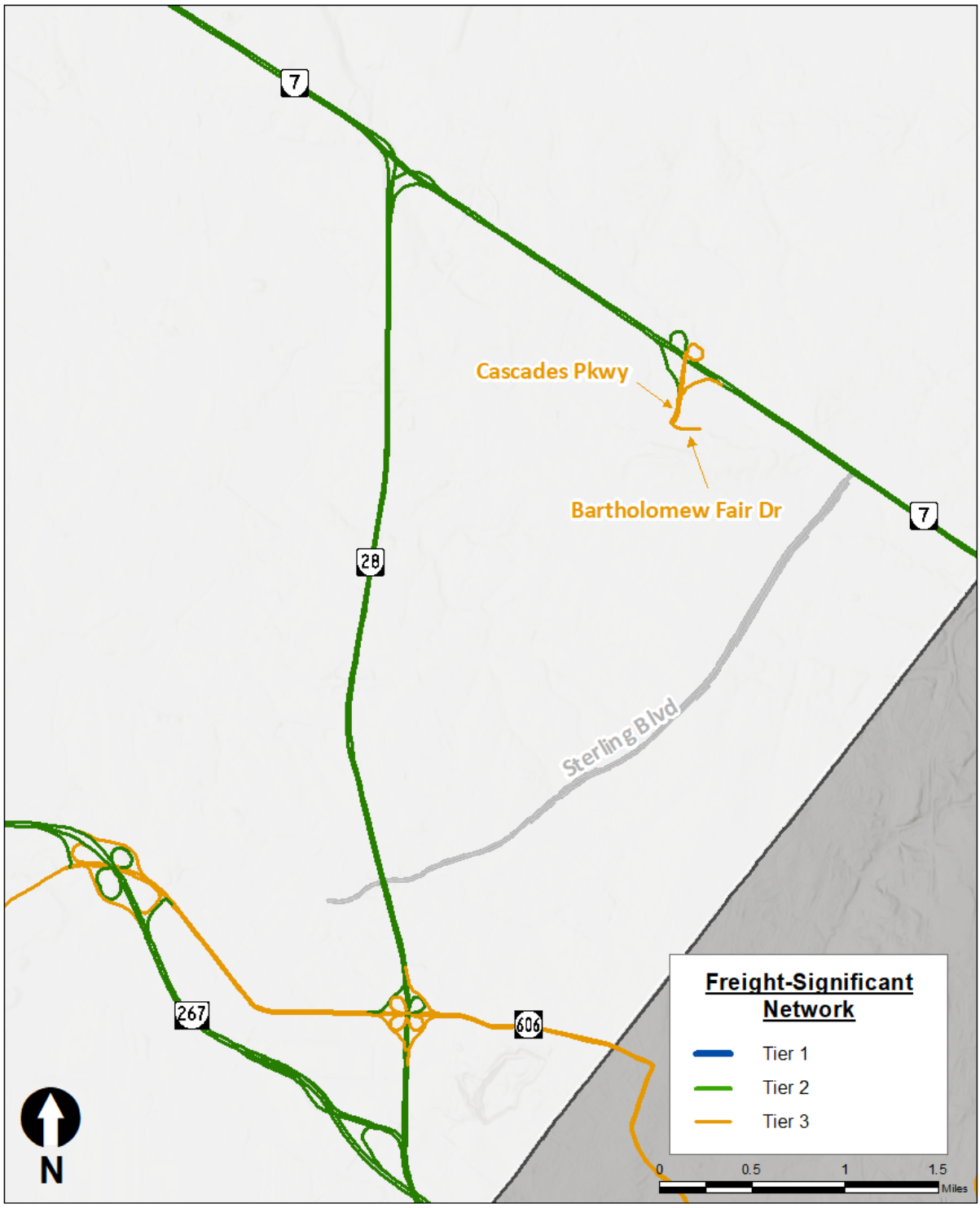


Figure 45: Regional Freight-Significant Network - Fairfax County Area

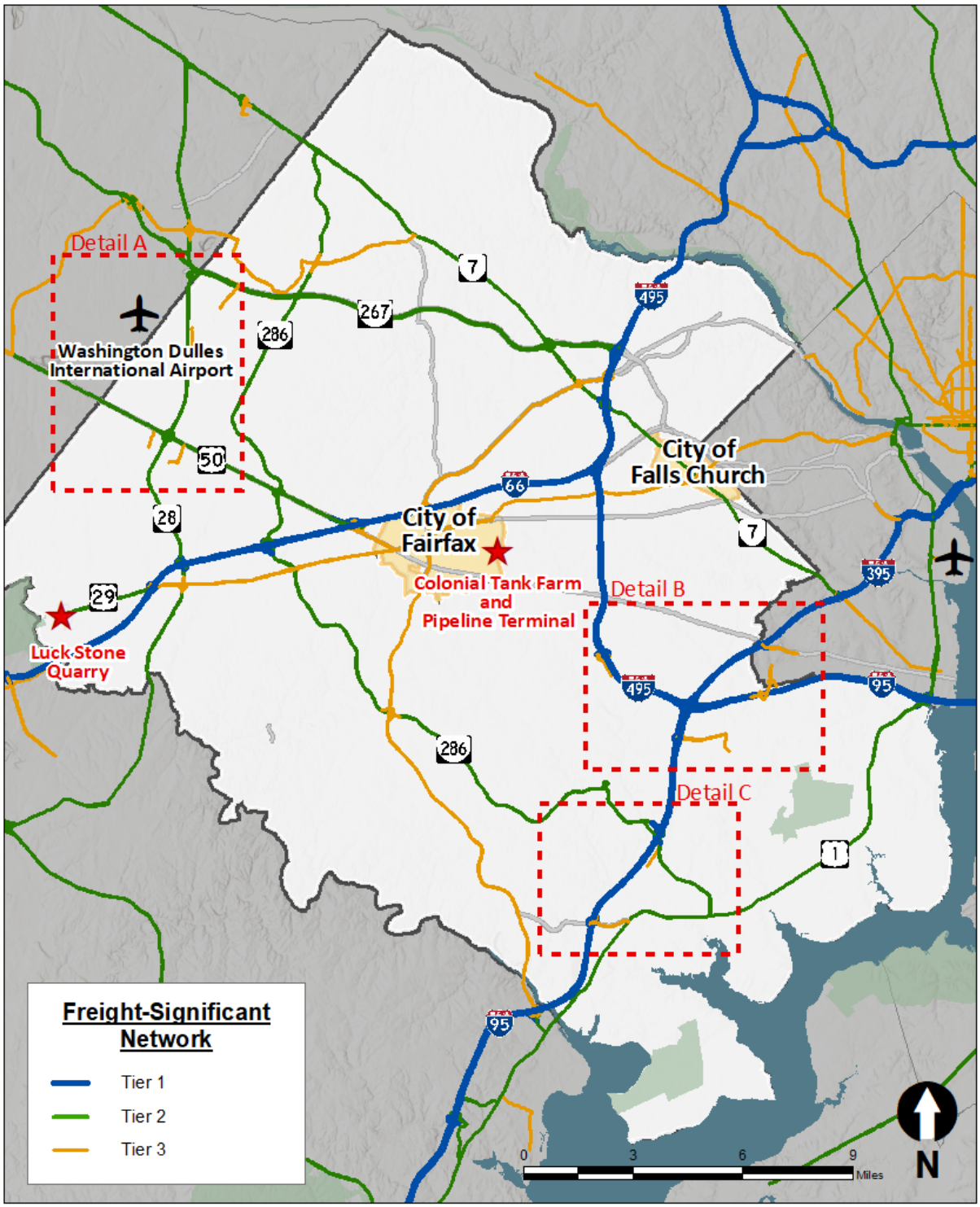


Figure 46: Fairfax County Detail A

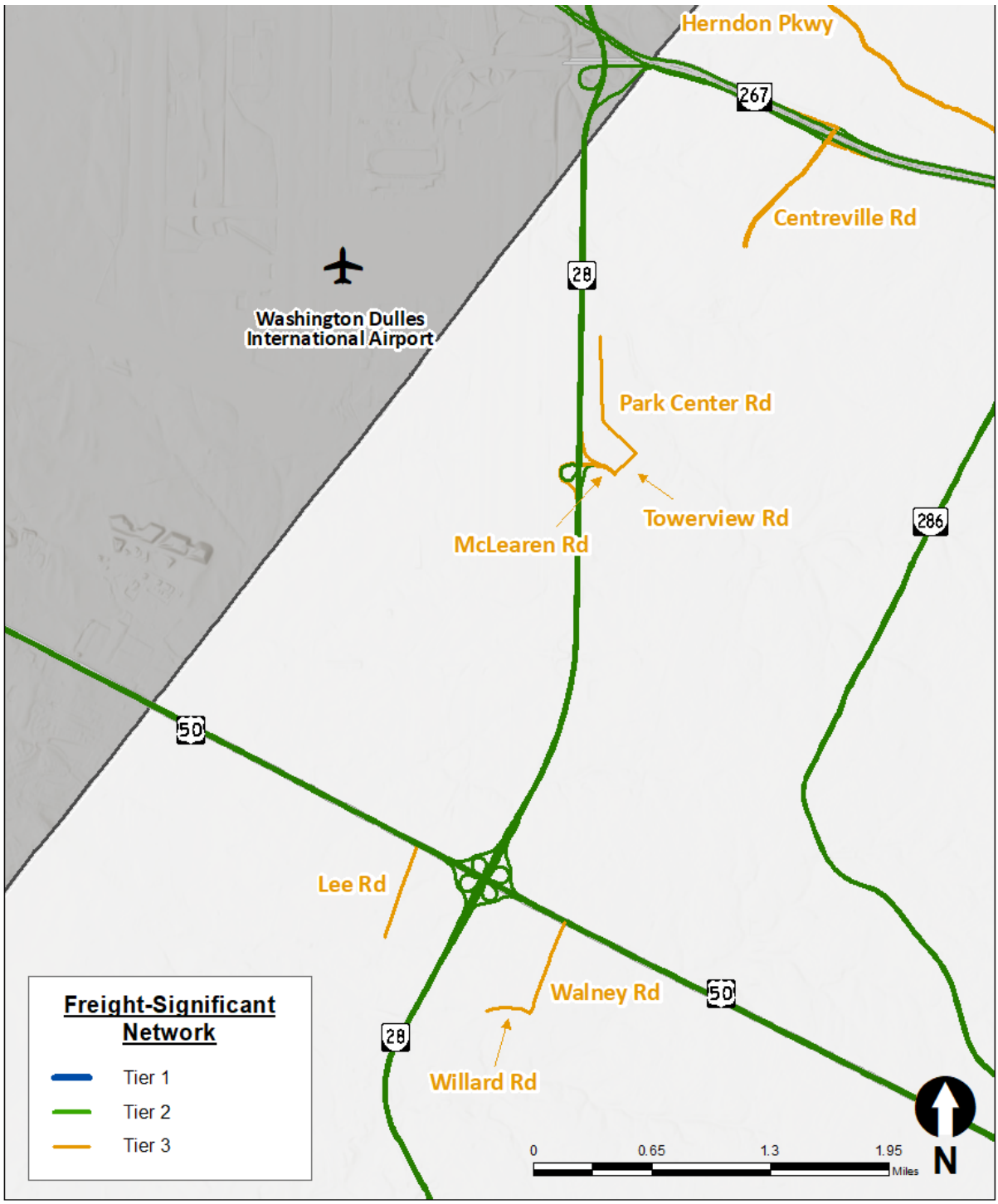


Figure 47: Fairfax County Detail B

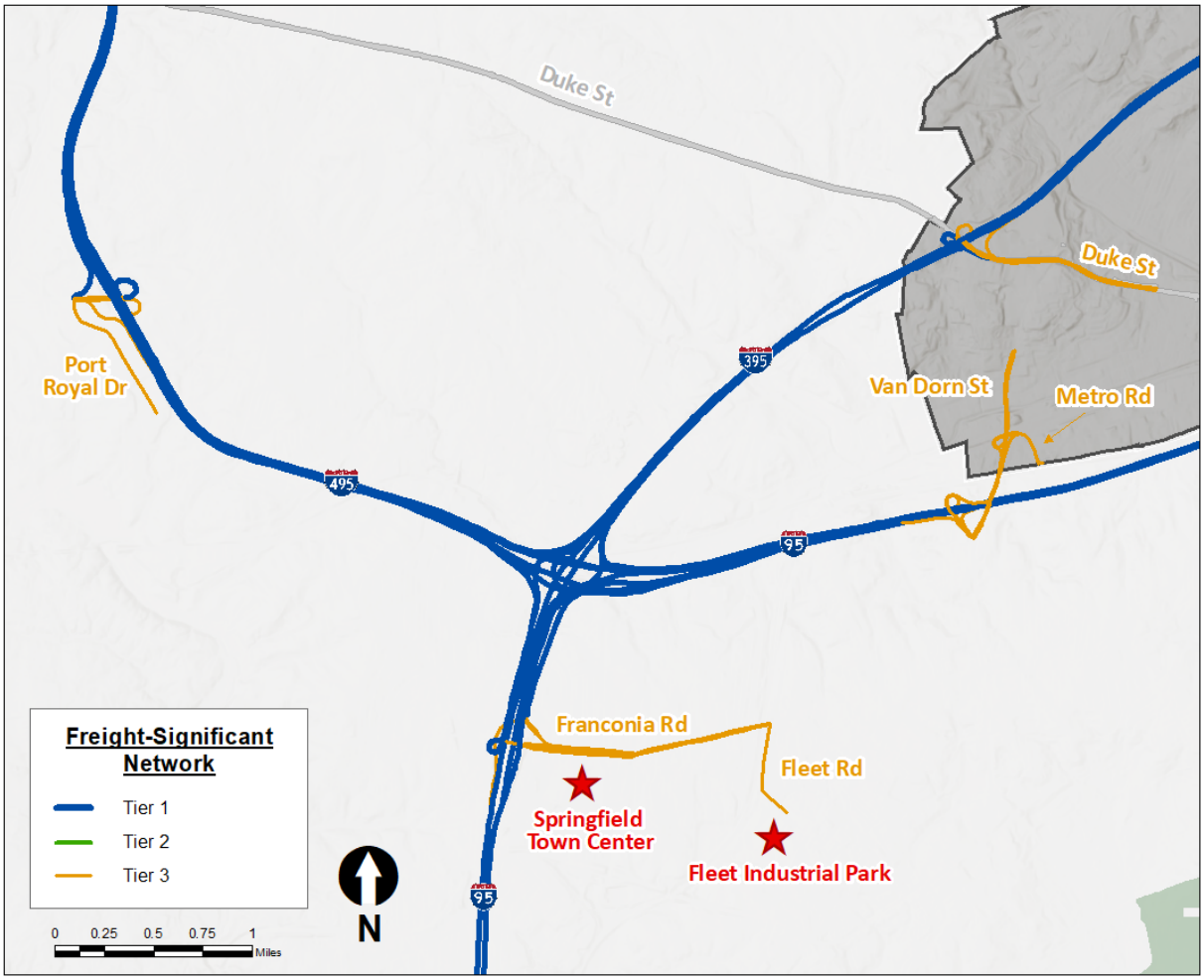


Figure 48: Fairfax County Detail C

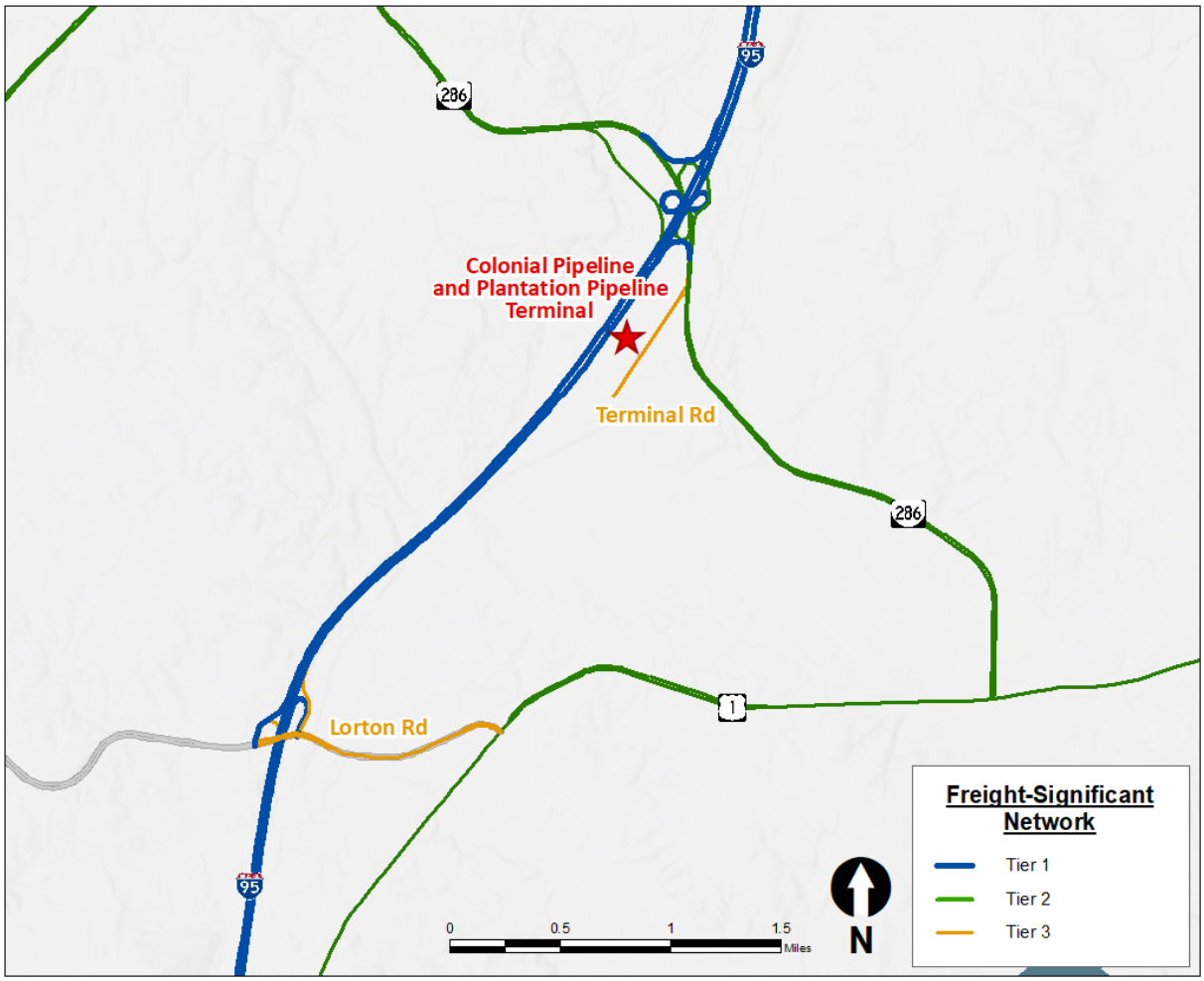


Figure 49: Regional Freight-Significant Network - Prince William County Area

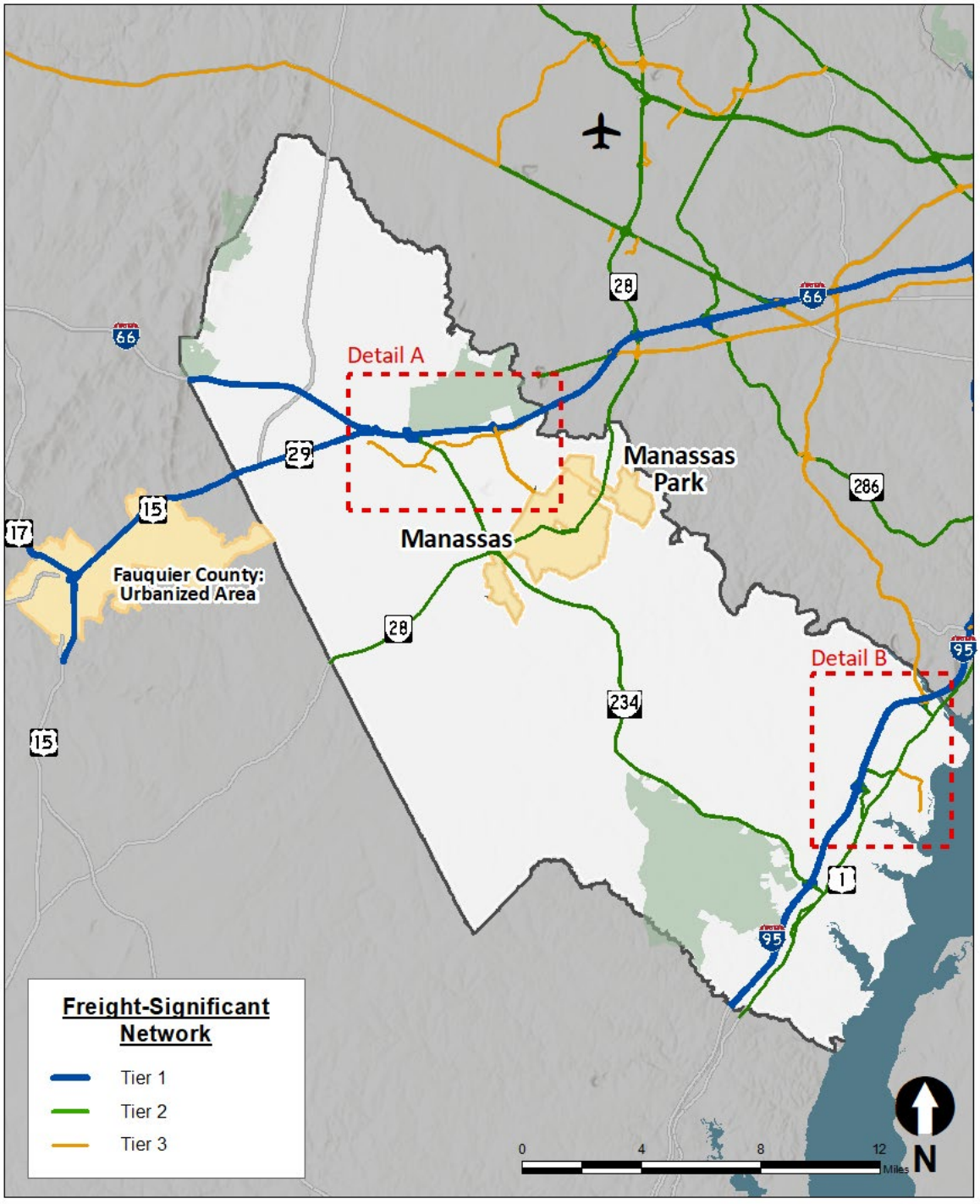


Figure 50: Prince William County Detail A

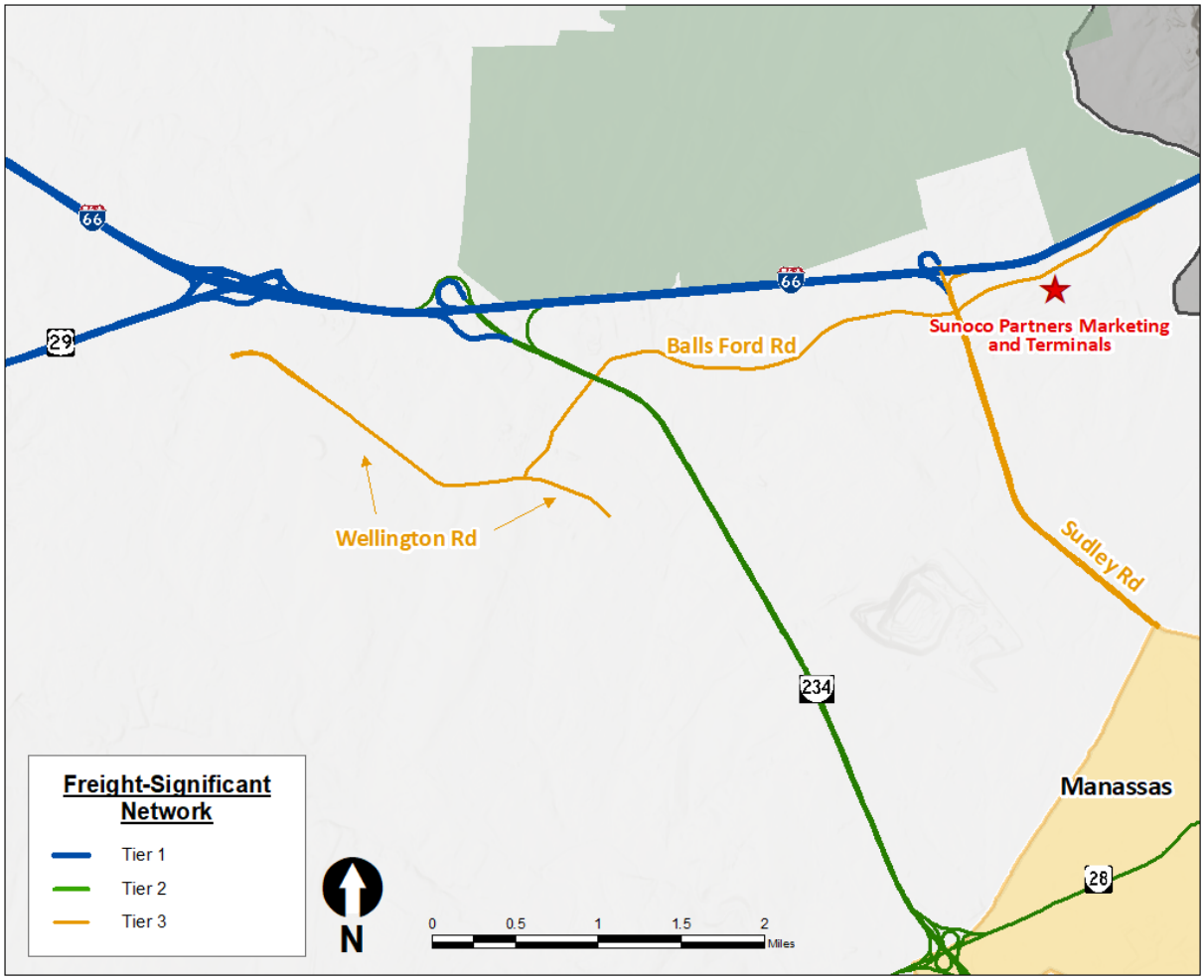


Figure 51: Prince William County Detail B

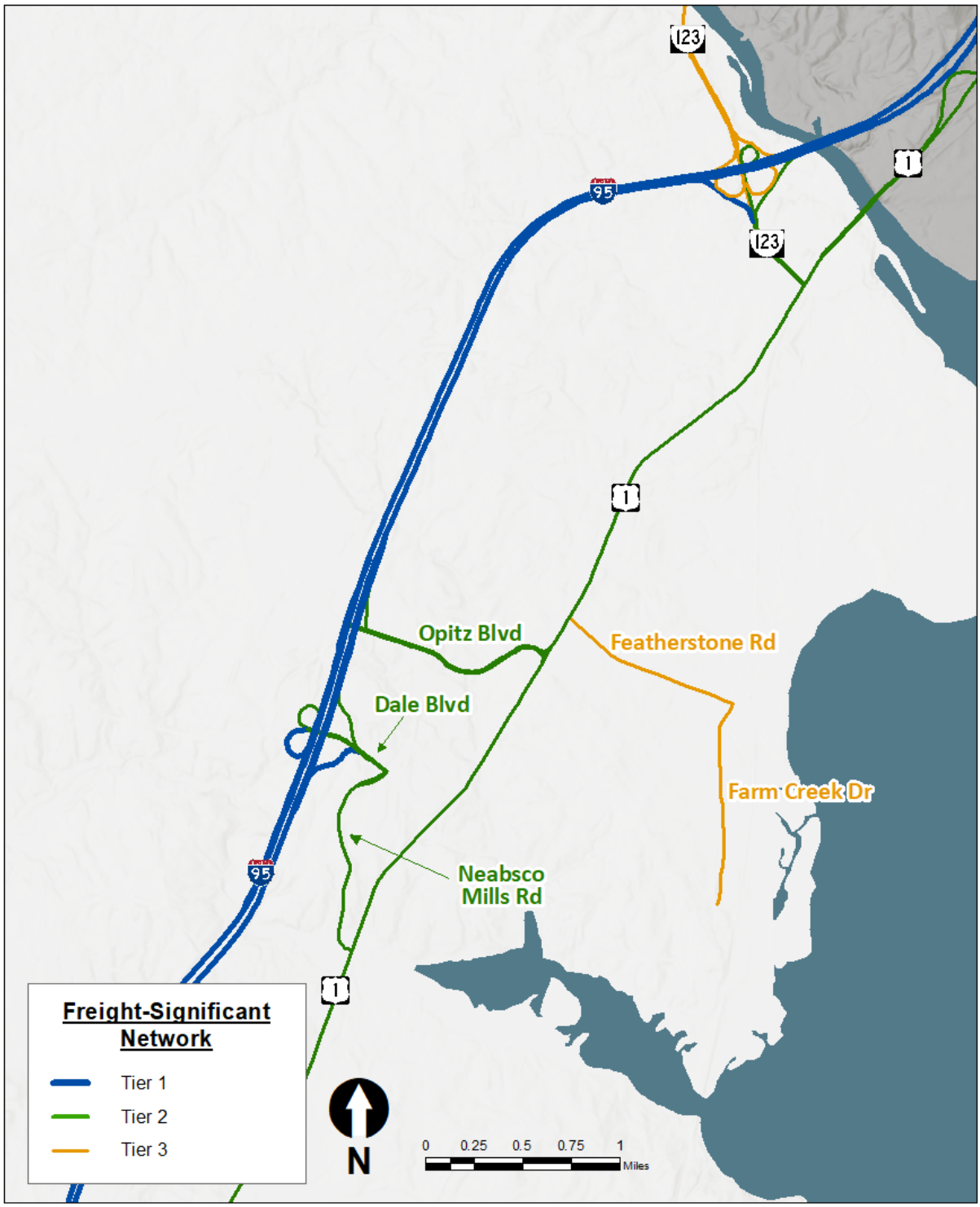


Figure 52: Regional Freight-Significant Network - Arlington County

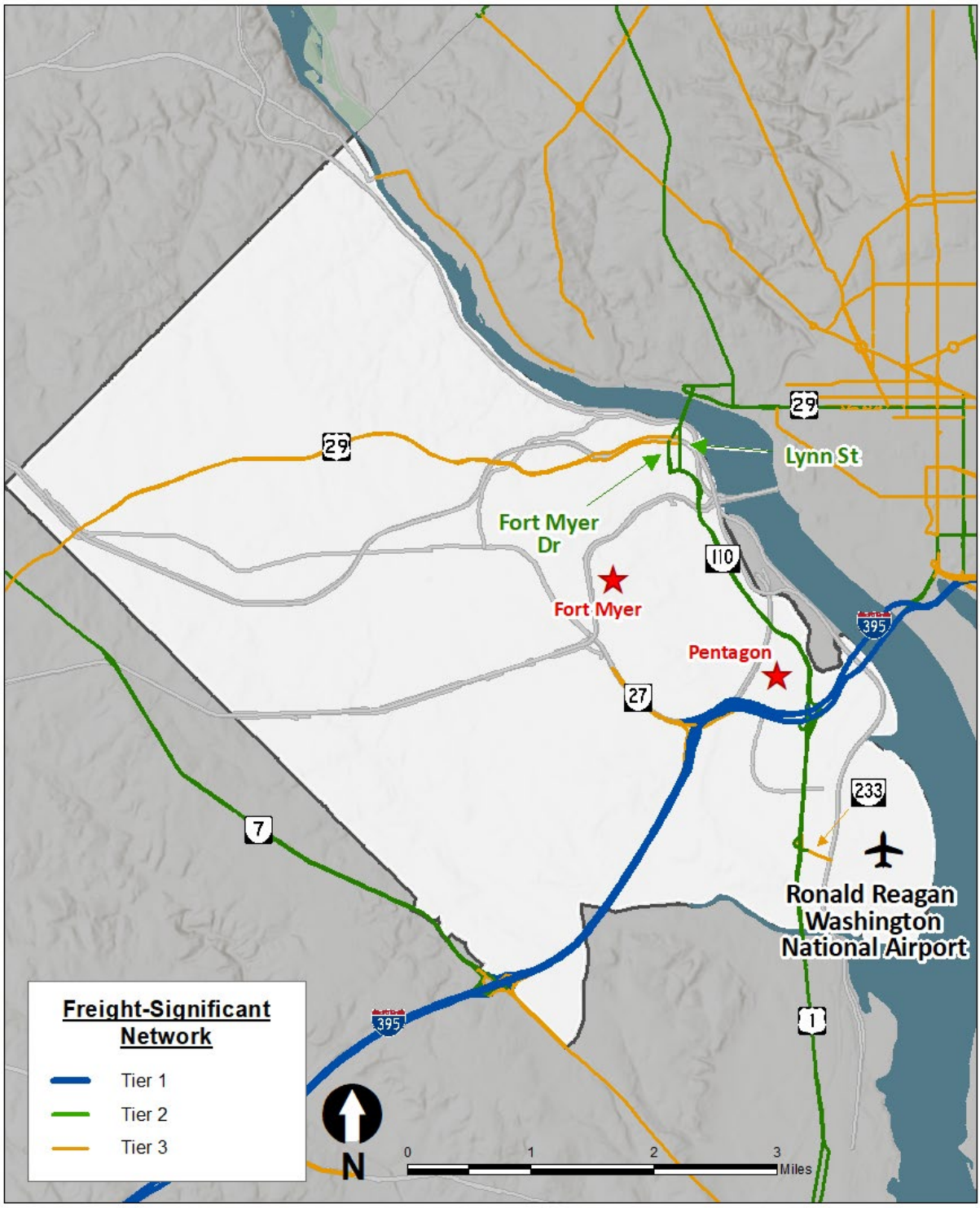
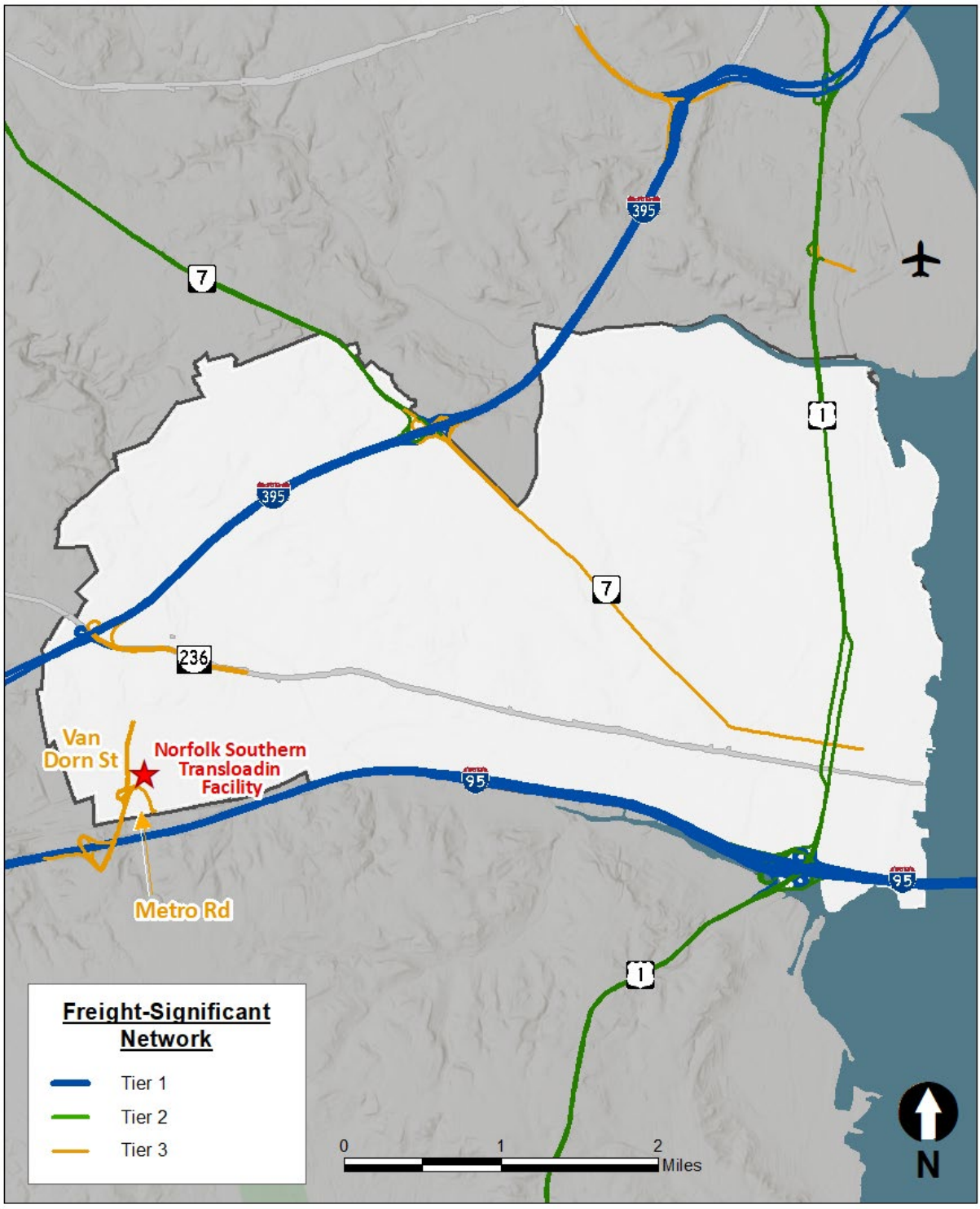


Figure 53: Regional Freight-Significant Network - City of Alexandria



APPENDIX C: FREIGHT ANALYSIS FRAMEWORK

This appendix contains technical information and supplementary materials for the National Capital Region Freight Plan. Relevant sections of the main body of the Freight Plan are referenced directly under each major topic area of this appendix.

C.1 Freight Analysis Framework

This section provides additional detail on the commodity codes and geographic regions used within the Freight Analysis Framework (FAF). It is related to chapter 3 within the main body of the Plan.

C.1.1 FAF COMMODITY TYPES

The FAF dataset defines freight commodities according to the Standard Classification of Transported Goods[42] (SCTG) coding system. To provide concise commodity descriptions in the many tables and figures within this report, the FAF commodity descriptions have been shortened as shown in Table 37 below. Definitions of commodity descriptions have also been included for commodities with vague descriptions and can be found in Table 38. Definition of FAF Commodities. Additional detailed information about the specific types of goods included within each of the FAF commodities is available from the United States Census Bureau.

Table 37: FAF Commodity Descriptions

SCTG Code	FAF Commodity Description	Commodity Description Used in this Report
1	Animals and Fish (live)	Animals and fish (live)
2	Cereal Grains (includes seed)	Cereal grains
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)	Other agricultural products
4	Animal feed, Eggs, Honey, and Other Products of Animal Origin	Animal feed, eggs, honey & other animal products
5	Meat, Poultry, Fish, Seafood, and Their Preparations	Meat, poultry, fish, seafood
6	Milled Grain Products and preparations, and Bakery Products	Milled grain & bakery products
7	Other Prepared Foodstuffs, Fats and Oils	Other prepared foodstuffs
8	Alcoholic Beverages and Denatured Alcohol	Alcoholic beverages
9	Tobacco Products	Tobacco products
10	Monumental or Building Stone	Monumental or building stone
11	Natural Sands	Natural sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)	Gravel and crushed stone

[42] The SCGT coding system was developed by agencies of the United States and Canadian governments to address statistical needs in regard to products transported.

13	Other Non-Metallic Minerals not elsewhere classified	Other non-metallic minerals
14	Metallic Ores and Concentrates	Metallic ores & concentrates
15	Coal	Coal
16	Crude Petroleum	Crude petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)	Gasoline, aviation fuel, ethanol
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)	Fuel oils
19	Other Coal and Petroleum Products, not elsewhere classified	Other petroleum products
20	Basic Chemicals	Basic chemicals
21	Pharmaceutical Products	Pharmaceutical products
22	Fertilizers	Fertilizers
23	Other Chemical Products and Preparations	Other chemical products
24	Plastics and Rubber	Plastics & rubber
25	Logs and Other Wood in the Rough	Logs & wood in the rough
26	Wood Products	Wood products
27	Pulp, Newsprint, Paper, and Paperboard	Pulp/newsprint/paper/paperboard
28	Paper or Paperboard Articles	Paper & paperboard articles
29	Printed products	Printed products
30	Textiles, Leather, and Articles of Textiles or Leather	Textiles, leather, & their articles
31	Non-Metallic Mineral Products	Non-metallic mineral products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes	Base metal
33	Articles of Base Metal	Articles of base metal
34	Machinery	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment	Electronic and electrical equipment
36	Motorized and Other Vehicles (includes parts)	Motorized and other vehicles
37	Transportation Equipment, not elsewhere classified	Transportation equipment
38	Precision Instruments and Apparatus	Precision instruments and apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, and Illuminated Signs	Furniture, mattresses, lamps, signs
40	Miscellaneous Manufactured Products	Miscellaneous manufactured products
41	Waste and Scrap (excludes agriculture or food)	Waste and scrap
43	Mixed Freight	Mixed freight
99	Commodity Unknown	Unknown

Source: United States Census Bureau 2017 Commodity Flow Survey Standard Classification of Transported Goods (SCTG)

Table 38. Definition of FAF Commodities

SCTG Code	FAF Commodity Description	Definition of the FAF Commodity
7	Other Prepared Foodstuffs, Fats and Oils	Dairy products (excludes beverages and preparations of milk); Processed or prepared vegetable, fruit, or nuts (excludes dried or milled, and juices); Coffee, tea, and spices (excludes unprocessed coffee and unfermented tea); Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waves, and flours and meals of oil seeds; Sugars confectionery in solid form, sugar syrups not containing added flavoring or coloring matter, and cocoa and cocoa preparation; Confectionery, cocoa, and cocoa preparation; Other edible preparations not elsewhere classified and vinegar; Non-alcoholic beverages not elsewhere classified, and ice
13	Other Non-Metallic Minerals not elsewhere classified	Table salt; Other salt; Natural calcium phosphates; Dolomite; Sulfur; Kalinic clays; Other clays; Pumice stone; Gypsum and anhydrite; Asbestos; Leucite; Other non-metallic minerals.
19	Other Coal and Petroleum Products, not elsewhere classified	Lubricating oils and greases; Other refined petroleum oils and oils obtained from bituminous minerals; Gaseous hydrocarbons such as liquefied natural gas, propane liquefied, other liquefied gaseous hydrocarbons.
23	Other Chemical Products and Preparations	Paints and varnishes; Vegetable tanning extracts or coloring matter; Inks; Essential oils, resinoids, and mixtures of odoriferous substances used as raw materials; Perfumery, cosmetic, or toilet preparations; Soap, organic surface-active agents, cleaning preparations, polishes and creams, and scouring preparations; Photographic or cinematographic film, plates, paper, paperboard, or textiles; Insecticides, rodenticides, fungicides, herbicides, anti-

		sprouting products, plant-growth regulators, disinfectants, and similar products; Glues and prepared glues Prepared explosives, pyrotechnic products; Activated carbon, activated natural mineral products, and animal black; Anti-knock preparations, oxidation or gum inhibitors, viscosity improvers, anti-corrosive preparations, and other prepared additives for mineral oils such as gasoline; hydraulic brake and transmission fluids containing none or less than 70 percent by weight of petroleum or bituminous oils; anti-freezing preparations; and prepared de-icing fluids; Industrial monocarboxylic fatty acids and acid oils from refining Water-treatment preparations; Other chemical products and preparations not elsewhere classified
40	Miscellaneous Manufactured Products	Arms and ammunition; Toys and sporting equipment; Clocks and watches; Prefabricated buildings; Precious metal forms and shapes; Writing or drawing instruments and inked ribbons and pads; Pearls, precious or semi-precious stones; Costume jewelry; Musical instruments; Brooms, brushes, mechanical floor-sweepers, mops, feather dusters and paint pads or rollers; Sewing and knitting needles; Works of art, collections, and antiques; Other miscellaneous manufactured products, not elsewhere classified
43	Mixed Freight	Items (includes food) for grocery and convenience stores; Supplies and food for restaurants and fast food chains; Hardware or plumbing supplies; Office supplies; Miscellaneous

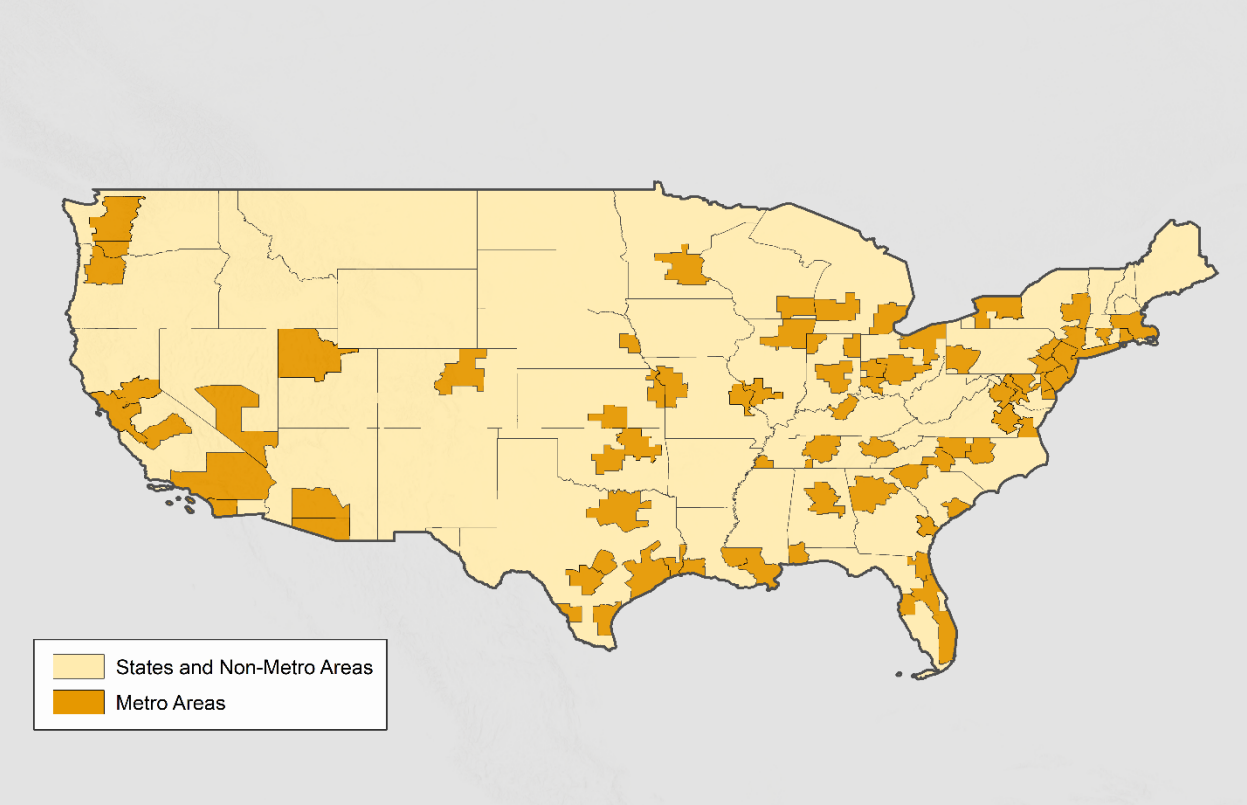
Source: United States Census Bureau 2017 Commodity Flow Survey Standard Classification of Transported Goods (SCTG)

C.1.2 FAF GEOGRAPHIES

The FAF dataset is organized into 123 domestic FAF regions (see Figure 53). Each of these FAF regions falls into one of the following categories:

- Census defined Consolidated Statistical Region (CMA)
- Census defined Metropolitan Statistical Area (MSA)
- The rest of a state (everything in a state that is not included in a CMA or MSA)
- An entire state (if that state does not include a CMA or MSA)

Figure 54: FAF Regions



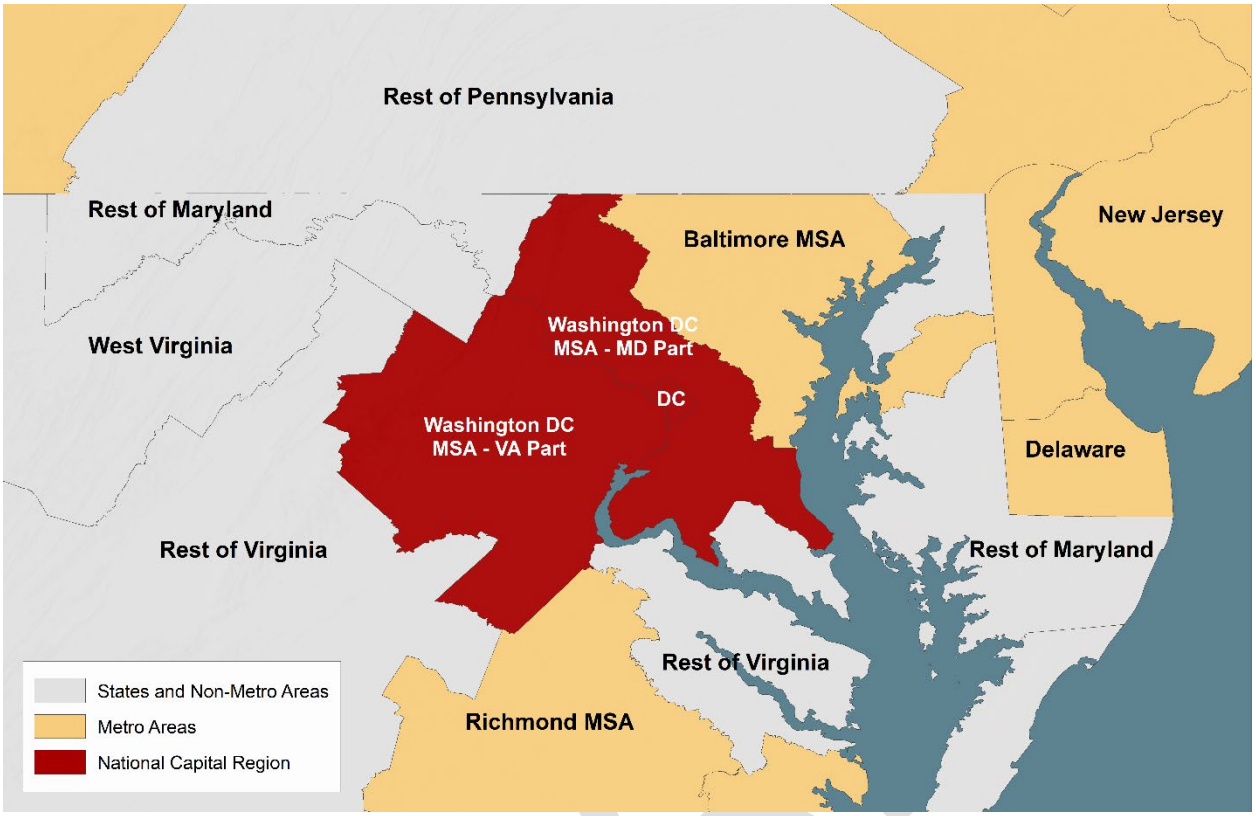
Source: Federal Highway Administration Freight Analysis Framework and Metropolitan Washington Council of Governments

For purposes of FAF analysis, the National Capital Region is an amalgamation of three FAF regions (see Figure 54):

- Washington, DC MSA – District of Columbia part
- Washington, DC MSA – Maryland part
- Washington, DC MSA – Virginia part

While the geography of these combined FAF regions does not precisely match the boundaries of the National Capital Region's planning area, it is sufficiently proximate to provide useful information.

Figure 55: FAF Regions Comprising the National Capital Region



Source: Federal Highway Administration Freight Analysis Framework and Metropolitan Washington Council of Governments

Endnotes

[1]https://www.mwcog.org/documents/2022/06/15/visualize-2045-a-long-range-transportation-plan-for-the-national-capital-region-featured-publications-tpb-visualize-2045/
[2] https://parkdc-dcgis.hub.arcgis.com/documents/DCGIS::parkdc-executive-summary-final-20190109/explore
[3] https://ddot.dc.gov/release/ddot-curbflow-research-project-finds-high-demand-pickup-dropoff-zones
[4] https://www.fhwa.dot.gov/fastact/
[5] https://ddot.dc.gov/sites/default/files/dc/sites/ddot/page_content/attachments/DC%20SRP%20FinalReport.pdf
[6] https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/DistrictFreightPlan2020Addendum.pdf
[7] https://movedc-dcgis.hub.arcgis.com/
[8] https://planning.dc.gov/comprehensive-plan
[9] https://mdot.maryland.gov/OPCP/MDOTTruckParkingStudyWeb.pdf
[10] https://www.mdot.maryland.gov/OPCP/MDOT_State_Freight_Complete_2022_12_06.pdf
[11] https://www.mdot.maryland.gov/OPCP/Maryland_State_Rail_Plan_FINAL_Approved_November_2022.pdf
[12] https://www.drpt.virginia.gov/studies-and-reports/2017-virginia-statewide-rail-plan/
[13] https://www.vtrans.org/resources/VTrans2040-Freight-Element.pdf
[14] https://vtrans.org/resources/2022_VTrans_Freight_Plans_01_13_2022.pdf
[15] https://storymaps.arcgis.com/collections/f83c1618157b45388bc794dde93d0f81
[16] https://vtrans.org/resources/VDOT_2022_Truck_Parking_Study.pdf
[17] https://www.virginiadot.org/projects/resources/virginiatruckparkingstudy_finalreport_july2015.pdf
[18] https://www.mdot.maryland.gov/tso/pages/Index.aspx?PageId=80
[19] https://www.virginiadot.org/projects/resources/virginiatruckparkingstudy_finalreport_july2015.pdf
[20] https://www.mdot.maryland.gov/OPCP/MDOTTruckParkingStudyWeb.pdf
[21] https://www.novaregion.org/1141/Commuter-Ferry-Service.
[22] Through share analysis performed by TPB in-house consultant staff in May 2023, based on 2020 FAF data.
[23] Measured in year 2000 dollars. See U.S. Bureau of Transportation web site http://www.rita.dot.gov/bts/programs/freight_transportation/html/freight_and_growth.html accessed June 6, 2015.
[24] https://ops.fhwa.dot.gov/freight/intermodal/freight_tech_story/freight_tech_story.htm
[25] EPA Smartway. “Improve you Performance”: https://www.epa.gov/smartway/smartway-logistics-company-partner-tools-and-resources#improve
[26] https://rosap.ntl.bts.gov/view/dot/65990
[27] 2022 State of the Port: https://www.flipsnack.com/portofvirginia/2022-state-of-the-port-presentation/full-view.html
[28] Visualize 2045: A Long Range Transportation Plan for the National Capital Region. Viz2045-rp-Final-Report-Approved-20220615.pdf
[29] 2017/18 Regional Travel Survey; mwcog.org/transportation/data-and-tools/household-travel-survey/
[30] 2017/18 Regional Travel Survey; mwcog.org/transportation/data-and-tools/household-travel-survey/
[31] ATRI Top 100 Truck Bottlenecks: https://truckingresearch.org/2023/02/07/top-100-truck-bottlenecks-2023/
[32] https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/all_corridors/
[33] https://www.mwcog.org/assets/1/6/EEA_2022_web.pdf
[34] https://ops.fhwa.dot.gov/publications/fhwahop12006/sec_2.htm
[35] https://scag.ca.gov/socal-goods-movement-communities-opportunities-assessment
[36] Though Visualize 2045 indicated a completion date of 2022 for this project, as of this writing the project has not been constructed.
[37] The Mega Grant Program | US Department of Transportation, https://www.transportation.gov/grants/mega-grant-program
[38] The INFRA Grant Program | US Department of Transportation, https://www.transportation.gov/grants/infra-grant-program