Pathways to the Future
TRANSPORTATION

Technical Report C:
State of Transportation Report

Long Range Transportation Plan 2050



Richmond Regional Transportation Planning Organization
POWERED BY PlanRVA

--- THIS PAGE INTENTIONALLY LEFT BLANK ---

TITLE

State of Transportation Report

AUTHORS

Dorian Allen
Sulabh Aryal
Myles Busching
Sarah Stewart
Ellen Cook
Phil Riggan
Dan Motta
Kerry Wagenhauser
Will Heller
Ken Lanz
Sarin Adhikari
Elizabeth Greenwell

PROJECT MANAGER

Sulabh Aryal

DEPUTY PROJECT MANAGER

Dorian Allen

ABSTRACT

The Richmond Regional Transportation Planning Organization (RRTPO) is in the process of updating the regional Long-Range Transportation Plan (LRTP) to the horizon year 2050. As part of this process, RRTPO staff conducted a multimodal transportation existing conditions analysis, culminating in the region's 2024 State of Transportation Report.

The purpose of this document is to assess the current performance, connectivity, and accessibility of regional transportation networks across all modes, including roadways, transit, bicycle, pedestrian, freight, and emerging mobility services. This analysis serves as a foundational component of the region's long-range transportation planning efforts, providing data-driven insights into current travel patterns, infrastructure conditions, safety concerns, and equity considerations.

This report is produced as part of the Long-Range Transportation Plan Multimodal Needs Assessment which includes elements from Technical Report B: Richmond Regional Structural Inventory & Assessment Report 2024 and Technical Report D: Congestion Management Process Report 2024.

Richmond Regional Transportation Planning Organization
POWERED BY PlanRVA

ACKNOWLEDGEMENT

Pathways to the Future: Transportation 2050 was prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration, Virginia Department of Transportation, and the Virginia Department of Rail and Public Transportation. This report also represents the collective work of state, regional, local and special interest representatives of the RRTPO 2050 Long-Range Transportation Plan Advisory Workgroup.

DISCLAIMER

The contents of this report do not necessarily reflect the official views or policies of the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Virginia Department of Rail and Public Transportation (VDRPT) or the Virginia Department of Transportation (VDOT). This report does not constitute a standard, specification, or regulation. PlanRVA and RRTPO are responsible for the facts and accuracy of the data presented herein.

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government, the Commonwealth of Virginia, PlanRVA and the RRTPO member organizations assume no liability for the contents or use thereof.

NONDISCRIMINATION

PlanRVA and the RRTPO fully comply with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. PlanRVA, on behalf of the RRTPO, will strive to provide reasonable accommodation and services for people who require special assistance to participate in this public involvement opportunity. For more information on meeting accessibility, or to obtain a Title VI Complaint Form, see PlanRVA.org/TitleVI or call the Title VI Coordinator at 804- 323-2033.

NO DISCRIMINACIÓN

Aviso de Título VI abreviado al público: RRTPO cumple plenamente con Título VI de la ley de Derechos Civiles de 1964 y con estatutos relacionados en todas programas y actividades. El RRTPO se esforzará por proporcionar alojamiento y servicios razonables para las personas que requieren asistencia especial para participar en esta oportunidad de participación pública. Para más información sobre accesibilidad de la reunión o para obtener los documentos de reclamación de Título VI, por favor visita https://planrva.org/TitleVI o llama el Coordinador del Título VI en 804-323-2033.

NOTE PlanRVA is the brand of the legal entity known as Richmond Regional Planning District Commission. RRTPO is the brand of the federally designated Richmond Area Metropolitan Planning Organization.

Contents

Introduction 4

Highways 4

Functional Classification of Roads 4

National Highway System 5

VDOT Highway System and Maintenance 6

CMP 6

Pavement Conditions 9

Toll Roads 11

Roadway Usage 13

Public Transportation 14

Existing Service 14

Ongoing Service Enhancements 16

Demand Management 16

Park-and-Ride/Carpool/Vanpool 16

Active Transportation 18

Passenger Rail 22

Regional Planning Projects, Studies, and Initiatives 24

Travel and Tourism 24

Freight and Intermodal 25

Rail 26

Port 29

Port of Virginia Capital Improvements 31
Trucking 31
Airports 33
Maintenance and Safety 34
Bridge Condition 34
Safety 37
Other Strategies and Initiatives 40
Transportation Network Company (TNC)/ Shared Mobility 40
Micromobility 41
Alternative Fuel Vehicles 41
Autonomous Vehicles 42
Air Quality 43
Environmental Resource & Mitigation 45
System Resiliency – Security 46
Cyberattacks on Transportation Systems 47
Hazardous Materials Spills: 47
Terrorist Attacks on Transportation Hubs: 47
North Anna Power Station (NAPS) Incident: 47
System Resiliency – Natural Hazards 48
Economic Development 50
Housing and Transportation 51

List of Exhibits

Exhibit 1: National Highway System 5
Exhibit 2: Top Congested Roadway Segment in the Richmond Region 7
Exhibit 3: Congestion Ranking 8
Exhibit 4: Richmond Region Pavement Conditions 9
Exhibit 5: City of Richmond Pavement Conditions 10
Exhibit 6: RMTA Facility Toll Rate by Vehicle Class 11
Exhibit 7: VDOT Facility Toll Rate by Vehicle Class: 12
Exhibit 8: Globalvia Facility Toll Rate by Vehicle Class 12
Exhibit 9: Daily Vehicle Miles of Travel (2012-2022) 13
Exhibit 10: Richmond Region Public Transit and Park and Ride Network 14
Exhibit 11: Richmond Regional Completed Bike Infrastructure (Miles): 19
Exhibit 12: Existing Bike Infrastructure 20
Exhibit 13: 2023 Richmond Region Passenger Rail Ridership 23
Exhibit 14: 2024 Richmond Region Passenger Rail Ridership 23
Exhibit 15: Tourism Spending by Locality (Source: Richmond Region Tourism) 25
Exhibit 16: Richmond Region Rail Network 26
Exhibit 17: RMT Commodity Flow by Weight and TEU 29
Exhibit 18: RMT Contributions to All-POV Impacts 30
Exhibit 19: Richmond Region Highway Freight Network 31
Exhibit 20: Truck Commodity Flow by Tonnage 32
Exhibit 21: Richmond Internation Airport (Source: RIC) 33
Exhibit 22: RIC Cargo by Pounds 34
Exhibit 23: Poor and Cusp Rated Structures in the Richmond Region 35
Exhibit 24: Fatal Crashes (January 2020 - November 2024) 37
Exhibit 25: Serious Injury Crashes (January 2020 - November 2024) 38
Exhibit 26: Regional High Injury Network 39
Exhibit 27: People Killed and Seriously Injured by Year (2006 - 2022) 40
Exhibit 28: Number and Type of Charging Stations by Locality (Source: DriveElectricVA) 42

Exhibit 29: Clean Air Ozone History - Richmond Region....43
Exhibit 30: AQI Index or Air Quality....44
Exhibit 31: Air Quality Alert Days in Richmond (1990 - 2024)....44
Exhibit 32: PM 2.5 Annual Three-year Averages in the Richmond Region....45
Exhibit 33: Environmental Resources....46
Exhibit 34: Employed Living Ratio by Locality - Richmond Region....51
Exhibit 35: Detailed Regional Commuting Pattern....52
Exhibit 36: Commute by Transportation Mode (Source: 2022 ACS)....53
Exhibit 37: Commute Time by Locality (Source: 2022 ACS)....53
Exhibit 38: Mean Commute Time (Source: 2022 ACS * One-directional commute)....54

Introduction

This document serves as a condensed snapshot of the current transportation system in the Richmond Region. The State of Transportation Report is a part of the ongoing regional process that identifies, develops, evaluates, and implements transportation strategies that enhances safety and mobility. This report is produced as a part of PlanRVA's Pathways to the Future – 2050 Long Range Transportation Plan which seeks to identify multimodal transportation issues and deficiencies including congestion, safety issues, interconnectivity/accessibility, and other operational issues.

The transportation sector plays a pivotal role in the economic, social, and environmental development of the Richmond Region. In this report, we examine the current state of regional transportation, exploring its various dimensions, including infrastructure, safety, sustainability, and accessibility. As global urbanization accelerates and technological innovations reshape how we move, understanding the strengths, challenges, and opportunities within the transportation landscape is more crucial than ever.

This report provides an in-depth analysis of the state of transportation, focusing on key trends, developments, and future projections. It evaluates current transportation networks, modes of transport, public policies, capital improvements and emerging technologies to offer a comprehensive picture of the transportation system's performance. By assessing these elements, we aim to highlight areas for improvement, propose strategic recommendations, and support the continued development of transportation systems that are efficient, inclusive, and sustainable for all users.

Highways

Functional Classification of Roads

As the name suggests, the Functional Classification of roadways provides a system to organize roadways based on their levels of mobility and access. The categories of Functional Classification include "Arterials," "Collectors," and "Local" roadways. In addition to the three classification categories, the Federal functional classification as maintained by the Federal Highway Administration includes further subcategories including "major" and "minor" sub-classifications and distinctions between rural and urban development patterns, and access-controlled and full-access roadways.

These distinct categories describe levels of access and mobility provided by a roadway. “Arterial” roadways are roads that provide a high level of mobility, while “Local” roadways describe those that offer higher levels of accessibility. In this context, mobility and access describe the opportunity for users to enter and exit a roadway. Roadways with fewer opportunities for users to enter and exit the roadway are concerned with providing mobility. Roadways concerned with providing access have many opportunities for entry and exit. The functional classification of roads that have a greater balance between access and mobility are labeled “Collectors.”

The amount of traffic a roadway experiences may or may not influence a road’s Functional Classification. Though roadways Annual Average Daily Traffic (AADT) may have a general relationship with a road’s Functional Classification, the purpose a road serves, and the context of its environment is the main factor that determines the classification. A road’s AADT may influence the Functional Classification if it is between, or on the cusp of two classifications. In those cases, AADT can function as a sort of tie breaker between classifications.

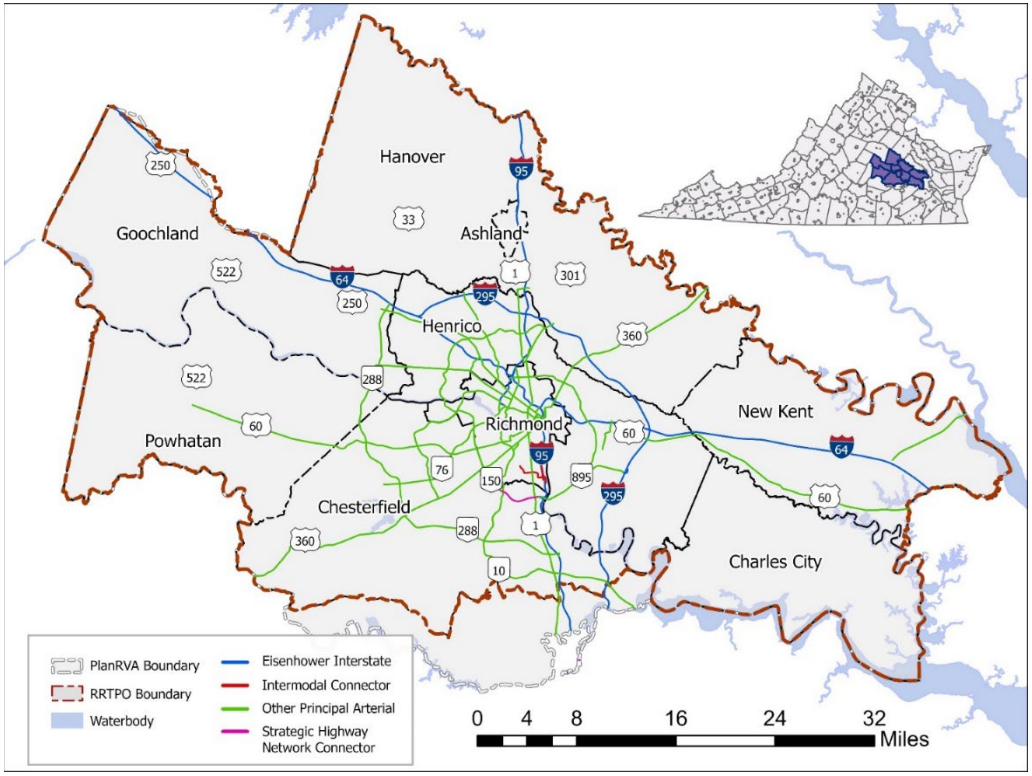


Exhibit 1: National Highway System

National Highway System

The National Highway System (NHS) is a collection of roadways that are considered important to the country’s defense, mobility, and economy. The Federal Highway Administration keeps this system in place to ensure that there is a maintained mass highway system connecting strategic locations across the nation to ensure people and goods can be moved safely and efficiently. The NHS is made up of five subsystems of highways; “Interstate”, “Other Principal Arterials”, “Strategic Highway Network” (STRAHNET), “Major Strategic Highway Network

Connectors", and "Intermodal Connectors." Within the NHS, "Interstates" refers to the highways that make up the Eisenhower Interstate System. "Other Principal Arterials" are found in both rural and urban areas and provide access between an arterial roadway and an airport, public transportation facility, a major port, or another intermodal transportation facility. The roadways designated as "Strategic Highway Network" (STRAHNET) outline the highways that are deemed important to the US' strategic defense policy. These highways are important for providing emergency capabilities and continuity for defense. "Major Strategic Highway Network Connectors" provide access between STRAHNET highways and major military installations. Finally, highways labeled "Intermodal Connectors" provide access between the previously mentioned subsystems of roadway in the NHS, and major intermodal facilities.

The majority of the RRTPO roadways in the National Highway System are considered "Other Principal Arterials."

VDOT Highway System and Maintenance

Congestion Management Process (CMP)

The Congestion Management Process (CMP) report for the Richmond Region focuses on identifying, monitoring, and reducing roadway congestion through systematic approaches. It aims to enhance transportation efficiency, especially during peak travel hours (6 AM - 10 AM and 4 PM - 8 PM). The report uses available traffic volumes, travel times, and performance metrics such as the Planning Time Index (PTI) and Level of Travel Time Reliability (LOTTR) to highlight major areas of congestion. These locations are assessed as factors that contribute to congestion, including heavy traffic, inadequate road design, and external factors such as construction or accidents. The report also suggests solutions such as improving traffic signals, upgrading infrastructure, and encouraging alternative transportation modes. It serves as a key resource for transportation planners and decision-makers in the region. More information about the CMP is available in PlanRVA's 2050 LRTP CMP Appendix.

The CMP is focused on improving roadway traffic management in the Richmond area by analyzing congestion patterns and offering actionable solutions to enhance mobility and reduce delays during busy times. Since there are

so many roadways in the Richmond region these roads have been whittled down to the larger and more traveled roads.

Solutions

- Implementing **Dynamic Lane Management** and **optimized signal timing** could reduce congestion during peak periods.
- Upgrading **congested intersections** and improving **public transportation** would also alleviate traffic on major corridors.
- **Real-time traffic management systems** and promoting **non-motorized transportation** can reduce congestion by providing better information and encouraging alternative modes of travel.
- Regular data collection and **collaboration with local agencies** ensure the success of these strategies and help address emerging congestion issues proactively.

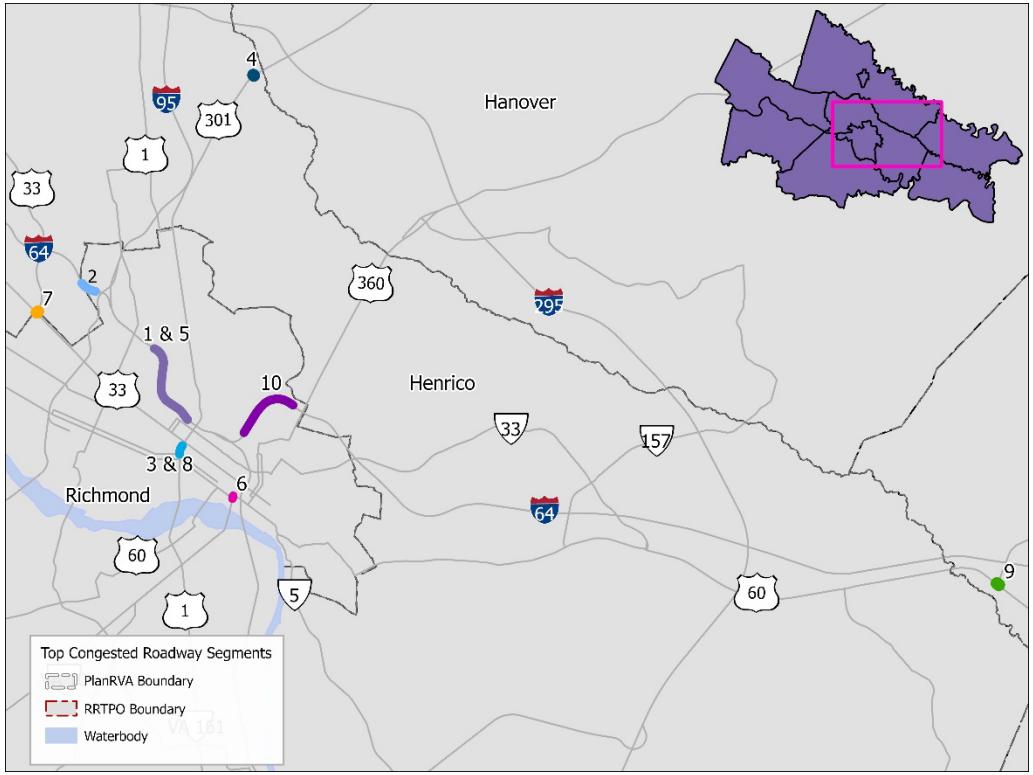


Exhibit 2: Top Congested Roadway Segment in the Richmond Region

Methodology

The methodology used to assess traffic congestion in the region incorporates several contributing factors, including **TTI (Travel Time Index), BTI (Buffer Time Index), Comparative Speed, Congestion, TTR (Travel Time Reliability), PTI (Public Transportation Index), and Bottleneck**. These factors were weighed equally to ensure a balanced evaluation of congestion, with a particular focus on fair comparisons using quartiles for all factors except **Bottleneck**. The approach was as follows:

1. **Ranking by Quartile:** Each factor was categorized into one of four quartiles based on its performance compared to other factors. Quartiles divide data into four equal parts, making it easier to assess and compare the congestion levels across multiple areas.
2. **Assigning a Value Based on Quartile:** Factors in the highest quartile (top 25%) received higher scores, while factors in the lowest quartile (bottom 25%) were assigned lower scores. This allowed for differentiation based on the severity of congestion.
3. **Calculating Points:** After quartile values were assigned, each factor earned points based on its performance relative to other factors. This step quantified how well each factor contributed to congestion.
4. **Dividing Points by Possible Points:** The total points for each factor were then divided by the total possible points, resulting in a ratio or percentage that showed how each factor performed relative to the maximum potential.
5. **Ranking the Factors:** The factors were ranked based on their ratio or percentage, with the highest-performing factor being ranked first.

The approach to evaluating congestion relied on dividing various factors into quartiles to ensure balanced analysis across factors like **TTI, BTI, Comparative Speed, and others**. The **Bottleneck** metric focused on the top 10 most problematic areas. After ranking these factors, points were assigned based on quartile placement, then used to calculate each factor's relative performance. The final rankings give a clear picture of the worst congestion areas, with detailed results provided in the appendix for further insight.

RANKING	Road Segments
1	I-64 from exit 76B to the entrance ramp near Arthur Ashe Blvd and Robinson St
2	I-64 from exit 186 to the alternate side exit 79
3	S Belvidere St between W Canal St and E Byrd St
4	E Parham Rd and Chamberlayne Rd
5	I-64 between N Belvidere St and exit 78
6	S 14th St between E Cary St and E Main St
7	Staples Mill and W Broad St
8	N Belvidere St between W Broad St and Downtown Expressway
9	Pocahontas Trail and New Kent Highway
10	I-64 between I-95 to Mechanicsville Turnpike

Exhibit 3: Congestion Ranking

Pavement Conditions

For a majority of the RRTPO, including New Kent, Powhatan, Hanover, Goochland, and portions of Chesterfield within the TPO, VDOT inspects and maintains pavement conditions. For The City of Richmond, The Town of Ashland, and Henrico, the localities inspect and maintain their own pavement conditions. While the goal is the same, VDOT and the localities that collect their own data use different criteria for measuring pavement conditions. VDOT and the Town of Ashland use the "Critical Condition Index" (CCI) while the City of Richmond and Henrico County use the "Pavement Condition Index" (PCI). The PCI is an index originally developed by the US Army Corps of Engineers for rating airfield pavement. It is widely used across the US. PCI assigns pavement condition a number between 0 and 100. A score of 100 represents the best possible condition and a 0 represents the worst possible condition. The PCI is divided into seven classes.

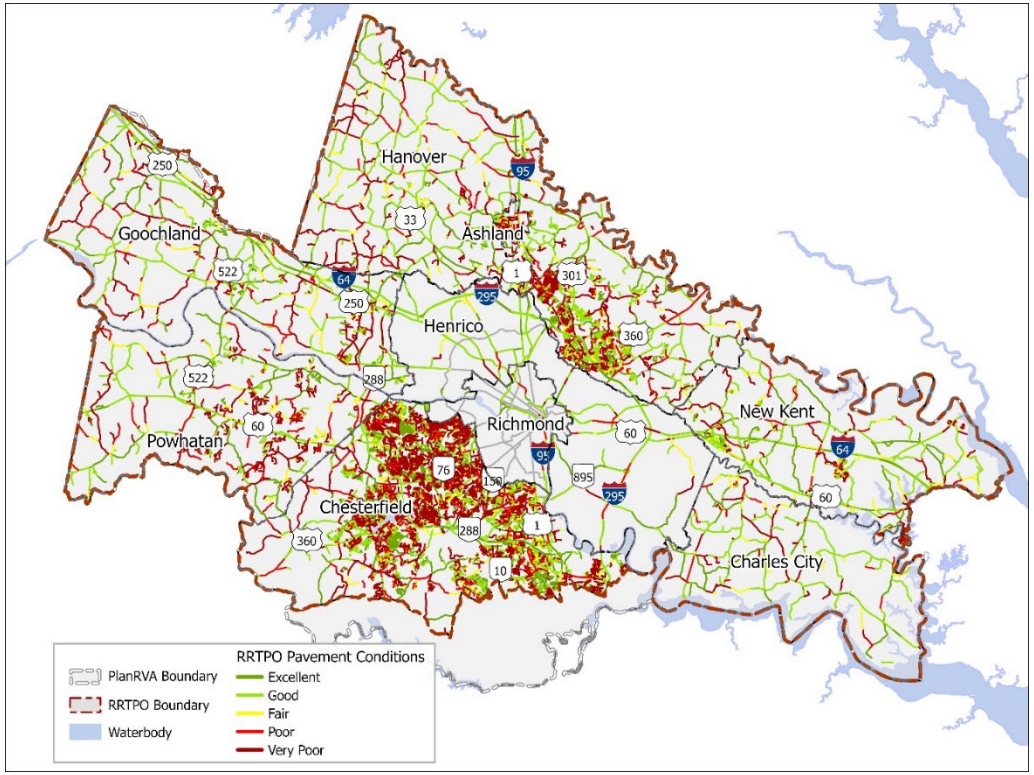


Exhibit 4: Richmond Region Pavement Conditions

- 100-86 – Good
- 85-71 – Satisfactory
- 70 – 56 – Fair
- 55 – 41 – Poor
- 40 – 26 – Very Poor
- 11 – 25 – Serious
- 10- 0 – Failed

As previously mentioned, VDOT sets their own criteria for measuring pavement conditions, with the CCI. Like the PCI, the CCI is on a scale of 0 – 100, with 0 representing the worst possible pavement condition and 100 representing the best possible condition, but unlike the PCI, the CCI only has five categories.

- CCI Range
  - 100 – 90 Excellent
  - 89 – 70 Good
  - 69 – 60 Fair
  - 59 – 50 Poor
  - 49 – 0 Very Poor

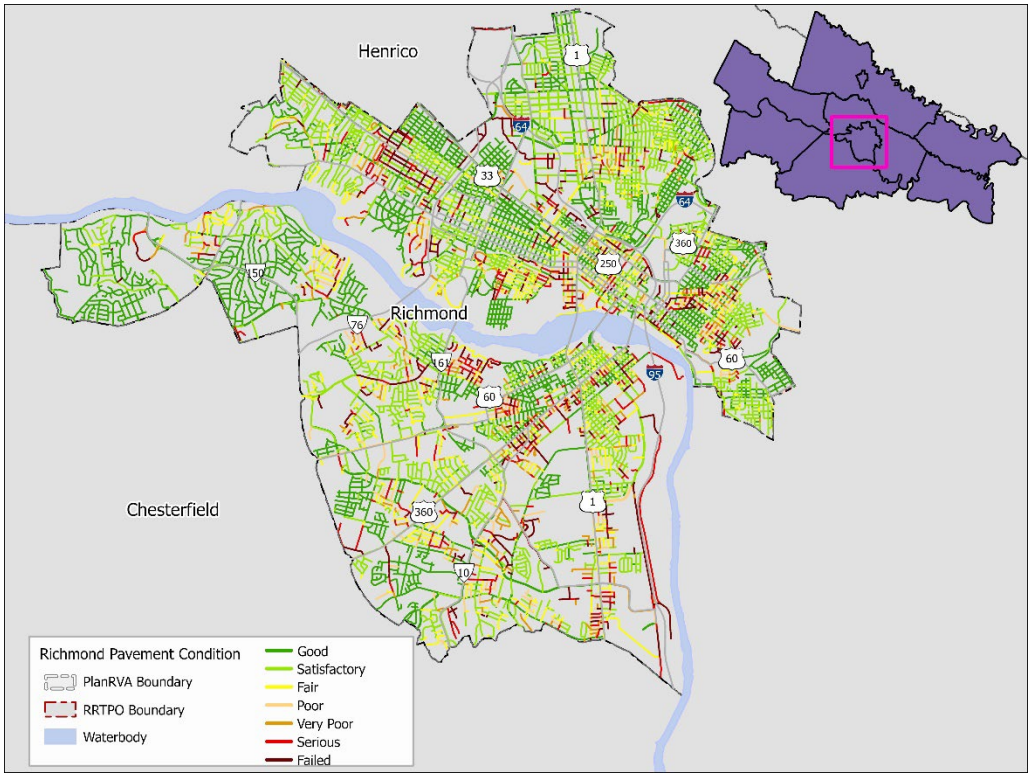


Exhibit 5: City of Richmond Pavement Conditions

At the time of writing this section of the LRTP, Henrico County was in the process of gathering their pavement condition data and were unable to provide their current pavement conditions to RRTPO Staff. These pavement conditions will be added to the LRTP, should the data become available before completion.

Of the 12,587 RRTPO pavement segments reported on by VDOT a majority, 54%, are within the Excellent, Good and Fair categories and determined to be "Sufficient." The remaining, 46%, of segments are categorized as Poor and Very Poor, and considered "deficient." The largest single category of pavement conditions is the Very Poor category, at 35%, the second largest category is Good at 27%. The pavement conditions data provided for the 10,749 segments maintained by The City of Richmond shows many segments, 81%, in the Good, Satisfactory, and Fair conditions. The remaining 29% are considered Poor, Very Poor, and Failed. The largest single category of pavement conditions is the Good category, at 40%, the second largest category is Satisfactory at 32%.

Toll Roads

There are five toll roads in the Richmond Region, Powhite Parkway Extension, Boulevard Bridge, the Downtown Expressway, Pocahontas Parkway, and Powhite Parkway. Powhite Parkway, the Downtown Expressway, and Boulevard Bridge are all within the city limits. A small portion of the Powhite Parkway crosses into Chesterfield County where it connects with the Powhite Parkway Extension. Henrico county has the Pocahontas Parkway, the final toll road in the region. Tolls are typically collected to help fund the construction, maintenance, and operation of the road or infrastructure projects. Toll payments can be made at toll booths along the road or electronically through transponders, which automatically charge a driver's account as they pass through designated sections. The cost of using toll roads varies based on factors like distance travel, time of day, or type of vehicle.

RMTA tolls were increased effective September 1, 2023, due to increasing costs of maintenance and capital improvements. Prior to this increase, the tolls were previously increased in 2008, 1998, and 1988. It is estimated that continued maintenance and capital improvements to the Expressway System for the next 6 years will reach $96.3 million.

RMTA Facility	Vehicle Class			
	2 Axle	3 Axle	4 Axle	5+ Axle
Powhite Parkway				
Mainline Plaza	$ 0.70	$ 0.80	$ 0.90	$ 1.00
Forest Hill Avenue	$ 0.70	$ 0.80	$ 0.90	$ 1.00
Douglasdale Road	$ 0.20	$ 0.40	$ 0.40	$ 0.40
Downtown Expressway				
Mainline Plaza	$ 0.70	$ 0.80	$ 0.90	$ 1.00
Second Steet	$ 0.35	$ 0.70	$ 0.70	$ 0.70
Eleventh Street	$ 0.30	$ 0.60	$ 0.60	$ 0.60
Boulevard	$ 0.35	$ 0.70	N/A	N/A

Exhibit 6: RMTA Facility Toll Rate by Vehicle Class

Virginia Department of Transportation (VDOT) plans to remove the 75-cent toll on the Powhite Parkway Extension by late 2026 or early 2027. Additionally, Chesterfield County is currently in phase one of the Powhite Parkway widening project. The nearly 2.5-mile project will widen the last portion of the parkway from two lanes to four and extend it from Route 288 to Woolridge Road.

VDOT Facility	Vehicle Class				
	2 Axle	3 Axle	4 Axle	5 Axle	6 Axle
Powhite Parkway Ext.					
Mainline Plaza	$ 0.75	$ 1.00	$ 1.25	$ 1.50	$ 1.50
Mainline Plaza (East and West Ramp	$ 0.25	$ 0.35	$ 0.45	$ 0.55	$ 0.55
Route 60 Ramp	$ 0.25	$ 0.35	$ 0.45	$ 0.55	$ 0.55
Courthouse Rd Ramp	$ 0.50	$ 0.60	$ 0.70	$ 0.80	$ 0.80

Exhibit 7: VDOT Facility Toll Rate by Vehicle Class:

VA-895/Pocahontas Parkway Toll Rate below reflects a recent increases effective April 1, 2025. This is a scheduled increase in accordance with the June 2006 Concession Agreement between Pocahontas Parkway and the Virginia Department of Transportation.

Globalvia Facility	Vehicle Class				
	2 Axle	3 Axle	4 Axle	5 Axle	6 Axle
Pocahontas Parkway					
Mainline Plaza	$ 5.95	$ 7.35	$ 8.75	$ 10.20	$ 11.70
Laburnum Ave.	$ 3.45	$ 4.85	$ 6.30	$ 7.70	$ 9.15
Airport Drive	$ 3.45	$ 4.85	$ 6.30	$ 7.70	$ 9.15

Exhibit 8: Globalvia Facility Toll Rate by Vehicle Class

Roadway Usage

The amount of roadway travel is measured in terms of vehicle miles of travel, which is total number of miles driven by all vehicles within a specific area and time period. VDOT annually releases estimates of jurisdictional roadway travel levels based on traffic counts collected on a regular basis. VDOT estimates that there were nearly 35 million vehicle-miles of travel (VMT) on the typical day in the Richmond Region in 2022. However, the amount of roadway travel fluctuated in the Richmond Region prior to the pandemic according to VDOT estimates. However, between 2020 and 2020, there was a 12% increase in daily vehicular travel, surpassing pre-Pandemic levels.

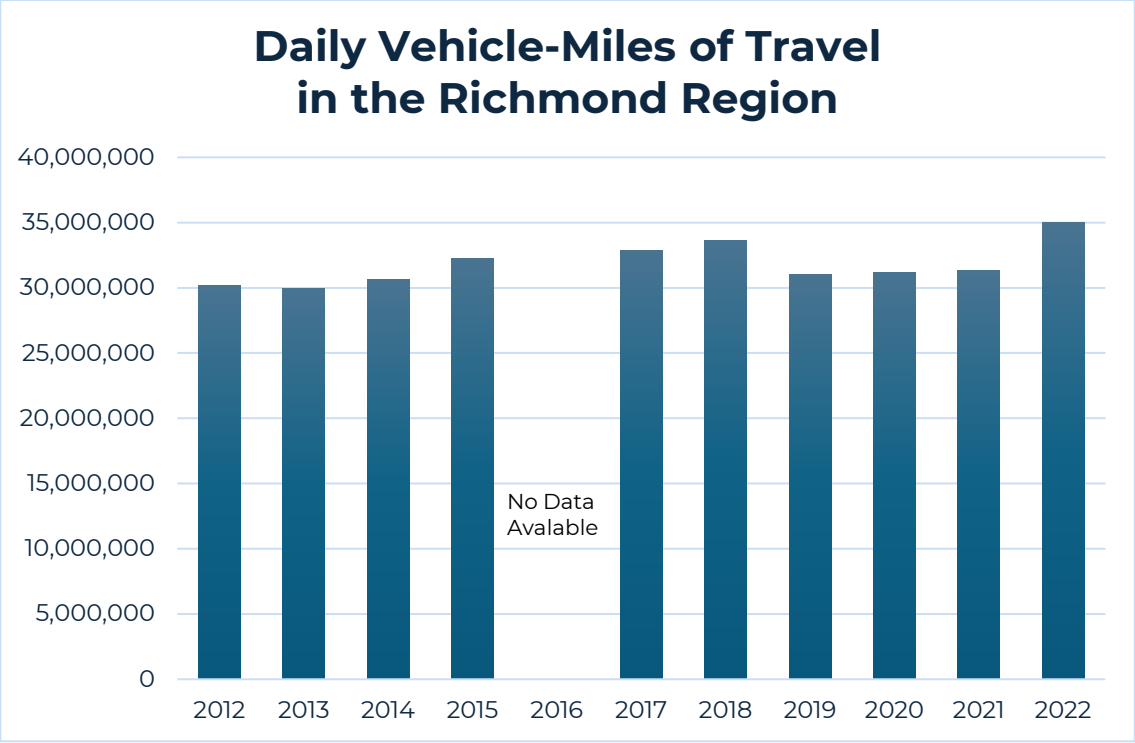


Exhibit 9: Daily Vehicle Miles of Travel (2012-2022)

Public Transportation

Existing Service

The Richmond region offers a transit system that integrates various modes of transportation, including bus rapid transit, local fixed-route bus, intercity buses, rail services, and multimodal support through park-and-ride facilities. These elements work together to reduce traffic congestion, improve accessibility, and promote sustainable mobility across the region.

GRTC Transit Network

The Greater Richmond Transit Company (GRTC) operates multiple services tailored to meet the transportation needs of the region:

- **Bus Rapid Transit (BRT)**: The Pulse BRT offers a high-frequency east-west service primarily along Broad and Main Streets, connecting Rocketts Landing to Willow Lawn through downtown Richmond. Features such as dedicated lanes, transit signal priority, and enhanced stations make this an efficient transit option for residents and visitors.
- **Local Fixed-Route Buses**: GRTC provides extensive coverage with routes that link neighborhoods, shopping areas, employment hubs, and healthcare facilities primarily within Richmond, Henrico, and Chesterfield. Goochland also has limited access to the fixed-route network.

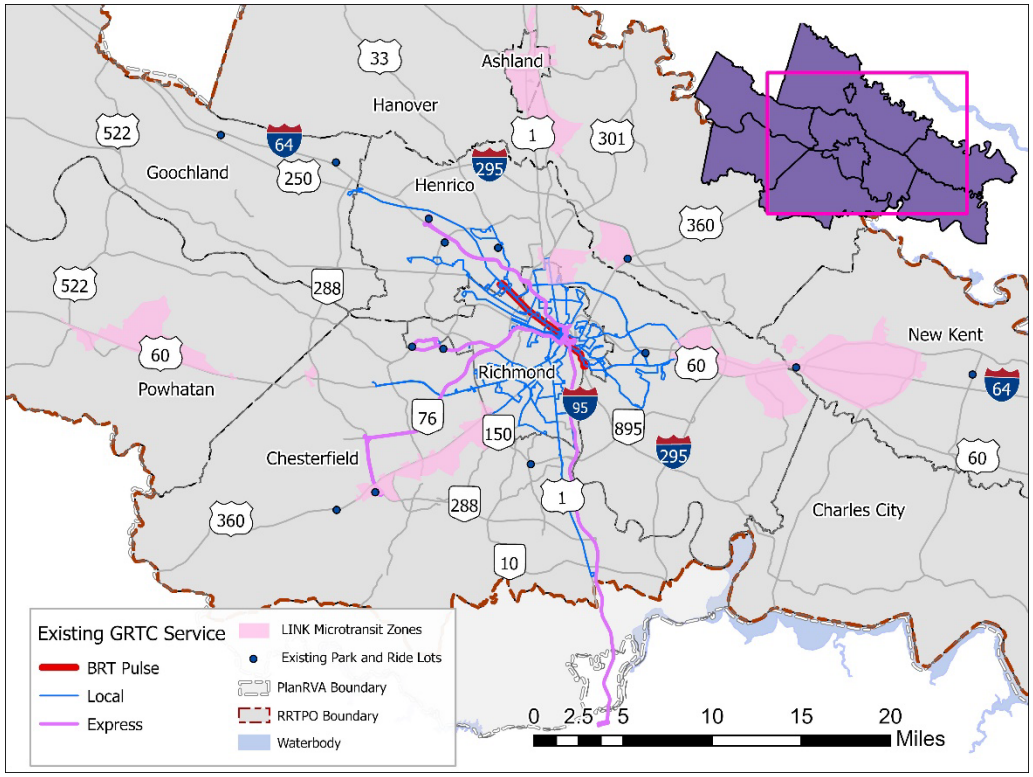


Exhibit 10: Richmond Region Public Transit and Park and Ride Network

- **Express Buses**: These peak-hour services connect suburban areas, including park-and-ride locations, to downtown Richmond and other employment centers, providing faster commutes by minimizing stops. An express route also links Richmond to Petersburg with four departures every weekday.
- **LINK Microtransit Zones**: The app-based LINK service operates in select areas, offering flexible, on-demand rides. This service complements the fixed-route network by covering low-density regions and addressing first-mile/last-mile gaps.

Downtown Transfer Station

The temporary transfer station currently in use in downtown Richmond is operating on a short-term lease that expires in 2027. While this facility handles over 7,500 daily transfers, GRTC is actively working toward securing a permanent transfer hub. Recent studies and public meetings have narrowed down potential sites, with the former Public Safety Building property at 500 N. 10th St. emerging as the preferred location. The permanent hub is planned to be part of a mixed-use development featuring retail, residential, and possibly office components, aiming to serve as a central nexus for bus routes and further stimulate downtown economic growth.

Paratransit Services

GRTC operates CARE, an ADA-compliant paratransit service that ensures individuals with disabilities have access to door-to-door transportation. The service covers Richmond and parts of Henrico and Chesterfield counties, offering essential mobility to destinations such as hospitals, retail centers, and workplaces.

Intercity Bus Services

Richmond is a hub for several intercity bus operators, providing direct connections to destinations across the region and beyond:

- **Virginia Breeze**: This state-supported intercity bus service offers multiple routes through Virginia, including connections from Richmond to Blacksburg and Northern Virginia, expanding affordable travel options throughout the state. A new service opening in 2025, the Tidewater Current, will connect Harrisonburg to Virginia Beach through Richmond.
- **Megabus**: Connects Richmond with Washington, D.C., New York City, and several Virginia cities, including Danville, Farmville, Martinsville, and South Boston.

- **FlixBus**: Offers direct routes from Richmond to major cities along the eastern seaboard, including D.C., Norfolk, Raleigh, Charlotte, Philadelphia, and New York.
- **Wanda Coach**: Provides regional connections with direct routes from Richmond to cities along the I-95 corridor.

These services operate from central locations in Richmond, often integrating with GRTC's local transit network to provide seamless transfers.

Ongoing Service Enhancements

GRTC is ramping up its regional transit improvements by not only increasing service frequency but also expanding its network to better connect communities across the Richmond region. Two major projects currently underway illustrate this commitment:

- The first project is a westward extension of the existing Pulse BRT line. This extension will push the current route from Willow Lawn Drive to Parham Road. In addition to improving frequency and seamlessness for the existing system, the project plans to incorporate a small park-and-ride facility to serve growing demand in Henrico County. The aim is to create more efficient, reliable service that ties together residential areas, commercial centers, and employment hubs.
- The second project introduces an all-new north–south BRT line. This corridor will start at Azalea Avenue and Brook Road in Henrico County and continue through a series of key thoroughfares—Chamberlayne Avenue, Leigh Street, and a combined segment of 8th/9th Streets—then along Commerce Road, Hull Street, East Belt Boulevard, and finally Midlothian Turnpike, terminating at Stonebridge Plaza in Chesterfield County. By creating this new north–south link, GRTC intends to provide a rapid, high-capacity service that not only cuts travel times but also enhances access to jobs, education, and community services. This project is designed to integrate with existing routes and to support equitable transit access across the region.

Demand Management

Park-and-Ride/Carpool/Vanpool

Park-and-ride lots play a vital role in facilitating multimodal commuting by enabling residents to park their personal vehicles and transfer to public transit, carpools, or vanpools. These lots help reduce congestion on highways,

especially during peak hours, and improve transit access for suburban and rural residents. Official park-and-ride locations in the Richmond region include:

- Bottoms Bridge
- Cogbill/Hopkins/Chippenham
- Gaskins Road
- Glenside Drive - Dumbarton
- Hickory Haven
- Mechanicsville
- New Kent County Public Works
- Oilville
- Parham Road

Unofficial lots include:

- Bon Air Baptist Church
- Commonwealth 20
- Huguenot United Methodist Church
- White Oak Village

Carpool and Vanpool services are primarily coordinated through RideFinders, which further expands mobility options for residents who do not have access to direct transit. RideFinders, a division of the GRTC Transit System, is the regional non-profit transportation demand management (TDM)/rideshare agency that works to move more people in fewer vehicles around the Central Virginia region. RideFinders' efforts help increase the efficiency of the region's transportation infrastructure, protect the air quality, enhance the quality of life, and sustain a healthy economy. RideFinders' mission is "to foster increased efficiency of the transportation system by influencing travel behavior mode, time, frequency, trip length, or route". As a result, RideFinders expects to reduce traffic congestion, conserve energy, improve air quality and reduce transportation-related expenditures of individuals, employers and governments."

RideFinders provides a multitude of services for commuters and employers throughout Central Virginia, including:

- Transit information services
- Vanpool formation and support
- Carpool matching
- Clean Air campaign
- Commuter Choice Program
- Telework support
- Emergency Ride Home
- Transportation planning
- Employer-based strategies
- Bike and pedestrian commuter services
- Employer relocation and site analysis services

As of December of 2024, there are 75+ vans arriving to and departing from the Richmond Region with an additional 9 vans part of the Commuter Connections/OmniRide's program that frequent the area. Destinations include Washington D.C./Northern Virginia, Blackstone, Prince George County, and Hampton Roads.

Active Transportation

PlanRVA's BikePedRVA 2045 Bicycle and Pedestrian Plan for the Richmond Region was adopted in May 2022. The plan details the definitions of bicycle infrastructure throughout the region:

Bike Lane: Designated bikeway adjacent to automobile travel lanes

- Designated for bike use by paint and signage
- Lacks physical separation, but may be buffered from traffic through use of striping on roadway
- Regulated to the edge of a roadway near the gutter, which often accumulates more sand, dirt, and debris than separated bicycle facilities, increasing risks of flat tires and possible injury

Shared Use Path: Separated off-street bicycle and pedestrian facility

- Often integrated into linear parks and utility or rail-to-trail corridors

- Opportunities more limited in developed urban areas
- Serves a vital pedestrian function in suburban and rural areas

Cycle Track: Fully protected one- or two-way on-street bikeway

- Also called protected bike lanes (PBLs)
- Bicycle facilities running along or on a street
- Physically separated from motor vehicle lanes with curbs, bollards, planters, concrete dividers, or parking lanes

Mixed Traffic Facility: Low-volume and low-speed street designed to encourage biking and walking

- Can be considered a bike route if speed and traffic volume are low
- Includes bike boulevards, walk/bike streets, or advisory bike lanes
- To be most successful, these facilities should incorporate comprehensive traffic calming techniques, such as street trees, chicanes, raised crosswalks, and traffic diverters

In the region, there are approximately 186 miles combined with all these examples of bicycle infrastructure, an increase from 150 miles in the past five years. The breakdown as of March 2025:

Locality	Bike Lanes	Shared Use	Cycle Track	Mixed Traffic	Total
Ashland	0.0	2.4	0.0	0.0	2.4
Charles City	0.0	26.3	0.0	0.0	26.3
Chesterfield	38.5	17.2	0.0	0.0	55.8
Goochland	0.0	0.0	0.0	0.0	0.0
Hanover	1.5	0.0	0.0	0.0	1.5
Henrico	24.8	22.9	0.0	0.0	47.7
New Kent	0.0	0.0	0.0	0.0	0.0
Powhatan	1.0	0.0	0.0	0.0	1.0
Richmond	33.4	4.5	9.6	3.8	51.1
Region	**99.2**	**73.3**	**9.6**	**3.8**	**185.9**

Exhibit 11: Richmond Regional Completed Bike Infrastructure (Miles):

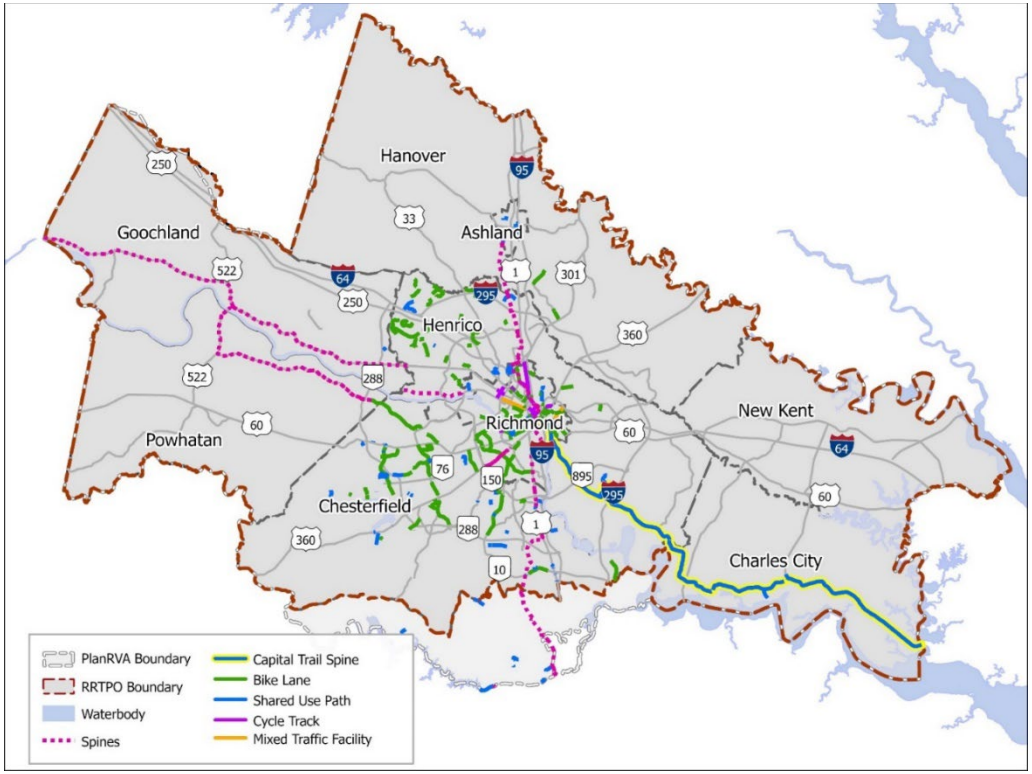


Exhibit 12: Existing Bike Infrastructure

Tracking active transportation progress

Spine Routes: The plan also establishes the north-south and east-west spine routes for a growing active transportation network. The Virginia Capital Trail, a 52-mile multiuse path connecting Richmond and Jamestown, opened October 2015 and represents the beginning of the east-west spine. Fall Line promises to be the north-south spine. The trail is a planned paved, shared-use path connecting the Town of Ashland to Petersburg along a 43-mile corridor generally following U.S. Route 1. Groundbreaking ceremonies and trail construction for several sections began in Summer 2024. The trail will connect the counties of Hanover, Henrico, Chesterfield, and municipalities of Ashland, Richmond, Colonial Heights, and Petersburg. Ashland completed its section in 2021.

Roadway reconfiguration: Many localities in the Richmond Region and VDOT have adopted the approach of creating bicycle lanes by way of roadway reconfiguration, or "road diet." Roadway reconfiguration is a broad term that can be defined as any striping change that alters a roadway's layout, according to VDOT. These actions generally involve removing one or more travel lanes from a roadway and utilizing the space for other uses or travel modes. The practice is often done during the repaving and restriping of the roadway, rather than more expensive efforts to widen roadways or purchase the right of way.

Roadway reconfiguration projects in the city of Richmond and the counties of Henrico and Chesterfield have created more than 75 miles of bikes lanes and cycle track, most implemented in the past five years.

- **Richmond:** 40 miles
- **Chesterfield:** 10 miles
- **Henrico:** 25 miles

Cycle tracks: Among those roadway reconfiguration projects, nearly 2 miles of two-way, protected cycle tracks in downtown Richmond connect along key streets like E. Franklin Street, 1st Street, and 3rd Street. Those bike lanes are protected from automobile traffic by floating parking, which aligns the parking as a buffer between the travel lanes and the cycle track. Floating parking is also used along the more than 4 miles of cycle tracks on Brook Road (2020) and Brookland Parkway in north Richmond and on more than 2 miles of cycle tracks on Moore Street (2024) in Scott's Addition and Malvern and Patterson avenues (2020) in the Near West End.

Locality Comprehensive/Master Plans: The City of Richmond guiding documents include the Richmond Bicycle Master Plan (2014), Better Streets (Complete Streets), Vision Zero, and the Richmond 300: A Guide For Growth (2020). Chesterfield incorporated a Bicycle and Trails chapter of the 2019 Moving Forward Chesterfield County comprehensive plan and is working to update that chapter as of Spring 2025. Henrico County is working toward a bicycle and pedestrian chapter in the county's comprehensive on-going plan update. Hanover County updated the Active and Healthy Living Neighborhoods chapter in the county's Comprehensive Plan in 2023.

In addition to Fall Line, several trail projects are underway in the region:

- **Gillies Creek Greenway:** Construction began in 2024 with this planned 2.3-mile paved shared-use path to connect from the Virginia Capital Trail and the James Riverfront along Gillies Creek to Oakwood Cemetery, the Church Hill community in Richmond, and connections into Henrico County.

- **James River Branch Trail:** An approximately 1.8-mile, 10-foot wide paved shared-use trail implemented along a former rail bed that will connect Westover Hills Boulevard to Hopkins Road in south Richmond. Extensions at each end could connect to Fall Line and the James River Park trails.
- **James River Park System and Downtown Riverfront:** Continued development of bicycle and pedestrian trails along the banks of the James River in Richmond, including the completion of the bicycle and pedestrian T. Tyler Potterfield Bridge in December 2016 and continued improvement of accessible trail connections along the Canal Walk and Brown's Island.
- **Three Notched Trail:** Potential for a trail connection between Richmond and Charlottesville as part of a larger trail effort, connecting the Blue Ridge Mountains to the Chesapeake Bay and tying together the Virginia Capital Trail and the proposed Trail 757 (Williamsburg to Hampton), which connect in Jamestown. This effort would create a continuous trial nearly 200 miles long.

Passenger Rail

The Richmond Region rail network provides critical links for efficient, low-cost, environmentally friendly movement of people and goods throughout the state and beyond. The region is served by both of Virginia's Class I railroads, CSX and Norfolk Southern, and limited short line railroads. The region is a key connection between the Southeast High Speed Rail (SEHSR) corridor, which runs from Washington D.C. to Atlanta, and the Northeast Corridor (NEC), which connects north to Boston, New York, and Philadelphia.

Every four years, DRPT develops an updated Statewide Rail Plan in accordance with the Federal Railroad Administration guidance that aligns with VTrans goals and objectives. The latest update to the Rail Plan was in 2022 and outlines guidance for the long-term development of the Commonwealth's rail system that addresses community and commercial needs, and policies for future rail investments.

The Richmond Region is served by four passenger rail Amtrak stations: Staples Mill station in Henrico County, Main Street Station in downtown Richmond, Ettrick station in Chesterfield County, and the Ashland station in the Town of Ashland, Virginia. Trains are known as Northeast Regionals and are under the State-Supported Service Line in Amtrak's system. Virginia routes extend onto the Northeast Corridor (NEC) and serve New York City, Springfield, MA, or Boston, MA, including intermediate station stops in Virginia and the Northeast.

- Route 47: Washington-Newport News (2 daily roundtrips)
- Route 50: Washington-Norfolk (3 daily roundtrips)
- Route 51: Washington-Richmond (1 daily roundtrip)

Service Line	Ashland (ASD)	Richmond-Staples Mill (RVR)	Richmond-Main Street (RVM)	Petersburg-Ettrick (PTB)
Washington-Newport News (VA)	9,761	84,041	94,281	-
Washington-Norfolk (VA)	18,531	179,572	-	26,883
Washington-Richmond (VA)	8,189	56,221	34,571	-
Carolinian (NC)	-	40,109	-	9,385
Silver Star (Long-Distance)	-	17,646	-	3,250
Silver Meteor (Long-Distance)	-	12,164	-	2,249
Palmetto (Long-Distance)	-.	42,785	-	8,969
Total	**36,481**	**432,538**	**128,852**	**50,736**

Exhibit 13: 2023 Richmond Region Passenger Rail Ridership

Service Line	Ashland (ASD)	Richmond-Staples Mill (RVR)	Richmond-Main Street (RVM)	Petersburg-Ettrick (PTB)
Washington-Newport News (VA)	10,699	89,988	94,188	-
Washington-Norfolk (VA)	19,554	194,010	-	32,659
Washington-Richmond (VA)	8,856	62,712	34,153	-
Carolinian (NC)	-	37,048	-	6,676
Floridian (Long-Distance)	-	4,684	-	798
Silver Star (Long-Distance)	-	16,788	-	3,418
Silver Meteor (Long-Distance)	-	12,824	-	2,662
Palmetto (Long-Distance)	-	43,150	-	9,622
Total	**39,109**	**461,204**	**128,341**	**55,835**

Exhibit 14: 2024 Richmond Region Passenger Rail Ridership

Regional Planning Projects, Studies, and Initiatives

Richmond-to-Raleigh: S-Line Corridor

S-Line corridor, part of the Richmond to Raleigh (R2R) project, is a railroad line on the Southeast Corridor (SEC) that will provide future high-performance passenger rail services connecting communities from Richmond, Virginia to Raleigh, North Carolina. While primarily focused on passenger services, the project also aims to improve regional freight capacity. The congestion mitigation of the corridor could lead to more streamlined movement of both passenger and freight rail.

Hanover Third Track (Siding C)

This Project is scheduled to construct approximately 3 miles of third track in Hanover County between the South Anna River and Vaughan Road. The project also will include the reconstruction of the roadway bridge at Washington Highway and construction of a new, single-track rail bridge at Elletts Crossing Road. Siding C will increase the efficiency of passenger and freight trains throughout the rail network and in the area between Fredericksburg and Ashland.

Travel and Tourism

Federal law requires that metropolitan planning organizations consider a series of additional factors when developing their transportation programs and plans. These factors address issues such as supporting economic vitality, increasing multimodal systems safety, and protecting and enhancing the environment, among others. “Enhance travel and tourism” was added as a factor starting with the Fixing America’s Surface Transportation (FAST) Act and is maintained in the IIJA.

The Richmond region offers a rich blend of history, culture, outdoor activities, and unique local experiences. From historical landmarks such as the Virginia State Capitol and the Civil War Museum to cultural attractions, such as the Virginia Museum of Fine Arts and the Altria Theater, the Richmond Region offers a plethora of opportunities for leisure for all visitors. In fact, The Richmond Region hosted 17.9 million visitors in 2023 who spent approximately $4 Billion, according to the Richmond Region Tourism’s FY 2023–2024 Annual Report.

Tourism plays a significant role in the economic development of the Richmond Region through job creation, infrastructure development, and tax revenue. The growth of tourism often drives the development and expansion of

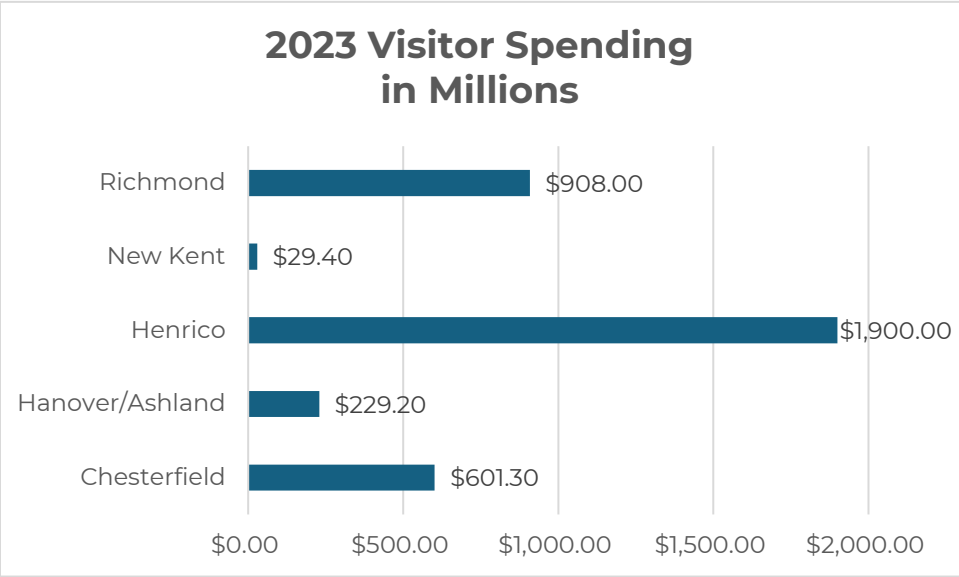


Exhibit 15: Tourism Spending by Locality (Source: Richmond Region Tourism)

transportation infrastructure, and in turn, improvements in transportation systems can make destinations more accessible, thus boosting tourism. To facilitate a comprehensive, cooperative, and continuing planning process, economic development and tourism agencies should work with state, county and city agencies and departments to ensure that visitor multimodal transportation needs are considered and addressed in their broader transportation strategies and plans.

Richmond Region 2030, the region's foremost tourism plan, takes a strategic approach to defining an overarching vision and competitive positioning for the region as a tourist destination. The plan makes several reference points to the importance of strategic transportation planning to the regional tourism industry, including helping to identify options that leverage existing transportation solutions, advocating for a visitor transportation strategy for the Richmond Region that encourages multimodal transportation options, and conducting visitor studies that predict future demand to be used in transportation policies. Accordingly, The PlanRVA 2050 LRTP Process should promote safe and convenient connections to and from prominent tourist destinations.

Freight and Intermodal

Freight plays a crucial role in the broader supply chain by ensuring that goods are efficiently transported within specific geographic areas, from local freight generators to regional markets, and ultimately to larger distribution networks. Implications of freight stretching beyond conventional considerations of transportation planning can influence various facets of society, the economy, and the environment. The Richmond area serves as a vital freight hub for the Mid-Atlantic, with access to major population centers along the east coast. It is home to an extensive freight network of railways (Norfolk Southern, CSX, and Buckingham Brach), highway access (I-95, I-64, I-295, and

access to I-85) and inland waterways (James River) with access to the Port of Virginia. The Region is also home to Richmond International Airport (RIC), which handles approximately 170 million pounds of cargo a year.

Freight movement is a vital component to the region's economic competitiveness. However, there are many challenges facing industry today, including growing demands for faster, more frequent deliveries, infrastructure and capacity limitations to facilitate this increased demand, and congestion-related delays in delivery, among other issues. To ensure that the Richmond Region maintains its competitiveness, it is critical for regional transportation planners, local governments, logistics and economic development and environmental professionals to work towards addressing these issues in freight movement.

Rail

The region's multimodal freight systems are linked together and operate from storage and distribution hubs at the Richmond Marine Terminal, the Richmond International Airport, distribution centers, and rail yards. The rail and highway systems in the region are intended to efficiently move freight.

The Richmond area has been served by multiple railroads for nearly 200 years. Railroads are designated by class I, II, or III according to their annual revenue. There are three rail entities that own and maintain tracks in the region: Class I CSX Corporation (CSX) and Norfolk Southern Corporation, and Class III Buckingham Branch Railroad.

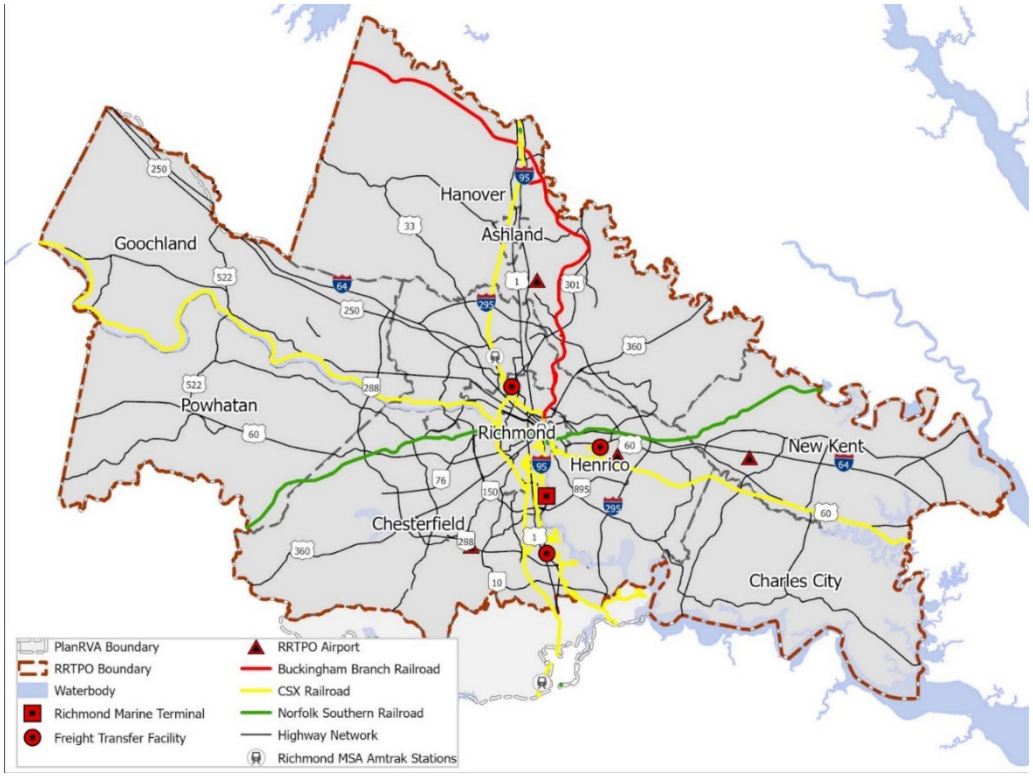


Exhibit 16: Richmond Region Rail Network

Two main rail hubs in the Richmond Region are maintained by CSX: Acca Yard and Fulton Yard. Acca Yard is the primary facility, located at the junction of the two north-south CSX mainlines. Acca Yard has about 20 tracks and provides various freight services for north-south and east-west lines, such as crew switching, staging, bulk transfer, and rail car maintenance. Amtrak passenger trains using the same rail pass through Acca Yard when changing direction or for over-night layovers.

Between the Fulton Bottom and Lower Rockets sections of the City's East End, Fulton Yard has a surplus freight storage capacity. The 13-track yard is primarily used for staging and train switching but also has capacity for bulk transfer and industrial switching. Fulton is used by CSX for switching and staging before trains are sent to Acca Yard for coordination into freight movement queues. Despite its smaller size, Fulton Yard is a key component for freight movement in the region, especially as a supplemental staging area for Acca Yard. Fulton Yard is not served by Norfolk Southern.

The region's freight rail system accounts for approximately 300 miles of track and carries thousands of tons of cargo each year. Freight railroads transport approximately seven percent (7%) of the tonnage and two percent (2%) of total value that passes to, from, and within the Richmond Region. There are four intermodal freight transport facilities that operate within the Richmond Region responsible for transporting freight materials through multiple modes of transportation. Approximately 5 million tons of cargo entered the Richmond MSA by rail in 2023 totaling $1.143 billion. This is the culmination of a steady uptick in cargo tonnage entering the region since the Pandemic, where about 4.5 million tons of cargo traveled by rail to the Richmond Region in 2020 totaling $1.147 billion. Coal, basic chemicals (such as biofuels, edible and base oils), waste/scrap, and cereal grains were the top commodities entering the Region via rail in 2023 by tonnage. Electronics were the most valuable commodity that traveled to the region by Rail at a total of $125 billion worth of goods.

Rail Industrial Access Program

The Department of Rail and Public Transit's Rail Industrial Access Program helps local businesses improve their connection to both regional and national freight networks. This is particularly important for industries in the area, such as agriculture, manufacturing, and distribution, which rely on rail to transport bulk materials efficiently. Below are several applications of the Rail Industrial Access Program in the Region:

North Branch Resources: Hanover County

- Jobs Added, 4

- Capital Investment, 1,805,000

Houff Doswell Terminal: Hanover County

- Jobs Added, 4
- Capital Investment, 1,750,000

Buckingham Branch Railroad – Doswell: Hanover County

- Jobs Added, 37
- Capital Investment, 12,395,000

Recycling Management Resources: Henrico County

- Jobs Added, 6
- Capital Investment, 370,000

Carolina Ave LLC: Henrico County

- Jobs Added, 5
- Capital Investment, 3,175,000

Mondelez International: Henrico County

- Jobs Added, 140
- Capital Investment, 55,000,000

Ashton Creek Industrial Park LLC: Chesterfield County

- Jobs Added, 18
- Capital Investment, 3,550,000

Richmond Layover Facility

Virginia is implementing a series of rail infrastructure improvement projects between Richmond to Washington, DC, to expand and enhance passenger rail and freight operations in Virginia. This new facility is necessary to support existing and future passenger rail service in the corridor as it will eliminate non-service trips to Staples Mill Station and help reduce rail congestion and encounters with freight operations in the area.

Virginia Passenger Rail Association completed the Richmond Layover Facility Feasibility Study in April 2023, in which CSX Fulton Yard was determined to be the least impactful site for a layover facility. This new layover facility is expected to be completed by 2026

Virginia Grade Crossing Action Plan

In 2022 The Virginia Department of Transportation in conjunction with the Virginia Department of Rail and Public Transit published the Virginia Grade Crossing Action Plan which sought to provide strategies and actions that will improve rail service, with a particular focus on rail-highway grade crossings. The Richmond Region has an estimated 179 at-grade rail crossings which can lead to dangerous circumstances for users of all modes of transportation. Accordingly, the region saw 47 highway rail incidents between 2018 and 2023, with most being in Richmond (17) and Chesterfield County (13).

Port

The Richmond Marine Terminal (RMT) is one of six facilities managed by the Port of Virginia. Its strategic location within the Richmond Region provides streamlined service to Central and Western Virginia from the Hampton Roads area. The Richmond Marine Terminal is a container-on-barge service between Richmond and Hampton Roads making it part of a dynamic regional and national transportation gateway located on the James River with direct access to several modes of freight transportation. This barge service provides a maritime alternative to I-64 by transporting goods via the James River and significantly cuts down on trucking imports bound for regional distribution. In 2023, the barge service to and from Richmond Marine Terminal kept 33,500 trucks off the road — saving 3.4M truck miles on Virginia's highways. This culminated in 60 percent less carbon emissions compared to moving freight by truck.

Loaded	Tons	TEUs
Exports	254,158	19,390
Imports	305,754	36,132
Total Loaded	559,912	55,522
Empty		16,080
Exports		1,536
Imports		
Total Empties		17,616
Total Moved	**559,912**	**73,138**

Exhibit 17: RMT Commodity Flow by Weight and TEU

The 121-acre terminal, equipped with over 300,000 sq. ft. of warehouse space and a 1,570-foot-long wharf, is capable of handling up to 60,000 TEUs annually. With its strategic location offering quick access to I-95, I-64 and I-85, RMT stands out for its logistical efficiency and connectivity.

The terminal has direct rail access to the **Richmond Terminal Subdivision**, a key freight line for CSX that connects to broader national rail networks. With approximately 19,640' of rail track, cargo arriving at the Richmond Marine Terminal by water can be efficiently transferred to rail for transportation to places across the U.S., including major distribution hubs. Through the Port of Virginia, the RMT has direct access to over 80 ports, a 24-hour drop-off facility for trucks, and distribution and warehouse facilities.

All the Port of Virginia (POV) tonnage and TEUs passed through the POV deep-water terminals. However, a portion of the container import cargo was shipped to the Richmond Marine Terminal by rail, truck, and barge. The Richmond Marine Terminal's 559,912 tonnage of cargo was only 2.2 percent of the total POV tonnage but served a valuable function in moving exports from and imports to Richmond area international trade customers.

In 2023 the Richmond Marine Terminal (RMT) contributed $2.7 billion in output purchases, of which $1.4 billion was Virginia value-added, funding $882 million in labor income for over 12,000 workers. This contribution accounts for over two percent of the total POV Virginia impacts, as shown in Table 10. The RMT impact contribution is predominantly created by customers using imported goods as inputs in processing, making, and distributing their products; import use accounted for over 90 percent of the RMT value-added, labor income, and employment impact contributions.

POV All-Ports Impacts and RMT Contributions ($ in millions)	Output	Value-added Purchases	Labor Income	Employment
All Ports Impact	$124,095.00	$62,970.20	$41,411.00	565,063
RMT Impacts Contribution	$2,668.10	$1,355.60	$882.20	12,157
Percent of Total	2.20%	2.20%	2.10%	2.20%

Exhibit 18: RMT Contributions to All-POV Impacts

Port of Virginia Capital Improvements

The Port of Virginia's Gateway Investment Program outlines major capital improvements, with a **$1.4 billion** investment aimed at expanding and modernizing its facilities. This is part of a broader strategy to enhance its capacity, improve efficiency, and position the port as a more competitive player in the global logistics and shipping industry. Of this, $6.1 million has been allocated specifically for RMT for capital improvements over the past 5 years, including:

- Upgrading gate throughput to allow faster truck cargo processing through the terminal
- New secured overnight drop lot area for next day processing of truck cargo
- Improved lighting to extend barge loading/unloading schedule for faster turn times (Est. Completion – Q1 2025)

Trucking

The FAST Act requires the establishment of a National Highway Freight Network, a vital component of the country's transportation infrastructure, designed to improve the efficiency, reliability, and safety of freight movement. The network is crucial for supporting economic activity by ensuring that goods can be moved quickly and safely between major cities, ports, and manufacturing hubs. Components of the NHFN consist of The Primary Highway Freight System (PHFS), Critical Rural Freight Corridors; Critical Urban Freight Corridors; and those portions of the Interstate System that are not part of the PHFS. Additionally, States and in certain cases, Metropolitan Planning

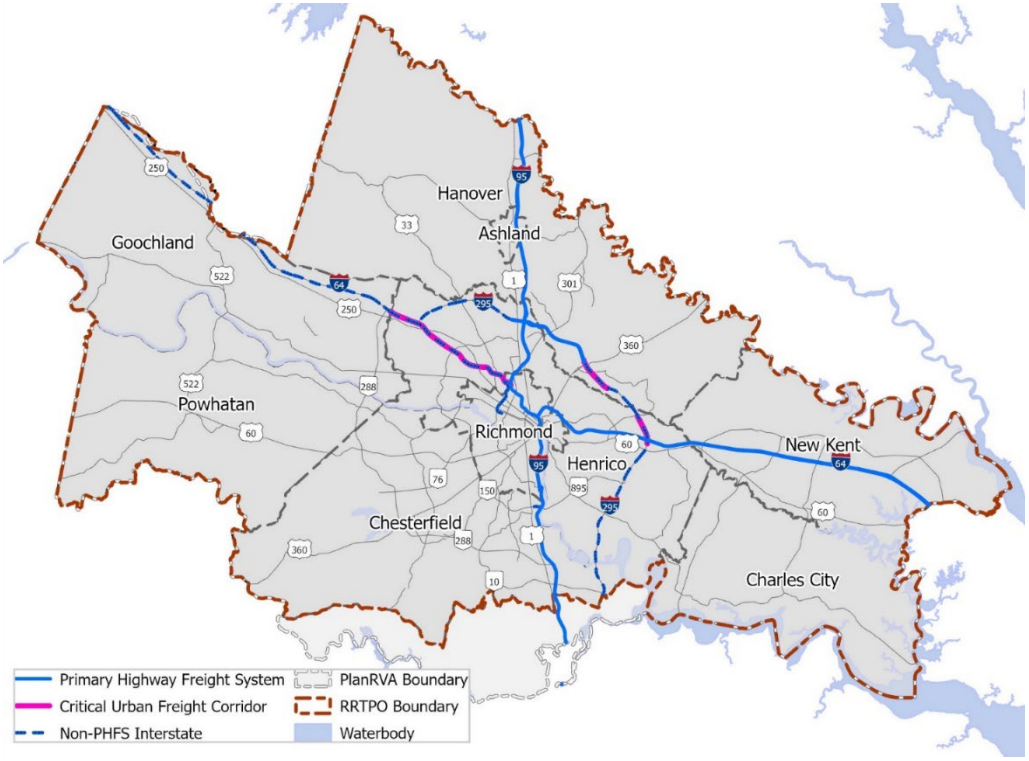


Exhibit 19: Richmond Region Highway Freight Network

Organizations (MPOs), are responsible for designating public roads for the CRFCs and CUFCs in accordance with section 1116 of the FAST Act and the Bipartisan Infrastructure Law section 11114.

The Richmond Region is served by several routes on the NHFN including I-95, I-64, and I-295 that act as critical freight gateways in and out of the region. Average daily truck traffic on all regional interstates, highways, and principal arterials is over 1500 AADT. Interstate 95 sees the region's bulk share of truck traffic. On average, approximately 18,000 trucks travel on interstate 95 with daily truck traffic reaching as high as over 21000 in specific road segments in 2023: I-95 southbound between the Sliding Hill Rd interchange and the I-295 interchange experiences the maximum volume of daily truck traffic. Interstate 295 is a beltway, auxiliary interstate around the city of Richmond and Interstate 64, the region's foremost east-west throughfare, also serve as primary routes for freight within the Richmond Region. I-295 saw an average of 8700 trucks a day in 2023 with the most heavily traveled segments comprise a 4.5 mile stretch of road between the US Route 301 Interchange and Pole Green Rd. between the I-95 interchange and Pole Green Road. Additionally, Interstate 64 serves as the 3rd most traveled regional route by truck with an average of over 3700 trucks per day. Eastbound and westbound road segments on I-64, between the VA-288 and I-295 interchanges experienced truck traffic volumes of over 8600 a day.

Most of the freight is carried by truck throughout the region. Of all outbound freight in 2023, trucks accounted for 94% of movement by weight and 85% by value. During the same year, of all inbound freight, trucks accounted for 65% of all tonnage and 80% of all value of cargo. Commodities such as nonmetal mineral products, gravel, logs and wood products, waste/scraps accounted for the highest commodities shipped by weight. Additionally, tobacco products, electronics, machinery, rubber/plastic, mixed freight, and motorized vehicles were the most valuable commodities shipped by truck.

Rank	Commodity by Truck (Origin)	Tonnage
1.	Nonmetal min. prods.	9,513.5
2.	Gravel	7,425.4
3.	Logs	3,645.4
4.	Coal	3,199.4
5.	Waste/Scrap	2,741.8

Rank	Commodity by Trucks (Destination)	Tonnage
#1	Nonmetal min. prods.	9521.1
#2	Gravel	7748.5
#3	Logs	3650.0
#4	Waste/Scrap	3210.8
#5	Wood products	2156.6

Exhibit 20: Truck Commodity Flow by Tonnage

Airports

The Richmond Region is served by four airports: the Richmond International Airport (RIC), Chesterfield County Airport, Hanover County Municipal Airport, and New Kent County Airport. Only RIC provides scheduled commercial airline service and major air cargo operations.

The number of passengers traveling via commercial air service was increasing at RIC prior to the Covid-19 Pandemic. Over 2.1 million passengers boarded flights at RIC commercial service airports in 2019 according to the Bureau of Transportation Statistics and local airport data. The number of passengers flying through RIC increased 88% from 2020 to 2021 after falling by 61% from 2019 to 2020. Approximately 2.4 million passengers boarded flights at RIC in 2023.

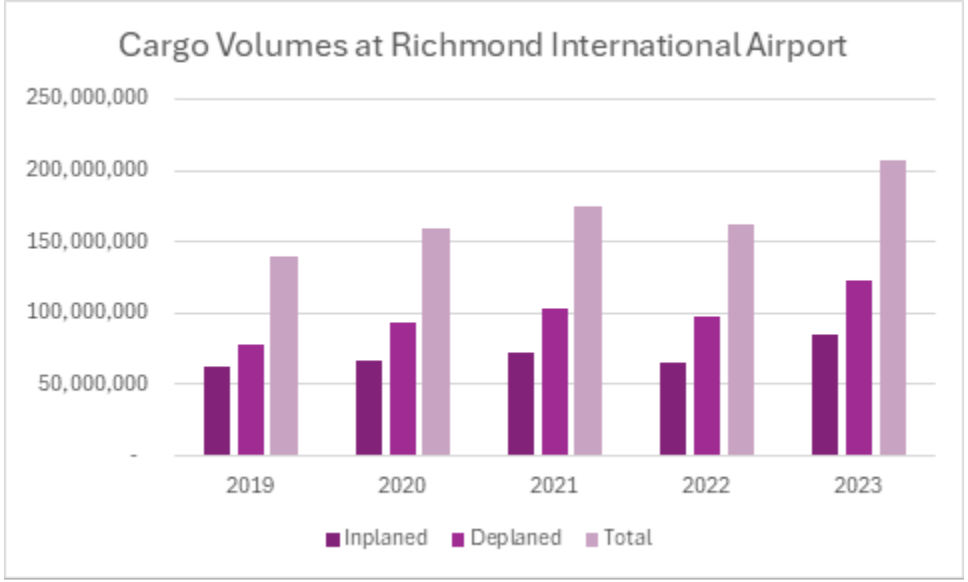


Exhibit 21: Richmond Internation Airport (Source: RIC)

Domestic airfare at Richmond International Airport has fluctuated over the last five years. Pandemic-related travel restrictions resulted in major decreases in airfare, nationally. By late 2020, airfares at RIC had plummeted to $283, a decrease of about $110, or roughly 28%. By the end of 2023, the average airfare at RIC had risen to $397, which was about $12 more than the national average. According to the Bureau of Transportation Statistics, average fares are based on the total ticket value, which consists of the price charged by the airlines plus any additional taxes and fees levied by an outside entity at the time of purchase. Fares include only the price paid at the time of the ticket purchase and do not include fees for optional services, such as baggage fees. Averages do not include frequent-flyer or “zero fares.”

An average of 72 flights departed RIC each day in 2023. This compares to 83 commercial flights departing from RIC airports each day prior to the pandemic in 2019. Calendar years (CY) 2021 and 2022 experienced 58 and 70 commercial flights a day, respectively. Another common method of measuring an airport’s person-carrying capacity is the available seat-miles. This number has increased steadily since its pandemic-induced decline of 793 million by the end of 2020. In the last fully reported year of 2023, available seat-miles reached 1.8 billion for domestic and international flights.

Load factor is another metric of airport efficiency and refers to the percentage of available seats (or capacity) that are actually filled with passengers. A high load factor means that more seats are occupied, which indicates better utilization of resources. Load factors had reached historic lows during the Pandemic at 58.61% by the end of 2020. This number has rebounded tremendously by 2023 to 82.16.



Over the last five years RIC has seen gradual increases in cargo volumes with deplaned cargo outpacing enplaned shipments. During this time period, RIC handled on average approximately 170 million pounds of cargo through several air carriers, including DHL, Federal Express (FedEx) and United Parcel Service (UPS).

Exhibit 22: RIC Cargo by Pounds

Maintenance and Safety

Bridge Condition

The RRTPO footprint is dotted with “structures” such as bridges, culverts, and tunnels, which are routinely evaluated over a two-year cycle for safety and maintenance needs. This evaluation is critical in the development of appropriate maintenance and funding strategies for current and future repairs. Data on the condition of structures is maintained and provided by VDOT the Office of Intermodal Planning and Investment (OIPI). Using the data to highlight which

structures are eligible for funding through VDOT's State of Good Repair program, allows the RRTPO to be strategic and thoughtful with funding.

These structures throughout the Richmond Region are owned and maintained by a variety of stakeholders, both part of VDOT's Road System, and separate from it. Structures on non-VDOT road systems include those maintained as part of the Richmond and Ashland urban system, those on Henrico County's Secondary System, the Richmond Metropolitan Transportation Authority (RMTA), and other private bridges and culverts. VDOT owns the greatest number of structures in the RRTPO at 84.7%, Henrico County is second, owning 6.6%, and The City of Richmond owns 5.7%. It is critical that structures are maintained in adequate condition due to the relatively high number of bridges in the region with numerous interstates, state highways, freeways, multiple major rivers and their tributaries, and crossing of three major railroad systems.

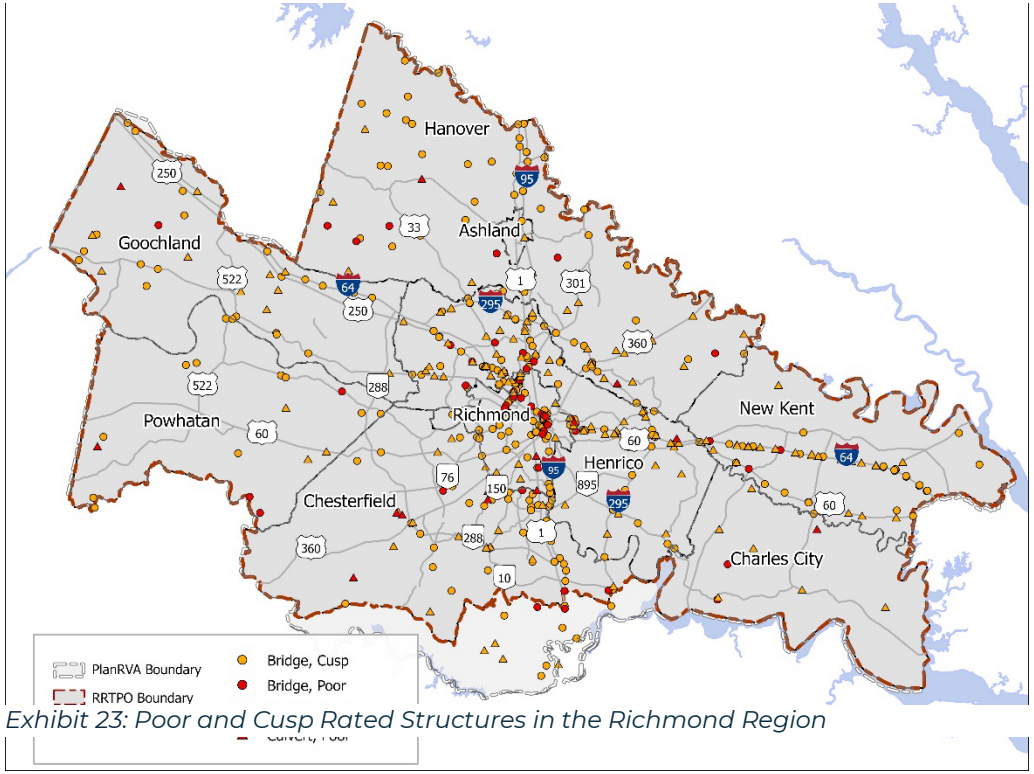


Exhibit 23: Poor and Cusp Rated Structures in the Richmond Region

A more in-depth look at the condition of structures is included in the Technical Report C: Richmond Regional Structural Inventory & Assessment Report 2024 at the end of 2050 LRTP. The report shows a total of 1,509 structures, 870 bridges and 639 culverts, with an average age of 46 years old. The 1,509 structures include all structures in Chesterfield County, even those outside of the RRTPO boundary. This was done to ensure that the condition of the structures in the entirety of all counties that are part of the RRTPO are included.

Of those, there are 50 Bridges, and 16 culverts rated "poor" this accounts for a total of 4.3% of structures in the RRTPO. Structures that are given a "poor" rating means that there are elements of the structure that need to be repaired or

monitored further. If a structure has been closed to traffic, restricted to light vehicles, or if they require rehabilitation, it is considered “poor.” The fact that a bridge is given a “poor” rating, does not mean it is unsafe, and it does not imply that the bridge is likely to collapse. Of the 66 total “poor” structures, 18 of them are classified as part of the National Highway System (NHS) and are listed below. In 2024, VDOT designated “cusp” as an additional condition categorization. Structures that fall into the “cusp” category are ranked just above “poor” they are given the “cusp” marker as they are on the cusp of being poor and should therefore be monitored more closely and repairs begun. 32.4% of structures in the Richmond Region are considered “cusp” structures, and the remaining 63% of structures in the Richmond Region are in the “fair” and “good” categories. More details about the categorization of structure conditions across the region can be found in the Technical Report mentioned above.

- Bridge ID: 4994 - Jeff Davis Hwy over Ashton Creek
- Bridge ID: 5151 - Route 288 (North Bound) over an unnamed tributary
- Bridge ID: 5162 - Route 288 (South Bound) over an unnamed tributary
- Bridge ID: 9634 - Parham Road and CSX Railway
- Bridge ID: 9803 - I-64 and Stony Run
- Bridge ID: 9880 - Rt. 195 and CSX Railway
- Bridge ID: 10008 - Southbound Chamberlayne and Rt. 195
- Bridge ID: 12641 - Eastbound Pocahontas Tr. And Toe Ink Swamp
- Bridge ID: 21287 - Ramp to 5th and I-95 S and I-95
- Bridge ID: 21531 - North Boulevard and CSX Railway
- Bridge ID: 21519 - Southbound Downtown Expressway and Rte 195 & 12th St.
- Bridge ID: 21548 - I-195 and Bellevue Ave.
- Bridge ID: 21556 - I-195 CSX Railway
- Bridge ID: 21569 - Broad St. and I-95
- Bridge ID: 21575 - Broad St. and CSX Abandoned Spur Line
- Bridge ID: 21583 - 14th St. And James River South (21583)
- Bridge ID: 21584 - 14th St. And James River South (21584)
- Bridge ID: 21585 - Hull St. And Manchester Canal

Safety

Our understanding of safety is changing, and we now recognize that crashes can be prevented, and deaths or serious injuries are unacceptable. Our focus has shifted to protecting people by preventing the most severe crashes, not just lowering overall crash numbers. Safety has become the major focus of transportation planning efforts with a growing recognition that if people can't arrive at their destination unharmed, the benefits of faster trips or less traffic don't matter.

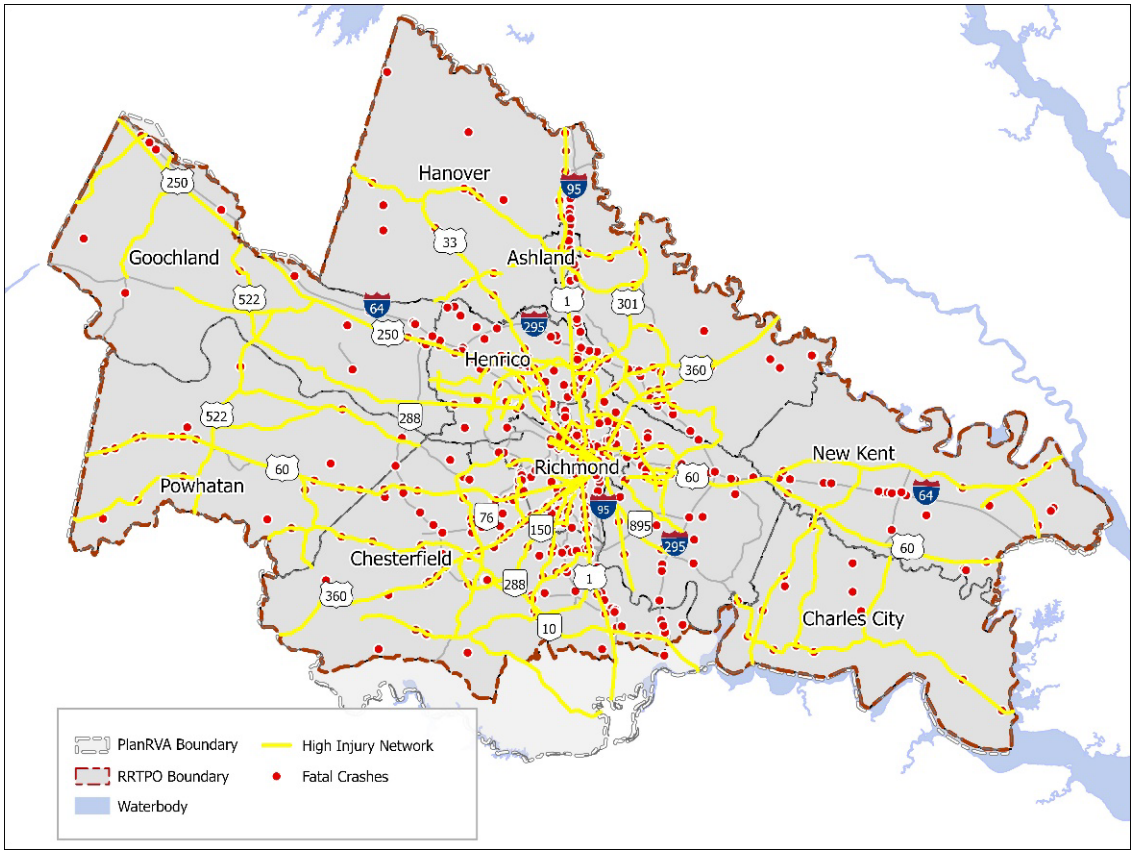


Exhibit 24: Fatal Crashes (January 2020 - November 2024)

Vision Zero is an approach to safety that starts with the ethical belief that everyone has the right to move safely in their communities, and that system designers and policy makers share the responsibility to ensure safe systems for travel. Vision Zero recognizes that people will sometimes make mistakes, so the road system and related policies should be designed to ensure those inevitable mistakes do not result in severe injuries or fatalities. It is a multidisciplinary approach, bringing together diverse and necessary stakeholders to address this complex problem. Vision Zero acknowledges that many factors contribute to safe mobility -- including roadway design, speeds, behaviors, technology, and policies -- and sets clear goals to achieve the shared goal of zero fatalities and severe injuries.

From 2018 to 2022, 116 people were killed every year on our regional roadways according to national Fatality Analysis Reporting System (FARS) data. This is the most recent data reported as part of the RRTPO's performance-based planning program. The map below shows fatal crashes between January 2020 and November 2024, more recent data than is included in FARS. The latest data shows that **1 person dies every 3 days** on our roadways. Based on data from the Virginia Department of Motor Vehicles, between 2019 and 2023, 871 people were severely injured in traffic crashes each year, suffering from things like severe burns, deep cuts, broken bones, unconsciousness, or paralysis which can have life-long consequences, even after the injuries are no longer visible. The map below shows preliminary data from 2020 to November 2024. Based on the latest numbers, **2 to 3 people are seriously injured each day on our roads**.

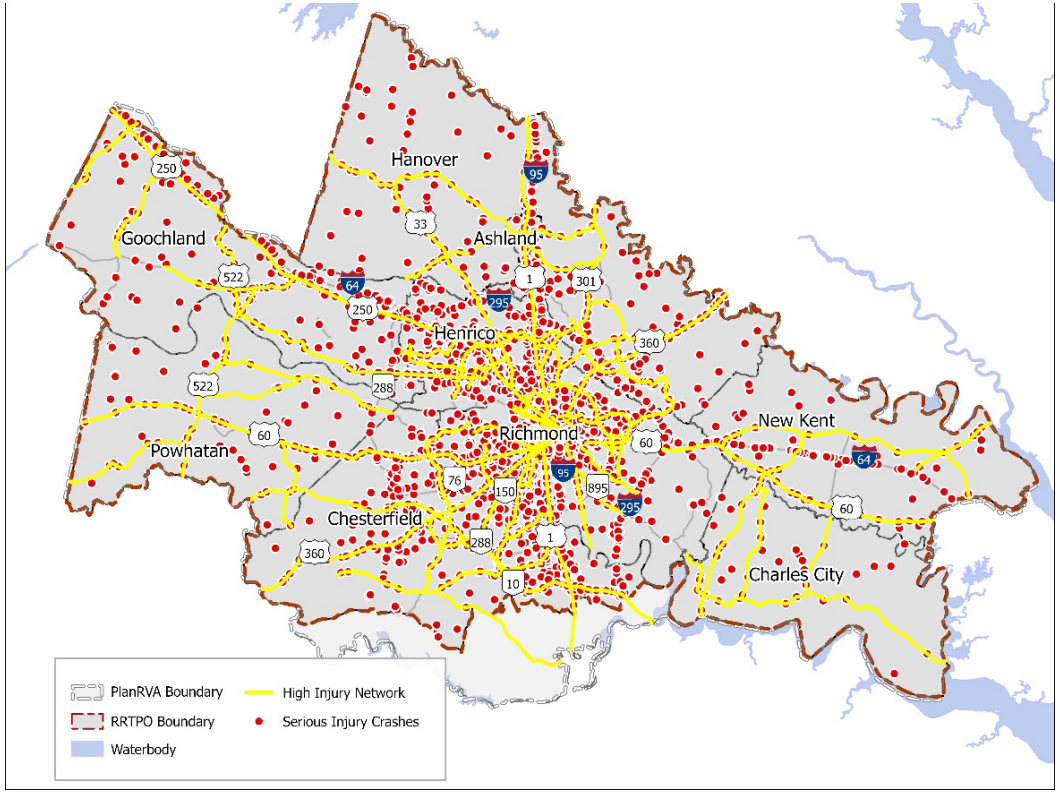


Exhibit 25: Serious Injury Crashes (January 2020 - November 2024)

Of the people killed or seriously injured each year, 109, or 11%, are killed or injured while biking, walking, or rolling. In response to this pressing issue, the RRTPO has adopted safety targets to reduce the number of people killed and seriously injured on our roads and developed a regional safety plan to understand what causes these crashes and suggest ways to fix the problems.

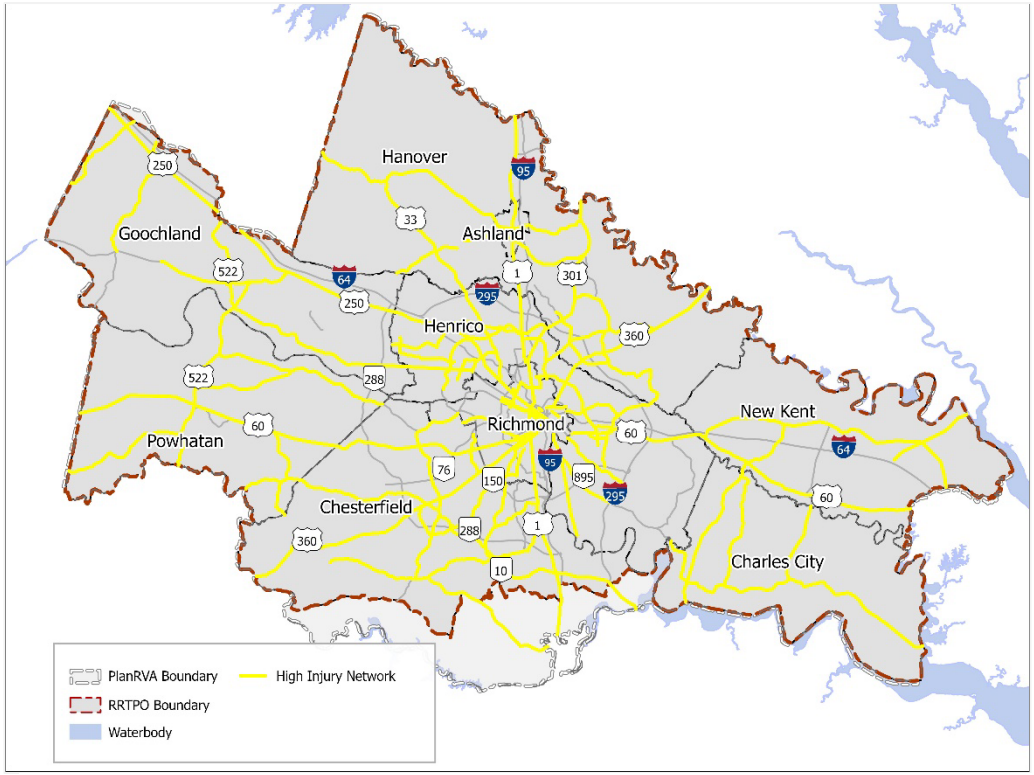


Exhibit 26: Regional High Injury Network

Using data from 2016 to 2020, the plan identified the High-Injury Network (HIN)—roads that account for an outsized share of the serious crashes. These roads make up just 8.2% of the total network but are responsible for 62.9% of crashes that kill or and seriously injure someone. RRTPO plans to update this data regularly to keep the safety information up to date. This map shows the HIN for each area of our region.

The City of Richmond, Chesterfield County, and Henrico County are working on their own safety plans, partly funded by the Safe Streets & Roads for All program at the U.S. Department of Transportation. Henrico expects to conclude their plan this spring. The City of Richmond and Chesterfield County have completed their safety plans, including updated mapping of high-injury streets within each locality. This planning work has helped to focus safety investments on the corridors which offer the most potential for serious crash reduction. Despite recent efforts, the number of people killed on our roads continues to climb.

Over the past decade, the average number of people killed each year has increased by 43%, climbing from a low of 81 people a year in 2016 to the current rate of 116 each year. While serious injuries have slightly declined and the number of people injured or killed while outside of a vehicle has generally stayed flat, these trends have seen reversals in recent years. Overall, the region's progress toward zero traffic deaths and serious injuries has slowed significantly over the past decade, consistent with overall national trends.

.

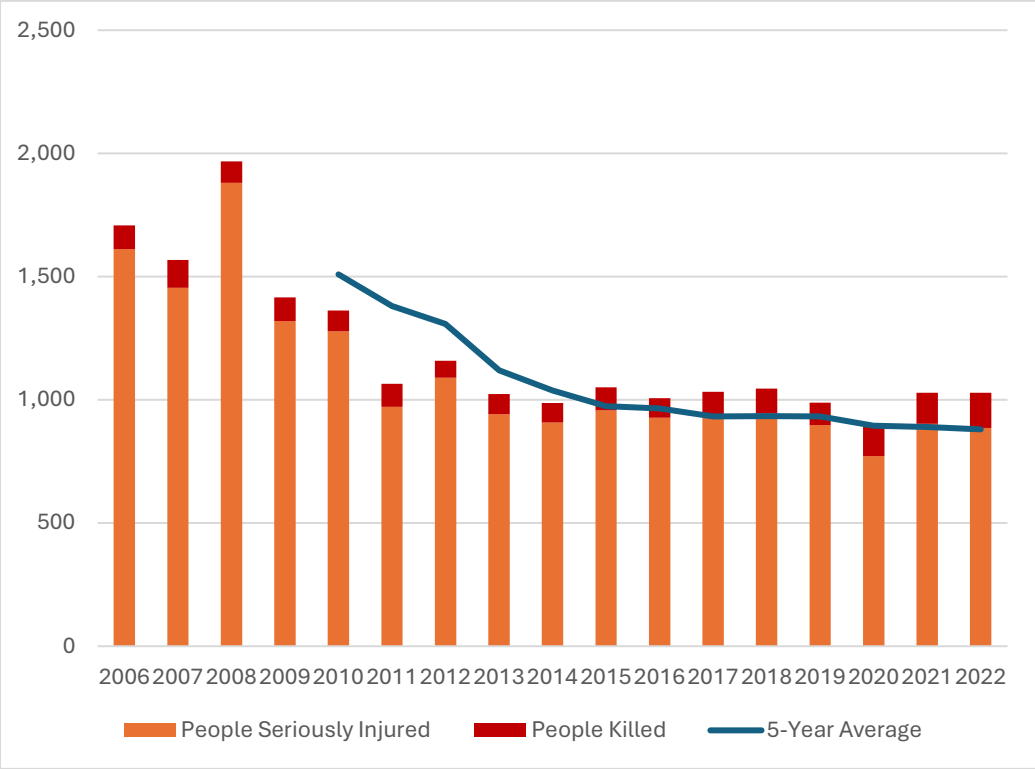


Exhibit 27: People Killed and Seriously Injured by Year (2006 - 2022)

Other Strategies and Initiatives

Transportation Network Company (TNC)/ Shared Mobility

Ride-hailing services like Uber and Lyft have become prevalent throughout the U.S. A common feature of these services is the ability of the traveler to request a driver and vehicle through a smartphone app, and users are provided with real-time information about wait times Having ride-hailing services offers positive benefits to fully integrate multimodal transportation systems to serve all travelers and reduce vehicle miles traveled (VMT) and transportation emissions. The less desirable aspect of ride hailing is that it serves merely as a more affordable taxi service, allowing

people who can afford personal ride services to forego alternative modes of transportation like public transit and biking, but still contributes to increases in traffic, emissions, and congestion.

Micromobility

The term “micromobility” encompasses very light-weight vehicles such as e-scooters, bicycles, or electric assisted bicycles that carry a single person for short and first/last mile trips. Micromobility can increase access to transit and unlock more parts of the region for people who do not own cars. Micromobility can be human or electric powered, privately owned or shared, and most commonly operates at low to moderate speeds. Shared micromobility programs or services are provided to the public for a fee commonly using a smartphone app. In the Richmond Region, bike share programs are most offered in the urbanized area and are provided by RVA Bike Share. Scooter sharing services operating in the region include Bird, SPIN, and Lime.

Alternative Fuel Vehicles

Electric vehicles (EV) represent a clean transportation mode with fewer or no tailpipe emissions, making them an important consideration to make transportation in the region more resilient looking to the future. Nearly 70 electric models are on the market today, with electric vehicle types including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and all-electric vehicles.

Today’s EV has an average driving range of around 300 miles on a single charge. As of 2022, there were 10,433 EV registered to owners in the region (DriveElectricVA). The percentage of EVs in the region is projected to increase through the early 2030s, then level out.

Charging infrastructure is needed to serve electric vehicles. Recent data for the region showed 348 level 2 ports across 160 locations and 163 level 3 ports across 26 locations. Several different charging networks are present in the region, as well as some non-networked ports. ChargePoint leads the local market, followed by Tesla. Exhibit 28 shows the number of locations in each of the localities.

Electric vehicle charging locations are found in many types of places, including homes, retail shops and municipal buildings. Key locations for future charging infrastructure include Park and Ride lots and commercial centers. Many localities in the region have taken positive steps toward supporting EV, such as through policies and actions to electrify municipal vehicle fleets and make EV charging stations more accessible.

Other types of alternative fuel infrastructure, such as hydrogen fueling for medium and heavy-duty vehicles, are present in some other regions of the United States, but not yet within the Richmond region.

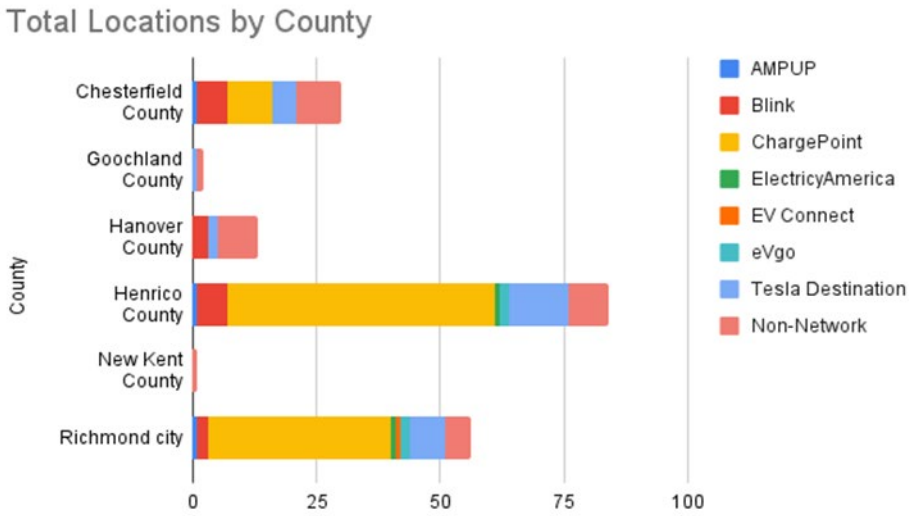


Exhibit 28: Number and Type of Charging Stations by Locality (Source: DriveElectricVA)

Autonomous Vehicles

In 2025, Richmond, Virginia, continues to advance its engagement with autonomous vehicle (AV) technology through several strategic initiatives. The Virginia Department of Transportation (VDOT) oversees the development of Connected and Automated Vehicles, aiming to enhance transportation safety and efficiency statewide.

Richmond has completed phases I and II of its communication backbone projects, connecting 400 out of 477 signalized intersections to an Advanced Traffic Management System, with plans for phases III and IV to further expand this network. Additionally, the Virginia Innovation Partnership Corporation (VIPC) collaborates with various stakeholders to position Virginia, as a leader in autonomous vehicle development, supporting research, technology commercialization, and educational opportunities in the field. These efforts underscore Richmond's commitment to integrating autonomous vehicle technologies into its transportation infrastructure, aiming to improve mobility and safety for its residents.

Air Quality

As required in the Clean Air Act, the Environmental Protection Agency (EPA) must set limits on certain (criteria) pollutants that are harmful to public health and the environment. In the Clean Air Act, there are six “criteria” pollutants: ground level ozone, particulate matter, carbon monoxide, lead, sulfur dioxide, nitrogen dioxide. These criteria pollutants are commonly found in the air and defined in the Clean Air Act as harmful to public health and the environment. These pollutants are related to transportation because some of them are caused by emissions from mobile sources.

Standard	Richmond-Petersburg’s Obligations
1991 Ozone NAAQS (124 ppb)	»1991-Moderate Nonattainment Area • Transportation Conformity, Stringent New Source Permitting, RACT »1997-Redesignated to Attainment
1997 Ozone NAAQS (84 ppb)	»2004-Moderate Nonattainment Area • Transportation Conformity, Stringent New Source Permitting »2007-Redesignated to Attainment
2008 Ozone NAAQS (75 ppb)	»2012-Designated Attainment Area »2013-Ozone Advance Action Plan
2015 Ozone NAAQS (70 ppb)	»2017-Designated Attainment Area »Monitoring data is well below the standard

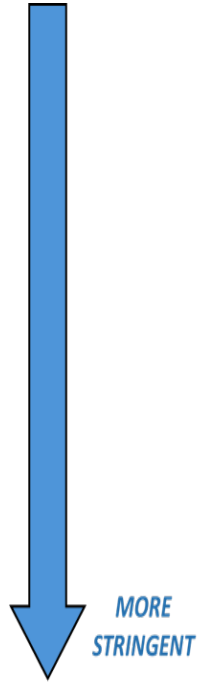


Exhibit 29: Clean Air Ozone History - Richmond Region

The Clean Air Act mandates that transportation planning, including metropolitan transportation plans and improvement programs, must "conform" to the state's air quality implementation plan, meaning transportation projects must be designed to not worsen air quality and must consider strategies to reduce emissions from vehicles to meet established air quality standards. While the Richmond region is considered in “attainment” for all current

emissions standards, the Richmond area once was classified as a “non-attainment” area, and later a “maintenance area” for the 1997 eight-hour ozone standard. In 2018, the D.C. Circuit Court issued a decision in South Coast Air Quality Management District v. EPA that requires all non-attainment or maintenance areas under the 1997 standards to demonstrate conformity for the long-range transportation plan and the Transportation Improvement Plan (TIP) even after having achieved attainment under the more stringent 2015 standards. Thus, in the Richmond region, the types of emissions included in the air quality conformity analysis are volatile organic compounds (VOCs)

Levels of Health Concern	$PM_{2.5}$	Ozone	Air Quality Index	Meaning
Good	0-12.0 ug/m^3	0-0.054 ppm	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	12.1-35.4 ug/m^3	0.055-0.070 ppm	51 to 100	Air quality is acceptable; however, a moderate health concern for a very small number of people who are unusually ssensitive to air pollution may exist.
Unhealthy for Sensitive Groups	35.5-55.4 ug/m^3	0.071-0.085 ppm	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	55.5-150.4 ug/m^3	0.086-0.105 ppm	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	150.5-250.4 ug/m^3	0.106-0.200 ppm	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	above 250.5 ug/m^3	Above 0.201 ppm	301 to 500	Health alert: everyone may experience more serious health effects.

Exhibit 30: AQI Index or Air Quality

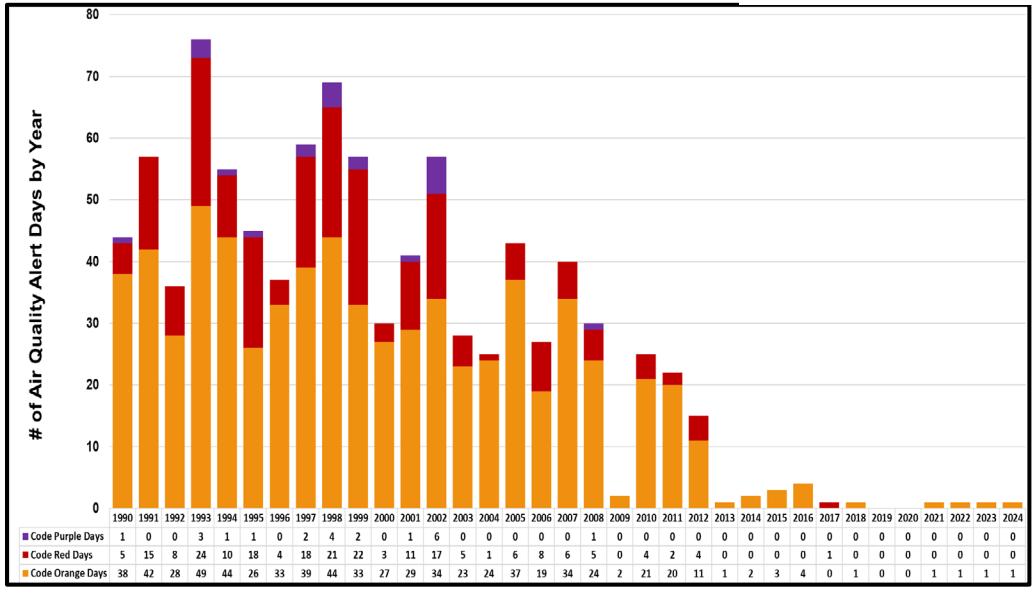


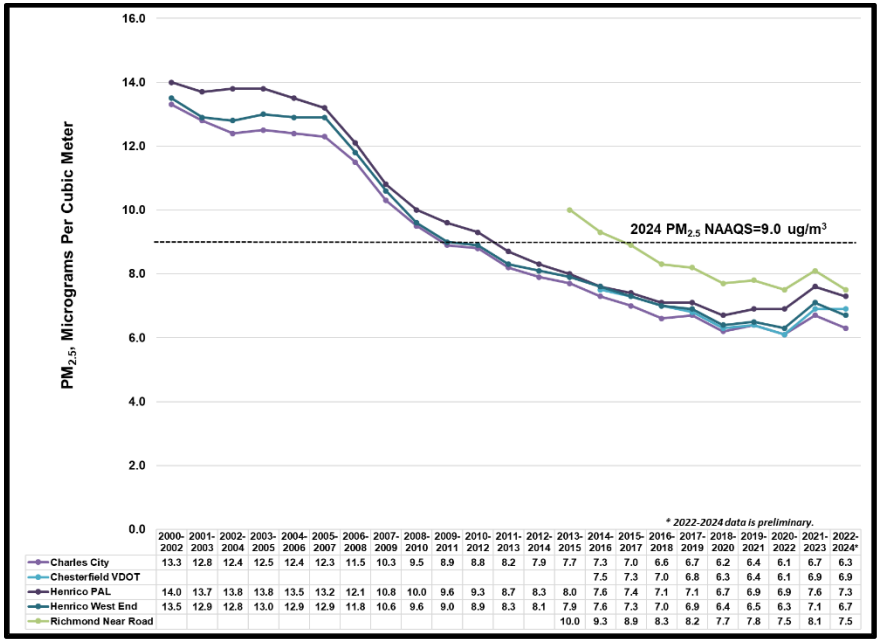
Exhibit 31: Air Quality Alert Days in Richmond (1990 - 2024)

and Nitrogen Oxide (NOx), which are building blocks for the formation of ozone gas. Fine Particulate Matter (PM2.5) which are mixtures of solid particles and liquid droplets found in the air with diameters that are generally 2.5 micrometers and smaller have historically been of some concern in the Richmond region. The U.S. Air Quality Index (AQI) is EPA's tool for communicating about outdoor air

quality and health. The AQI includes six color-coded (green, yellow, orange, red, purple and maroon) categories, each corresponding to a range of index values as shown in Exhibit 30. The higher the AQI values, the greater the level of air pollution and the greater the health concern. AQI value of 50 or below represents good air quality, while an AQI value over 300 represents hazardous air quality.

In the Richmond region, the ozone air quality has been very good since 2018. There has only been 1 or less orange code each year since 2018.

In the Richmond region, the PM2.5 pollution has been gradually going down since 2000. There was a slight uptick in 2023 largely due the impacts form out of state wildfires (New Jersey, Western US and Canada)



	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023	2022-2024*
Charles City	13.3	12.8	12.4	12.5	12.4	12.3	11.5	10.3	9.5	8.9	8.8	8.2	7.9	7.7	7.3	7.0	6.6	6.7	6.2	6.4	6.1	6.7	6.3
Chesterfield VDOT															7.5	7.3	7.0	6.8	6.3	6.4	6.1	6.9	6.9
Henrico PAL	14.0	13.7	13.8	13.8	13.5	13.2	12.1	10.8	10.0	9.6	9.3	8.7	8.3	8.0	7.6	7.4	7.1	7.1	6.7	6.9	6.9	7.6	7.3
Henrico West End	13.5	12.9	12.8	13.0	12.9	12.9	11.8	10.6	9.6	9.0	8.9	8.3	8.1	7.9	7.6	7.3	7.0	6.9	6.4	6.5	6.3	7.1	6.7
Richmond Near Road														10.0	9.3	8.9	8.3	8.2	7.7	7.8	7.5	8.1	7.5

Exhibit 32: PM 2.5 Annual Three-year Averages in the Richmond Region

Environmental Resource & Mitigation

ConnectRVA 2050 considers several environmental features and resources to help determine the best transportation network solutions and opportunities. Identifying the location of these resources and avoiding or otherwise accounting for their presence can help preserve unique habitats and cultural heritage resources, retain ecosystem function and services, help meet state and federal water quality goals, and reduce risks to the infrastructure from natural hazards. In addition, recognizing environmental features during the planning phase can guide the location or design of transportation projects, potentially reducing delays and costs during the project implementation phase when the project must demonstrate compliance with state and federal environmental and historic preservation laws.

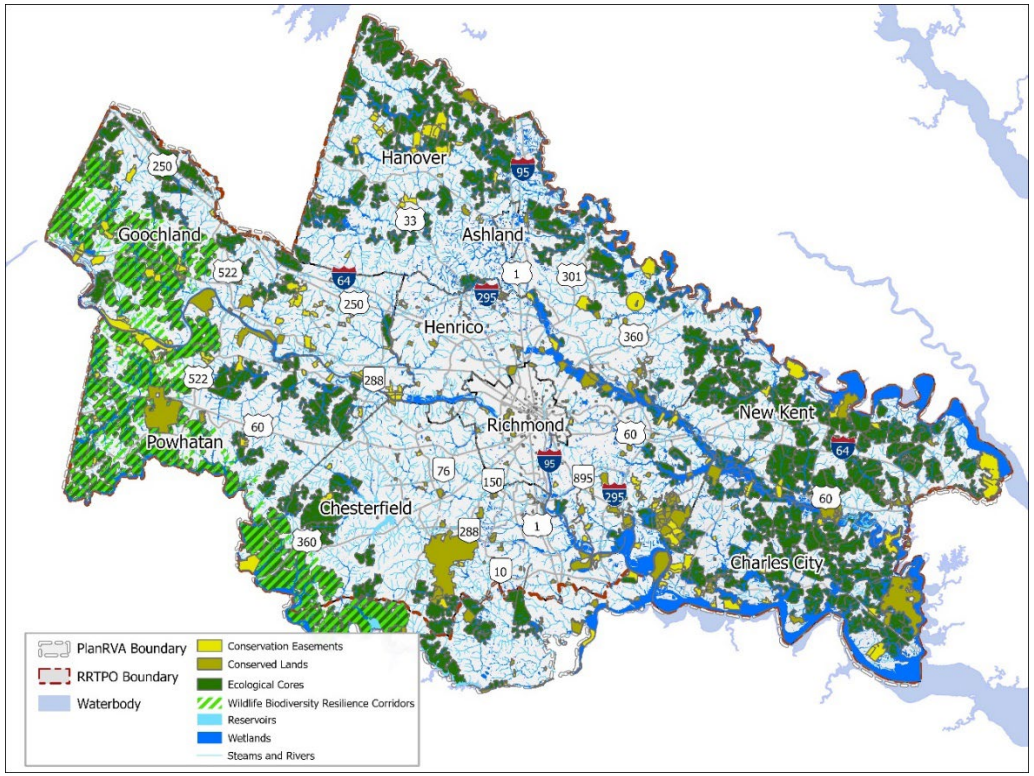


Exhibit 33: Environmental Resources

Wetlands are areas where water covers the soil, providing essential services like water quality improvement, flood mitigation, and shoreline protection. Ecological cores are large natural land patches that form a network for Virginia's ecosystems, while landscape corridors connect these cores, helping animals and plants move between habitats, crucial for biodiversity conservation. Conserved lands, owned by public or conservation-focused entities, are protected for natural resource conservation, recreation, or cultural heritage. Conservation easements are legal agreements that protect land from future development to preserve conservation values. Other factors to consider during planning and permitting include natural heritage locations, which highlight unique biodiversity, and Agricultural and Forestal Districts (AFDs), which preserve agricultural and forest land for ecological and economic purposes. Additionally, historic places are recognized and protected through national and state registers for their cultural and historical significance.

System Resiliency – Security

There are many types of events that could significantly impact the transportation system and its ability to provide movement of people and goods within the region. Information relevant to several types of events is covered in other sections of this report, including potential infrastructure failures due to poor condition (in the bridge and road conditions sections) and natural disasters (in the transportation system resilience section). A 2018 Threat and Hazard

Identification and Risk Assessment (THIRA) report for the region identified other events or conditions that could have significant impact, including:

Cyberattacks on Transportation Systems**:** Cyberattacks targeting transportation systems can range from malware affecting banking systems to ransomware disrupting major utilities, and even nationwide disruptions like AMTRAK switch alterations leading to train derailments. These incidents can severely disrupt transit and rail services, affecting both commuter movements and cargo deliveries. The financial impact due to halted operations and the ensuing repair costs can be substantial. Additionally, there are significant safety concerns with potential risks to passenger safety from uncontrolled train movements or station lockdowns.

Hazardous Materials Spills: A hazardous materials spill can occur, for example, from a collision between a semi-truck carrying chlorine and another with livestock on Interstate 95, resulting in a dangerous chemical plume. This type of incident typically leads to the immediate shutdown of transportation corridors within a 5-mile radius, severely impacting mobility and access. Health risks arise from exposure to chlorine, necessitating emergency medical responses and potential evacuations. The environmental impact can be profound, with long-term damage complicating cleanup and restoration efforts.

Terrorist Attacks on Transportation Hubs: Terrorist attacks targeting transportation hubs, such as the scenario of a hijacked passenger train that derail and explodes due to a terrorist attack, can cause significant casualties and major damage to transportation infrastructure. Such incidents require extensive repairs and heightened security measures. They also disrupt transportation services, affecting both regional and potentially national transit schedules, and demand a large-scale emergency response, necessitating significant coordination among various agencies.

North Anna Power Station (NAPS) Incident: Given the proximity to the North Anna Power Station in Hanover County, specific evacuation plans are necessary due to the potential risks associated with nuclear power generation. The evacuation strategy includes multiple roadways throughout Hanover County, which are essential for the rapid and efficient movement of residents away from potential hazards.

> *Local Roadways*: These are crucial for the initial phase of evacuation, facilitating quick departure from areas close to the power station.
>
> *Connectivity to Major Highways*: Seamless integration of local routes with larger roads is critical for enabling access to regional evacuation paths.

It is important for local authorities to regularly conduct evacuation drills and keep the public well-informed about these designated routes through maps, signage, and digital alerts that provide real-time updates on road conditions during emergencies.

Additionally, collaboration with meteorological services and emergency management agencies is vital for preemptive actions. Infrastructure improvements could include reinforcing roads, enhancing drainage systems, and ensuring adequate fuel and rest stops are available along evacuation routes.

The effectiveness of these evacuation measures during emergencies depends on their maintenance, the coordination of various governmental agencies, and the public's awareness and adherence to evacuation orders.

System Resiliency – Natural Hazards

The high costs and long-term nature of transportation network infrastructure requires consideration of risks to the network from various natural hazards. The Richmond-Crater Hazard Mitigation Plan (HMP), adopted in 2022, is a multi-region plan that presents information about natural hazards risks from a regional standpoint, based on both datasets and local knowledge and experience. The Richmond-Crater HMP lists six critical hazards with moderate or high risk: flooding, severe wind events, tornadoes, severe winter weather, droughts and extreme heat, and thunderstorms.

Assessments of the region's natural hazard frequency and economic impact have primarily focused on trends based on past patterns of hazard occurrence and amount of damage caused; as the climate changes, some hazards are projected to increase in frequency and severity. Climate models show projected risks for some types of hazards in future years between now and the end of the century, and under multiple emission rate scenarios. The following paragraphs provide information on several factors from climate models projections for the Richmond region.

In 2024, there were 39 days with a temperature over 90 degrees in the region. High temperatures may be further intensified in some parts of the region by the Heat Island effect, which can occur in urban areas where temperatures are higher than the surrounding areas due to high concentrations of infrastructure and limited green space.

According to the National Oceanic and Atmospheric Administration (NOAA) MARISSA Community Climate Outlook Report for Richmond, heavy rainfall in Richmond is increasing in frequency and intensity, with similar findings across the region. This changing precipitation pattern includes both increases in the number of heavy rainfall events, and

the total amount of annual precipitation. Between 1981 and 2024, there is a trend of annual precipitation increasing by 2.28 inches per decade (https://champ.rcc-acis.org/). These patterns could increase flooding risks in the region.

Sea level rise refers to the increase in the average level of the world's oceans due to the effects of climate change. Sea Level rise and land subsidence combine to result in relative sea level rise – or the net impact on sea levels. Virginia and the southern Chesapeake Bay region have the highest rate of sea-level rise on the Atlantic coast in the United States. The eastern portion of the region (east of Interstate 95) experiences tidal influence and is considered a coastal area. Given the topography, the impacts of sea level rise may appear less extreme here compared to Hampton Roads and areas directly along the Chesapeake Bay, but increased water levels have impacted and will continue to impact the eastern half of the region. Rising sea levels are projected to affect areas that are or may be routinely under water, areas that may be subject to storm surge, and areas that are or may have a likelihood of flooding.

The hazards discussed above can have a variety of potential impacts on the transportation system and its users. Many of these hazards can cause direct damage to transportation infrastructure. Tornados, hurricanes and other high wind events can damage bridges and other transportation infrastructure directly or through causing debris impacts. Storm surge or heavy rain generated by hurricanes or thunderstorms can cause flooding that can lead to washed out roadway pavement, destabilized slopes, and damaged culverts. High water levels can also cause dam overtopping or failure, potentially damaging roadways that are part of the dam structure or are in the dam break inundation zone. Very high summer temperatures can damage the metal components of rail tracks, cause the loss of asphalt pavement structural integrity on roads and airport runways, and cause bridge joints to expand and the entire structure to shift, threatening bridge stability. When combined with higher humidity, extreme heat conditions can cause corrosion of bridge joints and concrete-based roads.

Whether through direct damage or through operational issues creating unsafe conditions, disruptions to the transportation network can have significant implications. Disruptions to the network can endanger human health and safety, isolate communities and delay emergencies and recovery efforts. Disruptions can also affect normal movement of people and goods, including accessing schools and activities, daily commuting, provision of essential services, and other economic activities, leading to community hardship and economic loss. Damage to the transportation network can also have major cost implications. These costs could increase in the future since projected increases in extreme heat and other effects of climate change are likely to shorten the lifespan of

traditional materials used in transportation projects, especially asphalt, leading to the need for more frequent repairs and replacements.

Even when the transportation system is functioning normally, natural hazards can affect the health and safety of people using transportation facilities. Extreme heat and other types of hazards can be particularly dangerous for people using active transportation facilities or waiting for buses.

Other types of natural hazards may occur across the region, with unpredictable timing or areas of greatest impact. Hazards in this category include hurricanes, tornados, or lightning strikes. While unpredictable, the aspects of the hazards that cause structural damage such as high forces from windspeed or heavy materials, or temperature extremes, could be addressed through design and construction standards.

The transportation network can be designed and maintained to protect human safety in the event of a natural hazard occurrence. In the event of hurricanes, having well-planned evacuation routes is essential. Hurricane evacuation routes are strategically significant and should be prioritized for maintenance and potential upgrades to ensure their reliability during emergencies. Key routes in the Richmond region include:

VA-10 West: This route is vital for moving residents from coastal areas to safer inland locations.

US-60 West: As a major east-west thoroughfare, US-60 West helps distribute traffic from vulnerable areas, aiding in smoother evacuations.

I-64: This interstate is crucial for moving large numbers of evacuees quickly due to its capacity and connectivity with other major highways.

Natural hazard events, such as hurricanes and thunderstorms, have always occurred in the Richmond region. However, a changing climate has begun to affect the location, frequency and severity of hazards and hazard impacts. The largest contributor of climate pollutant emissions in our region is the transportation sector.

Economic Development

The Richmond region has a diverse economic base, including state government agencies, corporate offices, higher education institutions, health care, and advanced manufacturing. The largest sector in the region is Health Care and Social Assistance, followed by Retail Trade and Educational Services. Compared to the national average, the region has

high concentrations of employment in Management of Companies and Enterprises, Finance and Insurance, and Arts, Entertainment, and Recreation. Unlike in past decades, compared to some other regions in Virginia today, the Richmond region is less dependent on a small number of economic sectors.

The Richmond region's transportation system is critical for the functioning of the region's economy across all sectors, enabling people to travel to reach places of employment and to obtain goods and services, and enabling goods produced here to reach destinations within the region or to start their journey across the country or world. The positive attributes of our transportation system, from relatively low congestion levels to increasing options (transit and active transportation, etc.), also help to attract people looking for a region with a high quality of life, which in turn helps attract employment to the region. Economic development activity in established employment centers and expansion into new centers in the region both have benefited from, and have driven, investments in improved transportation infrastructure.

Housing and Transportation

Housing and transportation costs typically make up the largest portions of the cost of living for Americans. While housing costs in Richmond are lower than cities like New York and Washington D.C., increased housing prices have negatively affected the ability of existing residents to afford housing, particularly lower income residents. This issue can be seen in housing cost burden data, which looks at households where monthly housing costs (including utilities other than telephone) exceed 30% of monthly income. Recent data shows that almost 20% of the region's homeowner households, and around 45% of the region's renters, were housing cost-burdened (source: ACS 5-Year 2017-2021, data includes the Richmond region and the Tri-Cities)." Residents of the Richmond region may find more affordable housing options further from the urban core but can face increased gas costs/overall transportation costs and narrowed employment options. On the other hand, extending transit and planning for increased development density can lead to increased land and housing values, which could cause displacement of existing residents. Proactively working to include affordable housing and pursue anti-displacement approaches in transportation opportunity-rich neighborhoods and activity centers can make the overall cost of living lower, among other benefits. Careful consideration and alignment of housing and transportation policy helps to address these types of issues.

Locality	Employed/Living Ratio
Charles City	0.52
Chesterfield	0.82
Goochland	1.90
Hanover	1.01
Henrico	1.25
New Kent	0.47
Powhatan	0.51
Richmond	1.57
Region	**1.12**

Exhibit 34: Employed Living Ratio by Locality - Richmond Region

Each day hundreds of thousands of people in the Richmond region rely on the transportation system to travel to and from their place of employment. Within the region, localities with more employment centers draw higher shares of these workers and have higher levels of in-commuting, while some localities are more residential in nature with less employment.

The City of Richmond has more workers employed in the city than living there. This indicates many workers commute from the surrounding counties to the city. Conversely, Chesterfield has more workers who live versus who are employed there, suggesting more Chesterfield residents commute outside the County for work.

Exhibit 34 also shows a ratio between the number of workers employed and living in each locality. A ratio greater than 1.0 indicates a commuting destination, and the higher the number, the greater the employment opportunities for workers in the region in a particular locality. Using this ratio, Goochland, Hanover (which includes Ashland data), Henrico, and the City of Richmond are commuter destinations. In contrast, this ratio indicates the more predominantly residential nature of Charles City, Chesterfield, New Kent, and Powhatan counties. While Chesterfield has the largest labor force in the Region, many of its residents' commute outside of the county for employment.

Locality	Work Outside of Region/Live in Locality
Charles City	53.89%
Chesterfield	28.82%
Goochland	29.11%
Hanover	25.37%
Henrico	21.31%
New Kent	53.37%
Powhatan	25.58%
Richmond	22.56%

Locality	Live Outside of Region/ Work in Locality
Charles City	46.19%
Chesterfield	45.90%
Goochland	34.38%
Hanover	48.08%
Henrico	39.54%
New Kent	69.84%
Powhatan	37.45%
Richmond	33.41%

Exhibit 35: Detailed Regional Commuting Pattern

Some of the commuting patterns described above may be due to an inadequate supply of housing stock and a lack of affordable housing options. Workers that cannot afford housing in the three largest localities may seek more affordable units elsewhere within the region, or outside the region, such as in the Tri-Cities. Housing affordability,

quality of life, new telecommuting options and other considerations may also play a role in inter-regional commuting patterns.

Most commuters in the Richmond region travel to work by driving alone, with remote work and carpooling as the next most common options (Exhibit 36).

	Drives Alone	Carpool	Public	Walk	Bike	Taxi, Motorcycle, other	Remote	Total Workforce
Charles City	2,666	209	57	14	-	77	241	3,290
Chesterfield	148,397	17,811	438	1,192	184	1792	25,698	190,098
Goochland	8,866	551	-	85	-	41	1,897	11,470
Hanover	44,997	3,254	73	670	16	484	8,173	58,039
Henrico	130,212	13,761	1,156	1,231	231	2136	30,837	181,506
New Kent	9,253	779	25	47	-	106	2,163	12,381
Powhatan	11,998	830	18	77	-	45	2,388	15,453
Richmond	81,702	10,894	5,043	5,256	2,009	1829	17,093	124,714
Region (%)	73%	8%	1%	1%	0%	1%	15%	596,951

Exhibit 36: Commute by Transportation Mode (Source: 2022 ACS)

Exhibits 37 and 38 show the time it takes to travel to work in the region. Most commutes take between 10-30 minutes, with a mean commute time of 28.45 minutes; however, commute time varies significantly by locality.

	Under 10 min.	10 to 30 min.	30-60 min.	60-90 min	Over 90 min.
Charles City	218	674	1,808	180	101
Chesterfield	11,172	84,958	56,092	3,796	3,044
Goochland	831	3,876	4,095	437	190
Hanover	4,209	26,377	15,606	1,169	1,400
Henrico	15,177	91,803	30,293	3,016	2,780
New Kent	464	3,586	5,328	361	181
Powhatan	573	4,423	6,617	842	304
Richmond	11,845	65,517	20,654	2,995	1,654
Region	**44,489**	**281,214**	**140,493**	**12,796**	**9,654**
Overall Percent	**9%**	**58%**	**29%**	**3%**	**2%**

Exhibit 37: Commute Time by Locality (Source: 2022 ACS)

Mean Commute Time	
(In Minutes)	
Charles City	35.7
Chesterfield	26.4
Goochland	29.9
Hanover	26.6
Henrico	22.4
New Kent	31.7
Powhatan	32.9
Richmond	22
Richmond Region	**28.45**

*Exhibit 38: Mean Commute Time (Source: 2022 ACS * One-directional commute)*

Most commuters in the region travel to and from work by automobile, but significant numbers of workers face transportation challenges that affect access to this mode of travel. Workers that may face transportation challenges include households without a car, people with disabilities, people below the poverty level, and younger and older segments of the population that may not drive. For this region, the percentages of the population (total, not just those who are employed) in these categories were:

- Zero car households – 7%
- People with a disability – 32%
- People below the poverty level – 10%
- Under Age 18 – 16%
- Age 65 and over – 15%

Source: 2022 ACS

Limited access to automobiles can significantly affect the ability of workers to reach employment, including employment that optimally matches their education and skills.

Continued expansion of multimodal transportation options can provide better economic opportunities for individuals and their families. It can also allow more, and a broader range of people to get to jobs and training, an important consideration for employers given that in Virginia there are labor force needs, with 47 available workers for every 100 open jobs. (https://www.uschamber.com/workforce/understanding-virginia-labor-market?state=). More information about the existing conditions for transit and active transportation, and about the role employers in the region can play in how employees commute, is found in other sections of this report.

Many economic sectors in the region also rely on transportation infrastructure to move goods through the region, the United States, and abroad. Interstate Highways 64 and 95 converge in Richmond City, bisecting the region from east to west and north to south, and connecting the region to the entire East Coast, the Atlantic and all directions west. Highway infrastructure allows access to 45% of the U.S. population within one-day's drive, access within a two-hour drive to areas including Hampton Roads, Charlottesville, and the Washington, D.C./northern Virginia area, and access within a half-hour drive to the Tri-Cities of Petersburg, Hopewell and Colonial Heights. These assets, together with the rail lines, Richmond International Airport, Richmond Marine Terminal, and proximity to the Port of Virginia are also key

attractors for logistics companies, manufacturers and other companies that focus on movement of goods. More information about these components of the transportation system and about the region's commodity flows are found in previous sections of this report.