

ConnectRVA 2045



The Transportation Future of
the Richmond Region





ACKNOWLEDGEMENT

ConnectRVA 2045 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, and local representatives of the Richmond Regional Transportation Planning Organization (RRTPO) 2045 Long-Range Transportation Plan (LRTP) Advisory Committee.

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POLICY BOARD AGENDA 10/4/21; ITEM B.-1.**ConnectRVA 2045 – Adoption****Richmond Regional Transportation Planning Organization**

On motion of James M. Holland, seconded by Christopher Winslow, the Richmond Regional Transportation Planning Organization (RRTPO) Policy Board unanimously approved the following resolution:

RESOLVED, that the Richmond Regional Transportation Planning Organization (RRTPO) Policy Board adopts ConnectRVA 2045, the Regional Long-Range Transportation Plan, as presented;

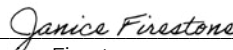
FURTHER RESOLVED, that the RRTPO Policy Board authorizes the transmittal of this plan to the Federal Highway Administration and the Federal Transit Administration; and

BE IT FURTHER RESOLVED, that the RRTPO Policy Board authorizes staff to add the ConnectRVA 2045 constrained list of projects to the 2045 Cost-Feasible Scenario of the Richmond/Tri-Cities Travel Demand Model for use as a baseline scenario for any future regional transportation study/plan.

This is to certify that the Richmond Regional Transportation Planning Organization Policy Board approved the above resolution at its meeting held October 4, 2021.

WITNESS:

BY:



Janice Firestone
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Chet Parsons
Secretary, Richmond Regional Transportation
Planning Organization

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Technical Report H: Public Participation and Outreach Report
Technical Report I: Fiscal Year 2021 Congestion Management Process
Technical Report J: Regional Air Quality Conformity Assessment
Technical Report K: <i>ConnectRVA 2045</i> Federal Compliance Report

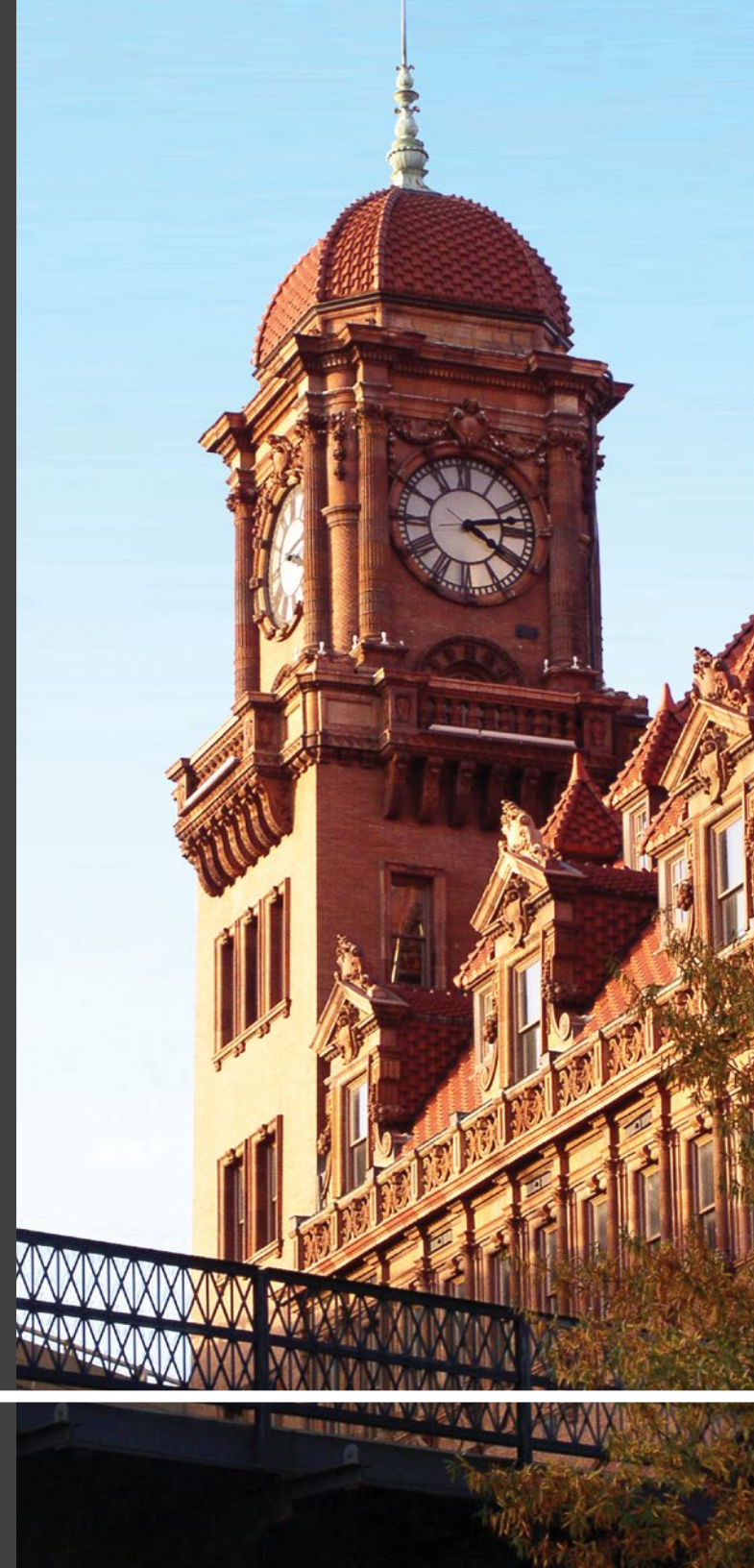
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Chapter 1

Executive Summary

- What is *ConnectRVA 2045*?
- What is the planning process for *ConnectRVA 2045*?
- How have you been involved?
- What's required for *ConnectRVA 2045* to be effective?
- Why is *ConnectRVA 2045* important?





**Riverside Drive,
south bank of the
James River**

Executive Summary

ConnectRVA 2045 represents the 25-year vision for the community's transportation needs and expectations. Developed collaboratively by the [Richmond Regional Transportation Planning Organization \(RRTPO\)](#) and supported by [PlanRVA](#), it considers all types of travel and identifies projects that will best serve bicyclists, pedestrians, people using public transportation, and occupants of single-occupancy vehicles, as well as ensure the efficient movement of goods and services.

A coordinated transportation plan for the Richmond Region's future depends on a clear understanding of how people and goods move around the country today and how these movements are expected to occur in the next 20 to 25 years. Every five years, urban planners at PlanRVA, along with partners from [member localities](#), the [Virginia Department of Transportation \(VDOT\)](#), and the [Virginia Department of Rail and Public Transportation \(DRPT\)](#) have brought their expertise to the development of the long-range transportation plan. Regional plan development is critically influenced by ideas and opinions of community members participating in public meetings, workshops, and surveys, and have been essential to the creation of a successful plan. The last plan was adopted in 2016 and evaluated needs through 2040; *ConnectRVA 2045* projects regional needs out to the year 2045.

What is *ConnectRVA 2045*?

The RRTPO is a [federally mandated](#) and funded transportation policy-making body serving as a Metropolitan Planning Organization (MPO) made up of representatives from local government and transportation providers. The RRTPO provides planning guidance for how federal funding for transportation projects and programs is applied in the Richmond Region, with one of its major activities being the management of the long-range transportation plan.

The long-range transportation plan is a federally mandated plan guided by a vision, goals, and objectives. It addresses comprehensive transportation needs of the region over at least the next 20 years, with updates added every five years.

ConnectRVA 2045 is the latest five-year update. It is a multimodal plan that makes recommendations for transit, bicycle, pedestrian, air, road, and freight-related projects with identified short-term and long-term strategies.

ConnectRVA 2045 includes three major focus areas to meet the ever-changing mobility needs of the region:

- 1. Identify what's needed:** *ConnectRVA 2045* identifies all the transportation projects anticipated to be needed over at least the next 20 years to handle future growth. The plan assesses how the projects collectively may affect the transportation system by analyzing factors including policy, demand for services from future population and employment growth, changes in transportation technology, and community input about what transportation improvements are desired moving forward.
- 2. Create a cost-affordable plan:** *ConnectRVA 2045* identifies which needs can be funded with available transportation revenues from federal, state, and local sources, and considers all modes of travel. With input from the public and the RRTPO member localities, the transportation needs are addressed by project, ranked and prioritized using approved technical criteria, and placed in an implementation timeline. As described in [Chapter 6](#) and shown on [Exhibit 37](#), approximately \$5.5 billion of the total \$20.4 billion anticipated to be appropriated for all surface transportation improvements over the planning period are the subject of *ConnectRVA 2045* after funding is taken off the top for maintenance and operations.
- 3. Ensure plan components are equitable and accessible:** This is a regional plan intended to serve the entire population. Past decisions both locally and nationally have impacted minority neighborhoods and caused hardship for segments of our population. It is readily recognized that plans and projects need to work especially hard to provide benefit to everyone—with a clear focus in the decision-making process on people who have been negatively impacted because of their race, age, income, or ability to access a car. *ConnectRVA 2045* analyzes these impacts through data and factors those impacts as priority inputs into the final project rankings. Since the impacts are data-driven, RRTPO will be able to track them over time to show trends and help move toward making conditions more equitable.

[View Constrained Project List](#)

What is the planning process for *ConnectRVA 2045*?

The long-range planning process includes:

- a comprehensive evaluation of the current transportation system and existing conditions in the region;
- projections of population and employment growth to the year 2045;
- creation of a travel demand model to help predict future impacts of transportation decisions;
- the development of vision, goals and objectives to guide the plan;
- identification of issues and needs for the region;
- locating and describing problems with the current system;
- development of a Universe of Projects, containing all the possible solutions to meet identified needs and issues;

- understanding the ability of the region to afford the range of possible improvements; and
- creation of a budget-realistic (or constrained) plan of projects by five-year time bands.

ConnectRVA 2045 is a multi-year process that began in 2019 and was completed for public review from August 16, 2021 to September 15, 2021. It was considered for adoption by the RRTPO Policy Board on October 4, 2021, with the plan's schedule having provided a variety of opportunities for the community to get involved.

How have you been involved?

RRTPO is committed to public engagement in its planning processes and values community input. In the fall of 2019, we developed a comprehensive strategy for outreach to community organizations, neighborhood groups, key stakeholders, and regional partners. When the COVID-19

2045 Vision



The transportation system in the Richmond Region will reliably and safely connect people, prioritize more equitable opportunities for all to thrive and live healthy lives, promote a strong economy, and respect environmental stewardship.

2045 Goals



GOAL A: Safety

Improve the safety of the transportation system for all people

GOAL B: Environment / Land Use

Reduce the negative impact the transportation system has on the natural and built environment

GOAL C: Equity / Accessibility

Improve equitable access through greater availability of mode choices that are affordable and efficient

GOAL D: Economic Development

Improve connectivity and mobility for strong economic vitality

GOAL E: Mobility

Increase travel efficiency and mode choices by maintaining the transportation system in a state of good repair

Learn more about the *ConnectRVA 2045* Vision, Guiding Principles, Goals and Objectives in [Exhibit 32a](#).

pandemic hit in March, we were forced to pivot and shift our focus for *ConnectRVA 2045* to virtual engagement, providing as much opportunity through online surveys and interactive mapping for residents to share their opinions remotely. Much of the active discussion has taken place through an Advisory Committee that is representative of the community and who participated throughout the planning process. The committee was instrumental in developing the [Vision, Goals, and Objectives](#), and in assessing the performance metrics that measure the effectiveness of the plan's implementation.

What's required for *ConnectRVA 2045* to be effective?

Federal and State Requirements

ConnectRVA 2045 was developed to be consistent with the requirements of the [Fixing America's Surface Transportation Act \(FAST Act\)](#), which was signed into law on December 4, 2015. This legislation builds upon previous federal transportation acts, such as the [Moving Ahead for Progress in the 21st Century Act \(MAP-21\)](#). As with previous transportation laws, the FAST Act includes a series of metropolitan planning factors that ensure that the work of the RRTPO is based on a continuous, cooperative, and comprehensive process.

Community Input & Engagement

Federal and state guidelines and requirements set the larger framework for *ConnectRVA 2045* and ensure that the plans for all metropolitan areas are consistent in process and basic content. However, it is the residents within each metropolitan area and region who ultimately decide the future of their



transportation system. Therefore, engaging the public through a variety of involvement activities during the entire plan development process is vital to accurately capture the needs and collective vision for the area and region.

An effective plan will also have a solid foundation, consisting of a framework of established local, comprehensive, and other regional and short-term transportation plans. It is a unifying document that considers and builds upon the projects and initiatives of all local and regional transportation implementing agencies for a cohesive plan. *ConnectRVA 2045* ultimately considers all other plans and initiatives within and around the Richmond Region, sets priorities, and applies fiscal constraint to develop the most accurate picture of the region's future transportation system.

Provides Resources for Strategic Regional Planning

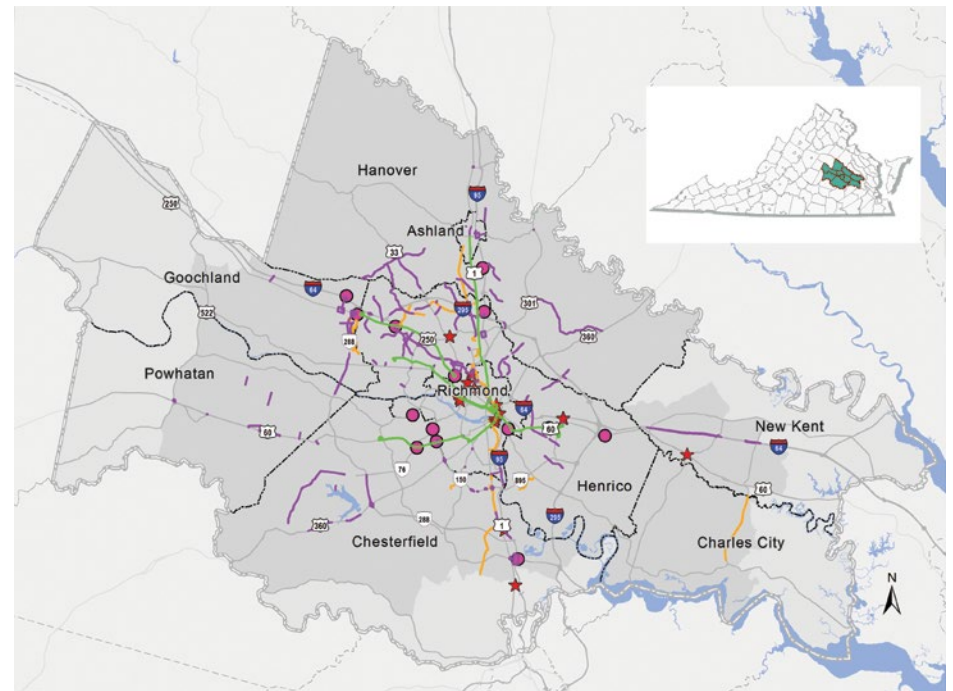
ConnectRVA 2045 provides valuable source material and resources for strategic planning and implementation to improve the overall transportation system, including:

- Socioeconomic Data Analysis & Growth Forecast Analysis, 2017-2045;
- Richmond/Tri-Cities Regional Travel Demand Model & Regional Land Use Model for assessing impacts and scenario planning;
- Project Prioritization Process using quantifiable data to measure project impacts on 15 performance metrics within the five goal categories;
- Supporting studies and plans including the Greater RVA Transit Vision Plan, Park & Ride Study, Regional Bicycle and Pedestrian Plan (in progress), Complete Streets toolbox, Richmond Regional Structural Inventory & Assessment Report; and
- Comprehensive Financial Plan projecting \$5.5 billion of potential investment from all available funding sources including those possible for allocation through the newly organized Central Virginia Transportation Authority (CVTA) over the next 25 years. [See Chapter 6: How Can We Realistically Get There?](#) for full accounting of plan resources.

Why is *ConnectRVA 2045* important?

The RRTPO has served as a collaborative table for the region's localities and partner transportation agencies since the first long-range transportation plan was developed in 1980. At that time, the study area was much smaller in geographic scope and the plan was limited to new highway facilities and a transit element. The region and its urbanized area have grown and so have the needs for addressing a wider variety of modes of travel for people and

goods. Adopted in 2016, [plan2040](#) was the first to consider financial projections from DRPT in addition to those provided by VDOT. *ConnectRVA 2045* builds on those previous projections by acknowledging the diversity of available financial resources, recognizes the necessary commitment to environmental stewardship, and focuses attention on equity toward a multimodal future. The plan is practical in its understanding of what it does well and what needs to be improved in the future. For the first time, *ConnectRVA 2045* commits to using performance measures to both identify priority projects and evaluate project effectiveness for all communities. This plan is intended to be an active tool used by decisionmakers to prioritize and implement regional transportation projects, collectively contributing to a better quality of life for the Richmond Region.



[View interactive map of *ConnectRVA 2045* projects.](#)

Chapter 2

Introduction

- The Richmond Region
- Richmond Regional Transportation Planning Organization (RRTPO)
- Environmental Justice
- Federal Guidance on Transportation Planning
- Statewide Transportation Planning
- Regional Transportation Issues
- Long-Range Transportation Planning Process

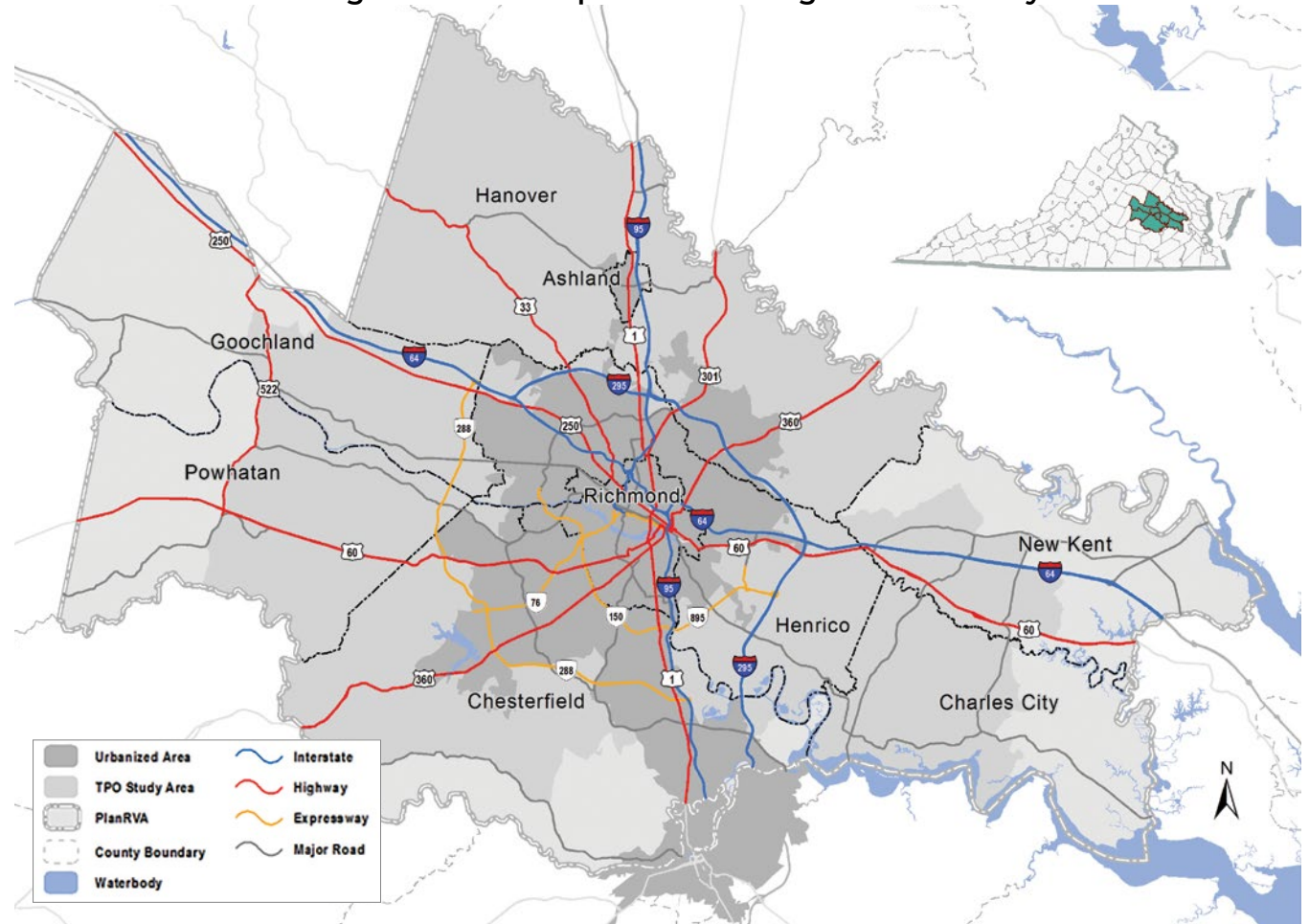


The Richmond Region

The Richmond Region is defined as the area covered by PlanRVA, which is comprised of the City of Richmond, the Town of Ashland, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, and Powhatan. The Richmond Region covers 2,165 square miles, and is located approximately 100 miles south of Washington D.C. and midway between Atlanta and Boston. Exhibit 1 depicts the PlanRVA region within which the federally recognized urbanized area (UZA) was established. The UZA serves as the basis for delineating the TPO, or Metropolitan Planning Area (MPA), study area boundary for federal and state transportation funding.

According to the *2045 Long Range Growth Forecast Analysis* (see *Technical Report B: 2045 Long-Range Growth Forecast Analysis*), prepared for *ConnectRVA 2045*, the region had a population of 1.1 million people as of base year 2017. The Richmond Region is forecasted to grow by nearly 30 percent, reaching a total of 1.4 million residents by 2045. The largest gains in actual population are projected in the three largest localities, Chesterfield, Henrico and the City of Richmond. In percentage terms, New Kent, Goochland, Powhatan and Hanover counties are expected to see the highest population growth. This regional population will live in 552,000 households, an increase of nearly 125,000 households by 2045.

Exhibit 1: Richmond Region with Metropolitan Planning Area Boundary



The City of Richmond is the capital of the Commonwealth of Virginia. Richmond Region employers provide more than 550,000 jobs for area residents. Henrico County remains the region's largest employment center. The region serves as home to Virginia Commonwealth University, the University of Richmond, Virginia Union University, Virginia State University, Randolph Macon College, and Reynolds and John Tyler Community Colleges with a collective enrollment of approximately 76,000 students.

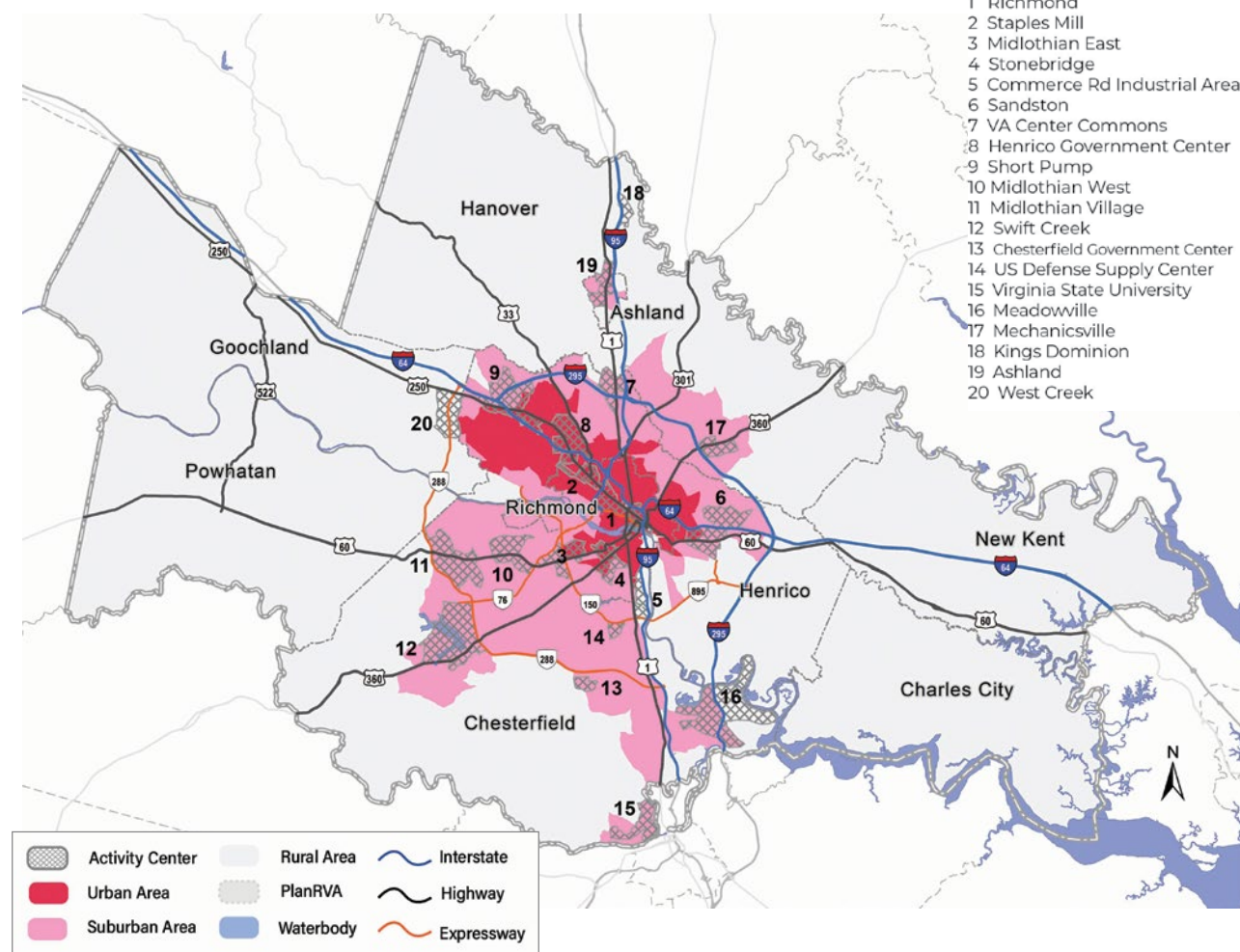
The region's strategic location south of Washington D.C. and west of the Hampton Roads coastal area positions it to capitalize on the opportunities offered by its geography.

The region is well served by the interstate transportation network, with I-95 and I-64 intersecting near its center.

Routes 295 and 288 form an outer circular beltway system, and businesses and residents both prosper from the relatively short 24-minute work commute, on average. Rail access provides connections to east coast and mid-west markets, and the region is well positioned to capitalize on anticipated increases in freight movement through the Port of Virginia in Hampton Roads.

The region includes both a well-developed urban core surrounded by older suburban neighborhoods and traditional subdivisions expanding into the more sparsely populated rural counties. The 2017 population density map shows the City of Richmond with the emerging development pattern of a higher density ring following major thoroughfares extending from the center to meet the outer expressways. The southeastern quadrant of the region represents a noticeable departure from this concentric pattern. The James River creates the natural boundary while Route 895 provides a connection between the I-295 bypass and I-95 with potential to facilitate more development by 2045. Employment densities following much the same

Exhibit 2: Map of PlanRVA Area and Activity Centers



pattern start to merge with population concentrations to define activity centers throughout the region. A mixed-use area where the density of commercial, industrial and residential land uses is highest is more conducive to a variety of transportation options, including transit. Twenty centers of activity ranging from urban and suburban to small town represent the areas of highest population and employment density within the Richmond Region.

Richmond Regional Transportation Planning Organization (RRTPO)

The RRTPO is a policy-making organization made up of local elected officials from each of the region's nine member jurisdictions and state and federal transportation agencies, area transportation service/system operators. PlanRVA serves as lead staff providing administrative and technical services for the RRTPO. In addition, the Virginia Department of Transportation (VDOT) and the Virginia Department of Rail and Public Transportation (DRPT) provide additional technical support.

The RRTPO serves as the forum for cooperative regional transportation decision-making. The RRTPO is required to carry out metropolitan transportation planning in cooperation with the state and transit providers. The RRTPO develops the region's transportation plans and programs, and approves *ConnectRVA 2045*, which is a prerequisite for the allocation of federal-aid highway and transit funds. The development of an efficient and effective multimodal transportation network is essential for the region if it is to sustain a strong economy, clean environment, and high quality of life standards.

Metropolitan Planning Organizations (or Transportation Planning Organizations) are designated under [Section 134 of Title 23, U.S. Code](#), for maintaining and conducting a "continuous, cooperative, and comprehensive" (3-C) regional transportation process that results in plans and programs consistent with adopted plans for development of the metropolitan area. Census-defined urbanized areas of 50,000 or greater in population are designated as "MPOs."

The Governor, with the concurrence of area local governments, is charged with designating the MPO's member organizations.

The RRTPO is designated as a "Transportation Management Area (TMA)," defined as a metropolitan area with a population of over 200,000, creating additional requirements for transportation planning, such as the Congestion Management Process (CMP).

Like many metropolitan areas, the RRTPO encompasses several jurisdictions, each with their own comprehensive plans and transportation programs. In Virginia, planning district commissions, which are established under state code to conduct regional planning, serve as TPO staff for most of Virginia's urbanized areas.

Member Jurisdictions and Partner Agencies

The following jurisdictions are voting members of the RRTPO with the number of votes apportioned according to population indicated in parenthesis:

- Charles City County (1)
- Chesterfield County (4)
- Goochland County (2)
- Hanover County (3)
- Henrico County (4)
- New Kent County (2)
- Powhatan County (2)
- City of Richmond (4)
- Town of Ashland (1)

Partner agencies that hold one vote include the Capital Region Airport Commission, GRTC Transit System, Richmond Metropolitan Transportation Authority (RMTA), and VDOT.



Non-voting members represent other RRTPO committees and partner agencies.

TPO Study Area

Under federal requirements, the study area for the RRTPO must encompass both the existing urbanized area and contiguous area expected to become urbanized during the time period covered by *ConnectRVA 2045* (for this document the horizon year is 2045). It must also cover areas designated by the Environmental Protection Agency (EPA) under the Clean Air Act as part of the non-attainment / maintenance area for air quality standards (currently designated as an “attainment area” for ozone air quality standards).

To ensure that the plan covers all urbanized areas, air quality attainment areas, and areas expected to become urbanized by 2045, the study area has been defined to include:

- Hanover County
- Henrico County
- Town of Ashland
- City of Richmond
- Charles City County, portion
- Goochland County, portion
- New Kent County, portion
- Powhatan County, portion
- A majority of Chesterfield County*

* The portion of Chesterfield County not included in the RRTPO is contained in the Tri-Cities MPO study area.

This includes those areas of Chesterfield County near Hopewell, Colonial Heights, and Petersburg. The RRTPO 2045 study area and designated urbanized area boundaries are shown on Exhibit 1 on page 8.

RRTPO Planning and Programming Process

The RRTPO developed a transportation planning and programming process in compliance with the current appropriations bill the 2015 Fixing America’s Surface Transportation Act (FAST Act) to ensure all transportation plans, projects, and programs requiring federal approval or using federal funds are reviewed on the basis of consistent and constant evaluation criteria. For the first time, the Richmond Region will evaluate and prioritize major projects using quantifiable data rather than qualitative review.

In particular, transportation decision-making is “continuing, cooperative, and comprehensive” (also known as the “3C” planning process). The RRTPO carries out the 3C planning process in numerous ways, but especially through a continuous and regularly scheduled series of meetings for both the TPO Policy Board and its standing committees including the Community Transportation Advisory Committee (CTAC and Technical Advisory Committee (TAC).

Special purpose committees, sub-committees and work groups have been established as needed and may include representatives from the TPO member organizations and various groups and organizations from throughout the region. Those subcommittees and working groups include:

- Long-Range Transportation Plan (LRTP) Advisory Committee, or *ConnectRVA 2045* Advisory Committee (AC)
- Active Transportation Work Group (ATWG)
- Vision Zero Work Group (VZ)



- Public Transportation Work Group
- Regional Funding Guidelines Subcommittee (for Regional Surface Transportation Block Grant (RSTBG)/ Congestion Mitigation Air Quality (CMAQ) and Technical Assistance (TA) funds)

In 2020, the General Assembly of Virginia created the Central Virginia Transportation Authority (CVTA). This new organization may use the plans and programs developed by RRTPO and allocate funds for development. The CVTA is the recipient of tax revenues collected through sales tax and fuels taxes that can only be used for specific transportation purposes within the PlanRVA area.

The participation of local elected officials on the RRTPO and the CVTA boards and technical staff on the TAC and its various committees allows the member jurisdictions to consider the implications of transportation decision-making at both the local and regional level. The process is “cooperative” since all member jurisdictions participate, and decisions are made collectively to best serve the Richmond Region. The process is also “comprehensive” in that the decisions made by the RRTPO are based on:

- Each jurisdiction’s best plans;
- Consideration of impacts that decisions will have on the entire region;
- Assessment of the region’s various multimodal transportation needs; and
- Responsible allocation of available resources with appropriate consideration to federal and state planning and programming regulations.

The transportation planning and programming process for the RRTPO provides a framework for guiding the development of transportation plans and projects that are federally funded within the Richmond area.

The four key elements of the transportation planning and programming process are:

1. Developing a process which considers the ten planning factors set forth in the FAST Act;
2. A citizen participation program providing full access to the process and equal opportunity for citizen input during all phases of the planning process;
3. Encouraging participation of operators of major modes of transportation, private transportation providers, and other interested parties to ensure all transportation perspectives are represented; and
4. Conformity of the transportation plan with the State Implementation Plan (SIP) for attainment of air quality goals.

The RRTPO planning process is responsible for bringing participants into the process to address issues such as environmental concerns, land use impacts, transit services, bicycle and pedestrian connectivity, freight delivery and strategies to increase overall network efficiency, safety and security.

Groups and advocates for each of these issues are part of the development process and the RRTPO responded by establishing the *ConnectRVA 2045* Advisory Committee (AC) which is comprised of transportation professionals, citizen stakeholders, elderly, disabled and minority representatives, as well as higher education, business, and transportation demand management advocates.

The need to financially constrain the plan and meet air quality conformity goals was first introduced in earlier legislation, and then refined by the FAST Act. Financial constraint and air quality conformity are the two primary motivating factors in plan project selection and recommendations as advised by the AC for decision making. The RRTPO and VDOT are responsible for developing a

collaborative process, including public outreach and RRTPO Policy Board involvement for updating the prioritization of transportation projects and strategies contained in *ConnectRVA 2045*.

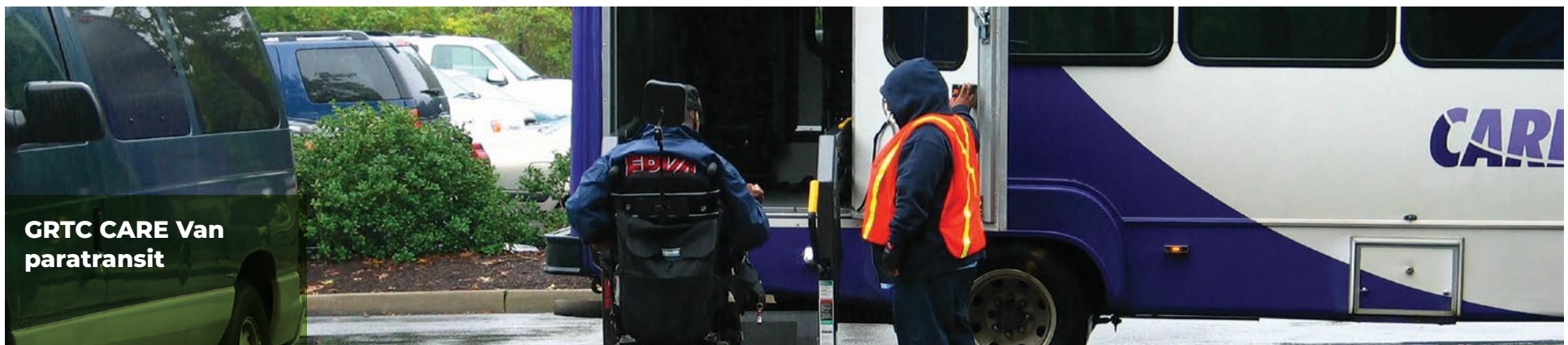
Regulations concerning the metropolitan planning process requirements are contained in [Title 23, Parts 450 and 500](#), and [Title 49, Part 613](#) of the Code of Federal Regulations. The process includes: (1) transportation and socio-economic data update, (2) future conditions and needs forecast, (3) identifying proposed projects to be evaluated and ranked, (4) financial evaluation, (5) distribution of benefits/burdens evaluation, (6) assessment of conformity with the State Implementation Plan (SIP) for ozone air quality standards, and (7) preferred alternative selection, if required. The RRTPO's current EPA designation as an "attainment area" allows for submission of air quality conformance analysis to the Governor, FHWA, and FTA for information purposes with the 5-year cycle in updating the long-range plan.

Environmental Justice

The purpose of environmental justice is to avoid, minimize or mitigate disproportionately high and adverse human health or environmental effects on low income and minority populations; to ensure full and fair participation of low

income and minority populations; and to prevent the denial of benefits to those same populations. Historically, minority and low-income populations have been identified as the largest disenfranchised group, both in terms of equal access to transportation supply and ability to influence change. Environmental justice seeks to ensure equal access to transportation systems and to the transportation planning process for everyone regardless of race, color, creed, or national origin. Limited English proficiency (LEP) populations are also included as part of the environmental justice analysis due to the rapidly rising numbers of this population in the Richmond Region.

The environmental justice regulatory framework started with [Title VI of the Civil Rights Act of 1964](#) and was reinforced by the [National Environmental Policy Act \(NEPA\) of 1969](#), the [Federal Aid Highway Act of 1970, Executive Order 12898 of 1994](#), and [U.S. DOT Order on Environmental Justice \(DOT Order 5610.2\) of 1997](#). Each TPO receiving federal funds is expected to identify residential, employment, and transportation patterns of low-income and minority populations; identify the distributions of benefits and burdens of the transportation system on these populations; and evaluate and improve the public involvement process to eliminate participation barriers and engage minority and low-income populations in transportation decision making.



Americans with Disabilities Act

The [Americans with Disabilities Act \(ADA\)](#) was enacted into law on July 6, 1990. The purpose of this civil rights legislation is “to provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities.”

It is the national goal of ADA to assure that persons with disabilities have equality of opportunity, have a chance to fully participate in society, are able to live independently, and be economically self-sufficient.

Clean Air Act Amendments

The [Clean Air Act Amendments \(CAAA\)](#) were signed into law on November 15, 1990. CAAA provided for a comprehensive revision of the 1977 Clean Air Act. It imposed major challenges for the metropolitan transportation planning and programming process in the nation’s designated non-attainment and maintenance areas. The Clean Air Act’s primary goals are the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS), and the prevention of significant deterioration of air quality in areas cleaner than the NAAQS. The NAAQS establish the maximum pollutant concentrations that are allowed in the outside ambient air.

EPA requires that each state submit a State Implementation Plan (SIP), including any laws and regulations necessary to enforce the plan that outlines how pollutant concentrations will be reduced to levels at or below the standards. This achievement is referred to as “attainment.” Once pollution levels fall below the standards, the state must also show how it plans to keep these levels at the reduced amounts, referred to as “maintenance.” The CAAA requires transportation plans and programs to conform to the SIP for each applicable air quality standard. The air quality plans quantify pollution reduction needs and commit to reduction strategies through the SIP, transportation control measures (TCMs), and conformity provisions for transportation planning.

The EPA has defined NAAQS for six criteria pollutants, including ground level ozone, carbon monoxide, and particulate matter. Any area that fails to meet these standards by a certain deadline can be reclassified to a higher-level designation with additional and more stringent compliance requirements.

The only NAAQS impacting the Richmond Region in recent years is ozone. Ozone is formed when its precursor emissions—volatile organic compounds (VOCs) and oxides of nitrogen (NOx)—react in the presence of heat and sunlight to form ozone or smog. VOCs are organic emissions that originate from mobile sources such as cars, trucks, and buses; stationary sources such as power plants, oil refineries, and chemical manufacturers; and area sources such as lawn mowers, gas stations, and farm equipment, which are individually insignificant, but have a large cumulative impact. Further information on the Clean Air Act and NAAQS history is in the Land Use and Environmental Mitigation section of this document.

While in attainment for all current emissions standards, the Richmond Region had been a nonattainment area, and later a maintenance area, under 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* which requires all nonattainment or maintenance areas under the 1997 standards to demonstrate conformity for the TIP and long-range transportation plan, even when in attainment under the more stringent 2015 standards.

The current designation of an “attainment area” has removed the requirement of the air quality conformity analysis of the Cost-Affordable Plan, which involves a public review and running the Constrained Projects List in the Richmond/Tri-Cities Regional Travel Demand Model for adverse impacts. The conformity analysis also includes collaboration with other partner agencies, including DEQ and VDOT’s Environmental Department.

Federal Guidance on Transportation Planning

On December 4, 2015, the [Fixing America's Surface Transportation Act \(FAST Act\)](#) was signed into law. USDOT identifies the FAST Act as the first in over ten years that provides long-term funding certainty for surface transportation, and it remains the guiding legislation for surface transportation at a national level. Notable provisions include:

- Improving the resilience and reliability of the transportation system;
- Inclusion of intermodal facilities that support intercity transportation as part of the metropolitan and statewide planning process;
- Requirements for the inclusion of performance-based planning in plans and processes; and
- Requiring the consideration of public ports and freight shippers in long-range transportation plans.

The FAST Act addresses the many challenges facing our transportation system today – challenges such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connectivity, and protecting the environment – as well as laying the groundwork for addressing future challenges. It promotes more efficient and effective Federal surface transportation programs by focusing on transportation issues of national significance, while giving state and local transportation decision makers more flexibility for solving transportation problems in their communities.

- The [Highway Trust Fund \(HTF\)](#) is the source of funding for most of the programs in the FAST Act. The HTF consists of the Highway Account, which funds highway and intermodal programs, and the Mass Transit Account.

Federal motor fuel taxes are the major source of revenue for the HTF. The FAST Act authorizes specific dollar amounts for each program, and each year Congress provides an annual appropriation which funds the programs specified in Act.

- FAST Act funding for transit is administered by the Federal Transit Administration (FTA) which helps communities support public transportation by issuing grants to eligible recipients for planning, vehicle purchases, facility construction, operations, and other purposes.
- Federal law regulates not only the imposition of the taxes, but also their deposit into and expenditure from the HTF.

The FAST Act provided for the continuation of metropolitan and statewide transportation planning processes, with changes made in the planning process to add flexibility and efficiency, new consultation and environmental planning



requirements and safety and security as separate items to be considered in both metropolitan and statewide planning processes. Consultation requirements for states and TPOs are also expanded. Requirements are added for plans to address environmental mitigation, improved performance, multimodal capacity, and enhancement activities; tribal, bicycle, pedestrian, and differently-abled interests are also to be represented.

Statewide Transportation Planning

The statewide planning process is coordinated with metropolitan planning and statewide trade and economic development planning activities. The statewide plan includes measures to ensure the preservation and most efficient use of the existing system. The state transportation improvement program (STIP) is to be updated at least every four years. Funding from the FAST Act generally flows from the federal government to the Commonwealth of Virginia. The Commonwealth then determines how the federal apportionments will be allocated to each of its metropolitan areas and other areas of the state.

Metropolitan Planning

The policy for the metropolitan planning process is to promote consistency between transportation improvements and state and local efforts. The RRTPO is required to consult with officials responsible for other types of planning activities that are affected by transportation in the area (including State and local planned growth, economic development, tourism, natural disaster risk reduction, environmental protection, airport operations, and freight movements) or to coordinate its planning process, to the maximum extent practicable, with such planning activities.

The RRTPO is required to develop a Transportation Improvement Program (TIP)—a list of upcoming transportation projects—covering a period of at least four years. The TIP must



be developed in cooperation with the state and public transit providers. The TIP should include capital and non-capital surface transportation projects, transit, bicycle and pedestrian facilities and other transportation enhancements, Federal Lands Highway projects, and safety projects. The TIP must be cost-feasible and realistic in its programming of projects.

The FAST Act requires that ten planning factors be considered in the development and update of regional transportation plans. These factors are addressed in *ConnectRVA 2045* and are as follows:

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
2. Increase the safety of the transportation system for motorized and non-motorized users;
3. Increase the security of the transportation system for motorized and non-motorized users;
4. Increase accessibility and mobility of people and freight;

5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;
7. Promote efficient system management and operation;
8. Emphasize the preservation of the existing transportation system;
9. Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation; and
10. Enhance travel and tourism.

The federal planning factors plus consistency with statewide transportation plans and local comprehensive land use plans act as initial criteria for candidate ranking and selection in the project prioritization process utilized by the RRTPO for *ConnectRVA 2045*.

Significant FAST Act provisions for developing *ConnectRVA 2045* include:

- Local officials, in cooperation with the state and transit operators, are responsible for determining the best transportation investments to meet metropolitan transportation needs;
- TPOs are responsible for adopting the metropolitan transportation plan (MTP) or *ConnectRVA 2045*; the Governor and TPO approve the transportation improvement program (TIP);
- The MTP and TIP remain separate documents;
- Requirements for a 20-year planning perspective, air quality conformity, fiscal constraint, environmental justice, and public involvement;
- MTP must contain: operational and management strategies to improve the performance of existing transportation facilities; investment and other strategies that provide for multimodal capacity

increases based on regional priorities and needs; and proposed transportation and transit enhancement activities;

- A Congestion Management Process is required in Transportation Management Areas (TMAs) or urbanized areas larger than 200,000 people;
- The planning process in TMAs requires joint FHWA/FTA certification;
- TPOs are encouraged to consult or coordinate with planning officials responsible for other types of planning activities affected by transportation, including planned growth, economic development, environmental protection, airport operations, and freight movement; and
- The metropolitan planning process promotes consistency between transportation improvements and state and local planned growth and economic development patterns.



Regional Transportation Issues

Funding transportation projects in the Richmond Region has traditionally been limited to the following mechanisms:

- 1. Federal and State Allocations:** Historically, major transportation projects have been funded through partnerships between the federal government, state departments of transportation, and local governments. It has long been the practice, through federal legislation, for the regional transportation needs to be deliberated through established Metropolitan Planning Organizations, and in Virginia, Planning District Commissions. The Richmond Regional Transportation Planning Organization manages the evaluation of projects and distribution of regional funding to the member organizations, and this practice helps advance needed infrastructure across the region. The amount of funding available has always been short of the demand for improvements.
- 2. Smart Scale:** The foundation of the Smart Scale program was built by action of the 2014 Virginia General Assembly. It established comprehensive requirements for an objective and quantifiable process for project evaluation and allocation of construction funds. The process was adopted by the Commonwealth Transportation Board (CTB) in 2015 and includes evaluation of each project's relative merits in congestion mitigation, economic development, accessibility, safety, environmental quality, and land use. It is a competitive process.
- 3. Virginia Regional Authorities:** Following the success of Smart Scale, Virginia regions realized the utility in providing local funds to both overcome continued transportation funding shortages and to leverage Smart Scale and other funding opportunities with local dollars. In 2014, the General Assembly created regional transportation authorities in Northern Virginia and

Hampton Roads – each started to adopt similar processes to evaluate regionally significant projects, prioritize funding needs, and generate dedicated revenues for transportation projects. The 2019 General Assembly also created the I-81 Authority, which provides a dedicated source of funding for projects that benefit a specific area delineated along the I-81 corridor in western Virginia.

Transportation needs can be unique to a geographic area, and the [Central Virginia Transportation Authority \(CVTA\)](#) was created specifically to address the needs



of central Virginia. Organized in August of 2020 following action by the Virginia General Assembly, this newly created regional agency has the power to identify transportation projects and programs and commit funding collected from tax revenues generated by sources in the region to their development and construction. The CVTA is responsible for the region encompassed by PlanRVA, made up of the Town of Ashland, the City of Richmond, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, and Powhatan. It also overlaps the RRTPO and is organized to help address the same issues identified by the TPO. Among those issues of focus by the CVTA are:

- 1. Safety & Accessibility:** Residents and visitors of the Richmond Region need safe and accessible transportation options, ranging from well-planned and functioning interstate interchanges to neighborhood streets and intersections that recognize the importance of all modes of travel.
- 2. Maintenance & Capacity:** The regional transportation network encompasses roughly 5,700 lane miles of roadway (not including minor collectors and local roads) and the level of service of these corridors typically functions at a stable level. Some corridors do experience high

traffic volumes at peak times and those flows need to be addressed to positively impact travel patterns. The region has a great need for continued maintenance and operation of the current travel network across all modes. Maintenance and operations needs are typically addressed as the highest priority from available funding sources.

3. **Transit:** Transit demand is growing around the region. Access to jobs, meeting the mobility needs of the community and providing opportunities for residents are all needs to address.
4. **Local service:** Even before the onset of COVID-19, local government bodies in the region had large backlogs of transportation projects years away from construction. As residents' travel needs evolve, more and more demands are placed on boards and councils to provide multimodal options for travel between home, work, and school.

The creation of the CVTA allows the nine jurisdiction members of PlanRVA to set their own course and have more ownership in transportation investments in central Virginia with the following key advantages:

Funding Partner: The presence of the Authority will provide a resource for member governments and agencies that previously did not exist. A new partner can leverage additional resources for make funding proposals more competitive on a larger scale. *ConnectRVA 2045* and other long-range plans offer the potential to provide the planning foundation for CVTA funding decisions.

Stability for Future Needs: Much like the future-forward planning work that occurs through PlanRVA, the CVTA will allow the region to look more strategically to the future, knowing that there is a stable foundation of financial resources to support investments in the region.

Funding Sources & Requirements: The Authority will administer transportation funding generated through the imposition and collection from new regional tax mechanisms:

1. Sales and Use tax of 0.7 percent (revenue collection began October 2020)
2. Wholesale gas tax of 7.6 cents per gallon of gasoline and 7.7 cents per gallon of diesel fuel (revenue collection began July 2020). The gas tax rates are indexed for inflation.
3. Transit: Local maintenance of effort for transit funding is required to be at least 50 percent of the amount that was provided as of July 1, 2020, with such amount to be indexed beginning in 2023.

The legislation assigns the following responsibilities to the CVTA:

1. **Transit Governance Report** – The Authority is directed to review the governance structure of existing transit service providers in the Richmond Region, and evaluate the possibility of creating a transportation district
2. **Development of a Regional Prioritization Process** for project selection pertaining to the regional apportionment of revenues (35 percent)
3. **Development of a Regional Public Transportation Plan** that annually prioritizes regional transit projects and spending needs (15 percent)
4. **Oversees the distribution** of member locality revenues (50 percent)
5. **Issue bonds** as needed for project development and construction



Long-Range Transportation Planning Process

The process for preparing *ConnectRVA 2045* began in October 2019 with the establishment of a Long-Range Transportation Advisory Committee and the adoption of a public engagement plan. The scope of work outlined a process that would address five key questions:

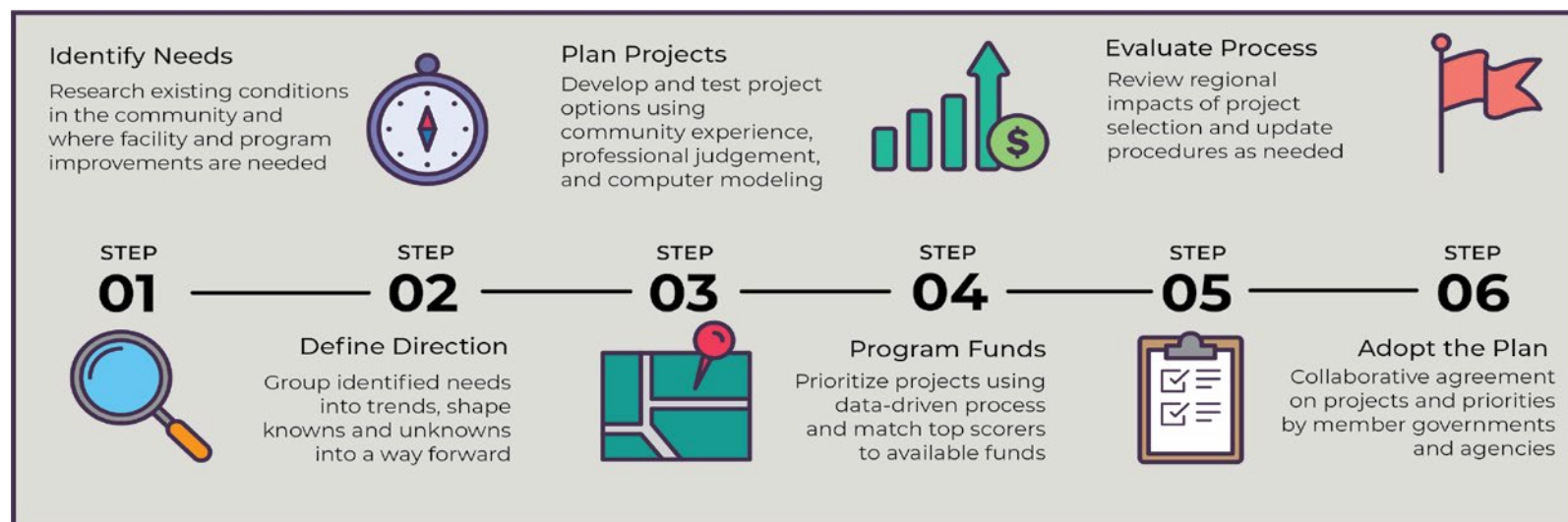
1. What are the transportation issues to address defined deficiencies and needs in the transportation system to serve present and future growth?

- Socioeconomic data from 2017 base year and 2045 horizon year;
- Richmond/Tri-Cities travel demand model update; and
- Multimodal transportation deficiencies identified through related studies and plans to include congestion, safety, interconnectivity, operational problems and inadequate roadway capacity.

2. **What matters most for the future expressed through Vision, Goals, Objectives and Performance Measures** to monitor progress in implementation as developed for the Plan?
3. **What are the full-range of projects or programs** to be considered to implement the plan?
4. **How can we realistically get there** based on financial projections for funding, allocation guidelines and a strategy for project selection and prioritization?
5. **How did we do this time** and how can we do better next time? The measures of effectiveness include the degree of unfunded regional needs, quality of public engagement and response, regional performance monitoring and ability to meet target objectives, environmental justice analysis, accessibility analysis, and air quality conformity/interagency consultation.

Following the process as outlined by Exhibit 3, the scope of work for *ConnectRVA 2045* was adopted by the RRTPO Policy Board on October 3, 2019.

Exhibit 3: *ConnectRVA 2045* Planning Process



Chapter 3

What are the Transportation Issues to Address?

- Highways
- Transit
- Park and Ride
- Active Transportation
- Passenger Rail
- Freight and Intermodal
- Maintenance and Safety
- Other Strategies and Initiatives
- Environmental Resources and Mitigation
- System Resiliency
- Economic Development/Tourism



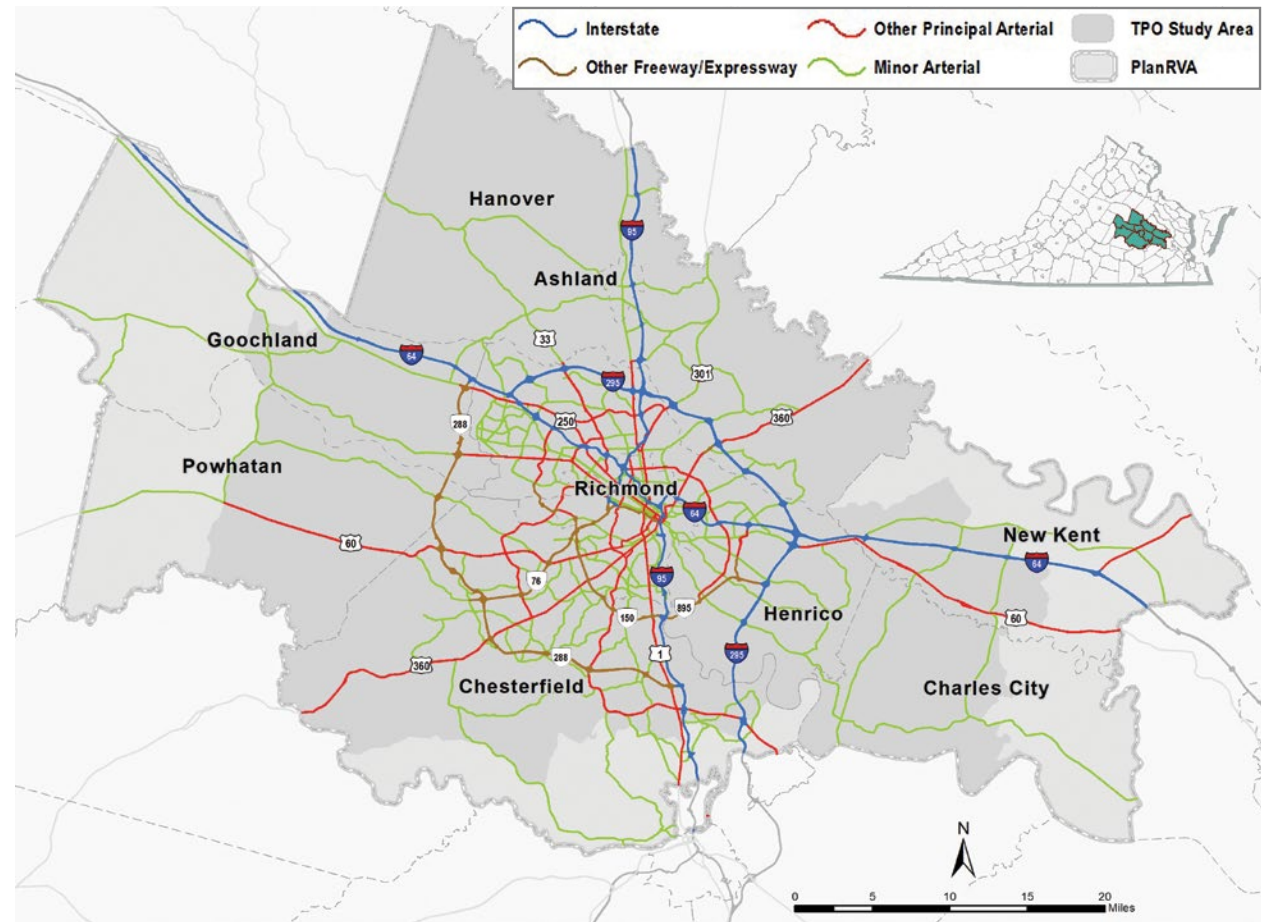
What are the Transportation Issues to Address?

RRTPO staff identified multimodal transportation needs and deficiencies in the existing system related to congestion, safety concerns, lack of connectivity and accessibility, operational problems, and inadequate roadway and transit capacity. In the analysis, staff also considered needs like travel demand management, system resiliency, and economic development.

The study of issues included review of regional and local plans and studies, additional recommendations provided by LRTP advisory committee members, and future issues identified through the Richmond Tri-Cities Travel Demand Model. Staff identified issues contained across 41 distinct plans, report, and studies at the local, regional, and state levels that still needed resolution. The final component of issues identification included virtual public review through virtual meetings of the LRTP advisory committee and public invitation to add or note transportation issues on an interactive Wikimap that allowed individuals to add problem areas and comment on others.

The full report of regional transportation issues was approved by the LRTP advisory committee on May 28, 2020 (additional information can be found in *Technical Report D: Local and Regional Transportation Issues Report*).

Exhibit 4: Regional Highway Network



In total, there were 1,089 total transportation issues identified for the region:

- 555 issues considered regionally significant and eligible for inclusion in the LRTP
- 127 issues related to a transportation need identified through VTRANS, Virginia's statewide transportation plan
- 272 issues relating to policy/programs, justification for additional study, or local issues
- 135 issues directly shared by the public

Highways

Existing Highway Network

Exhibit 4 shows the Richmond Region's extensive network of interstate highways, non-interstate expressways, U.S. and state highways, arterials, collectors, and minor streets. The highway network provides the basic framework for travel through and within the region. The network is capable of serving multiple modes of travel, ranging from trucks, passenger vehicles, transit, bicycle and pedestrian for movement of people and goods.

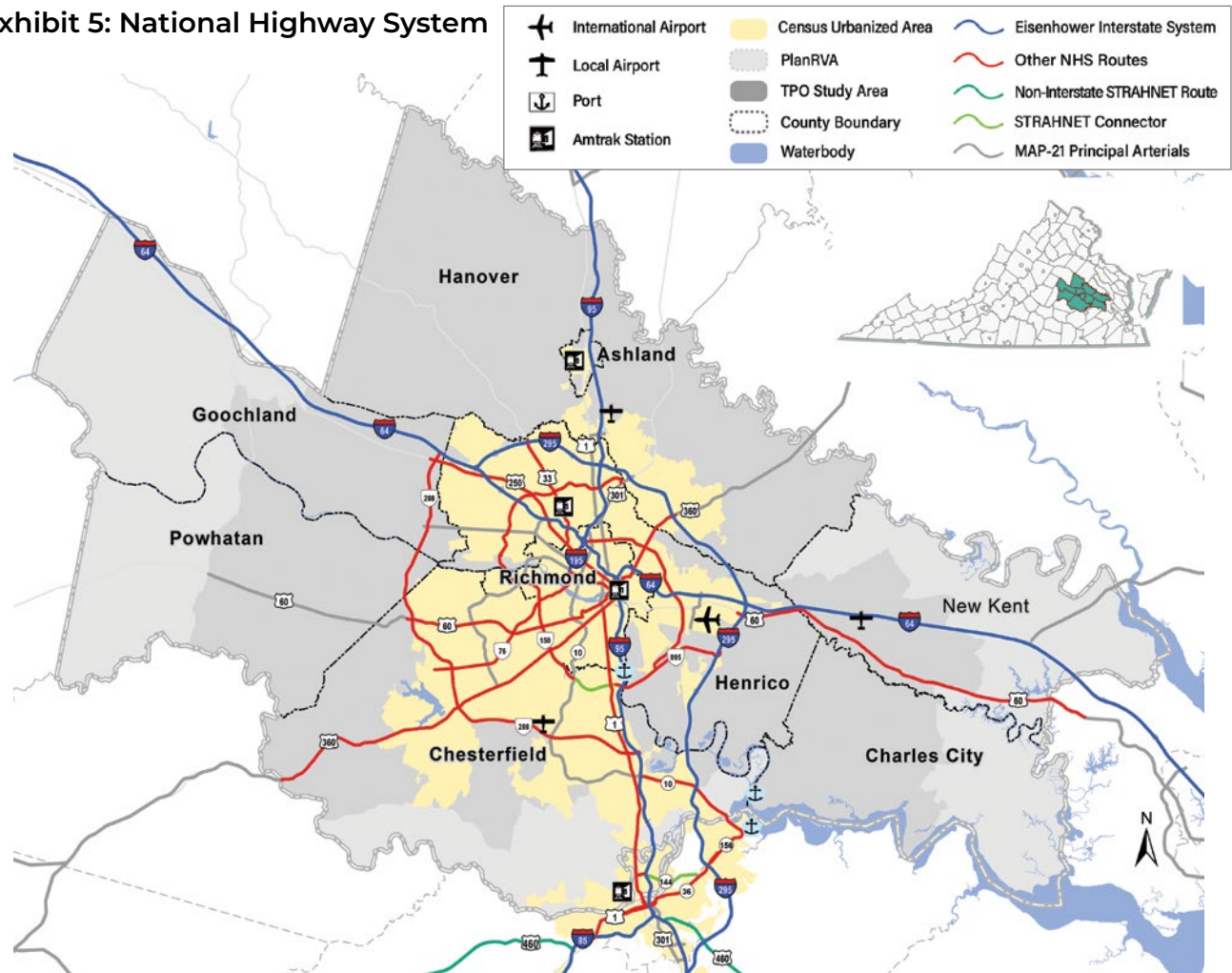
Federal Functional Classification of Roads

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Most travel occurs through a network of interdependent roadways, with each roadway segment moving traffic through the system toward destinations. The functional classification categories include:

1. Principal Arterial
 - a. Interstate-major east-west route Interstate 64 (I-64) and major north-south route Interstate 95 (I-95)
 - b. Other freeways and expressways including three-digit interstates, Interstate 195 (I-195) and Interstate 295 (I-295)
 - c. Other- Several limited-access highways effectively form an outer beltway. These include Interstate 295 from I-64 west of Richmond southeasterly to VA-895 east of Richmond and VA-288 in the southwest and western areas, between I-95 south of Richmond and I-64 west of the city.
2. Minor Arterial-U.S. Highways in the Richmond area include US-1, US-33, US-60, US-250, US-301 and US-360.
3. Collector
 - a. Major Collector
 - b. Minor Collector
4. Local Streets

VDOT is responsible for maintaining the Commonwealth's official federal functional classification system. VDOT determines the functional classification according to federal guidance.

Exhibit 5: National Highway System



National Highway System

As depicted on Exhibit 5, the National Highway System (NHS) consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the Interstate system; other principal arterials which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility; Strategic Highway Network (STRAHNET) which are important to the United States' strategic defense policy and which provide defense access; Major Strategic Highway Network Connectors which provide access between major military installations and highways and Intermodal Connectors which provide access between major intermodal facilities and the other four subsystems described above.

VDOT Highway System and Maintenance

VDOT maintains most of the roads in the Richmond Region. For funding and maintenance purposes, they are divided into these categories:

1. Interstate – connect states and major cities.
2. Primary – Two-to-six-lane roads that connect cities and towns with each other and with interstates.
3. Secondary - local connector or county roads and are numbered 600 and above. Henrico County maintains its own county roads with VDOT funds.
4. Frontage - local road running parallel to a main road or highway and giving access to residences and businesses.

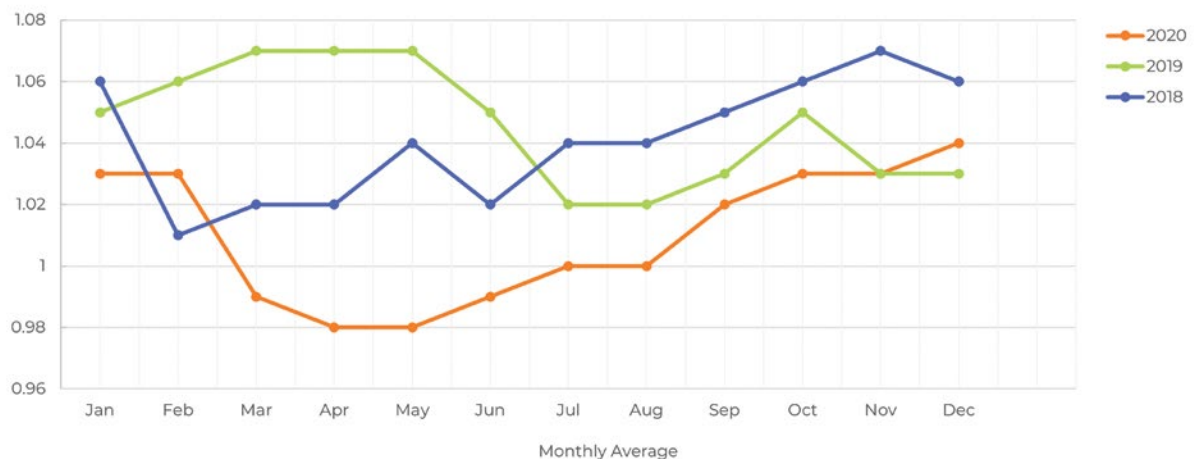
A separate system includes urban streets, maintained by cities and towns with the help of state funds. The Town of Ashland and the City of Richmond maintain their

own roads. Additional toll roads that are maintained by other public and private entities include the Downtown Expressway (195) in the city of Richmond, Powhite Parkway and Powhite Parkway Extension (VA-76) in Richmond and Chesterfield County, the Boulevard Bridge (the “Nickel Bridge”) in the city of Richmond and Pocahontas Parkway (VA-895) in Chesterfield and Henrico County.

Congestion Management Process

The Congestion Management Process (CMP) is a cyclical process which continually evolves as congestion issues, data sources, strategies, and goals and objectives change over time. The CMP tracks system performance measures, outlines strategies to manage demand, and works to ensure the continued reliability and safety of the regional multimodal transportation system. As such it is a continuous part of the metropolitan planning process, which includes the Long Range Transportation Plan (*ConnectRVA 2045*), the Transportation Improvement Program (TIP), and the Unified Planning Work Program (UPWP). Through the CMP,

**Exhibit 6: Travel Time Index for the Richmond CMP Network
Average of AM (7-9) and PM (4-6) Peak Hours**



data is collected on roadways which are part of the National Highway System (NHS) in the Richmond Region. The interstates, expressways and major roads of the region are designated as part of the NHS.

The CMP tracks several performance measures. As shown on Exhibit 6, the Travel Time Index (TTI) measures how long a trip will take compared to free flow time, Level of Travel Time Reliability (LOTTR) measures the reliability of the network, and Truck Travel Time Reliable (TTR) measures reliability of the network for freight. Exhibit 7 shows the Richmond Region scores well on all measures.

The TTI for the network has consistently been under 1.06 since 2015, meaning average travel on the network is very close to free flow speed. The LOTTR of 94.1 percent is well above the target of 82 percent set by VDOT, and TTTR at 1.48, is also below VDOT's target of <1.56. These measures show a regional roadway network which is performing well overall, but also having areas of the network which experience congestion. The CMP uses the TTI statistics gathered on the network to examine where and when travel times are especially high. Morning 7-9 am and evening 4-6 pm peak hours are tracked at a segment level over time to show how and where congestion occurs. [The CMP StoryMap](#) contains animations of this data for both the morning and evening peak hours.

Exhibit 7: Level of Travel Time Reliability

Federal Performance Measure	VDOT Target	RRTPO		
		2017	2018	2019
Percentage of Person-Miles Traveled that are Reliable (Interstate)	82.0%	94.4%	94.8%	94.1%
Percentage of Person-Miles Traveled that are Reliable (Non-Interstate NHS)	82.5%	90.6%	90.9%	92.6%
Truck Travel Time Reliability Index	<1.56	1.42	1.47	1.48

Bottlenecks, or areas of recurring sustained congestion, are highlighted by the CMP and shown in Exhibit 8. Eight major bottlenecks occur during the peak hours. Four of these bottlenecks (#1, 2, 4, 8) occur where traffic enters the portion of the network known as the "I64/I95 overlap" where traffic from the two interstates comes together as it travels through the City of Richmond.

These bottlenecks have similar characteristics in that congestion occurs no matter which direction the traffic is traveling, and the morning and evening peak hours are both congested. (VDOT is currently conducting studies on I-64 and I-95.)

Another bottleneck (# 6) occurs at VA 76 (Powhite Parkway) and VA 150 (Chippenham Parkway) where the two expressways meet. This bottleneck occurs on only Powhite Parkway. The northbound segments experience the bottleneck during the morning peak hours and the southbound segments experience the bottleneck during the evening peak hours.

The last three bottlenecks occur on VA 288, a relatively new expressway serving the fast-growing western portion of the region. Traffic approaching the James River bridge from the south creates a bottleneck (#3) during the morning peak hours and from the north (#5) during evening peak hours. Both areas experience extreme reductions in speed and congestion that extends for miles. The third major bottleneck for Route 288 (# 7) occurs at the Hull Street (Route 360) exit which serving a fast-developing suburban area. This bottleneck occurs in the evening peak hours in the southbound lanes. All areas with bottlenecks are being studied by VDOT.

Safety data is also compiled for the CMP network, and is provided in greater detail in a later section on Safety in this report. Locations with recurring congestion can lead to locations with safety issues. VDOT analyzes roadway segments and intersections for safety and ranks them according to the potential for safety improvement (PSI).

1. **Demand management strategies** work to reduce travel of people driving alone in their cars, and examples include ridesharing, bicycle and pedestrian projects and parking management.
2. **Public transportation strategies** work to make public transit more attractive. Examples include more frequent bus service, bus rapid transit (BRT), electronic fare collection, and transit schedule and arrival apps.
3. **Traffic operations strategies** work to help the system work more efficiently. Examples include open road tolling, automated traffic signal systems, traffic cameras and traffic condition apps.
4. **Road capacity strategies** work to get more capacity out of the existing roadways. Examples include roundabouts, turn lanes, collector-distributor lanes and restriping with lane modifications.

ConnectRVA
2045 

[illegible]

Intelligent Transportation Systems (ITS) play an increasingly important role in maintaining the reliability and safety of the regional multimodal transportation system. ITS integrates advanced communications technologies into the transportation infrastructure and within vehicles. The technologies ITS uses are extensive and not implemented by the public sector. Technologies involving infrastructure and vehicles require applications to connect and share information. Common infrastructure examples include open-road tolling,

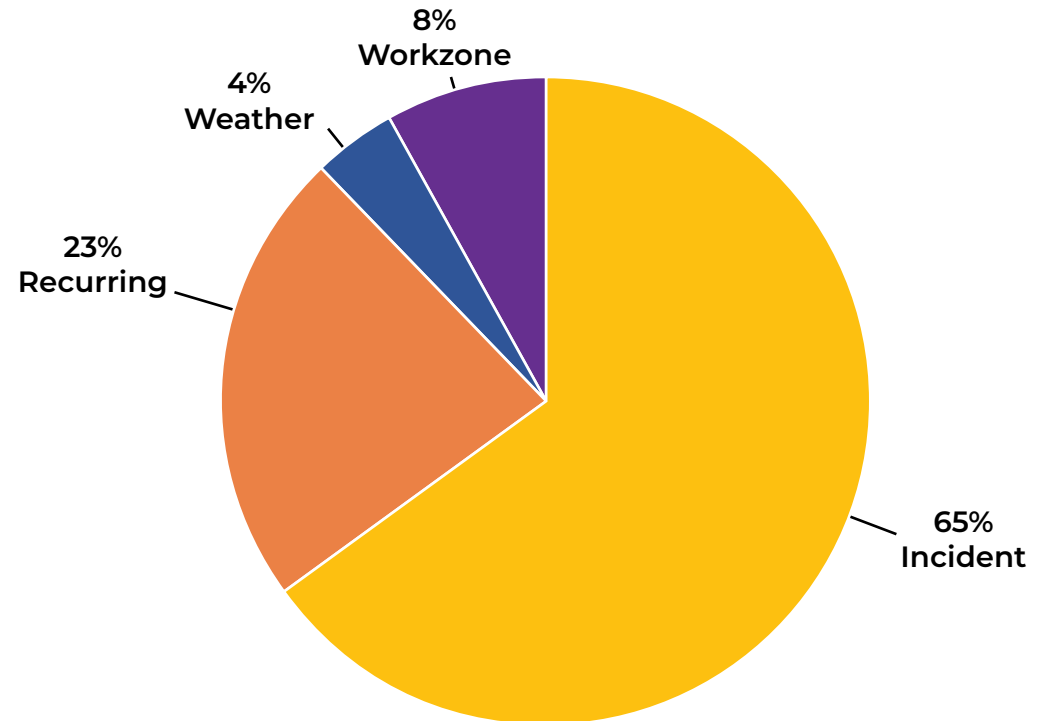
dynamic message signs, and traffic signal control systems. Common vehicle examples include rear-end collision avoidance systems, lane departure warning systems, signal preemptions for buses or emergency vehicles.

Common uses of data generated by ITS systems include transit trip planning apps, traffic and crash apps, and vehicle probe data used by traffic operations centers and planners.

The RRTPO promotes ITS by allocating funds to projects that would most likely make use of ITS, and programs them as part of the Transportation Improvement Program (TIP). Recent and ongoing projects have included the City of Richmond's integrated traffic signal system, traffic cameras, changeable message signs, and variable speed limits. Other projects include installing fiber in the right of way for the BRT signals to allow for data collection and communications. Vehicle probe data is used to compile data used in performance measures and planning.

ITS plays an important role in the safety of the transportation system. Transportation System Management and Operations (TSMO) staff watch for trends and prepare for traffic problems due to special events or weather. The dispatching of safety service patrols particularly on the interstate system is an important part of keeping travelers safe. More than two-thirds of the congestion in 2020 on interstates in the region was caused by traffic crashes or other incidents. Quick clearance of incidents prevents secondary crashes from occurring.

Exhibit 9: Causes of Congestion in 2020



Highway Issues/Needs

Highway issues represent the presence of deteriorated physical conditions, traffic congestion and/or identified needs for more efficiency and connectivity for better operations in the regional highway system. The Congestion Management Process (CMP) described in the previous section provides an analysis of the trends in roadway use, vehicle miles traveled, and safety and congestion challenges to set the foundation for identifying the needs of the highway system. Prioritizing highway needs to address the issues are intended to result in transportation project alternatives which can be implemented to alleviate congestion and mitigate known safety issues to make the overall roadway network safer and more secure for all users.

The population of the Richmond Region is projected to increase 30 percent by the year 2045. Given this population increase and a correlating increase in travel, the function of the existing highway system, if unchanged, would come to a virtual standstill. One way of measuring the degree of service provided by a particular roadway is the Level of Service (LOS). LOS is a qualitative measure used to relate the quality of motor vehicle traffic service standards based on the Highway Capacity Manual (HCM) by designating the letters "A" through "F," with A being the best and F being the worst, in accordance with the following: A-free flow; B- reasonably free flow; C- stable free flow; D – approaching unstable flow; E – unstable flow; and F – breakdown flow.

Exhibit 10: Congested Highway Network by 2045

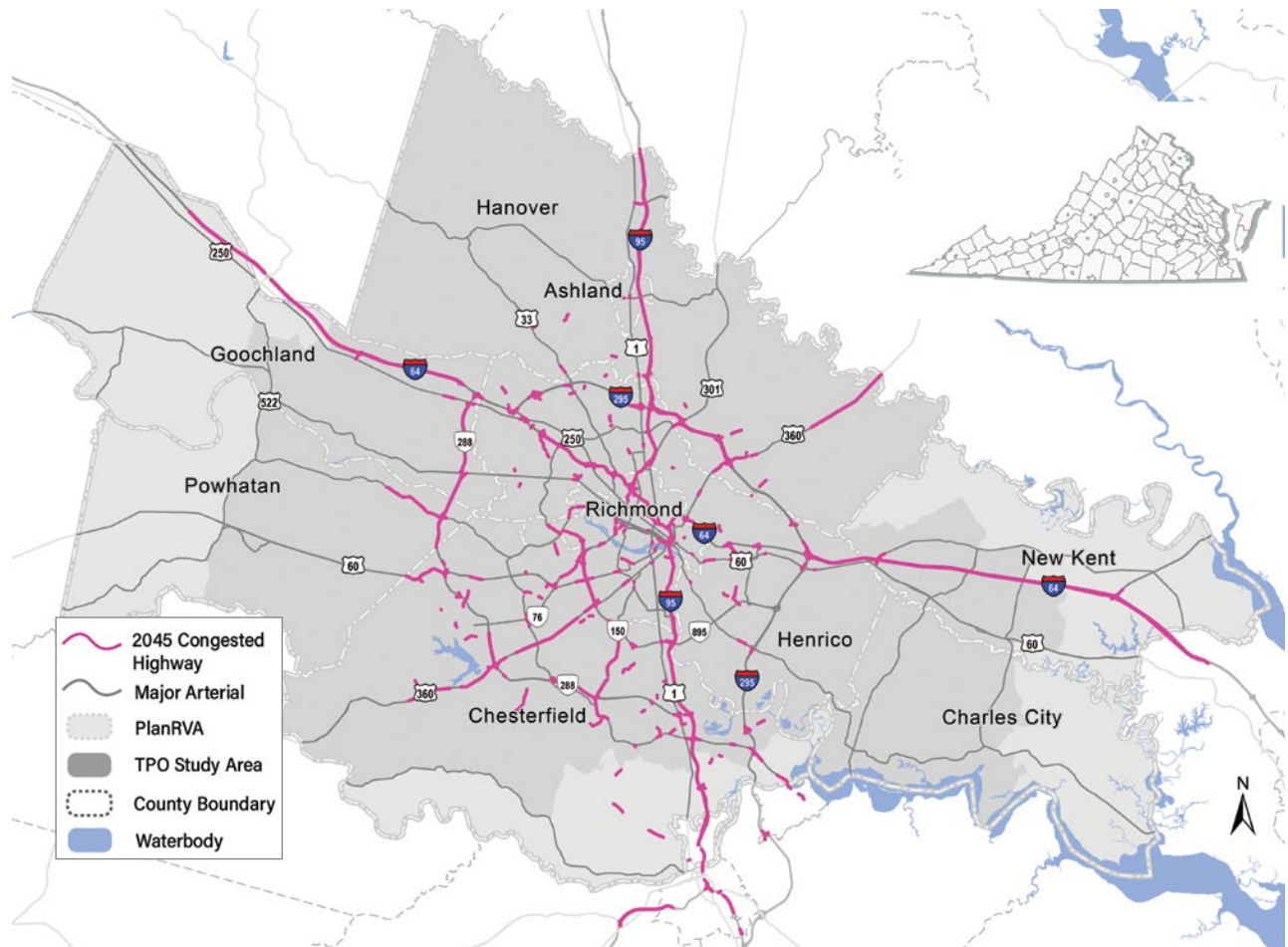


Exhibit 10 illustrates the congested network represented by an LOS of D or more on the region's existing and committed highway network with the projected future traffic volumes generated by the model for 2045. The existing and committed highway network serves as baseline showing both the existing highway network plus planned projects in the Six Year Improvement Plan (SYIP) for 2026, including highway and transit. Without a significant investment and financial commitment to the region's transportation system, this map illustrates that traffic congestion on the region's roadways would increase dramatically by 2045.

Road Surface Conditions

In general, wear and tear on roadway surfaces is due to two principal factors: 1) vehicle load related damages such as fatigue cracking, patching, rutting; and 2) non-load-related damages of multiple distresses including transverse and longitudinal cracking, longitudinal joint separation, bleeding which are caused by weathering of pavement surface or materials and/or construction deficiency.

Exhibit 11 illustrates the pavement condition of interstates, primary and secondary roads within individual jurisdictions of the Richmond Region.

A total of approximately 15,000 lane miles of interstate, primary and secondary roads serve the region, of which one-third are considered deficient. An overall estimate of 8 percent of interstate lane miles, 19 percent of primary lane miles and 37 percent of secondary lane miles are deficient in terms of surface conditions. Henrico County has the greatest number of interstate lane miles that are deficient. The City of Richmond has almost one-half of the total deficient primary lane miles. All the localities share a similar portion of deficient lane miles in the secondary road system.

Exhibit 11: Regional Highway Pavement Deficiencies

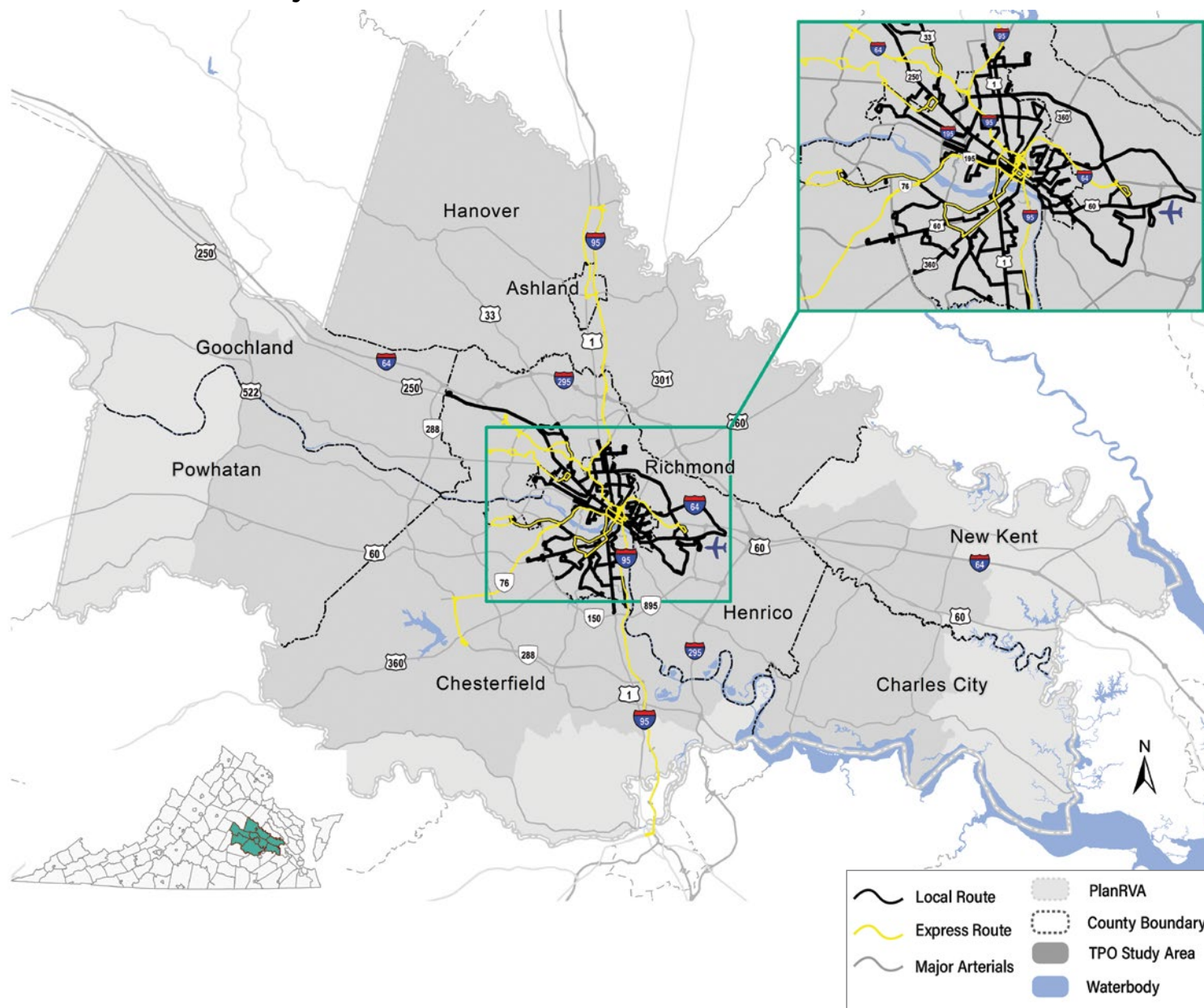
Lane Mileage by Jurisdictions									
Jurisdiction	Interstate			Primary			Secondary		
	Lane Miles Rated	Deficient Lane Miles	Percent Deficient	Lane Miles Rated	Deficient Lane Miles	Percent Deficient	Lane Miles Rated	Deficient Lane Miles	Percent Deficient
Charles City				88.28	12.04	13.6%	269.22	81.17	30.2%
Chesterfield	123.24	1.8	1.5%	542.43	55.38	10.2%	3,473.29	1,912.65	55.1%
Goochland	111.66	5.68	5.1%	190.31	12.2	6.4%	665.79	324.39	48.7%
Hanover	170.48	13.83	8.1%	236.96	27.35	11.5%	1,701.10	789.29	46.4%
Henrico	411.01	49.51	12.1%	362.78	36.6	10.1%	3,557.00	NA	NA
New Kent	81.12	6.21	7.7%	187.68	5.05	2.7%	429.24	176.04	41.0%
Powhatan				127.78	16.7	13.1%	635.34	372.84	58.7%
Richmond	97.6	2.7	2.8%	515.13	255.68	49.6%	1315.44	801.98	61.0%
Total	995.11	79.73	8.0%	2,251.35	421	18.7%	12,046.42	4458.36	37.0%

Public Transit

Existing Service

The Greater Richmond Transit Company (GRTC) operates the regional public transit service primarily serving the population in the City of Richmond, and along major corridors into Henrico and Chesterfield counties. GRTC is currently owned by the City of Richmond and Chesterfield County, and service traditionally has been provided on a demand-basis with operating costs supported by the individual locality requesting service. GRTC also provides specialized transit for elderly and disabled residents, and connects transit to car/van pools at park and ride lots throughout the region through RideFinders.

Exhibit 12: GRTC Transit System in 2020



The key to understanding the issues related to public transit is understanding the characteristics and needs of the populations served now and in the future through expanded service. The Exhibits 12a-12d show the existing GRTC system is made up of 32 fixed routes and 12 express routes, distinguished by the type of corridors and functions for the populations each serve:

- 1. Arterials**-The routes in this category travel more than 50 percent of their route on major corridors or thoroughfares. Terminus stops are major activity centers. The Bus Rapid Transit (BRT) service from Rocketts Landing to Willow Lawn launched in June 2018 is the newest part of the arterial system and prompted a full system redesign, resulting in double digit ridership growth in direct contrast to national trends.

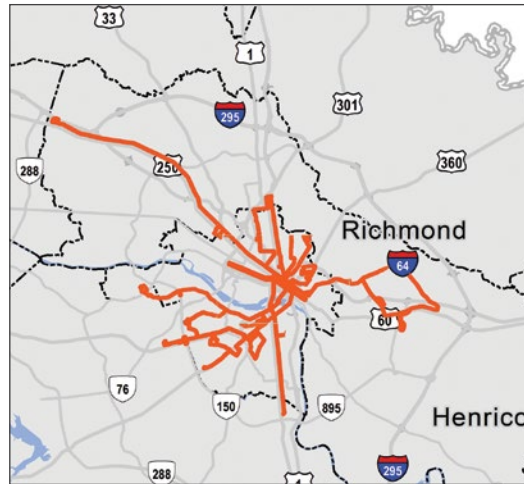


Exhibit 12A: Arterial Transit Routes

- 2. Community Radial**-The routes in this category serve as the neighborhood network and travel through the neighborhoods for the most of their service connecting to the main arterials.

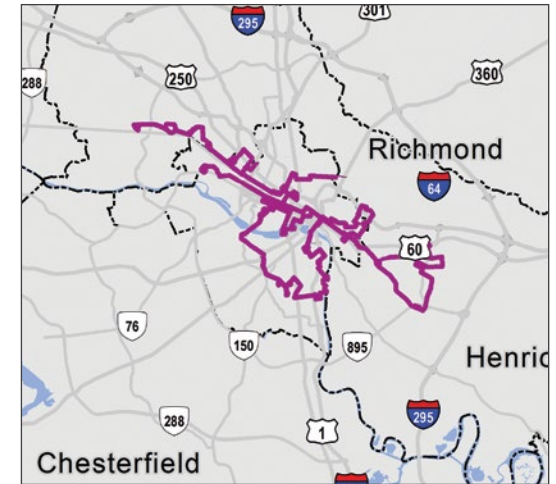


Exhibit 12B: Community Radial Transit Routes

- 3. Circulator/Feeder/Connectors**-The routes in this category connect outlying sections of the service area to each other, providing a stop at an activity center at one or both termini which allow for connection to an arterial or core arterial routes.

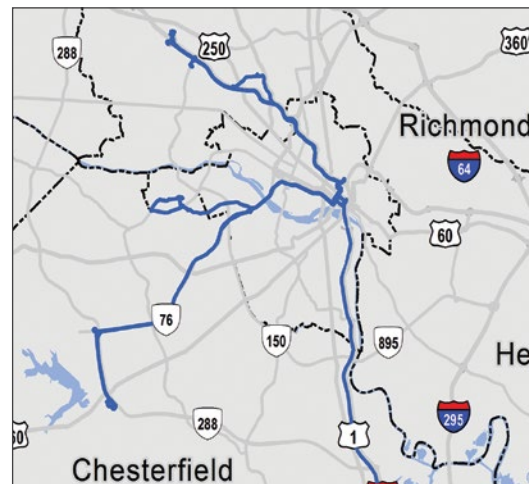


Exhibit 12C: Circulator/Feeder/Connector Transit Routes

- 4. Express**-The routes in this category serve an origination point, such as a park and ride lot, travel downtown with few or no stops in between; the service is only offered on weekdays during peak hours.

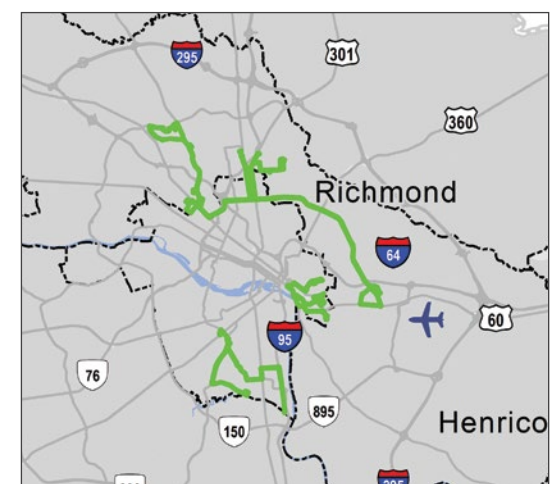


Exhibit 12D: Express Transit Routes

Before the COVID-19 pandemic, GRTC was projected to serve 10 million trips in FY21. Recent ridership [surveys](#) of May 2019 to May 2020 period indicate more than 92 percent of the riders were traveling between home and work, and a majority (70 percent) walked less than three blocks to a bus stop. More than one-half of the riders on local routes were from lower income households (less than \$25,000 annually) and approximately two-thirds were identified as a minority population. Further indicating transit dependency, about one-half of all local transit trips were one-ride or daily fare-payers. During the pandemic, fares were eliminated to reduce contact and maintain social distancing, leading to a focused effort on fare collection, whether to reinstitute it or eliminate fares altogether. Zero-Fare reduces revenues by \$5.3 million, but it is estimated to cost \$1.7 million to collect fares. GRTC and DRPT realize the need to adopt a Zero-Fare Pilot project in FY22 with a focus on making transit more equitable.

GRTC has adopted the following guiding principles for their focus on the core market they serve:

- To champion social and economic mobility by prioritizing connecting people to essential human services and needs.
- To prioritize the development of interconnected mobility infrastructure and services for historically underserved and economically distressed communities.
- To create multimodal partnerships that connect to high-frequency public mass transit to support essential connections between affordable housing, quality employment, food, education and health care.

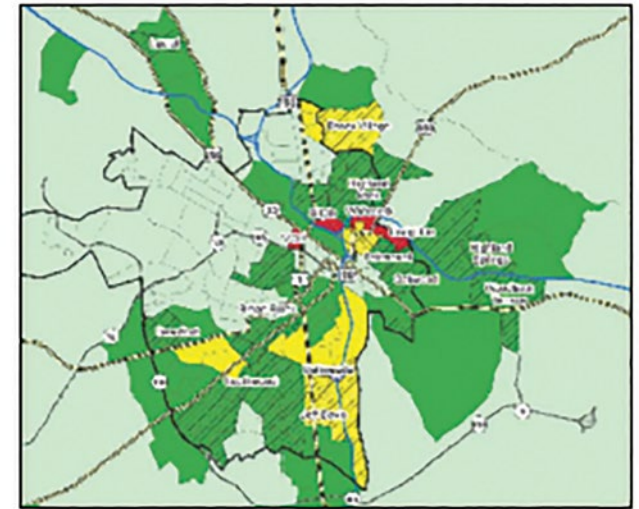
Proposed Service

RRTPO and DRPT completed and endorsed the [Greater RVA Transit Vision Plan \(transit2040\)](#) in April 2017.

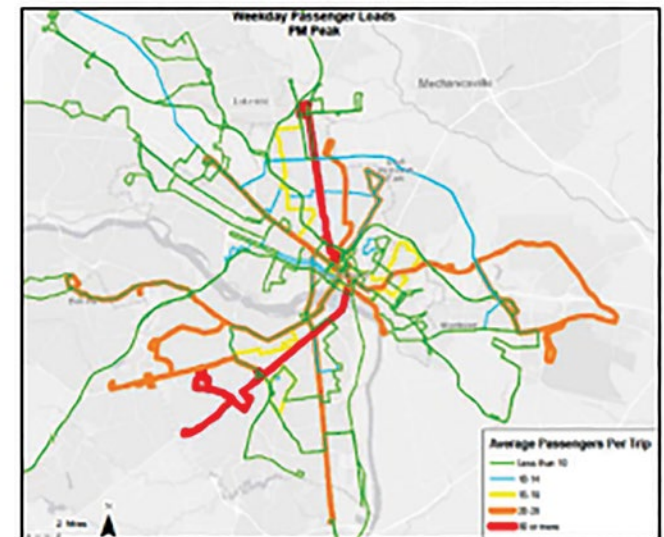
This long-range regional visioning process was undertaken in response to the region's existing and projected growth in population and employment paired with its comparatively limited public transit network. *transit2040* was developed through a collaborative process involving every jurisdiction in the RRTPO, both via direct outreach from the study team and frequent updates to the RRTPO citizen, technical, and policy boards.

Exhibit 13: GRTC Ridership Demographics

Economically Distressed Areas



COVID Essential Transit Trips



Since the RRTPO's endorsement of transit2040 in April 2017, the RRTPO, GRTC, and DRPT noted significant progress on critical first steps toward the 2040 vision, including:

- In June 2018, GRTC began operating the Pulse bus rapid transit (BRT) line along the region's densest corridor between Willow Lawn and Rocketts Landing. Ridership on the Pulse has exceeded expectations, and the creation of the Pulse also catalyzed a comprehensive rerouting and update of the [City of Richmond's transit network plan](#), which launched concurrently with the opening of the Pulse.
- In September 2018, GRTC also began operating Henrico County's largest expansion in public transportation in 25 years, including full service to Short Pump.
- Having completed a study of transportation service alternatives for the [U.S. Route 1/301 corridor](#) in July 2018, Chesterfield County obtained DRPT funds for a pilot project of service along the corridor from the County line to John Tyler Community College. Route 111 launched service in March 2020, and has realized positive ridership despite commuting slow-down due to the COVID pandemic.
- Public transit has also been gaining more institutional support. In 2018, Bon Secours Richmond Health System and VCU Health System partnered to secure joint sponsorship rights of the Pulse. VCU also began piloting a program with GRTC in the fall of 2018 to provide its faculty, staff, and students with unlimited GRTC passes, similar to the public transit option provided by the University of Richmond. As of fall 2018, every Richmond Public School high school student became eligible to receive an unlimited bus pass as well.

Studies, findings, and reports that illustrate the progress on the critical first steps of *transit2040*, as well as additional planning relevant to it, are incorporated by reference as foundational documents, including the [GRTC system-wide Transit Development Plan](#) completed in July 2018 for FY 2018–2022, the Richmond Regional Park & Ride Investment Strategy, and multimodal transportation connectivity studies like the [Henrico Transit Choices Report](#) and the Chesterfield Transit Options study.

Responding to this progress, the RRTPO worked with Kimley-Horn to further advance “Critical First Steps” from *transit2040* in preparing the [Greater RVA Transit Vision Plan Strategic Technical Analysis](#) to identify a range of short-term (1-5 years) and medium-term (6-10 years) needs and options for transit services, transit preferential treatments, if any, and transit-oriented land use that would advance the next incremental steps toward reaching the long-term goals of *transit2040*. This Phase II or Near-Term Strategy focused on the corridors identified in the *transit2040* vision for high-frequency service by 2040. The Phase II technical study operated within the long-term recommendations and vision gained through the *transit2040* process and was adopted by the RRTPO on September 3, 2020.



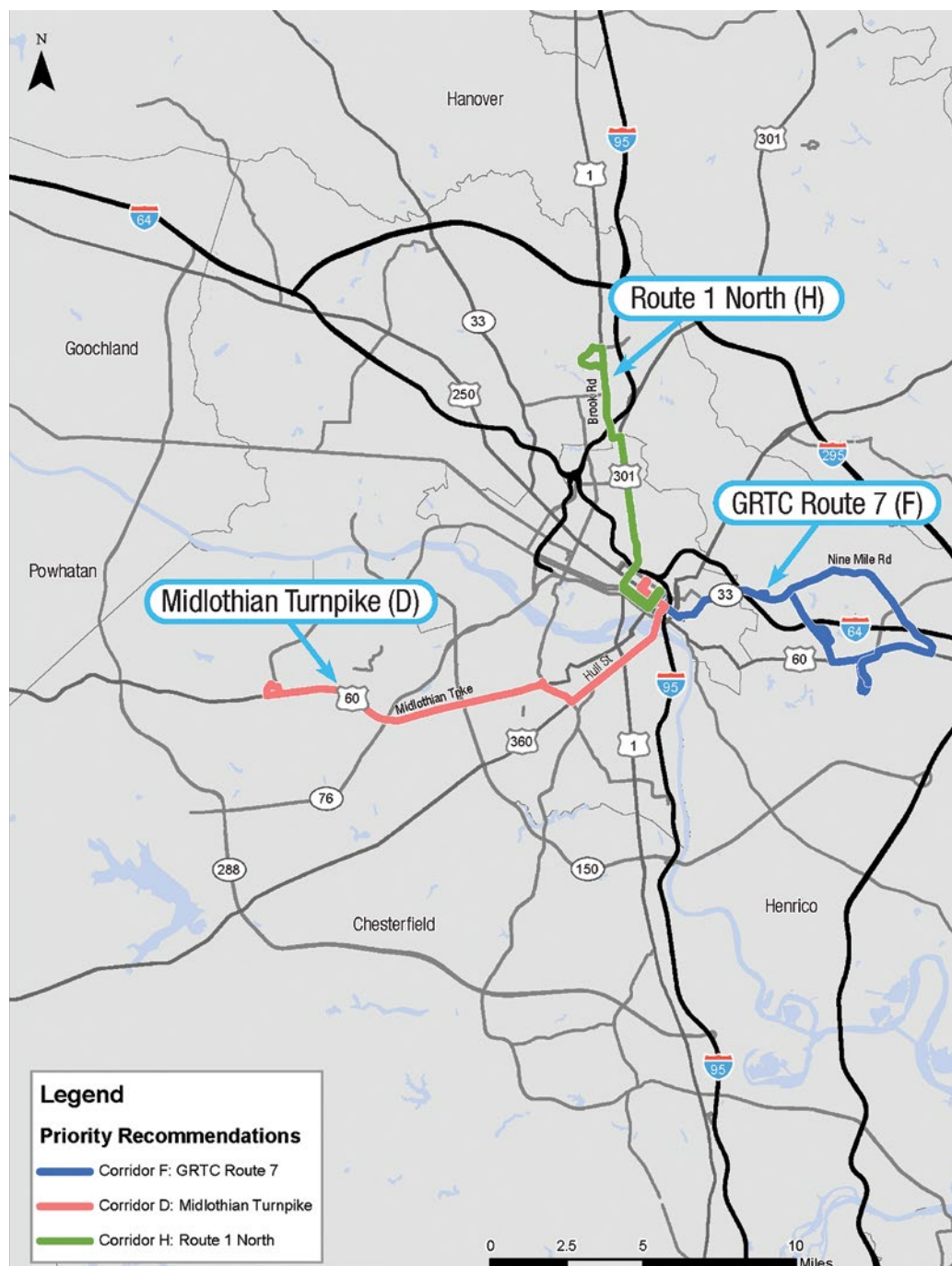
The Phase II Near Term Strategy identified the following corridors to be the most-ready, providing good extensions for the existing system and offering the greatest potential for ridership. These corridors were recommended for further refinement and study as the most feasible from an implementation standpoint:

- Corridor A-Broad Street to Short Pump (Willow Lawn to Bon Secours Short Pump)
- Corridor D-Midlothian Turnpike (Downtown Richmond to Huguenot Road)
- Corridor E-West End South (Downtown Richmond to Regency Square)
- Corridor F-Airport via Route 60 (Downtown Richmond to the Richmond Airport)
- Corridor H-Route 1 North (Downtown Richmond to Parham Road)

Of the five recommended corridors, the service plans for the top three corridors presented the most viable options for near-term implementation. Service Plan Option 1 was most viable for Route 1 North and Midlothian Turnpike and Service Plan Option 3 on the Airport corridor, improving service on the existing GRTC Route 7, rather than new service between Downtown and the Airport via U.S. 60.

A [StoryMap](#) of the Phase II Near Term Strategic Analysis serves as an Executive Summary for this plan, which will serve as a foundation for the Regional Public Transit Plan being prepared jointly by the RRTPO and GRTC.

Exhibit 14: Near Term Recommendations for Enhanced Routes



Regional Park & Ride

Existing Park and Ride Lots

Park & Ride lots strategically placed throughout the region provide opportunities to expand the reach of public transit, relieve congestion, and enhance multimodal transportation options by making better use of the existing highway infrastructure. Building on the VDOT Park and Ride Study and investment strategies from 2013 to 2018, the RRTPO adopted the [Richmond Regional Park and Ride Investment Strategy](#) on December 5, 2019 to leverage park and ride lots in the Richmond Region as part of the larger travel demand management strategy. The strategy was guided by an advisory group of representatives from all the localities, VDOT, DRPT, GRTC, and Ridefinders, and assessed existing needs and conditions, identified potential for meeting future needs, offered recommendations for future project service areas, and outlined implementation strategies to advance and promote park and ride projects in the Richmond Region.

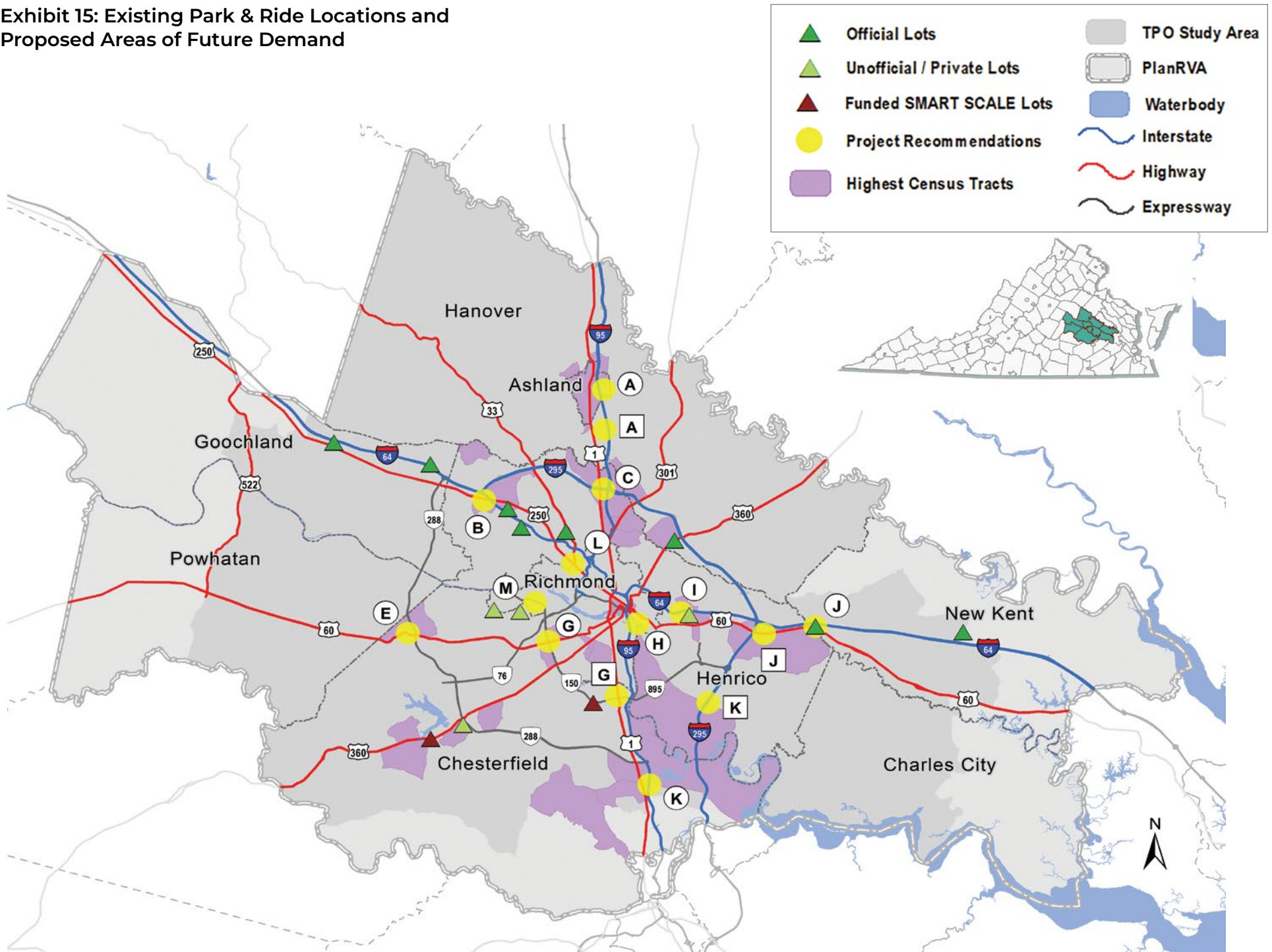
As of November 2018, eight official, park and ride lots existed within the RRTPO study area boundary. Four additional “unofficial” lots (private lots at which agreements are in place to allow commuter parking) are also located in the study area. While the official lots are primarily located along I-64 and northeast of the center of the City of Richmond, the unofficial lots are primarily found south of I-64. No additional lots have been constructed since this report finding, but two are programmed and have been funded for construction in Chesterfield County, adding 250 parking spaces by 2028 in the vicinity of Chippenham/Hopkins Road and Route 360 at the Career and Technical Center near Woodlake.

Park and Ride Needs

Eleven data-driven needs areas and two added-value needs areas were identified as potential areas on which to focus for park and ride lot locations in the future. The strategy also identified a range of lot sizes based on the potential demand and magnitude of cost estimates driven by the contextual location specific to each area, i.e. those in an urbanizing area with transit connections would tend to have more amenities for multimodal access. Implementation, including alternatives for funding sources and recommended actions short- mid- and long-term timeframes, rounded out the overall strategy.



Exhibit 15: Existing Park & Ride Locations and Proposed Areas of Future Demand



Active Transportation

Existing Conditions

Concurrent with the *ConnectRVA 2045* process, PlanRVA worked with a steering committee of locality and active transportation advocates to update the 2004 Richmond Regional Bicycle and Pedestrian Plan. Since 2004, many positive steps have moved the region forward to a more active transportation system, including the following projects now part of the existing system framework shown on Exhibit 16:

- **Virginia Capital Trail:** A 52-mile shared use path connecting Richmond and Jamestown, opened October 2015.
- **James River Park System:** Continued development of bicycle and pedestrian trails along the banks of the James River in Richmond, including the completion of the bicycle and pedestrian only T. Tyler Potterfield Bridge in December 2016.
- **Huguenot Bridge:** Widening of the bridge deck from two travel lanes to two lanes with emergency lanes and wider sidewalk to better accommodate cyclists and pedestrians, completed in 2013.
- **Cannon Creek Greenway:** A paved shared use path connecting Valley Rd. in Shockoe Bottom to just north of E. Brookland Park Boulevard along the Richmond-Henrico Turnpike, completed in 2012.
- **Gambles Mill Eco-Corridor:** The University of Richmond has a paved shared use path connecting Huguenot Road into the campus to UR Dr. and Ridgeway Road, completed in 2020.
- **Gillies Creek Greenway:** Proposed paved shared use path to connect from the Virginia Capital Trail and the James River along Gillies Creek to Oakwood Cemetery along Gillies Creek. This project was approved in FY21-22 for SMART SCALE funding.
- **Appomattox River Trail:** Master plan for this effort is to provide a coordinated guide to locating and prioritizing a non-motorized trail and signage system along the six localities of the 20-plus mile lower Appomattox River corridor from Lake Chesdin to City Point Park in Hopewell.
- **Fall Line:** Proposed shared use and paved path connecting the Town of Ashland to Petersburg along a 43-mile corridor generally following U.S. Route 1 including the counties of Hanover, Henrico, Chesterfield, and municipalities of Ashland, Richmond, Colonial Heights, and Petersburg. PlanRVA continues to work in a subcommittee with Ashland, Hanover, and Henrico on their segment of the Fall Line, the Trolley Line Trail, which runs from Lakeside to Ashland along a former street car line. The National Park Service's [Rivers, Trails, and Conservation Assistance \(RTCA\)](#) program has assisted with this effort. Ashland has completed their portion of the trail, a boardwalk that runs a third of a mile to connect with Hanover's Ashland Trolley Line Trail Park.
- **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. Chesterfield incorporated a Bicycle and Trails chapter of the 2019 Moving Forward Chesterfield County comprehensive plan. Henrico County is working toward a bicycle and pedestrian chapter in the county's comprehensive plan update. Hanover County includes an Active and Healthy Living Neighborhoods chapter in the county's 2017-2037 Comprehensive Plan.
- **Bicycle Network:** PlanRVA's bicycle and pedestrian plan details the definitions for bicycle infrastructure throughout the region, including shared use paths, cycle tracks, bicycle lanes, bike boulevards, and connector paths. In the region, there are approximately 150 miles combined of all these different examples of bicycle infrastructure.

Active Transportation Issues and Needs

This [2021 Richmond Regional Bicycle and Pedestrian Plan](#) effort has involved an extensive collection and analysis of data on the regional roadway and trail network, review meetings with each of the nine local government partners, site visits and experiential evidence gathering, and public input through the *ConnectRVA 2045* public input process with Wiki map comments and public surveys to determine the long-range needs for the region's population for a more active transportation system. The committee has helped shape the plan, revisiting progress since the 2004 plan, and updating standards for analysis using Federal Highway Administration (FHWA), National Association of City Transportation Officials (NACTO) and the American Association of State Highway and Transportation Officials (ASAHTO) standards and guided by the work of our peers on their own bicycle and pedestrian planning.

The steering committee engaged in an active dialogue to define a workable framework of guiding principles, a Vision Statement, and set of goals, objectives and performance measures to mark the progress toward making the bicycle-pedestrian mode of transportation viable for the population to live, work and play in the Richmond Region.

VISION: The Richmond Region provides mobility for people of all ages and abilities through a safe, continuous, recognizable, and intuitive pedestrian and bicycle network. Efforts to make walking and biking a safe travel mode are well-integrated into all regional and local comprehensive and related plans, implementing ordinances and guidelines to equitably enhance the quality of life, strengthen local economies, and preserve the natural environment.



Guiding principles:

1. **Provide Safe, multi-modal** regional transportation system recognizing that vehicle speed and conflict between modes lead to higher roadway injury and fatality rates.
2. **Build Equity** into all transportation planning and spending in the region with focus on connecting historically disregarded communities to employment and services.
3. **Ensure choice among all travel options** (private vehicle, transit, bike, walk) regionwide.
4. **Prioritize completion of regional bicycle & pedestrian networks** for individual and community health.
5. **Make last-mile transit access** a priority for a more resilient transportation system.
6. **Incorporate context sensitive design** of all facilities to reduce conflicts and enhance sustainable communities.

A [StoryMap](#) summarizes the layers of vital regional data and relevant planning factors and illustrates the following issues related to creating a regional active transportation network:

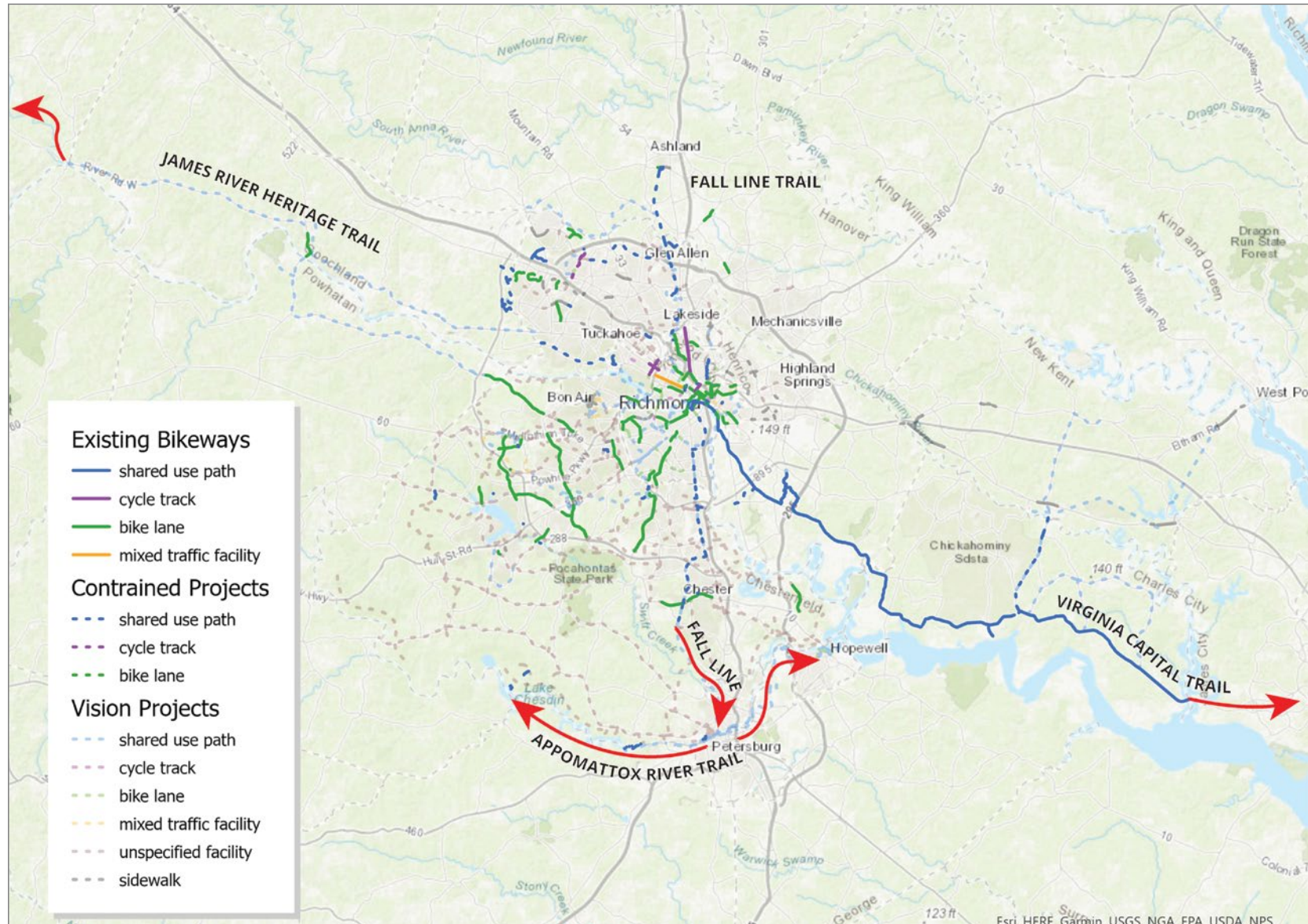
- **Safety Statistics:** Analysis of trends over past five years that are indicative of the need for improved bicycle and pedestrian infrastructure, safety programs, and public awareness. The statistics show that pedestrians killed in motor vehicle crashes through 2019 is 1.5 times the number in 2015, from 8 to 20 deaths. Injuries also increased by nearly 14 percent. Bicyclist fatalities were also up from three to four fatalities, but fortunately reported injuries declined by 16 percent. The mapping of a high-injury network is needed in order to identify the areas where the most serious conflicts between motor vehicles and bicyclists and pedestrians occur in order to prioritize improvements to make conditions safer.
- **Equity:** The needs for access to jobs and community services without dependence on a motorized vehicle is particularly acute in areas of concentrated poverty, minority, elderly, disabled, limited English proficiency, and non-car owning populations. These demographic areas are mapped throughout the region for special consideration in providing bicycle/pedestrian Infrastructure and transit service. Health equity as depicted by concentrations of low health outcomes is also recognized since greater offerings for active transportation can lead to greater individual and community health.
- **Multi-modal Choice:** Mapping existing and planned bicycle and pedestrian infrastructure along with the destinations depicted by activity centers, public schools, and proposed development in the planning stages start to show where the greatest need for providing the physical improvements necessary to create a range of transportation options for the population to move throughout the region. Opportunities for making more complete use of the existing roadway system where it offers the safest option for mixed traffic serve as one basis

for priority recommendations. Higher volume roadways, rivers and streams limit ease of connection and can serve as barriers to free bicycle and pedestrian travel. Identifying existing bridges and culverts that may be eligible for upgrade or replacement therefore offer the opportunity to improve bicycle-pedestrian access when upgraded. Existing utility easements for active transportation are also mapped to show where cross-region networks may be possible in the future.

- **Last- or First-Mile Transit Connections:** The existing transit network is mapped to show the coverage area for the existing population's access to regular transit service. Furthering the access, an understanding of the both the special environmental justice population needs for access and the existence of bicycle and pedestrian infrastructure to provide the full non-vehicular access to transit is important to establishing priorities for improvements.



Exhibit 16: Regional Bicycle-Pedestrian Network



The Regional Bicycle & Pedestrian Plan (BikePedRVA 2045) is in the process of being updated and will be considered for adoption later in 2021. Active Transportation projects proposed in the early stage of this separate planning process were included in the *ConnectRVA 2045* Universe of Projects, and this Exhibit represents the framework that guides BikePedRVA 2045.

Complete Streets & Regional Initiatives

Complete Streets

Everyone, regardless of age, ability, income, race, or ethnicity, should have safe, comfortable, and convenient access to community destinations and public places—whether driving, walking, bicycling, using a wheelchair, or taking public transportation. Beginning in 2017, PlanRVA developed a Complete Streets initiative for the region, using the Town of Ashland as a pilot community to develop Complete Streets guidelines. PlanRVA staff worked with Smart Growth America to develop a [Complete Streets toolbox](#) to provide assistance to Richmond jurisdictions to identify ways to make the street network safer for multimodal use building opportunities for stronger economies. The toolbox features design guidelines and examples for enhanced bus stops and travel lanes; best practices for lowering speeds and congestion with traffic calming infrastructure like traffic circles, roundabouts, and curb extensions; safer street crossings with curb ramps and pedestrian signals; and better biking with a variety of buffered and protected lanes and shared use paths.

Partnerships Within and Beyond Regional Boundaries

PlanRVA works with several government agencies, volunteer organizations and advocacy groups to help promote active transportation improvements and safety throughout the region:

- Sports Backers, through BikeWalkRVA, advocates for greater bicycle and pedestrian use, promoting sports tourism, environmental justice, economic growth, and safety.
- Virginia Capital Trail Foundation (VCT) is the group tasked with maintaining and advocating for the 52-mile multiuse trail that connects Richmond and Jamestown along the Route 5 corridor.
- East Coast Greenway Alliance (ECG), advocates for the development of a national trail system that connects 15 states and 450 cities and towns for 3,000 miles from Maine to Florida, more than 420 miles of which would be in Virginia.



**Bike lane and
traffic circle,
Lombardy—
Richmond**



Regional Vision Zero Work Group

PlanRVA hosts a regional Vision Zero work group that invites planning professionals from each of the region's nine localities in an effort to create a safer transportation network. Vision Zero puts priority on human life and works toward common understanding that traffic deaths and serious injuries are acknowledged to be preventable. The group's vision statement includes planning "with political commitment collaborating with multi-disciplinary leadership and using a system-based approach. Their plan is transparent, data driven, and engages our diverse communities, in an equitable manner." The regional group is currently working with VDOT and their consultant to identify a regional, statistically-based mapping of the High-Injury Network to guide improvements toward solving the highest priority challenges.

Fundamental Principles of Vision Zero include:

1. Traffic deaths and serious injuries are acknowledged to be preventable.
2. Human life and health are prioritized within all aspects of our transportation systems.
3. Transportation systems are created to account for human error.
4. Our work in transportation safety begins with system-level changes and follow with influencing individual behaviors.
5. Speed is recognized and prioritized as the fundamental factor in crash severity.

**Pedestrian
crossing on
Grove Ave—
Richmond**



**Brook
Rd bike
crossing—
Richmond**



Passenger Rail

Existing Conditions

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.

The 2008 [Passenger Rail Investment and Improvement Act \(PRIIA\)](#) directed the Federal Railroad Administration (FRA) to, "Develop a long-range national rail plan... to promote an integrated, cohesive, efficient, and optimized national rail system for the movement of goods and people." This plan recognizes the role rail can play in helping to deal with the rapid growth expected over the next several decades in already crowded urban areas. The plan identifies the need for both improved freight service as well as passenger service, including the expansion of high-speed rail.



In 2017, Virginia's DRPT completed its most recent rail plan. The [Statewide Rail Plan](#) provides the vision and strategies to address rail needs in the Commonwealth. The rail plan also established the [Virginia Passenger Rail Authority](#) which will be responsible for expanding the availability of passenger rail throughout the state. The plan also outlines the current condition of Virginia's rail system, challenges facing the system, and identifies projects necessary for improvement of the network. A 2013 companion document, the [Resource Allocation plan](#), details project selection and prioritization, funding and implementation schedules with an estimated \$6.9 billion in projects included in the Statewide Rail Plan.

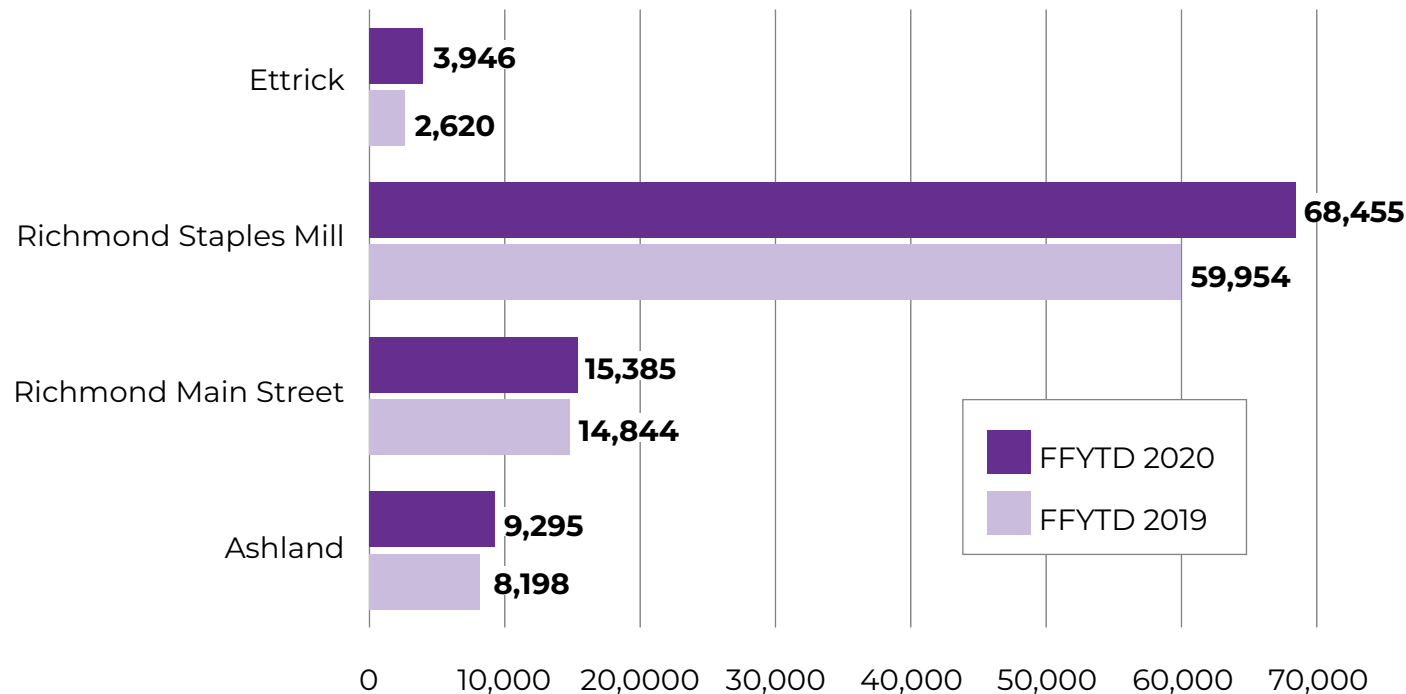
The Virginia Passenger Rail Authority (VPRA), established by the General Assembly in 2020, will be responsible for expanding the availability of passenger rail throughout the state. The VPRA will also lead the buildout of the [Transforming Rail in Virginia](#) Program and will manage the rail infrastructure assets acquired in 2021 from CSXT. The Transforming Rail in Virginia Program will work toward the eventual separation of passenger and freight rail operations in the I-95 corridor through capacity expansion, including a new two-track dedicated passenger rail bridge across the Potomac River between Washington D.C. and Northern Virginia. The program will allow for the incremental increase of both Amtrak and Virginia Railway Express (VRE) service over the next decade. It will accomplish the following:

- Double Amtrak round-trip service between DC, Richmond and Roanoke;
- Expand VRE service along the I-95 corridor with 15- minute intervals during peak periods and added night/weekend service;
- Increase Amtrak service to Newport News and Norfolk; and
- Lay the foundation to make the Southeast High-Speed Rail corridor possible through the acquisition of the out-of-service S-Line from Petersburg into North Carolina.

As shown in Exhibit 17, 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. According to Amtrak and the National Railroad Passenger Corporation, in fiscal year 2017 the Staples Mill Station saw 373,800 boardings and detrainings, making it the busiest station in the state. The heavy passenger flow is mainly due to the ease of access of the Staples Mill Station and consistent commuter travel north to Washington D.C.

In partnership with Henrico County and other stakeholders DRPT began work on a transportation improvement plan in 2020 for the Staples Mill station and surrounding area. The plan includes a complete redesign of the station building including an improved and more accessible passenger boarding area, additional terminals, and increased capacity for passenger boarding, detrainings, and transfers. Outside of the immediate station improvements, the plan envisions a transit-oriented development (TOD) approach to the Staples Mill/ Glenside/Hilliard Road area with a focus on multimodal connectivity, pedestrian access to the station, surrounding businesses and residential neighborhoods. The Staples Mill station improvements are planned to be completed by 2030.

Exhibit 17: Regional Passenger Train Station Activity



Richmond presents a few capacity constraints affecting rail operations; CSXT has two north-south mainlines that operate through Richmond, and one east-west line that runs along the James River.

Along with the Buckingham Branch Railroad's western connection, all four lines make the City of Richmond a crossroad for north-south and east-west rail traffic. Currently, there is enough grade separation between the one east-west and the two north-south tracks so that east-west trains do not affect those running north-south. However, if a train needs to change its primary direction from east-west to north-south the process is cumbersome and slow. Trains switching their primary direction often get delayed by the low-speed S-Line or the steep uphill grade between Main Street Station and Acca Yard. Norfolk

Southern operates an east-west freight line through the Richmond Region that extends eastward through Henrico and New Kent Counties to West Point and westward through Chesterfield and Powhatan Counties west to connect with the larger NS network.

Freight and Intermodal

Existing Conditions

Rail

The Richmond Region is served by a network of highways, local roads, waterways, and rail lines to move freight throughout the region and beyond. 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. There are three rail entities that own and maintain tracks in the region; CSX Corporation (CSX), Norfolk Southern Corporation, and Buckingham Branch Railroad. The CSX and Norfolk Southern lines are both Class I rails, meaning they are long-haul lines that interchange with short line railroads and other transportation modes at facilities or terminals.

The Buckingham Branch is a short-line, Class III railroad that includes terminal rail and switching operations (local transport). All three lines perform switching services and short hauls in the Richmond Region.

As shown on Exhibit 18 on the following page, 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 approximately 20 tracks and provides various freight services for both 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. In 2018 CSX partnered with the Department of Rail and Public Transportation (DRPT) to complete a series of rail projects around the Richmond Region to improve capacity constraints and ease traffic congestion.

The addition of several miles of double track along the western edge of the Acca Yard bypass was included among the improvement projects. The additional tracks now allow for both freight and passenger trains to pass around the yard, rather than slowing down to pass directly through the center of the yard in its previous configuration.



To the east, Fulton Yard has surplus 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.

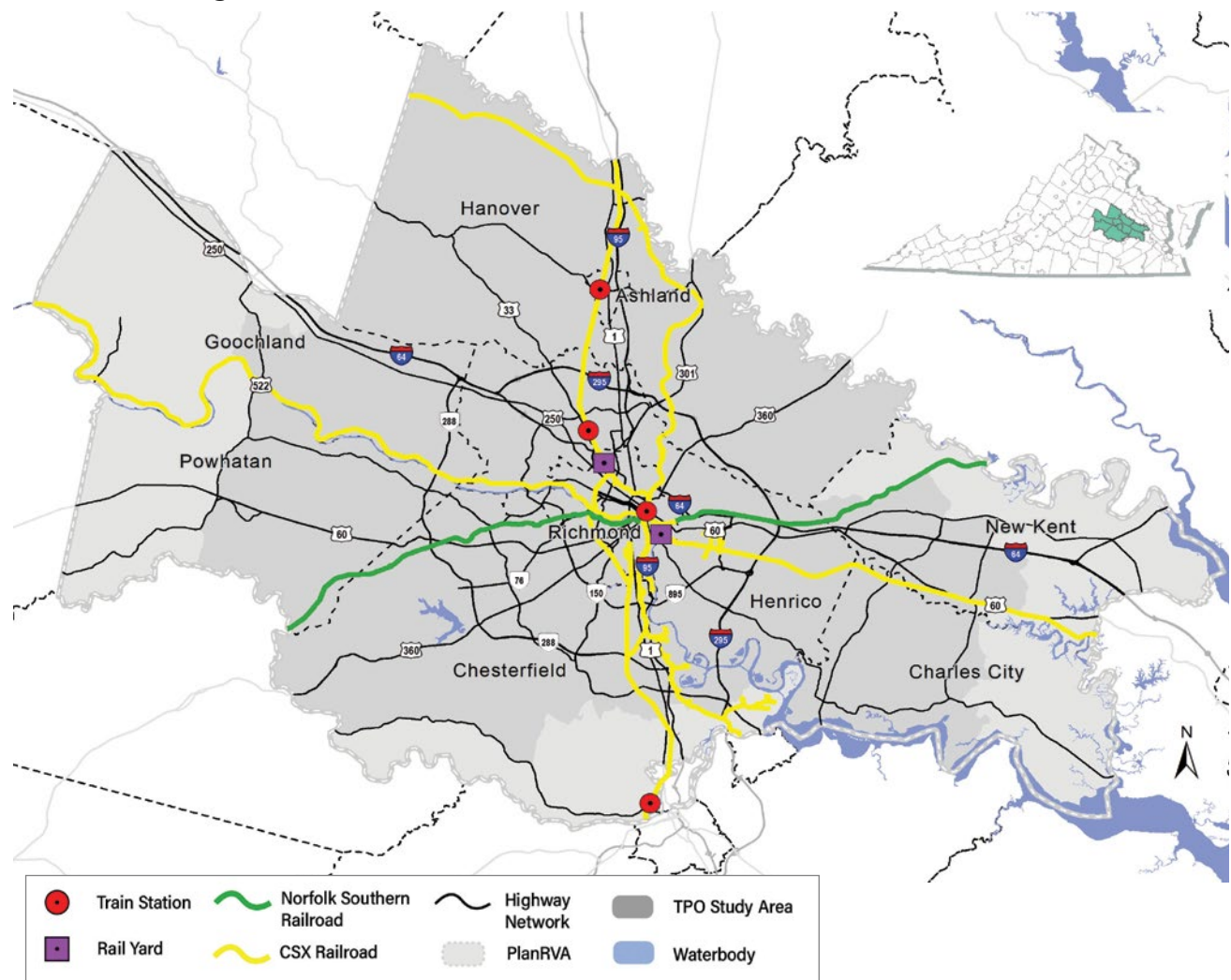
Richmond Marine Terminal

The Richmond Marine Terminal (RMT) 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 highway, air, and major rail services. The 121-acre port is owned by the City of Richmond and under a long-term 40-year lease to the Port of Virginia (POV) for barge service operation and maintenance. The long-term nature of the lease is important because it enables the POV to invest in its improvements to ensure growth and operational efficiency.

Transformative capital improvements which have allowed the RMT to go to five sailings a week have included a new drop lot outside of the gate, 40-plug central power unit and heavy-lift forklift, and bulkhead/fender repair.

Through the Port of Virginia, the RMT has direct access to over 80 ports, a 24-hour drop off facility for trucks, and distribution

Exhibit 18: Regional Rail



and warehouse facilities. 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. The RMT has the capacity to move more cargo. In fiscal year 2020 the RMT increased total imports and exports up 22.5 percent to 41,019 containers, or TEUs (twenty-foot equivalent unit). Each TEU can be considered to represent one truck trip

taken off the highway. From 2016 to 2020 imports and exports at the RMT have been at or near equilibrium. With the expansion of the port's two container terminals, RMT was able to process even more cargo in the year 2020 despite setbacks from the Coronavirus pandemic and trade complications with China.

The RMT and the surrounding industrial areas are in Foreign Trade Zone #207 offering certain tax advantages. Foreign trade zones allow businesses to defer paying U.S. Customs duties on imported goods held within the zone until the goods enter the country for domestic consumption. No duties are paid if the goods are re-exported and businesses can store goods in a Foreign Trade Zone for an unlimited amount of time. The RMT and surrounding areas are also designated as a local Enterprise Zone 1 by the City of Richmond which offers qualified projects the opportunity to apply for real estate tax abatement, brownfields and machinery and equipment rebates, and other miscellaneous incentives that can be instrumental in stimulating employment growth and investments “outside the gate of the RMT.” In fact, according to the Port of Virginia from June 2016 to July 2019, seven enterprises have invested and created nearly 1,000 jobs in the surrounding port area.

Commodity Flow

Trucking

According to the 2017 report [Virginia Performs](#) by the Council on Virginia's Future, the percentage of Virginia originated freight shipped by single-mode truck transport represented 85.5 percent of economic value in 2012 (the last year for which national level data was available). The report further states, “Vehicle miles traveled on Virginia's heavily used interstate highways remained fairly steady in the period studied from 2005 to 2014. The mix of traffic changed slightly during this time, with two-axle passenger cars, buses, and trucks (as well as motorcycles) accounting for an increasing share of volume: 89.2 percent of Daily Vehicle Miles Traveled (DVMT) compared to 87.3 percent in 2005. At the same time, the DVMT for multiple-axle trucks decreased from 8.3 million in 2005 to 7.3 million in 2014.”



The length of trip and type of commodity largely influences the mode choice for freight. The report points out that “freight with higher value-to-weight ratios and haul distances less than 500 miles typically use short-haul modes like trucks. Shipments with lower value-to-weight ratios and longer travel distances are more likely to choose long-haul modes such as rail and water. Shipping often involves multiple modes to combine the cost or speed advantages of one mode (e.g., rail, water, air) with the pickup and delivery convenience of truck transportation.”

Virginia experiences large freight volumes, due largely to the presence of a major East Coast port in Hampton Roads and military installations. Approximately 41 percent of Virginia's freight tonnage passes through the state on the way to or from other states. Consequently, Virginia hosts a relatively large logistics and supply chain management industry, providing state-of-the-art services for the storage, movement, and distribution of freight that in turn supports a robust multimodal transportation system.

The operation of the Richmond Marine Terminal by the Port of Virginia is a big influencer of freight movement in the

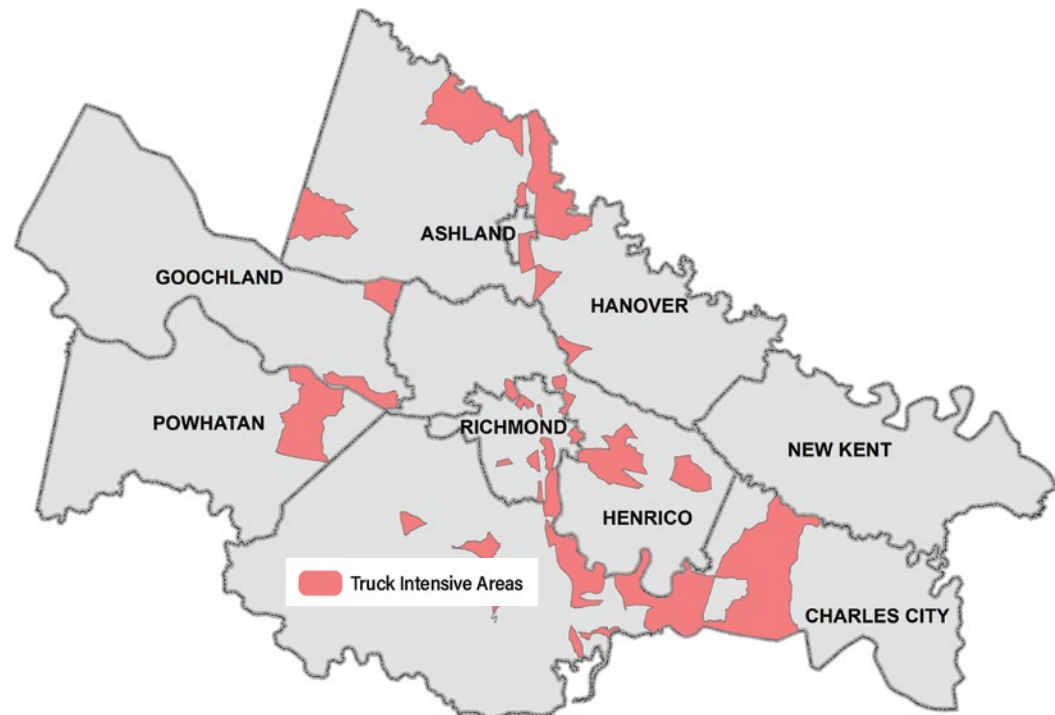
region. Most cargo going in and out of the port travels by truck. As evidenced by the increase in volumes shown on Exhibit 19 the Port of Virginia is working to increase transportation by alternative modes like rail and barge to reduce roadway congestion. In 2015, 36 percent of freight through the POV was transported by rail and barge, down for the second year from 2013's record high of 38 percent.

Defining the truck-intensive areas within the Richmond Region is one way to assess major impacts of trucking. Truck zones as shown in Exhibit 19A are zones for which there is reason to believe that the rate of truck trip ends per employee is likely to be higher than usual. This is because a review of satellite photos or local knowledge indicates the zone represents a concentration of industrial or warehousing land uses or a specific truck generating activity, such as a truck stop, an intermodal transfer facility, or a trucking firm office. Truck Zones were developed by a VDOT consultant using desktop analysis of aerial photography and refined by VDOT staff to be used in the RTC model. A TAZ is either designated as a Truck Zone or not.

Exhibit 19: Cargo Flow Volumes at Richmond Marine Terminal



Exhibit 19A: Truck Intensive Areas



Airports

Four airports—the Richmond International Airport (RIC), Chesterfield County Airport, Hanover County Municipal Airport, and the New Kent County Airport—serve the Richmond Region. Only RIC provides scheduled commercial airline service and major air cargo operations. The other airports support general aviation activities of various levels.

Over the last five years (2015-2020) cargo volumes out of RIC have been gradually increasing, with a slightly higher rate of outbound cargo. Despite the pandemic in 2020, RIC saw a record cargo volume, nearly 160 million pounds, with a year-over-year increase of 14 percent (see Exhibit 20). The difference of around 19 million pounds of cargo between 2019 and 2020 directly reflects the sudden change in buying habits as consumers switched from in-person shopping to online retail. Conversely, RIC passenger volumes took a dramatic downturn from 2019 to 2020, a direct result of the travel restrictions put in place for the pandemic. From 2019 to 2020 RIC saw a loss of 2 million passengers, a stark 45 percent decrease in traffic. Prior to 2020, passenger volumes had been gradually increasing with a 24 percent increase in passenger volume from 2015 to 2019.

Exhibit 20: Cargo Volumes at Richmond International Airport

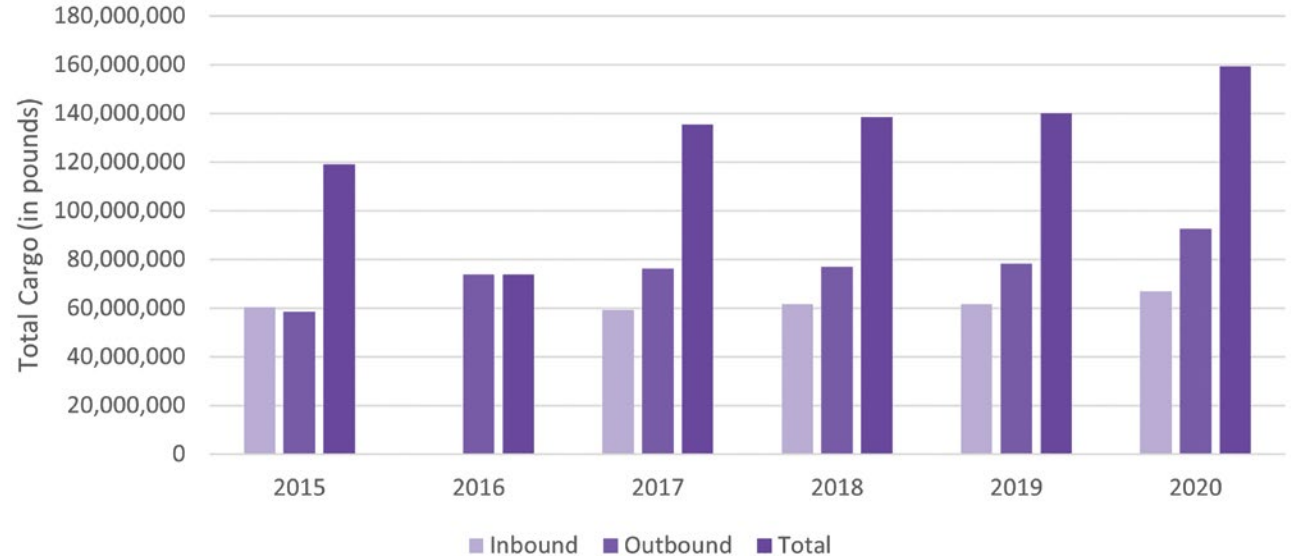
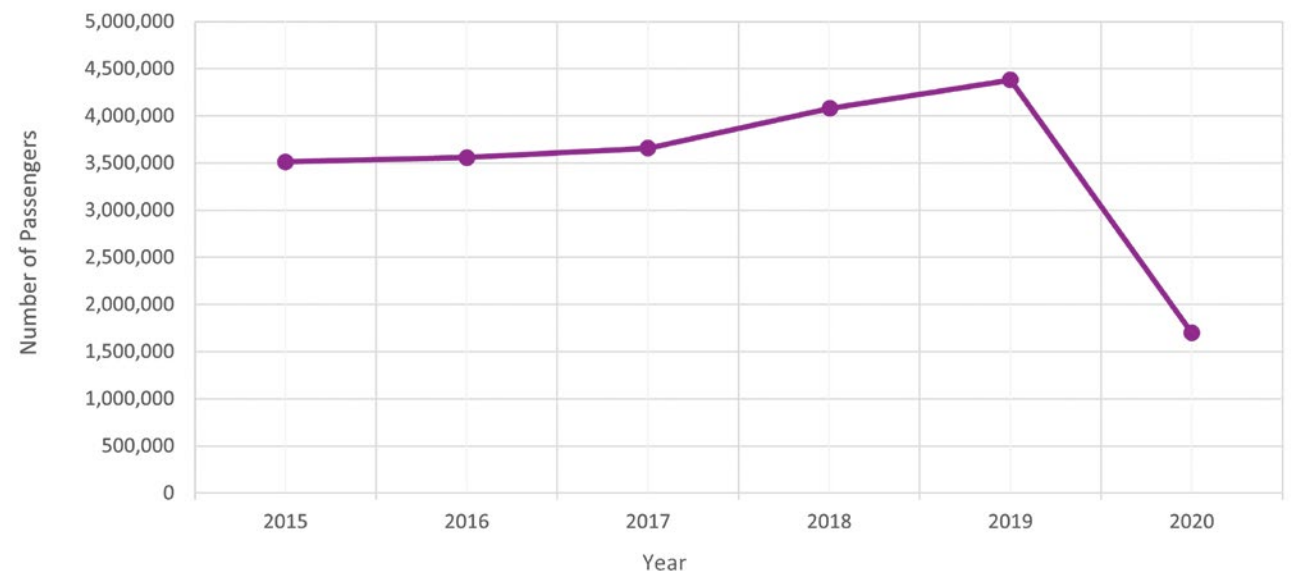


Exhibit 21: RIC Airport Passenger Trends

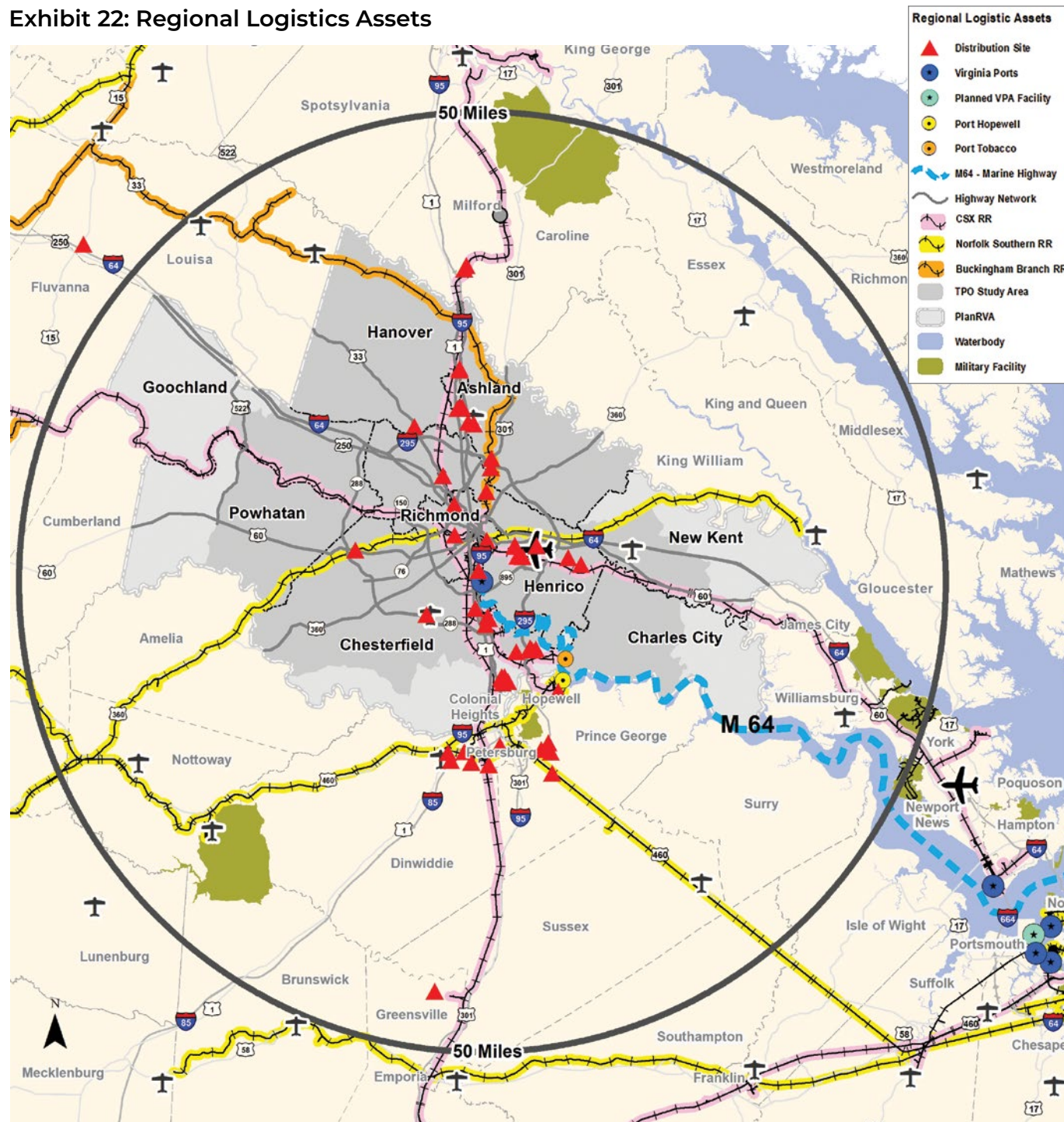


Freight and Intermodal Needs

Richmond Region Logistics Network

Given the region's locational advantages offered by interstate access north-south and east-west at a mid-point of the East Coast, the area is witnessing a significant growth in distribution centers (see Exhibit 22), including opportunities in the southern portion of the larger metropolitan region with the 2005 Base Realignment of Fort Lee as the U.S. Army's third largest training site and logistics center. From 2011 to 2019, the larger Richmond-Petersburg MSA has seen an increase of 140 percent from 24 to 58 distribution centers, mostly clustered along the I-95 corridor. The renewed investments by the Port of Virginia that have increased barge service at Richmond Marine Terminal has supported the emergence of several new industrial parks in the immediate area outside of the gate in the I-95/commerce corridor area.

Exhibit 22: Regional Logistics Assets



Maintenance and Safety

Bridge - Condition and Needs

Collectively referred to as “structures,” bridges, culverts, and tunnels are critical building blocks of an efficient transportation system. Bridge location, design, and structural soundness is a key element in planning and maintaining an effective transportation network. Bridge dependability is especially important in the Richmond Region due to the relatively high number of bridges in a region with numerous interstates, freeways and state highways, the crossroads of three major railroad systems, and multiple major rivers and the creeks and streams that feed them. Concerned about the number of aging bridges in the region and the apparent lack of funding for maintaining or replacing them, RRTPO has been tracking the condition and funding based on data maintained by VDOT on the condition of the region’s bridges since 2014.

ConnectRVA 2045 includes technical reports that provide a more detailed assessment of important foundational elements for the plan. *Technical Report C: Richmond Regional Structural Inventory & Assessment Report 2020* shows there are a total of 1,428 structures, including 818 bridges and 610 culverts as of 2020 in the Richmond Region. The median age of the structures is 30 years. Bridges and culverts included in the VDOT system and also in the non-VDOT road system, such as those maintained as part of the Richmond and Ashland urban system, Henrico secondary system, Richmond Metropolitan Transportation Authority (RMTA), and private bridges and culverts.

“Structurally deficient” means there are elements of the structure that need to be monitored and/or repaired. Structures are considered structurally deficient or in poor condition if they have been restricted to light vehicles, closed to traffic or require rehabilitation. The fact that a bridge is “structurally deficient” does not imply that it is likely to collapse or that it is unsafe. In 2020, 65 structures were classified as structurally deficient structures or in poor condition.



Technical Report C: Richmond Regional Structural Inventory & Assessment Report 2020 highlights the structures and the elements of those structures identified in poor condition. The report also documents the Commonwealth's State of Good Repair (SGR) Prioritization Process Methodology for replacement and rehabilitation of structurally deficient state and locally owned bridges as adopted by the Commonwealth Transportation Board (CTB). Of the 65 total structurally deficient bridges, only the 14 that are classified as part of the National Highway System (NHS) as shown on Exhibit 23 are included as part of the *ConnectRVA 2045* Universe of Projects, and include the following:

1. U.S. 1 over Ashton Creek
2. I-64 east and westbound at Airport Drive
3. I-195 at VA-197 (Westwood Avenue) and CSX Rail
4. Parham Road over CSX Rail
5. US-60 eastbound over Toe Ink Swamp
6. Broad Street over I-95
7. Cary Street over I-195 and CSX Rail

This map displays the TPO Study Area in the Richmond Region, highlighting areas with structurally deficient bridges. The study area is shaded in light gray and includes several localities: Hanover, Ashland, Goochland, Powhatan, Richmond, Chesterfield, Henrico, New Kent, and Charles City. The map features a network of roads, including Interstates (red and blue shields), Highways (red shields), Expressways (orange lines), and Major Roads (black lines). Water bodies are shown in blue. Bridges are marked with green pentagons. A legend in the top right corner defines these symbols. An inset map in the bottom left corner provides a broader view of the region, showing the location of the study area relative to the surrounding areas. A north arrow is located in the bottom right corner.

8. 14th Street over James River (Mayo Bridge)
9. Broad Street over abandoned CSX spur line
10. I-64 westbound over I-95
11. I-195 southbound over VA-76, CSX Rail, and Ramp S
12. I-64 at 5th and I-95 south
13. North Boulevard over CSX Rail
14. Westover Hills Boulevard over James River (Nickel Bridge)

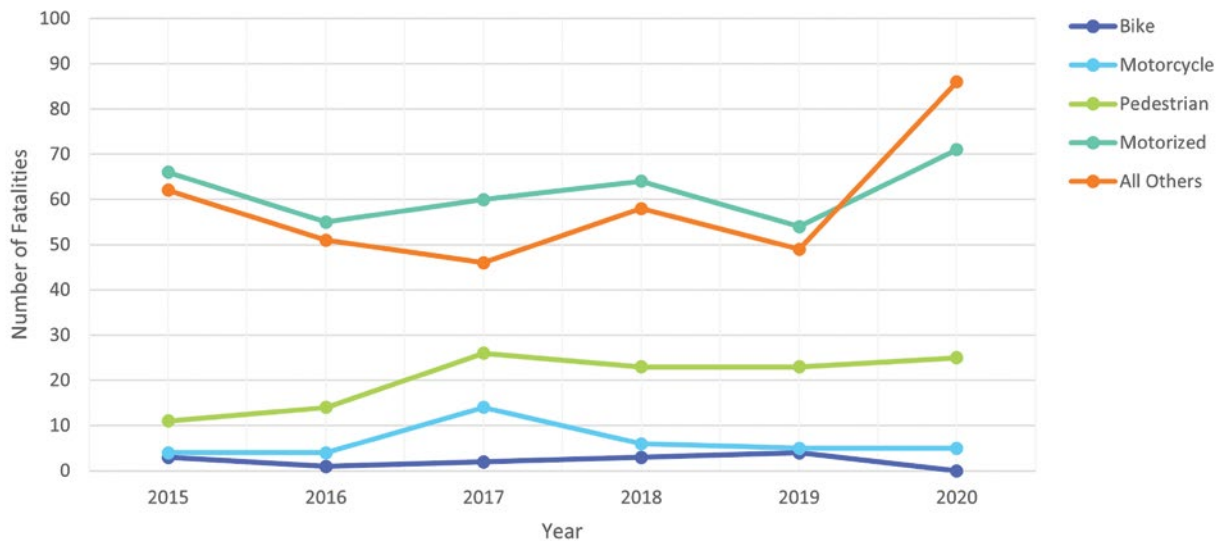
Safety

RRTPO staff tracks the reported statistics on vehicular crashes resulting in serious injury and fatalities to comply with Federal Transportation Performance Management standards. In 2017, the RRTPO Policy Board set aggressive aspirational goals aimed at reaching zero fatalities by 2040. These goals call for a 4.5 percent annual reduction in fatalities, an eight percent annual reduction in serious injuries and a five percent annual reduction in nonmotorized i.e., cyclist and pedestrian, fatalities and serious injuries.

Over the past five years, serious injuries resulting from all modes have declined by nearly 27 percent, dropping from the high of 729 in 2015 to 533 in 2020. For bicycle/pedestrian non-motorized modes, the decline in serious injuries has been even greater with a nearly 50 percent decrease. However, while fatalities in all modes started to drop in 2016, the 5-year change has resulted in a 20 percent increase in fatalities from 80 in 2015 to 96 in 2020. Bicycle and pedestrian fatalities have seen a big increase of more than 78 percent, rising from 14 in 2015 to 25 in 2020 as depicted by the following graphs..



Exhibit 24A: Fatalities for Motorized and Non-Motorized Travel



A region-wide network analysis of crash data for the RRTPO metropolitan planning area does not currently exist. Infrastructure and behavioral safety improvements would benefit from a full, regional assessment of crash factors and diagnosis, network screening analysis, prioritized lists of areas, segments and intersections needs. This information could provide guidance on high priority locations most in need of road safety assessments reviews or help define field investigations to shape counter-measures and project development. Having data and understanding a baseline condition would help the region decide about design, policy, and programmatic next steps.

Exhibit 24B: Severe Injuries for Non-Motorized Modes

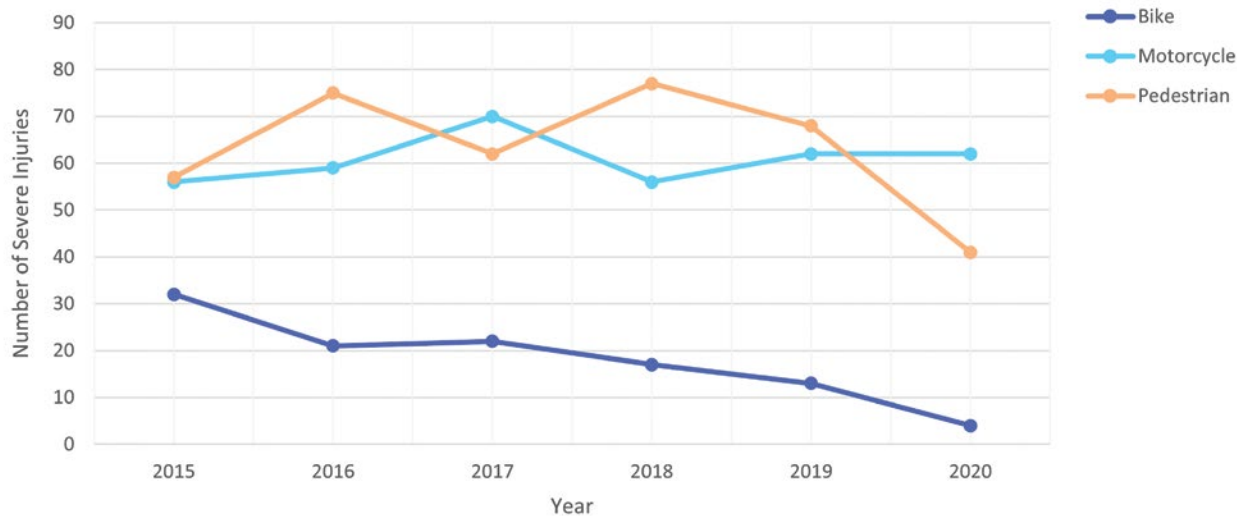
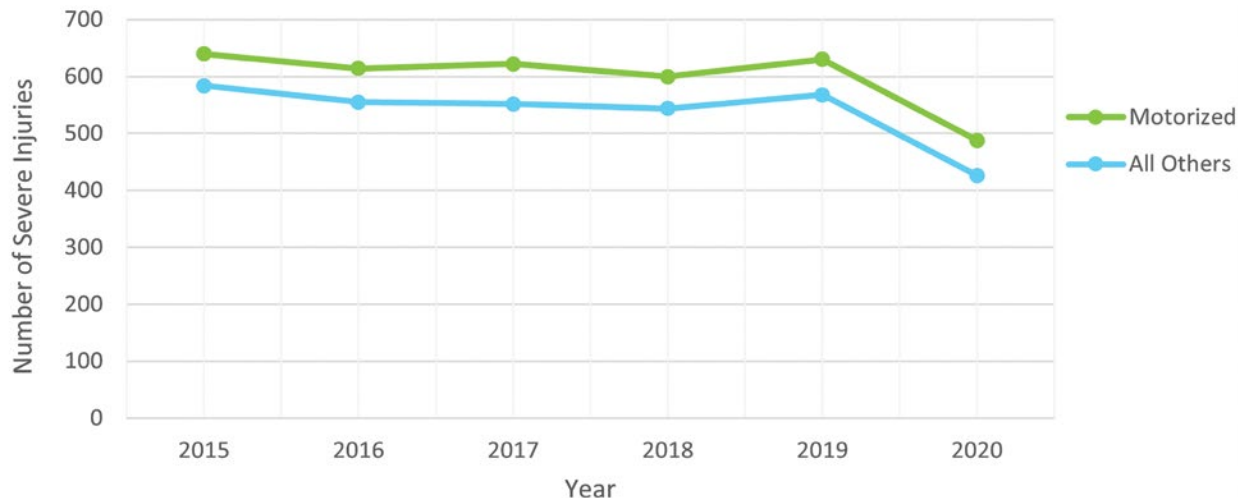


Exhibit 24C: Severe Injuries for Motorized Modes



Vision Zero

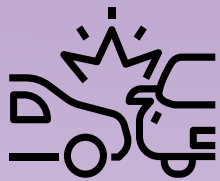
Vision Zero starts with the ethical belief that everyone has the right to move safely in their communities, and that system designers and policy makers share the responsibility to ensure safe systems for travel.

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.

RRTPO recognizes that each locality in the region is at a different place regarding goal-setting, but everyone is interested in reducing fatalities and serious injuries on our travel network. The City of Richmond adopted a Vision Zero policy in 2016 which established a framework of partners to comprehensively strategize best practices to achieve their policy goals over time.

The central goal of the City's Vision Zero policy is to achieve zero fatalities and serious injuries by 2030. This effort is serving as the seed for a regional Vision Zero Work Group convened by the RRTPO in 2020 and meeting on a quarterly basis to explore common interests and practices that can make the region's transportation network safer and more efficient. The regional VZ group is currently working with VDOT and their consultants to produce an in-depth analysis of transportation safety in the region. One of the outcomes of this analysis will be the mapping of a high injury network and recommendations to improve safety. This information will be used throughout the planning and programming process of the RRTPO in the future.

City of Richmond Vision Zero Snapshot 2014-2021



13,638

Total
Crashes



6,971

People
Injured



42

People
Killed

Source: [Richmond Public Works](#)



Other Strategies and Initiatives

Demand Management

RideFinders

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."

The list below contains the programs and services RideFinders provides for commuters and employers throughout the Central Virginia:

- 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
- Park and ride lots

RideFinders provides real-time carpool matching services through its mobile phone app, and also manages a program that rewards program participants for switching from drive alone to teleworking, carpooling/vanpooling, biking, or using transit

For FY20, it is estimated that the recorded telework, carpool, vanpool, transit, bike, multimodal and walk trips taken by the participants in the various RideFinders' programs resulted in gasoline savings of over 79,000 gallons, and reductions of CO2 emissions of 775 tons. Much of 2020 ridership and vanpooling was affected by the pandemic, with the number of active vanpools declining from 149 to 63. During the pandemic RideFinders has provided telework technical assistance to employers, as well as carpool, vanpool and transit tips for workers who must continue to commute in the region.

In 2019 RideFinders received a Clean Air Excellence Award for Transportation Efficiency from the Environmental Protection Agency. In 2020, RideFinders received the Association for Commuter Transportation's Commuting Options-Vanpooling award.



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.

In major cities 21 percent of adults have personally used ride-hailing services. Twenty-four percent of ride-hailer adopters use it on a weekly or daily basis and substitute it for driving themselves. There is uneven adoption of ride-hailing across income classes and age groups. Ride hailing adopters tend to be younger, more educated, and have higher incomes. The ride-hailing rate for those 18-29 is 36 percent; for those 65 and older it is only 4 percent. Policies and programs addressing ride-hailing must be flexible enough to address the impacts occurring across the diverse communities, but specific enough to offer real guidance and targets.

Reflecting use in the Richmond Region, a [2019 transit ridership survey](#) conducted by Warner Transportation Consulting for GRTC indicates that if transit service was not available, 20 percent of the respondents would use a taxi, Uber or Lyft, while an almost equal number (18 percent) would not even be able to make the trip. Transit market research conducted in late 2019 by SIR to determine the demand for the extension of transit service south from the City down Route 1 into Chesterfield County indicated a limited use of Uber and Lyft (3 percent) or specialized services of [Access Chesterfield](#) (4 percent)

by residents within the area along Route 1, while at the same time 62 percent reported an awareness of the three services available. An estimated 72 percent reported the need for transit was driven by employment access, and 68 percent for shopping. This market research served as justification for the extension of GRTC service (Route 111) through a pilot project funded by DRPT from Chippenham Parkway to John Tyler Community College.

Transportation providers in the Richmond area have entered into contracts with transportation network companies for supplemental or replacement services, including GRTC's contracts for CARE Plus service and Hanover County's specialized transportation services. GRTC partners with TNCs Roundtrip and UZURV for wheelchair accessible vehicles to offer optional, same day, direct non-stop TNC trips to qualified CARE customers. CARE customers are responsible for the first \$6.00 cost of the trip, and GRTC will pay up to an additional \$15.00. Additional costs are the customer's responsibility.



**GRTC Bus on
Broad Street
at Science
Museum**

Primary motivations for transit agencies to contract with TNCs may be to demonstrate innovation, increase mobility for existing and new transit customers, improve cost efficiency, and avoid major capital investments. Contracting with TNCs may also attract new customers and demonstrate good-faith efforts to solve local mobility challenges, including specialized transportation. Transit agencies can address Federal Title VI requirements with a call center for customers without smartphones and offer a prepaid debit card or engage a third-party provider to accept cash for unbanked customers.

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 service is provided to the general public for a fee commonly using a smartphone app. In the Richmond Region, bike share programs are most commonly offered in the urbanized area and are provided by RVA Bike Share. Scooter sharing services operating in the region include Bird, Bolt, Helbiz, and Lime.

Micromobility should be generally accepted by the community at large as a beneficial service and a way to lessen the amount of vehicular traffic, even among members of the community who do not use or directly benefit from the system. Micromobility should contribute to the safety goals by reducing the overall number of motor-vehicle injuries and fatalities. Micromobility should be accessible, available, and increase mobility options for all members of the community. The program should identify groups that require improved inclusivity and attempt to establish program elements that better serve these groups.

Micromobility should strengthen the resilience of the overall transportation system by providing redundancy and more efficient use of existing infrastructure. Accommodations for micromobility may include protected bicycle or light individual transport lanes, cycle highways, slow streets, and protected lanes on streets with higher speed limits and traffic volumes.

Recommendations regarding large-scale deployment of micromobility include:

- **Use and Enforcement:** Prepare for surprise deployments with policy guidance; consider pilot programs to determine best right-of-way policy, costs, sustainability, identify private sector vendors, pick-up and drop-off locations, and performance expectations by ordinance.
- **Public Safety:** The biggest challenge localities face is understanding how to keep residents safe while allowing them to utilize new services. Concerns include how riders interact with sidewalks, bike lanes, roads, cars, pedestrians and other parts of the infrastructure; e-bikes and scooters should have maximum speed limits.
- **Equity:** Work with operators to share plans for outreach and engagement, serving underserved areas, and unbanked users; sharing usage data with local partners.
- **Provide incentives for proper use:** Allow micromobility use on bike lanes where appropriate while not allowing motorcycles or other higher speed devices in protected lanes; repurpose underutilized spaces for micromobility parking and implement a reward/fee system for e-scooter parking to keep pedestrian right of way clear.

Human Services Transportation

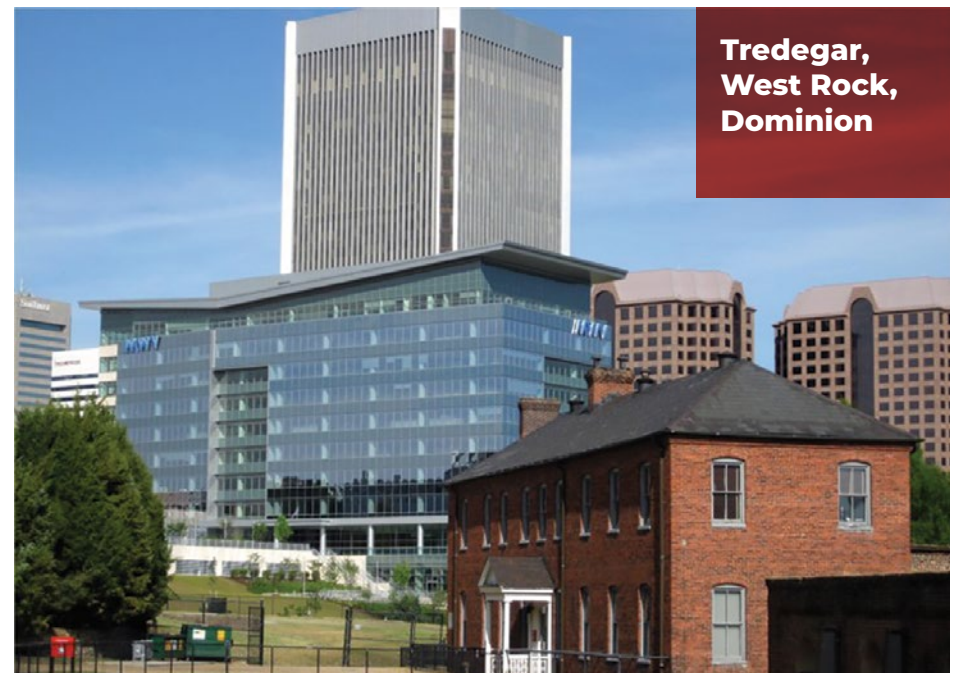
In addition to the fixed route and ADA-paratransit or specialized services provided by GRTC, transportation services are provided for persons based upon their age, income, or disability including the following:

- **Volunteer driver programs** are provided within the region by the Shepherd's Center of Chesterfield, the Shepherd's Center of Richmond, the Hanover Rides Program and Powhatan Ride Assist Services. Characteristics of these services include: they are provided by individuals driving their personal cars; individuals must be ambulatory or able to transfer from a wheelchair to the passenger seat (wheelchair accessible service is not available); the service is limited to weekdays only, for medical appointments and in some cases personal business and to defined geographic areas; and requests for trips must be submitted several days in advance.
- **Agencies and Service Providers:** Virginia's Medicaid-managed care organizations and human service agencies, such as [Goochland Cares](#), [Heart Havens](#), [Senior Connections](#), [SOAR 365](#) and [St. Joseph's Villa](#) provide transportation for their clients. These agencies are typically the recipients of FTA Section 5310 grants. Section 5310 grants are intended to improve mobility by removing barriers and expanding available transportation options. The program's goals include: increase public transit projects that exceed ADA requirements; improve access to fixed-route services and decrease reliance on paratransit; and provide alternatives to public transit that assist seniors and individuals with disabilities.
- **Local Governments:** both Chesterfield and Hanover Counties operate specialized transportation services for qualifying individuals. [Access Chesterfield](#) provides advance reservation trips for work, medical and personal purposes. [Hanover DASH](#) provides trips for medical appointments, grocery shopping, errands and formal social programs. Service is available Monday-Saturday and

is provided within Hanover and a seven-mile area beyond the county boundary.

The most recent 2019 [Coordinated Human Service Mobility Plan \(CHSMP\)](#) is built on an inventory of both public and private services, needs and gaps, and recommendations to provide transportation for seniors and individuals with disabilities who cannot use public transportation or live in areas not served by public transportation and to develop a one click/call approach for human service transportation.

PlanRVA prepared the [2015 Needs and Gaps Assessment for the Transportation Disadvantaged](#) which recommended that Senior Connections/the Capital Area Agency on Aging to serve as the designated coordination entity for seniors and disadvantaged. In this role, Senior Connections has hosted transportation symposiums and established a steering committee of a broad cross-section of transportation stakeholders to prepare a strategic plan.



Emergency Management Alliance of Central Virginia

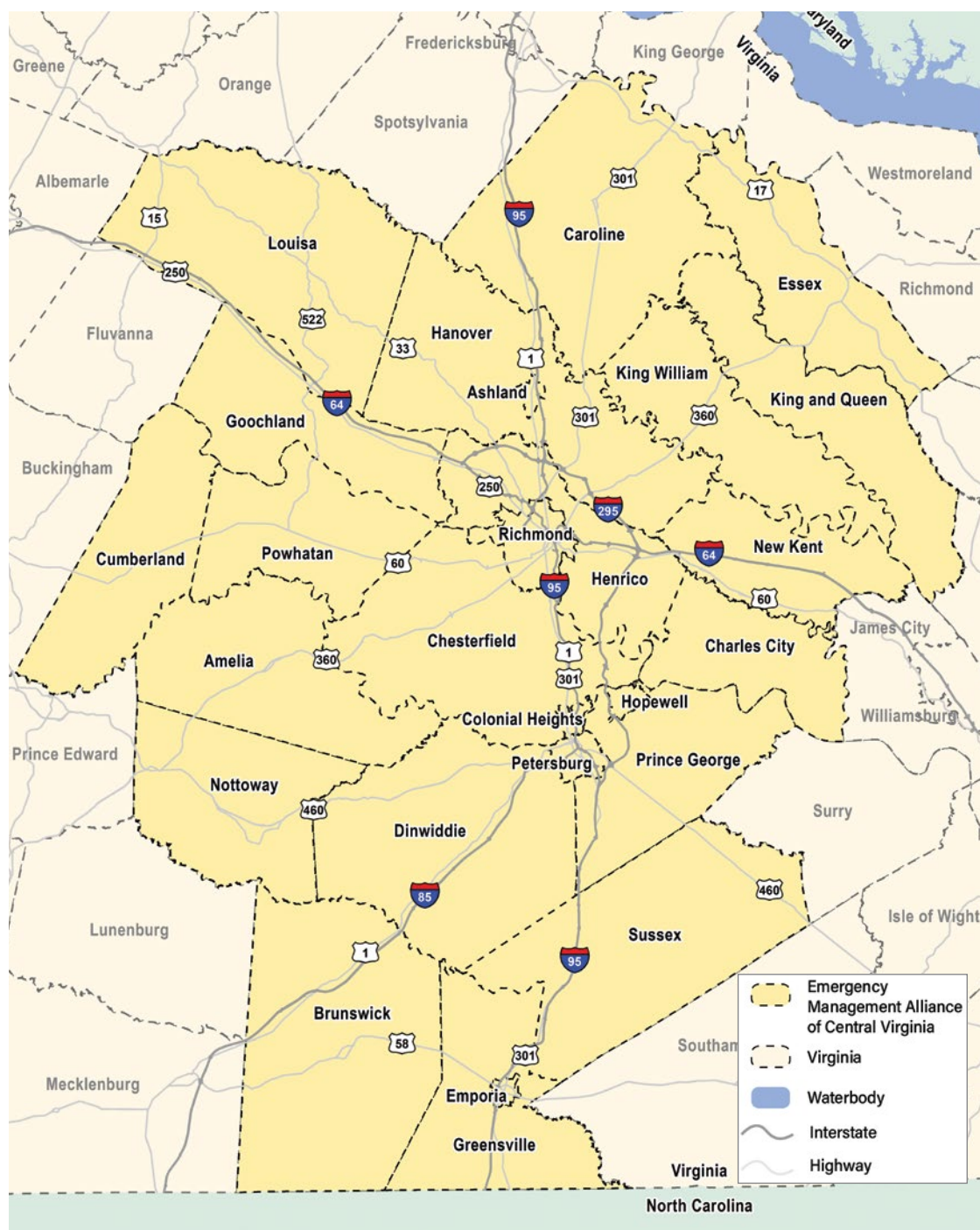
The Emergency Management Alliance of Central Virginia (EMACV) is a voluntary association of government and key stakeholder organizations that manage emergency preparation, response, relief, recovery, and mitigation in Central Virginia. The Alliance was originally referred to as the “Central Virginia UASI” when the region was part of FEMA’s Urban Area Security Initiative Program. Following the loss of its UASI designation in 2012, regional emergency managers and partners sought to maintain the partnerships and regional collaboration that had formed during the UASI program and created the Emergency Management Alliance of Central Virginia. The Alliance consists of a much larger area than the RRTPO, including 25 counties and cities in central Virginia as pictured in Exhibit 25.

The Alliance provides a forum for local emergency managers, public safety officials, federal, state, regional, health care, higher education, non-profit, and public service partners to prepare, plan, and train together so they can better serve the community during an emergency.

The Alliance is also comprised of several subcommittees that work on various projects and initiatives in the region. These committees include Public Outreach, Regional CERT, Planning, Training and Exercise, Mass Care, and Human Services. Each committee typically receives grant funding from the State Homeland Security Program to fund its projects. These grants are applied for with assistance by PlanRVA and the regional planner on a yearly basis. Some emergency management project initiatives that are signature to our region include the Disaster Preparedness Workshop, regional training and exercises, and the Regional Recovery Framework.

More information about the Alliance can be found at PlanRVA.org/Emergency-Management.

Exhibit 25: EMACV Service Area



Hazard Mitigation Planning

Hazard Mitigation Plans are required by the Disaster Mitigation Act of 2000 (DMA2K) for hazard mitigation assistance (HMA) grant program eligibility, help local governments determine risks and vulnerabilities and identify projects to reduce these risks. To fulfill this requirement and support cooperation and hazard mitigation and emergency management planning, PlanRVA and Crater PDC join together to create the [Richmond-Crater Hazard Mitigation Plan](#). Last updated and adopted in 2017, the multi-region Hazard Mitigation Plan includes an analysis of the risks posed by various natural hazards to life, property, and critical infrastructure in the study area. Critical infrastructure is defined by each region and locality but typically includes critical facilities such as public facilities used as shelters; fire and EMS stations; hospitals; water, wastewater and communications facilities; interstate, highway, and public transit infrastructure.

Hazards analyzed include flood, winter weather, tornadoes, hurricanes, thunderstorms and wind. These critical infrastructure elements and the risk posed by hazards are analysed by looking at the location of vulnerable populations. The plan assesses the capabilities of each community to respond to natural hazards, looking at their resilience to physical damage as well as economic impacts. Finally, the Plan also includes mitigation actions for each community in the study area to reduce the risk posed by the hazards analyzed.

In November 2020, PlanRVA and Crater PDC hosted a kick-off meeting for an update to the multi-region Hazard Mitigation plan. With this update, expected to be completed in 2022, regional and local staff intend to improve public outreach about the risks hazards pose, improve the analysis of the risk posed by flooding, and maintain annual updates of the plan after adoption.



**Tornado
damage in
Chesterfield
(2019)**



Electric Vehicles

Electric vehicles (EV) represent a clean transportation mode with no tailpipe emissions, making them an important consideration to make the *ConnectRVA 2045* plan more resilient looking to the future. Over 30 electric models are on the market today and most manufacturers have committed to additional models. Electric vehicle types include hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and all-electric vehicles. The Virginia General Assembly has taken positive steps toward expanding and making EV [charging stations](#) more accessible in concert with the U.S. Department of Energy .

HEVs are powered by an internal combustion engine and an electric motor that uses energy stored in a battery. The vehicle is fueled with gasoline to operate the internal combustion engine, and the battery is charged through regenerative braking, not by plugging in. PHEVs are powered by an internal combustion engine and an electric motor that uses energy stored in a battery. PHEVs can operate in all-electric (or charge-depleting) mode. To enable operation in all-electric mode, PHEVs require a larger battery, which can be plugged in to an electric power source to charge. All-electric vehicles always operate in an all-electric mode and have a battery that is charged by plugging the vehicle in to charging equipment.

Today's electric vehicles have a driving range of 80-330 miles on a single charge, with nearly 80 percent of charging done overnight. Electric vehicles are expected to comprise 10 percent of the vehicle fleet by 2025, 28 percent by 2030, and 58 percent by 2040.

Richmond Electric Vehicle Initiative

Funded by a Virginia Clean Cities Community Readiness and Planning Grant for Plug-In Electric Vehicles and Charging, the [2013 Richmond Electric Vehicle Initiative – Electric Vehicle Readiness Plan \(REVI Plan\)](#) involved a wide cross-section of stakeholders including Dominion Virginia Power, local governments, the Virginia Department of Mines, Minerals

and energy, Virginia Department of Motor Vehicles, Virginia Commonwealth University, J. Sergeant Reynolds Community College, the Virginia Automotive Dealers Association, and the Richmond Area Homebuilders Association. The plan analyzed the technological, regulatory, and educational issues associated with the widespread deployment of electric vehicles and outlined the following steps to advance EV technology:

- Set up an advisory board led by organizations involved in EV deployment and infrastructure;
- Create a network of charging stations, with parking spaces for EV charging stations, and uniform signage;
- Develop common zoning regulations and development guidelines;
- Support tax credits that advance EV and EV infrastructure purchase and deployment;
- Conduct an outreach program for the public and elected officials; and
- Establish and promote training programs for the automotive industry, first responders, and the general public.



Autonomous Vehicles

Any long range transportation plan that looks forward 25 years should consider the opportunity and challenge that Autonomous Vehicle (AV) technology presents for the future of travel. For purposes of *ConnectRVA 2045*, AVs are those that are equipped with standalone sensors and cameras allowing for some or all aspects of safety features of the vehicle to function without direct driver input or interference.

Predictions are showing that vehicles with provisions for driver control will hit the market in 2025 followed by fully autonomous vehicles in 2030. After 2050, nearly all vehicles in use may be autonomous.

AV Advantages:

- Crash reduction caused by human error;
- Reduced need for parking requirements;
- If done properly, reduced congestion by as much as 40 percent;
- Assistance to those who cannot drive, elderly, disabled, children;
- Improved productivity, less driving and stress; and
- Alternative for long-haul freight, decrease in delivery times.

AV Challenges:

- Impact on land use inviting sprawl;
- Reduced state and local revenues to fund transportation;
- Increased congestion and Vehicle Miles Traveled from empty vehicle travel;
- Replacing jobs within certain transportation sectors, TNCs, taxi, truck drivers;
- Health implications from reduced walking, bicycling and transit use;
- Reduced transit ridership;
- Increasing privacy and security concerns; and
- Demands on infrastructure maintenance to comply with higher standards.

AVs may offer special application for first- and last- mile transit connectivity, supplement transit service during nonpeak hours, as a micro or on-demand circulator, and serving in underserved areas. AVs could improve access to employment centers, particularly for populations without personal vehicles.

Locality comprehensive plans should focus on long-term goals for AV use instead of prescriptive regulations to allow for innovative growth and set up pilot areas to test functionality. Considering specific areas or application would be useful in scenario planning to better anticipate future impacts on the transportation system. Consideration of AVs as part of an overall iterative system will be essential over the next few years to ensure mobile connections. Regional plans should weave vehicle connectivity and automation into the transportation system in a way that is context sensitive to the existing urban fabric and community vision and helps meet regional goals and needs.

Advancing AV technology and use will require policy attention to:

- Local ordinances that enable communities to be responsive to AVs while providing flexibility to reclaim abandoned infrastructure;
- Model legislation that authorizes localities to control public infrastructure for public benefits and exploit the opportunities presented by shared use of AVs;
- Guidance for the design of buildings, public spaces, facilities, roads, highways, and bridges;
- Flexible parking policies
- Understanding fiscal implications of AV deployment on transportation taxes and fees, personal property taxes, parking fees and fines, and traffic violation fees and fines; and
- Research, professional development and education programs to help planners keep pace with the state of the practice

Environmental Resources & Mitigation

ConnectRVA 2045 considers a number of environmental features and resources to help determine the best transportation network solutions and opportunities. Ignoring environmental limitations or mitigation actions can result in the development of infrastructure at risk from natural hazards and flooding, be detrimental to unique natural and/or cultural heritage resources, and negatively impact air and water quality. If environmental features are not recognized during the planning phase, the resulting project implementation leads to lower quality of life and wasted infrastructure spending in risky locations.

Other factors to consider include emissions of other criteria pollutants and mobile source air toxics (MSATs), and CO₂ emissions. Properly accounting for climate change-related costs and benefits requires consideration of various effects related to carbon sinks (benefits of wetlands, forests, and other natural areas that help to absorb and store CO₂ from the atmosphere), heat islands, and community resiliency, among other things. While these factors are not included in the plan at this time, RRTPO plans to investigate development of data resources to better track these costs and benefits for consideration during project development.

The following features are included in the sensitive environmental layer of Exhibit 26: Environmental Resources map:

- **Wetlands** – Wetlands are areas where water covers the soil or is present at or near the surface of the soil all year or for varying periods during the year. Wetlands provide many services humans benefit from: water quality improvement, flood mitigation, and shoreline erosion protection. Wetlands also provide habitat to support a wide variety of plants and animals. The Richmond Region is home to non-tidal wetlands throughout and freshwater tidal wetlands in the eastern portion of the region. Wetlands are found in riparian or floodplain areas along streams and rivers. *Source: U.S. Geological Survey [National Wetlands Inventory](#)*

- **Conserved Lands** – Some lands across the region are considered conserved due to their ownership by a public entity or other organization for the intent of natural resource conservation, recreation, or cultural heritage. These lands include local parks, state Wildlife Management Areas, Natural Area Preserves, and other similar areas. Transportation infrastructure to and near these lands as well as planned network improvements should consider both the interest in and recreational demand of these lands as well as the ecological importance that some of them play in landscape. *Source: Virginia Department of Conservation and Recreation [Conserved Lands Database](#)*
- **Conservation Easements** – A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently protects specific conservation values by limiting the future development of the land. Land under a conservation easement is still held by the owner and can be used actively according to the terms of the easement, for example, for recreation, agriculture, forestry, or as general open space. Each conservation easement is unique. Transportation network improvements should acknowledge the conservation intention of easements and avoid impacts to them whenever possible. *Source: Virginia Department of Conservation and Recreation [Conserved Lands Database](#)*

Additional factors are important for consideration as projects are being planned and move forward through permitting toward construction, but are not represented on Exhibit 26:

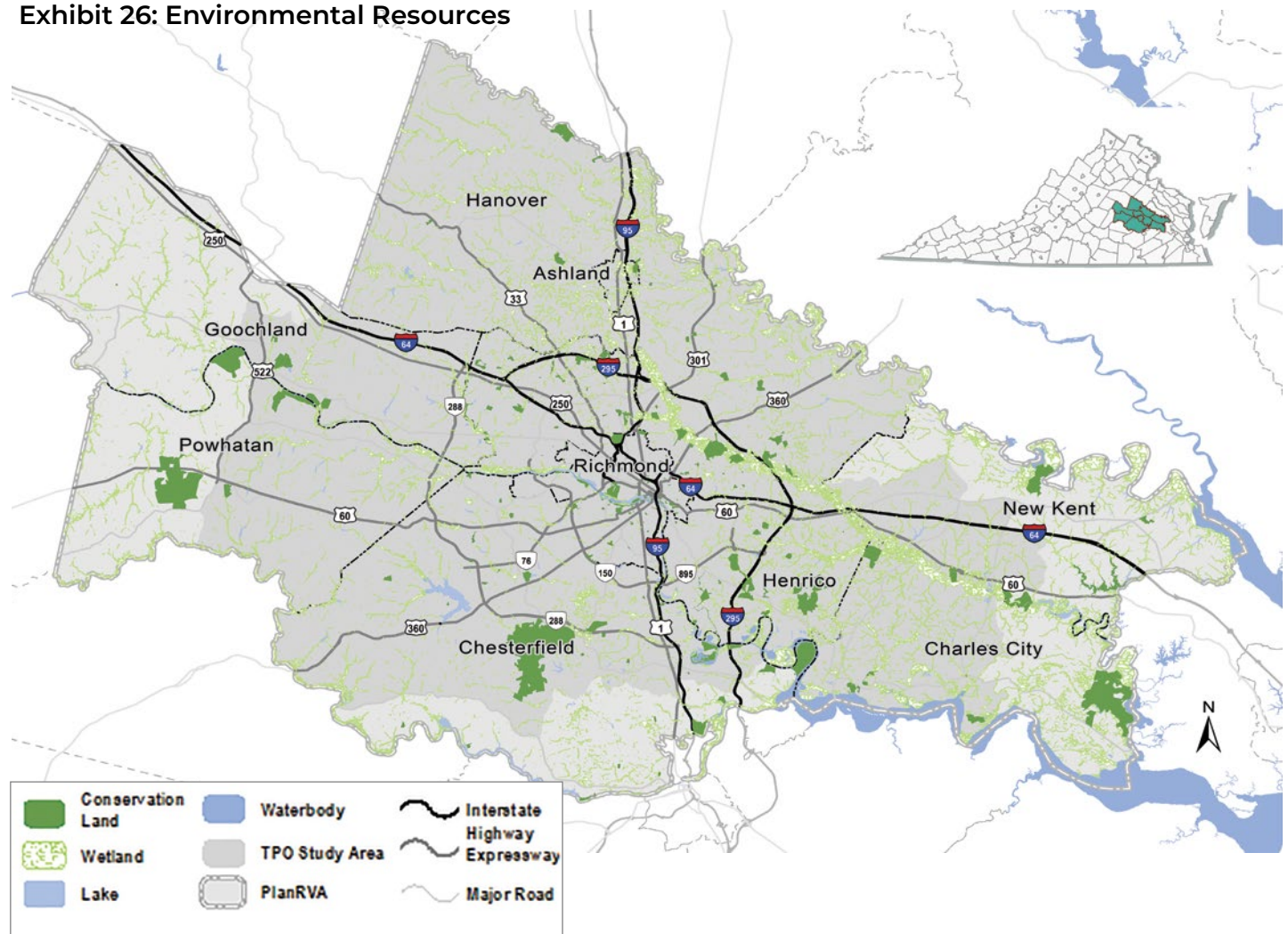
- **Natural Heritage Locations** – Natural heritage refers to the geographic features and biodiversity of plants and animals found in a region that make it unique. The Richmond Region is home to listed species of state, federal and global conservation interest; these can be rare, threatened or endangered species. Biologists at the Virginia Department of Conservation and Recreation Division of Natural Heritage use field data, species records, aerial photography and other resources to map known

and likely locations of significant species and communities across the Commonwealth. The available data includes appropriate buffers to protect the safety of species and natural communities.

Source: Virginia Department of Conservation and Recreation Division of Natural Heritage [Rare Species and Natural Communities](#)

- **Agricultural-Forestal Districts (AFD)** – In 1977 the Virginia General Assembly passed the [Agricultural and Forestal Districts Act](#). AFDs are preserved areas of land that maintain the ecological importance of agricultural or forest spaces. Land owners can voluntarily designate their land as an AFD if that land continues to be managed and preserved as mandated in a participating locality. After the land is designated as an AFD the land cannot be developed intensively for several years. While these areas are not preserved in perpetuity like conservation easements, they are a form of land conservation and considerations for their ecological importance and economic function as active

Exhibit 26: Environmental Resources



farm or silvicultural operations should be included in transportation planning. Source: Virginia Department of Forestry [Agricultural and Forestal Districts](#)

- **Historic Places** – The National Park Service maintains the National Register of Historic Places as an official list of the Nation's historic places worthy of preservation. The Virginia Department of Historic Resources maintains

the Virginia Landmarks Register (VLR), an official list of places of historic, architectural, archaeological and/or cultural significance. The VLR has the same criteria and nomination process as the National Register. These locations are included in the sensitive features map layer because transportation projects should avoid damaging the integrity or context of these sites given their significant historic, educational, and cultural importance. *Source: Virginia Department of Historic Resources [Virginia Cultural Resources Information System](#).*

System Resiliency

The high costs and long-term nature of transportation network infrastructure requires consideration of how resilient the planned network will be to a changing climate, natural hazards, and extreme weather. The Richmond Region faces risks from many forms of natural hazards including heavy rainfall and flooding, hurricanes, and winter weather storms. To better understand the risks these events pose to the network or need to be accounted for by construction standards, the *ConnectRVA 2045* team analyzed the following GIS data indicating where flooding is likely to occur:

Special Flood Hazard Area - This data depicts the special flood hazard area of FEMA's National Flood Insurance Program. Identified as 100-year floodplains, these areas have at least a 1 percent annual chance of flood. Floodplains should be avoided to the greatest extent possible. *Source: Federal Emergency Management Maps (FIRM) [Map Service Center](#) as of the date of this report.*

Storm Surge – Storm surge is the abnormal rise in coastal waters during a storm caused by a storm's winds pushing water on shore. Storm surge is measured as the height of the water above the normal predicted tide level. This data depicts storm surge flooding based on storm surge modeling. Data for storm surges associated with Category 1 and 2 hurricanes up to those more likely to occur and having

a moderate risk are depicted. This data is only available for areas with tidal influence. *Source: National Hurricane Center [storm surge data](#).*

Dam Break Inundation Zones – The area of anticipated flooding if a dam structure were to fail. *Source: Virginia Department of Conservation and Recreation Dam Safety Program and [Dam Safety Inventory System](#)*

Sea Level Rise (SLR) — 2 feet – This data depicts potential flooding due to sea level rise; PlanRVA staff chose to use two feet of SLR which coincides with SLR estimates associated with NOAA's High-Intermediate curve for the late 2040s in keeping with the horizon year of the plan. Many well researched and science-backed resiliency planning efforts across Virginia use similar assumptions about SLR including the [Executive Order 45](#), the [Virginia Coastal Resilience Master Plan Framework](#), and analysis by the [Commonwealth Center for Recurrent Flooding Resiliency](#). Transportation infrastructure that coincides with these areas will likely see increased inundation by water in the future. *Source: National Oceanic and Atmospheric Administration's Office for Coastal Management [Sea Level Rise data](#)*



Exhibit 27: System Resiliency



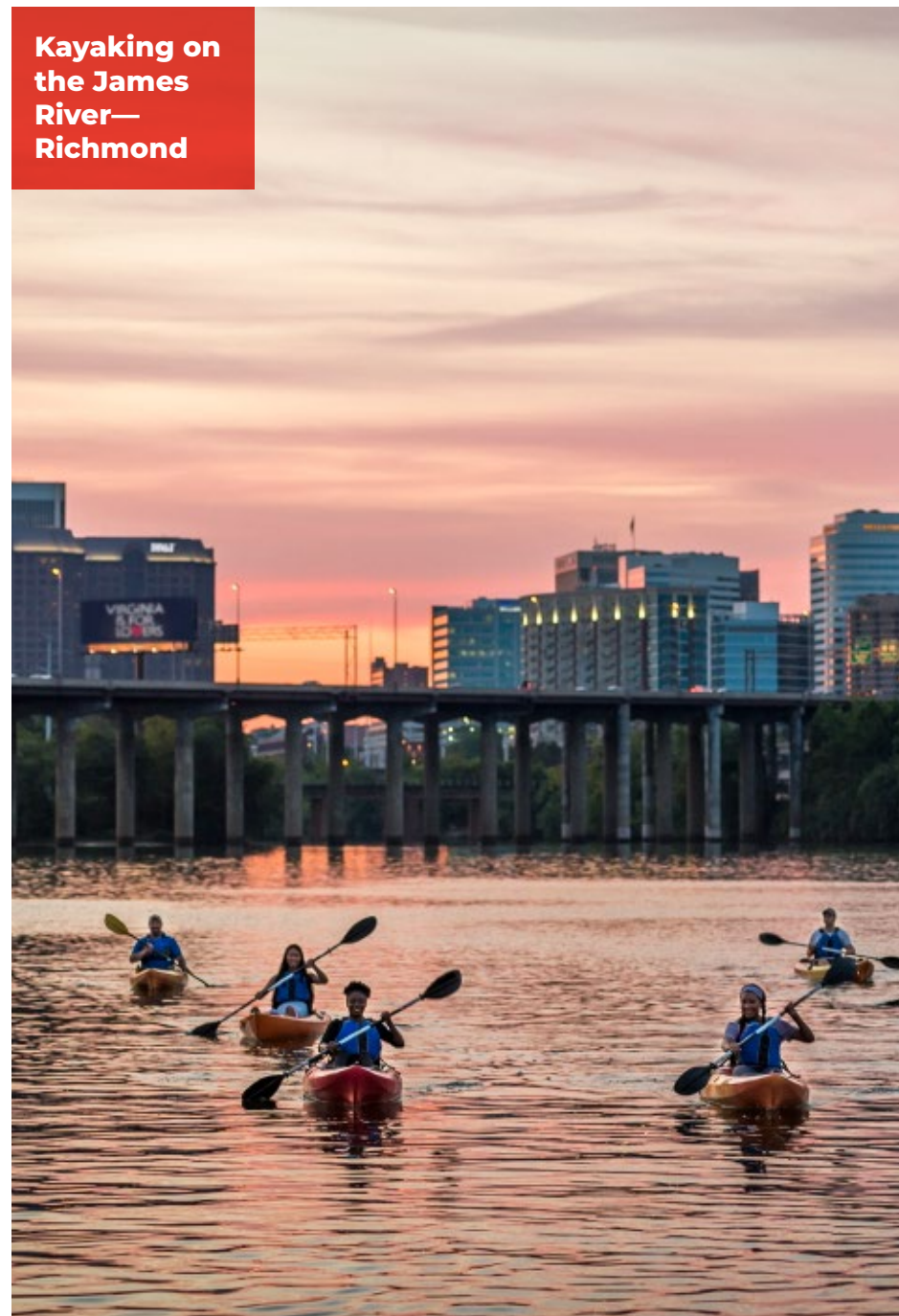
Economic Development & Tourism

The Richmond Region including the localities, economic development agencies, educators, workforce, private sector and non-profit partners collaboratively prepared a [Comprehensive Economic Development Strategy \(CEDS\)](#) in 2014 and updated the document and process annually through 2018. The CEDS serves as a useful framework through which to address the economic well-being and advancement of the region through the wise investment in infrastructure to create the right jobs to employ the region's workforce now and in the future. In fact, one of the principal outcomes of the CEDS was to "identify priority physical infrastructure improvement projects, including highways, rail, public water and sewer, communications and transit service, to best support job creation and growth."

Understanding existing commuting patterns in the Richmond MSA is essential to understanding the impacts the location of population and employment centers have on the function of the transportation system. An estimated 80 percent of workers commute within the Richmond MSA, 20 percent commute to the Washington D.C. Metro, Hampton Roads, and other metro areas, such as Charlottesville, Roanoke, and Lynchburg. In contrast, these same metropolitan areas send an almost equal proportion of their residents to the Richmond MSA for work.

Of the workers living in the Richmond MSA, Henrico County commands the largest share followed by the City of Richmond. Within the region, nearly 20 percent of the commutes are made to Chesterfield and Hanover Counties. Additionally, an estimated 33 percent are commuting to other jurisdictions including Goochland, the City of Petersburg, Prince George, the City of Hopewell, Fairfax County, and the City of Virginia Beach, among others.

Kayaking on the James River—Richmond



The current-day economic landscape is formed by the following positive and negative attributes:

Strengths/Opportunities:

- Location
- Strong brand identity, sense of place in history
- Diversity of employment base
- Higher education enrollment
- Ease of travel and lack of traffic congestion
- New funding sources (CVTA) for regional transportation

Weaknesses/Challenges:

- Economic weaknesses particularly in tourism and the service sector brought about by the global pandemic
- Strain on state and local resources to implement
- Stresses on confident, collaborative leadership, and siloed information
- Disparity of wealth, opportunity, and choice

Both the City of Richmond and Henrico have shown the greatest increases in poverty since 1970. Slightly more than 25 percent of the City residents are now living below the poverty level, as are nearly 13.2 percent of Charles City County residents. While the poverty rate for the Richmond Region has slightly decreased over this forty-year period, pockets of poverty are more prevalent in the urban core showing a wider disparity.

The Richmond Region has become more racially diverse over the past almost 30-year period. Whites constitute a shrinking portion of the population; 70 percent in 1990 became less than 60 percent in 2017. Growth of all other races accounted for this drop. An estimated 28 percent of the population identifies as Black or African American according to the 2013-2017 ACS. Those of Hispanic or Latino ethnicity represent the second largest minority population group making up almost

65,000 people, or 15 percent of the minority population in the region in 2017.

Although less diverse than the U.S., the Richmond Region is and has been growing at a faster rate. Racial and ethnic diversity in the region is expected to increase in the future. The most problematic aspect of demographics in the Richmond Region in future years will be the aging population. It is very important that the region attract and retain skilled workers and college graduates to support a thriving economy.

The region's economy will undergo major adjustments due to COVID-19 along with the rest of the nation and global economy that is expected to have a tremendous impact on these population and employment projections. A recent Chmura Analytics model was developed to predict the new job posting volume (RTI) expected each week of 2020 under a scenario as if the COVID-19 pandemic had never occurred. By comparing observed volume to expected volume, changes directly related to the pandemic and recovery can be identified that will be important to consider in subsequent scenario planning. Looking at the week of data from December 6, 2020, the Commonwealth of Virginia has



experienced a 32 percent decline from expected volumes. This places the Commonwealth among the most impacted states in the country when it comes to employment losses. COVID-19 impacts are also expected from major population shifts from large urban centers to mid-sized cities. For example, New York City and San Francisco have experienced 20 percent+ population losses while cities such as Richmond stand to gain due to migration. In recovery, this transformation has the potential to position the metropolitan Richmond Region as a key economic center. The region has historically been recognized as an economy focused on traditional sectors such as the tobacco industry, growth has steadily increased in financial services, health, logistics, professional services and advanced manufacturing sectors. The recent economic downturn has exaggerated issues of poverty and unemployment, a continued challenge in the core city, but also increasingly affecting the surrounding counties. The region has weak pockets of educational opportunities, and many families are concerned about residing in certain neighborhoods due to the quality of schools. This concern further isolates poverty populations and serves as one of the community's key obstacles to achieving a healthy and an economically stable region.

From a workforce perspective, many of the residents who live in poverty are not equipped for available jobs, and general readiness of the workforce with 21st century skills affects the economic vitality of the entire region. Business leaders indicate that future expansion plans for their businesses will be contingent upon the availability of a trained workforce. The workforce needs to be better connected to meet the demands of the business community both in terms of skills and transportation access.

Working within these parameters of positives and negatives, the CEDS offer a working set of all-encompassing goals that are still relevant today to guide decision makers in planning, prioritizing and implementing projects and programs which can also help to inform *ConnectRVA 2045*:

1. Create Best-In-Class Pre-K-12 Public Education System
2. Expand Productive Workforce Participation
3. Focus Capital Investments on Priority Economic Development Opportunities
4. Grow and Retain Jobs that Advance the Region
5. Expand Regional Choice in Housing and Transportation Access to Employment



Chapter 4

What Matters Most for the Future?

- Why is it important to establish a Vision, Guiding Principles, Goals, and Objectives?
- What is the process?
- Vision Survey
- Regional Goals and Priorities Survey
- Vision, Goals, and Strategies Survey
- How should our region spend transportation funds?
- Vision, Guiding Principles, Goals, and Objectives (VGO)
- Objectives and Performance Measures



Why is it important to establish a Vision, Guiding Principles, Goals & Objectives?

Lewis Carroll wrote in *Alice in Wonderland*, “If you don’t know where you are going, any road will get you there.” Or, as Yogi Berra rephrased it, “If you don’t know where you’re going, how are you gonna’ know when you get there?”

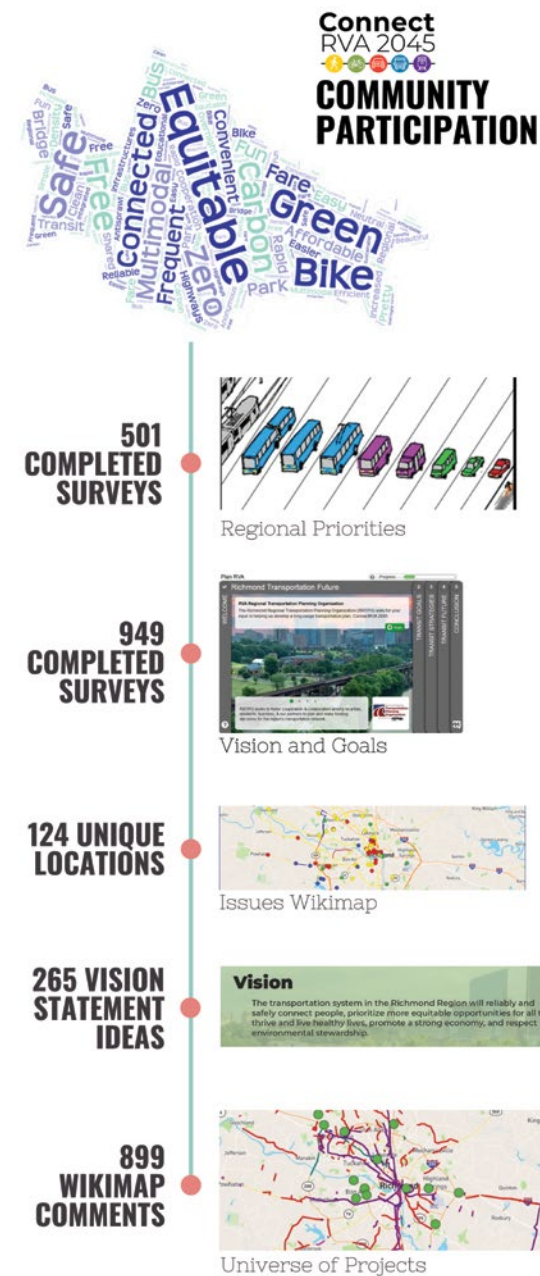
ConnectRVA 2045 presents the Richmond Region with one of the few opportunities to collectively discuss the needs and establish clear direction for the allocation of \$5.5 billion appropriated through multiple funding sources for the completion of regional transportation improvement projects over the next 20 years in accordance with the Project Prioritization Process (see *Technical Report E: Project Prioritization Process Report*).

What is the process?

Setting the *ConnectRVA 2045* plan in motion, the RRTPO Board approved the representation of the Long-Range Transportation Advisory Committee on October 3, 2019 and adopted the Public Engagement Plan following the required 45-day public review period on March 5, 2020. The plan outlines a strategy for reaching out to the public through meetings, workshops, and surveys to gain beneficial feedback on each section of the plan. The Public Engagement Plan defines three broad goals for public participation: (1) Robust and Creative Opportunities to Engage, (2) Informing and Educating the Public, and (3) Continuous Evaluation and Improvement. These broad goals each include recommended strategies, a set of measures to track, and definitions of success based on the measures.

With COVID-19 pandemic closures forcing a pivot early in the process, much of the engagement occurred through the Advisory Committee, through virtual meetings with community advocates and representatives, and by inviting participation through online surveys (see *Technical Report H: Public Participation and Outreach Report*).

Exhibit 28: Using Online Surveys for Public Input



www.connectRVA2045.org

Vision Survey

The public engagement process for *ConnectRVA 2045* began with the posting on March 12, 2020 of an ArcGIS map inviting public comment on transportation issues, offering the opportunity to note locations and specifics on the map. The RRTPO also asked respondents, “Tell us about your transportation vision for the Richmond region in one or two words.” The answers to this question by the respondents are illustrated by the Word Cloud in Exhibit 29. “Equity,” “safety,” “Green,” “Bike,” “Connected,” and “Multimodal” were all words that factored prominently.

Exhibit 29: Vision Survey Word Cloud



Regional Goals and Priorities Survey

The second public survey posted using Survey Monkey ran from June 24, 2020 through August 15, 2020. The 501 completed responses to the survey were well distributed throughout the region. The outer reaches of Goochland and Hanover counties were the only areas not represented by respondents. The center, more populated portion of the region achieved the highest response rate. Nearly one-half of the respondents lived in the City of Richmond, residents of Chesterfield and Henrico Counties made up one-third of responses, and all other jurisdictions represented the balance. The median age of the respondents was 41 years old and average commute was 15.4 miles.

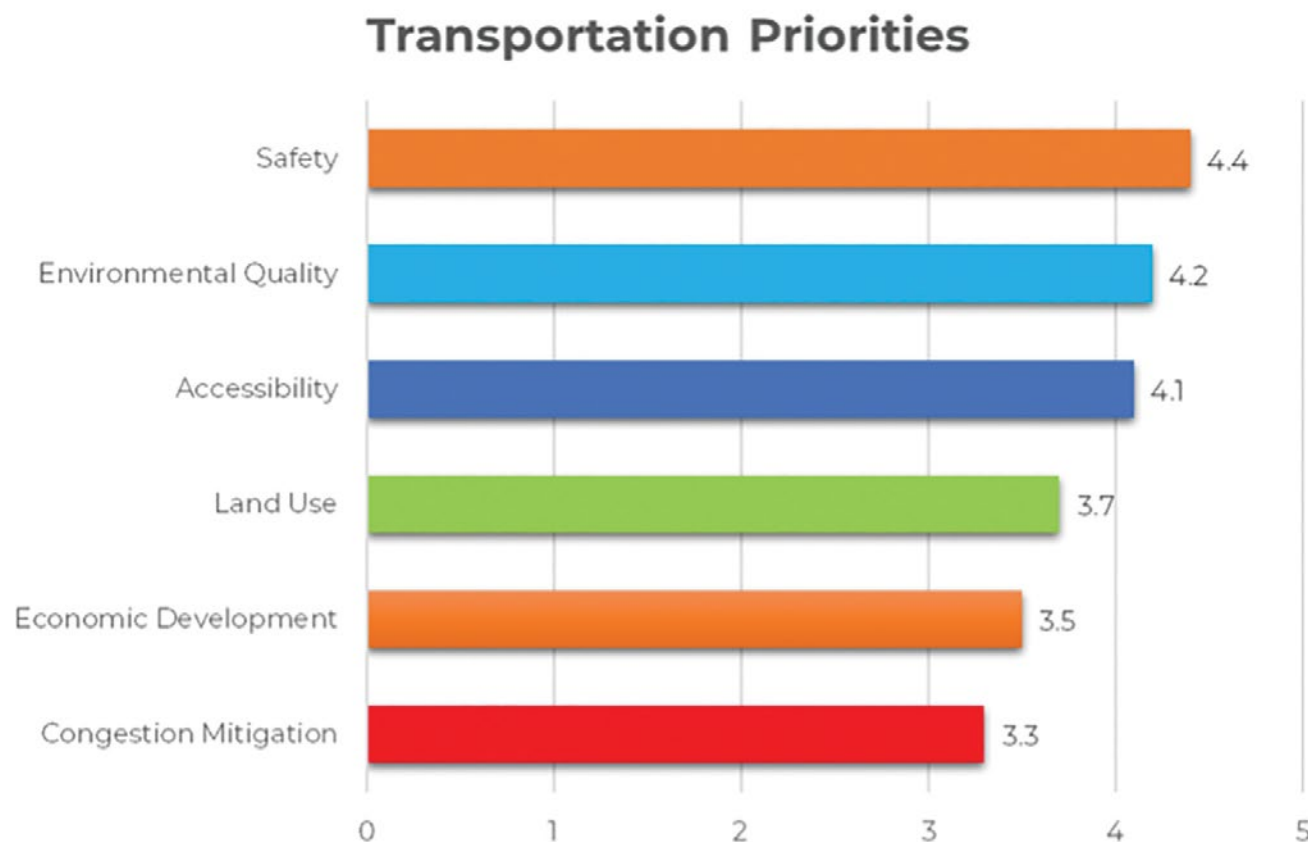
Of the six different priority areas listed in the survey, **safety** ranked the highest with bike/pedestrian, transit, and safer routes to schools being the most frequently mentioned. In the **environmental quality** category, the protection of natural resources was cited as being the most important. **Accessibility** with a focus on sidewalks and bikeways, access for those with disabilities, better connections between transit options, and improved options for low-income and communities of color were all equally weighted. **Land use** measured by priority on coordination between land use and transportation and creating walkable neighborhoods received the next highest attention. **Economic development** expressed in terms of connecting workers with jobs, local businesses, and improved quality of life was ranked sixth. **Congestion mitigation** was the lowest priority with more respondents calling for attention to road maintenance and reduced travel time. The selection of priorities was not mutually exclusive and represented a close range of values that only varied by 1.1 point, with 4.4 (out of 5) being the highest value in safety and congestion mitigation at 3.3 being the lowest.

Vision, Goals, and Strategies Survey

A MetroQuest survey supported by VDOT on behalf of the RRTPO was posted from August 15, 2020 to October 11, 2020 and received 949 responses. Respondents to this survey were predominantly from the metro area, but there was a greater response from Powhatan County than the first survey. The majority of respondents were in the 31-40 age bracket. The race and ethnicity of the respondents were not representative of the region's population composition with 82 percent of the respondents identifying as "White Caucasian," 7 percent as "Black or African American," and only 4 percent as "Hispanic or Latino."

As in the first survey, goal selection was not mutually exclusive, allowing multiple goals to be ranked by respondents equally. The range from the lowest category of "resiliency" to the highest of "safety" was only 1.26 points. With a high of 3.48 out of 4.0, the most mentioned area of strategic emphasis within the **Safety** category was "evacuation routes." **Health and Equity** at 3.31 called for "public input" and focus on "environmental." **Connectivity** at 3.16 garnered the most interest in making "transit stops convenient"; strategies for better bike/pedestrian access and walkability also factored highly in this category. **Accessibility** rated at 3.05 (out of 4.0) and suggested a focus on "community-based programs."

Exhibit 30: Regional Goals & Priorities Survey

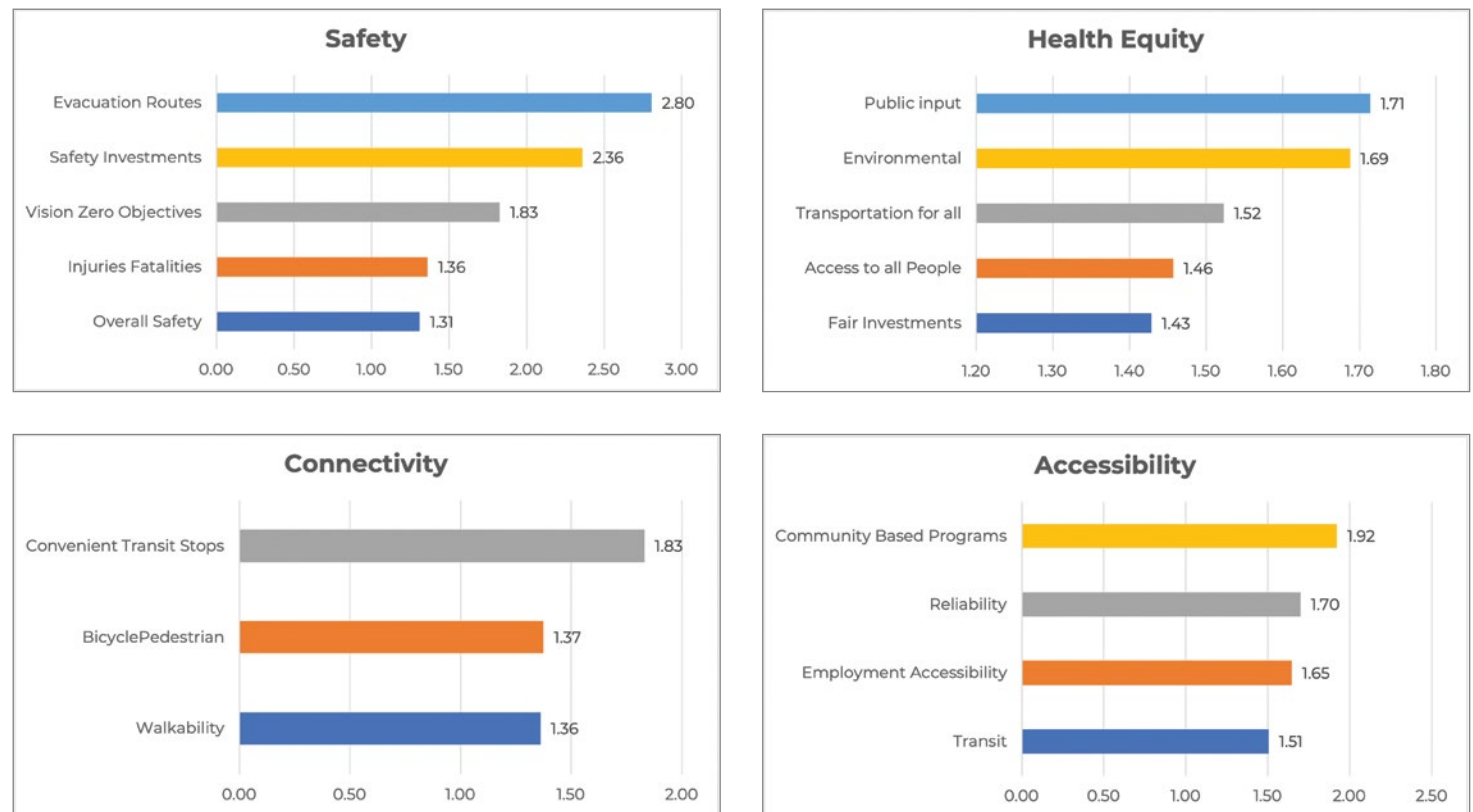


The most helpful aspect of this survey was an open-ended question asking respondents to craft their own Vision Statement for regional transportation. A total of 265 respondents provided their answers, which helped guide the Long-Range Transportation Plan Advisory Committee in devising the draft Vision Statement for discussion and input by committee members. The top word choices within their responses confirmed the priorities expressed through the survey questions.

Top word choices included:

1. Safe (95 responses)
2. Ped/pedestrian (50 responses)
3. Bike/bicycle (40 responses)
4. Environmental (35 responses)
5. Transit (29 responses)
6. Network (26 responses)
7. Equity/equitable (20 responses)
8. Connected/connection (19 responses)
9. Affordable (14 responses)
10. Multi modal/multimodal (11 responses)
11. Sustainable (10 responses)

Exhibit 31: Vision, Goals, and Strategies Survey



How should our region spend transportation funds?

A second MetroQuest survey asked, “How should our region spend transportation funds?” It was posted and directly distributed to 454 individuals, including those serving on RRTPO committees and Richmond Region residents who had indicated they were interested parties. Community groups, advocates, localities, and partners of the RRTPO

also posted the survey on their own websites. A total of 278 people participated in the survey, which was open from April 16, 2021 to May 14, 2021.

Respondents from across the region participated with the highest concentration in the center of the region with slightly less response from Chesterfield, Henrico, and Hanover counties and the Town of Ashland. Outer reaches of Powhatan, Goochland, eastern Hanover, southern Chesterfield, and New Kent counties also drew responses. More than three-fourths of the respondents said they

primarily traveled by car, a combined 18 percent bike or walk, and 5 percent use transit.

A very similar group of respondents participated in this survey as the previous one. The majority of participants were in the 30-39 age bracket, closely followed by those over 60. Race and ethnicity of the respondents were not representative of the region's population, with 83 percent of the respondents identifying as "White Caucasian," 6 percent as "Black or African American," and 4 percent as "Hispanic or Latino." The representation of respondents to this survey indicated a need to broaden opportunities in the future through our partners for greater, more representative participation both demographically and geographically.

More than one-half of those who participated either learned of the survey through social media or had the survey recommended by a friend or colleague. Indicating previous knowledge of the *ConnectRVA 2045* planning effort, 35 percent of the respondents received an email directly from the RRTPO. A total of 88 percent of respondents reported being familiar with The Pulse BRT. Knowledge of PlanRVA, the RRTPO, and the *ConnectRVA 2045* planning effort was reported by more than half of the respondents. The Central Virginia Transportation Authority (CVTA) and the Fall Line Trail—both relatively new to the conversation—were also recognizable by more than half of the respondents.



The response to the question, "How should the money be spent?," indicated the following order of priority based on an average amount of \$100 to be allocated:

Bicycle & Pedestrian Infrastructure	\$19.30
Transit Network Expansion	\$17.51
Highway Maintenance	\$16.98
Passenger Rail Service	\$16.38
Transit Frequency	\$14.08
Highway Expansion	\$ 7.13
Freight	\$ 5.03
Unaccounted	\$ 3.59

Many good suggestions were made about Public Engagement for the next round of public input which will be strongly considered once opportunities for direct public engagement are opened, including meeting directly with stakeholders and those affected, attending festivals and farmers markets, and presenting at council or supervisor district meetings.



Vision, Guiding Principles, Goals and Objectives (VGO)

The VGO statement was formulated using the input from the online public surveys and shaped through discussions with the LRTP Advisory Committee from October 2020 through January 2021. Draft statements and related guiding principles were continually posted on the *ConnectRVA 2045* website with invitations sent over the course of the review period to an “interested party” email list of over 450 individuals and organizations. The VGO statement (Exhibit 32a) and related objectives (Exhibit 32b) were adopted by the RRTPO Policy Board on February 4, 2021. It guided the development of performance metrics by which to score the candidate projects, or Universe of Projects. The project score helped to prioritize projects by time-band for funding consideration in the constrained project list, including all those projects for which known funding sources are identified over the next 25 years.



Exhibit 32a: VGO — Vision and Guiding Principles



Vision

The transportation system in the Richmond Region will reliably connect people, prioritize more equitable opportunities for all to thrive and live healthy lives, promote a strong economy, and respect environmental stewardship.

Guiding Principles

- GP1** Create a safe system for all users committed to the proven strategies in planning, design, operations and maintenance as well as advances in technology to eliminate fatal and serious injury crashes.
- GP2** Choice among all travel modes regionwide.
- GP3** Prioritize completion of regional bicycle and pedestrian networks to provide active travel alternatives to driving for better individual and community health.
- GP4** A robust transit network which delivers comprehensive, effective, and convenient service, particularly in areas of greatest need and to key destinations.
- GP5** Equity and inclusion in all transportation spending and planning decisions in the region with a focus on historically under-represented and under-served communities.
- GP6** Efficient movement of people and goods across the transportation network.
- GP7** Alignment of transportation investment and planning with land use, community health, and environmental stewardship.

Objectives and Performance Measures

For each goal, objectives were identified which describe specific, measurable statements that support the achievement of the goal. Performance measures were also developed for each goal that provide the technical means (data) for measuring the progress toward meeting the goal and objectives. The 15 measures used to evaluate each proposed project's effectiveness are shown on [Exhibit 38: Sample Project Scorecard](#). Of those measures, 11 are performance-based, which means they compare the outcomes of the proposed project with the current baseline. The remaining four measures do not compare the situation before and after but relate the project to the expected changes to the natural and built environment. The project evaluation guidelines (see *Technical Report E: Project Prioritization Process Report*) include more technical details on how each project was evaluated against these performance measures.

Exhibit 32b: VGO — Goals and Objectives

	A. Safety Improve the safety of the transportation system for all people.	A1. Enhance safety and comforts of bicycle and pedestrian facilities. A2. Work to eliminate all serious injuries and fatalities resulting from vehicular accidents.
	B. Environment/Land Use Reduce the negative impact the transportation system has on the natural and built environment.	B1. Address roadways prone to flooding and consider climate impacts in transportation planning prioritization and funding decisions. B2. Reduce transportation related pollutants, including decarbonizing transportation. B3. Reduce VMT (vehicle miles travelled) per capita. B4. Increase number and share of trips taken by shared and active transportation modes. B5. Tie land use planning to transportation investments through encouragement of walkable and transit-oriented communities. B6. Minimize impacts of transportation system on natural resources and communities with a particular emphasis on Environmental Justice (EJ) populations.
	C. Equity/Accessibility Improve equitable access through greater availability of mode choices that are affordable and efficient	C1. Reduce trip lengths for all people with a focus on Environmental Justice (EJ) populations. C2. Increase access to jobs and community services via transit, walking, and biking for all people with a focus on EJ populations.
	D. Economic Development Improve connectivity and mobility for strong economic vitality	D1. Reduce peak period travel times. D2. Increase transportation investment which focuses on economic vitality. D3. Improve reliability and accessibility of travel to and within the regional activity centers. D4. Reduce freight bottlenecks. D5. Increase multimodal access to tourist destinations.
	E. Mobility Increase travel efficiency and mode choices by maintaining the transportation system in a state of good repair	E1. Increase the percent of complete streets across the highway network to maximize use of available capacity. E2. Increase system efficiency through operational, transportation demand management (TDM), and technology-based solutions. E3. Improve system reliability across all modes.

Chapter 5

What are the Options?

- Project Development and Screening Process
- Project Inclusion Guidelines
- Programmatic & Local Projects
- Universe of Projects
- Highways
- Bridges
- Transit
- Active Transportation
- Park and Ride
- Rail



What are the options?

The comprehensive review of all possible transportation-related needs and issues began in January 2020 through staff review of a compendium of transportation plans, initiatives, and studies by local jurisdictions and state partners undertaken since the plan2040 long range transportation plan was adopted in October 2016.

Potential issues identified by virtue of projected population and employment growth through the study of socioeconomic trends from the base year 2017 to 2045 (*Technical Report A: Socioeconomic Data Report* and *Technical Report B: Growth Forecast Analysis*) were also instrumental in the inventory of specific issues and needs to be addressed by the long-range plan. Each of these issues were categorized according to the type of issue to be addressed—maintenance, safety, interconnectivity, capacity improvements, or accessibility—to provide a way of understanding the full realm of possible issues.



An interactive WIKI map was also posted on the *ConnectRVA 2045* website in March 2020 inviting additional comments from the public. The map was intended as a way to help the public visualize geographically where specific issues had been identified by problem type, and to offer an opportunity to post their own vision for the future.

The multimodal transportation deficiencies and needs were compiled in one extensive spreadsheet, "Regional and Local Transportation Issues Inventory," which was posted in May 2020. Following a 15-day public review and comment period from May 5 to May 20, 2020, this document was approved the LRTP Advisory Committee on May 28, 2020. This is documented in detail in *Technical Report C: Local and Regional Transportation Issues Report*.

The next step in the LRTP process was to identify transportation project-based solutions endorsed through the local, regional, and state planning processes to address these categorized issues and arrive at a streamlined inventory of all multimodal transportation projects that could be considered to be regionally significant, or what has been termed the "Universe of Projects."

Project Development and Screening Process

RRTPO staff first looked to the completed or on ongoing regional and local transportation studies and plans that identified a transportation project solution to address a specific identified transportation issue. If a transportation project solution was not evident from published sources to address needs for improvements, RRTPO staff worked with locality, VDOT, and DRPT staff to formulate possible solutions to address capacity and other issues. These issues surfaced when projecting future growth and development output through the RRTPO Congestion Management Process, the Richmond Tri-Cities (RTC) Travel Demand Model runs or were identified by the 2020 Structures Inventory and Assessment Report. In some cases, public

feedback offered through the Universe of Projects comment period eliminated or caused revision to some of the proposed project solutions.

To be considered for inclusion in *ConnectRVA 2045*, all possible projects are required to be regionally significant. Staff worked with the LRTP Advisory Committee to develop a commonly accepted set of Project Inclusion Guidelines for the *ConnectRVA 2045*. The Project Inclusion Guidelines helped to define whether a project is “regional” in nature or merely a “local” project. The Vision, Goals, and Objectives described in Chapter 4 were used to guide the refinement of the Project Inclusion Guidelines as the process moved through various stages of development.

Project Inclusion Guidelines

Regional Projects

The following types of projects are regional and therefore should be included in *ConnectRVA 2045*.

1. Roadway Projects

- Project on roads included in the Richmond/Tri-Cities Model’s transportation network (mostly Major Collectors and above functional classification)
 - Capacity change (add/remove lane; changing use of lanes e.g. High-Occupancy Toll (HOT) or High-Occupancy Vehicle (HOV) lanes, bus only lanes)
 - Realignment, extension, or relocation
 - New interchanges/ interchange modifications
 - Over/underpasses
 - Major Intersection Improvements (Arterials)
- New road or alignment that would normally be coded in the RTC Model’s transportation network

2. Bridge Projects (State of Good Repair)

- Replacement/major rehabilitation of National Bridge Inventory (NBI) structures on National Highway System (NHS)

3. Transit Projects

- Newly dedicated transit right-of way
- All new proposed regional transit routes
 - Transit service with limited stations and high operating speed (express bus)
 - Fixed route or demand response transit routes that cross jurisdictional boundaries or link origins and destinations in different jurisdictions
- New or relocated transit centers/stations
- New Park & Ride lots with 100 spaces or more
- Park & Ride lot expansions to existing lots that require 100 or more new spaces

4. Bike/Ped Projects

- Projects on segregated lanes within dedicated rights of way
- Projects of independent utility that are part of a larger multi-jurisdiction network or significantly contribute to filling identified gaps in an existing bike/ped network
- Projects that directly connect and support the existing transit service

5. Intermodal Projects

- Capacity change in intermodal corridors, including highways, navigable waterways, and rail lines.
- New or relocated rail stations or major improvements.

Programmatic & Local Projects

These projects do not qualify to be included in *ConnectRVA 2045*.

1. Roadway Projects

- Any projects on road not included in the RTC Model's transportation network (mostly Minor Collectors and Local Roads)
- The following work on any road (drawn from 40 CFR § 93.126 list of exempt projects)
 - Rehabilitation and Maintenance
 - Safety Projects
 - Operations
 - Intersection Improvements

2. Bridge Projects (SGR)

- Replacement/major rehabilitation of National Bridge Inventory (NBI) structures outside the National Highway System (NHS)

3. Transit Projects

- New bus purchase
- Bus shelter/stop improvements
- Transit maintenance and operations of facilities
- Park and Ride lots under 100 spaces
- TDM programs

4. Bike/Ped Projects

- Bike and pedestrian infrastructure within or adjacent to the existing right-of-way

5. Intermodal Projects

- All other intermodal projects (purchase, maintenance) not listed in the regional projects list

6. ITS Projects

7. Planning Studies (including PE only projects)

8. All other projects not specifically listed in the Regional Projects List

For a project to be included in *ConnectRVA 2045*, the following essential requirements were considered important to be met:

- The project addresses an issue listed in the Regional and Local Transportation Issues Inventory.
- The project qualifies as a regional transportation project based on the criteria of the LRTP Project Inclusion Guidelines.
- The project must be within the RRTPO's Metropolitan Planning Area (MPA) Boundary.
- The project must have location details ('From' and 'To'), anticipated project costs and time frame for which it will be phased for completion. Complex projects like interchanges required conceptual sketches as well.
- The project must be endorsed by a Project Champion. The Project Champion is defined as the jurisdiction or agency that is the project applicant or sponsor.
- The project should be demonstrated to have the political will to proceed. Public comment during the project review stage was a critical piece of the endorsement process.

Project Champions for different types of projects were consulted throughout the process as follows:

- Transit– GRTC/RRTPO/Localities
- Park and Ride – Ride Finders/ RRTPO/Localities
- Active Transportation – Localities/VDOT/RRTPO
- Rail – DRPT
- Airport related - CRAC
- Richmond Marine Terminal related- Port of Virginia /City of Richmond
- Freight/Intermodal – RRTPO/VDOT/DRPT
- System Resiliency – RRTPO/VDOT
- Highways (Non-Interstates and Freeways)
 - Highways within Town of Ashland – Town of Ashland
 - Highways within Charles City County – Charles City County
 - Highways within Chesterfield County – Chesterfield County
 - Highways within Goochland County – Goochland County
 - Highways within Hanover County – Hanover County
 - Highways within Henrico County – Henrico County
 - Highways within New Kent County – New Kent County
 - Highways within Powhatan County – Powhatan County
 - Highways within City of Richmond – City of Richmond
- Highways (Interstate and Freeways) - VDOT/RRTPO
- Bridge Replacement and Rehabilitation – VDOT





Highway
congestion

Universe of Projects

The RRTPO staff developed and screened the resulting master list of all potential regionally significant projects, known as the Universe of Projects, and it went through an official public review and comment period. The initial public review period for the Universe of Projects ran from March 8, 2021 until March 23, 2021 before being extended to April 15, 2021. The extension was made in response to public requests for additional time and LRTP-AC recommendation. A total of 151 comments were received in the initial period and 848 comments in the extended period, totaling 999 comments across this range of opportunities for engagement over the 38-day period. All public comments are documented in *Technical Report H: Public Participation and Outreach Report*.

Based on the comments received during this period, RRTPO staff worked with the jurisdictional staff to refine the Universe of Projects to remove duplicative, previously funded, or unsupported projects. The final Universe of Projects includes 268 projects in six project categories—highways, bridges, transit, active transportation, park and ride, and rail—and was approved by the RRTPO Policy Board on May 5, 2021. The projects in the Universe of Projects are documented in *Technical Report D: Project Prioritization Process Report*.

The following represents a brief overview of the six project categories covered by the Universe of Projects:

Highways

A total of 184 highway projects were included in the Universe of Projects. Projects include solutions to transportation issues which have been extensively studied and are ready for implementation, as well as those projects

which are still at a conceptual level. Total Highway Needs accounted for over \$5 billion. Exhibits 33 and 34 show the highway project breakdown by Federal functional classification and by type.

Exhibit 33: Highway Projects by Federal Functional Classification

Highway Project Type	Number of Projects	Cost Estimates
Auxiliary Lane	15	\$373,059,261
Interchange Modification	40	\$1,036,768,925
Intersection Improvement	23	\$293,773,231
New Interchange	7	\$566,500,000
New Overpass	1	\$26,000,000
New Road	1	\$15,435,000
New Underpass	1	\$18,829,345
Road Extension	15	\$648,312,087
Road Realignment	2	\$10,119,463
Road Relocation	1	\$25,000,000
Road Widening	78	\$2,097,726,640
Total	184	\$5,111,523,952

Exhibit 34: Highway Projects by Type

Federal Functional Classification	Total Number of Projects	Cost Estimates
Interstate	41	\$1,436,800,016
Other Freeway or Expressway	30	\$1,090,794,362
Other Principal Arterial	27	\$684,373,231
Minor Arterial	60	\$1,379,481,870
Major Collector	26	\$520,074,473

Bridges

A total of 16 bridge replacement or rehabilitation projects were included in the Universe of Projects, accounting for almost \$230 million. Only structurally deficient bridges in the National Highway System were included in this category.

Transit

A total of 11 transit projects were included in the Universe of Projects, accounting for around \$693 million in transit capital needs. This included five Bus Rapid Transit (BRT) routes and five Enhanced Service Transit Routes (15-minute service frequency). One transit center was also included.



Active Transportation

A total of 34 active transportation projects were included in the Universe of Projects. This includes all unfunded segments of Fall Line Trail within the RRTPO boundary (24 segments, including the Fall Line Trail Spurs, Virginia Capital Trail Spur and other major connectors). Active transportation needs totaled around \$215 million.

Park and Ride

A total of 14 Park and Ride projects are included in the Universe of Projects. Altogether these projects would add around 2,600 new parking spaces in the region. Park and Ride need is around \$64 million.

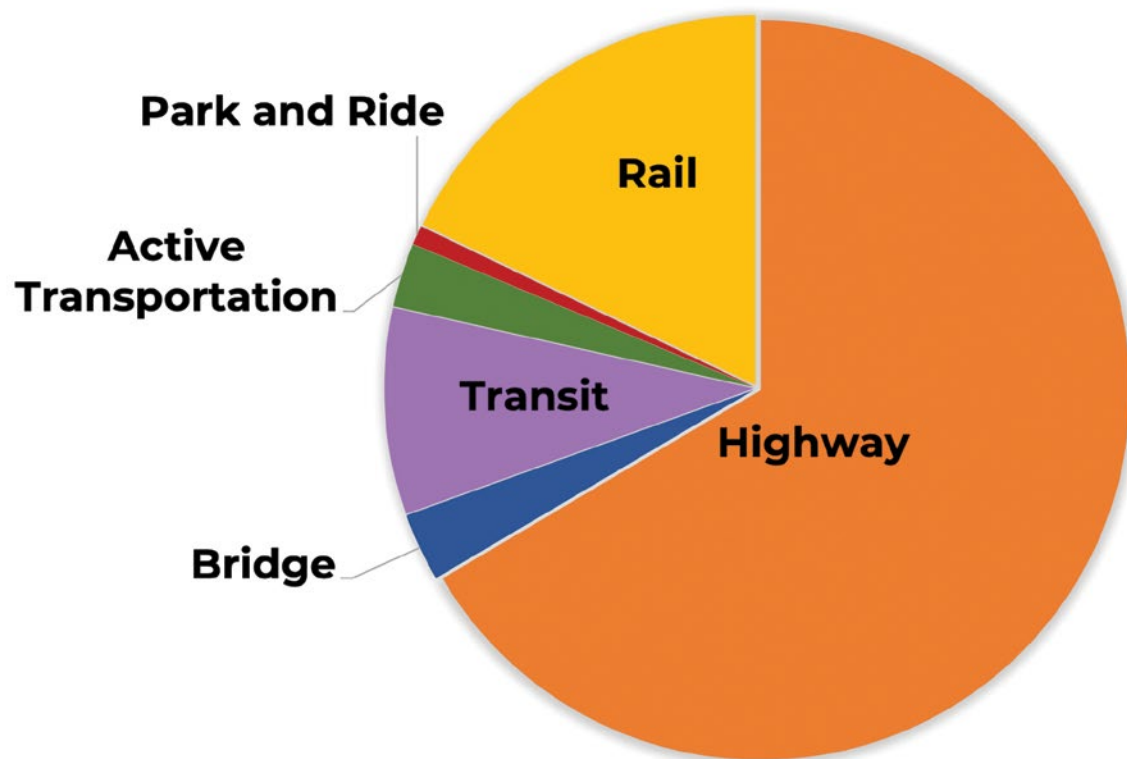
Rail

A total of nine rail projects are included in the Universe of Projects. This includes three of DRPT's Transforming Rail in Virginia Initiative projects, which are enhancement related to capacity change or grade separation of the railroad tracks. Three projects are related to the Staples Mill Station Replacement and Enhancement, and the other three are projects related to Industrial Access. Total Rail needs are around \$1.34 billion.

Total Needs - \$7.68 Billion

The summary of the Universe of Projects is presented in Exhibit 35.

Exhibit 35: Transportation Needs (Dollars) By Project Type



Transportation Project Type	Needs (Dollars)	Percentage of Total	Total Number of Projects
Highway	\$5,111,523,952	66.50%	184
Bridge	\$229,990,908	2.99%	16
Transit	\$693,708,000	9.02%	11
Active Transportation	\$214,455,327	2.79%	34
Park and Ride	\$64,000,000	0.83%	14
Rail	\$1,372,940,000	17.86%	9
Total	\$7,686,618,187	100.00%	268

Chapter 6

How Can We Realistically Get There?

- Financial Resources and Projections
- Project Selection and Constrained Plan Development
- Policy Needs
- Unfunded Regional Needs



Financial Resources and Projections

The term “constraint” describes the process of demonstrating that a proposed set of investments are possible within the parameters of expected revenues during the period of the plan. This demonstration requires the RRTPO to develop a financial plan that reflects expected revenues, investments to maintain the existing transportation system, and proposed improvements to the system. To put it plainly, the plan needs to ensure there is enough money to pay for the projects it recommends.

Exhibit 36: Total Investments

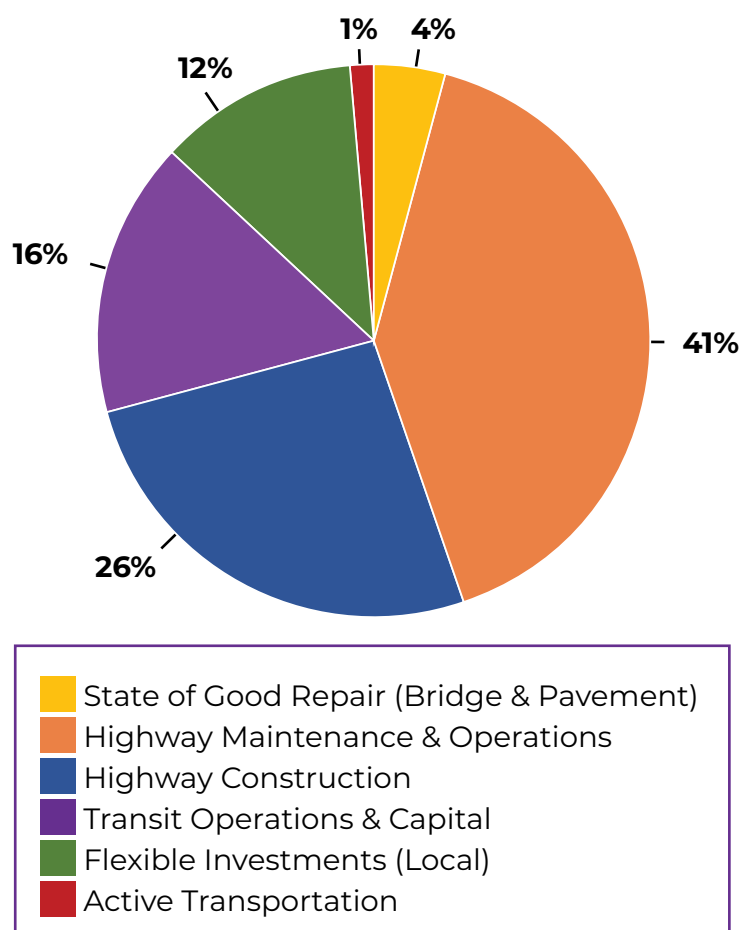


Exhibit 37: Projected Revenues and Planned Investments

	Total Investments (in millions)			
	Current	Near-Term	Mid-Term	Long-Term
	2022–2027	2028–2033	2034–2039	2040–2045
Total Available	\$3,952.26	\$4,737.06	\$5,525.60	\$6,402.04
Projected Revenue	\$3,952.26	\$4,690.63	\$5,494.55	\$6,360.56
Carryover from Previous	—	\$46.44	\$31.04	\$41.48
Total Investments	\$3,905.82	\$4,706.02	\$5,484.11	\$6,381.55
Programmatic Investments	\$2,185.84	\$2,681.40	\$3,105.94	\$3,571.18
Local Investments	\$623.80	\$603.42	\$708.01	\$822.70
Regional Investments	\$1,096.19	\$1,421.19	\$1,670.16	\$1,987.66
Allocated/Committed	\$427.07	\$225.38	—	—
Planned	\$669.12	\$1,195.81	\$1,670.16	\$1,987.66
Surplus	\$46.44	\$31.04	\$41.48	\$20.49

The RRTPO's revenue projections for *ConnectRVA 2045* were developed cooperatively with VDOT, Virginia DRPT, and GRTC. Highway funding and most transit funding was projected by the relevant state agency at the state level and allocated to the RRTPO based on historic regional success in obtaining funding and population-share within the region. Projections of federal transit revenues beyond 2025 were developed by RRTPO staff using a 1.7 percent annual escalator based on historic growth in revenues and mirroring the assumptions used by VDOT for other federal revenues covered by this plan. A full breakdown of the assumptions can be found in *Technical Report F: Constrained Plan Development*.

Investments were divided into programmatic (operation and maintenance of the existing system), local, and regional projects. The constrained project list in *Technical Report F* includes regional projects and regionally significant programmatic bridge rehabilitation projects. All project estimates were initially provided in 2020 dollars and inflated based on the expected year of construction. Details regarding inflation and the process for matching project estimates to expected revenues can be found in the Financial Plan in *Technical Report F*.

The main purpose of the financial plan is to show that cost of planned investments is less than or equal to expected revenues.

Exhibit 37 summarizes the available revenues and planned investments in *ConnectRVA 2045* and shows how the plan meets the financial constraint requirements.

Project Selection and Constrained Plan Development

All projects included in the Universe of Projects were assessed for inclusion in the constrained plan. Bridge rehabilitation and replacement projects were included automatically as programmatic projects using State of

Good Repair (SGR) funding. All rail projects were excluded from the constrained plan as rail revenue amounts are not provided at the MPO level.

For the remaining projects, each project was evaluated using the 15 performance measures shown on [Exhibit 38: Sample Project Scorecard](#) to assess the [expected benefits of the project](#) relative to the plan's vision and goals. For more details on the project evaluation methodology, see *Technical Report E: Project Prioritization Process Report*. All projects were given an overall score in the range of 0 – 100 for the expected benefit.

To maximize the benefit of the available revenues, the project benefit was divided by the estimated cost in tens of millions. This cost-benefit score was the final score used to prioritize projects. An example scorecard is shown in Exhibit 38 and all project scorecards are included in *Technical Report E*.

As discussed in depth in the Financial Plan of *Technical Report F*, the constrained project budget was developed after accounting for programmatic and local investments, as well as committed regionally significant projects that already exist. Available funding for the constrained plan was divided into four broad categories based on the limitations of a relevant fund's project applicability. All projects were evaluated in order of score. If a project could be included based on project type and remaining funds, it was added to the time period. If not, the project was skipped. This process was completed for each time period until remaining funds were insufficient to add additional projects.

This initial prioritization was then adjusted based on input from local project sponsors to reflect local priorities, to remove projects which received significant public opposition, and to match paired or phased projects to the same time period. The final project list is included in *Technical Report F: Constrained Plan Development Report*. A total of 210 projects are proposed to be included on the cost-constrained list of regional projects, which are listed in accordance with 6-year time band increments over the course of the 25-year plan.

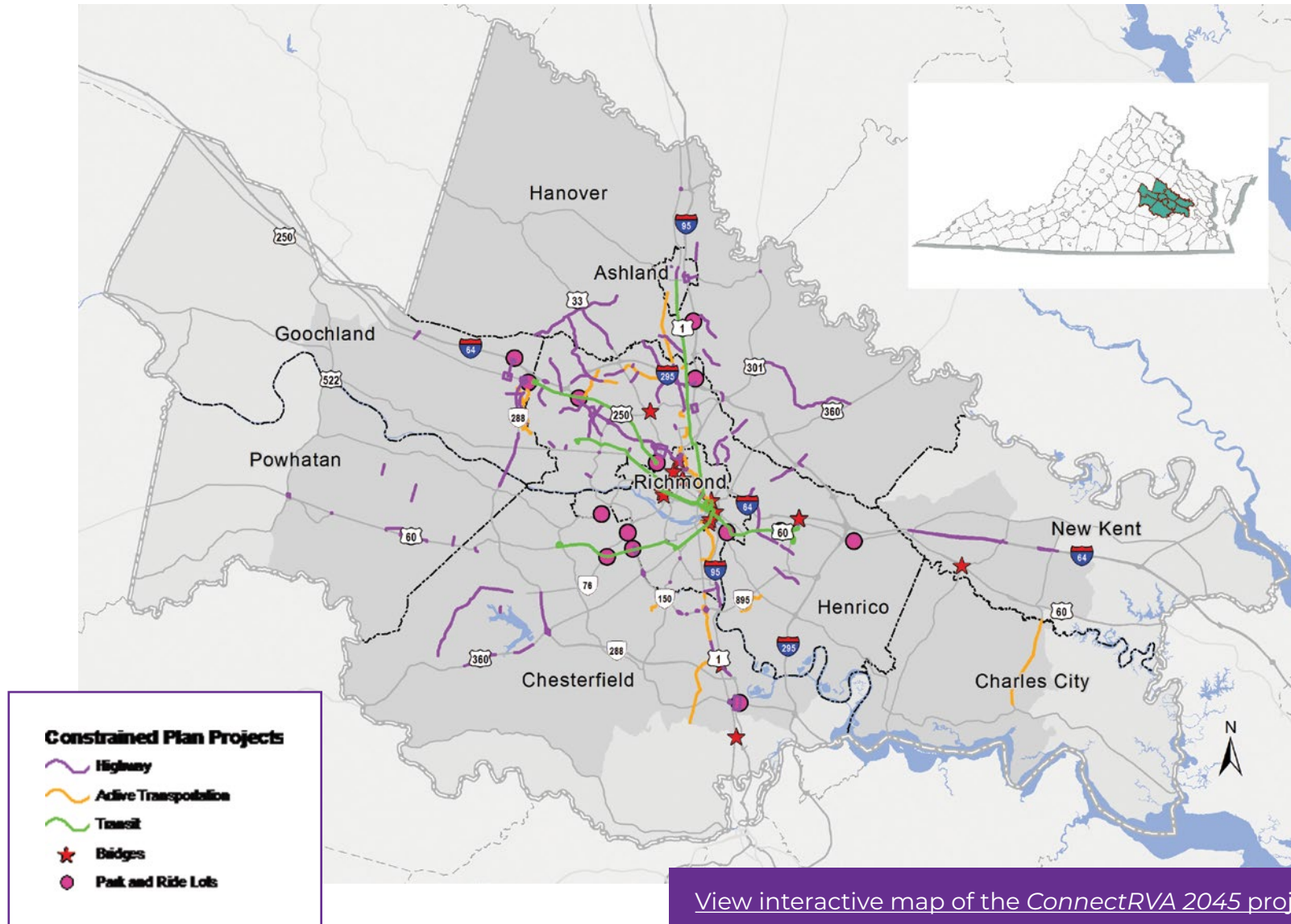
Exhibit 38: Sample Project Scorecard

ConnectRVA 2045 Project Scoring Sheet

Steps	L RTP Goals	Safety		Mobility		Equity and Accessibility				Economic Development			Environment/ Land Use			
	Project Performance Measure (PM)	Crash Frequency	Crash Rate	Person Throughput	Person Hours of Delay	Access to Jobs	Access to Jobs (EJ)	Access to Destinations	Access to Destinations (EJ)	Job Growth	Connection to Truck Intensive Areas	Truck Throughput	Sensitive Features	Air Pollution	VMT per Capita	Connection to Activity Centers
1	PM Value															
2	Normalized PM Value Relative to other Projects															
3	PM Weight	70%	30%	50%	50%	30%	20%	30%	20%	50%	25%	25%	25%	25%	25%	25%
4	Goal Value															
5	Goal Weight	25%		15%		25%				15%			20%			
6	Weighted Goal Value															
7	Project Benefit															
8	Project Cost															
9	ConnectRVA 2045 Project Score Benefit divided by cost in tens of millions															

Exhibit 39: Constrained Projects Map

To understand the extent of the constrained projects characterized by this plan, the reader is encouraged to view the regional map interactively using the link below this fixed map. *Technical Report F: Constrained Plan Development* provides a comprehensive list of all the constrained projects categorized by 6-year timeband. On the interactive map, you can click on specific projects to find out how a particular project was scored.



The following tables also help with understanding the projects as grouped in other ways:

Exhibit 40 shows the projects listed by the five major transportation modes.

Exhibit 41 illustrates the percentage distribution of projects by mode that have been determined by their relative score to be included in the constrained list. Four of the cost-possible Active Transportation projects are on the committed project list. Seven new Highway projects were added as regrouped projects, and four are in the committed or privately funded list. Two new transit projects were added later.

Tables 42a-e provide a good summary of projects by mode, but with specificity by the type of improvements attributed to each mode category.

Exhibit 40: Constrained Project List by Mode

Transportation Mode	Project Type	No. of Projects	Cost Estimate
Highway	Auxiliary Lane	14	\$492,413,000
	Interchange Modification	29	\$1,021,737,000
	Intersection Improvement	21	\$344,825,000
	New Interchange	1	\$163,549,000
	New Overpass	1	\$38,597,000
	New Road	1	\$19,758,000
	New Underpass	1	\$27,952,000
	Road Extension	11	\$611,206,000
	Road Realignment	2	\$12,363,000
	Road Relocation	1	\$37,113,000
	Road Widening	61	\$2,083,249,000
	All Highway Projects	143	\$4,852,762,000
Transit	Bus Rapid Transit - Capital	1	\$54,404,000
	Enhanced Transit - Capital	4	\$322,807,000
	New Transit Transfer Center	3	\$24,049,000
	All Transit Projects	8	\$401,260,000
Active Transportation	Off Road Trail	5	\$33,123,000
	Fall Line Trail Segments (Off- Road/On-Road Trail)	21	\$129,235,000
	Segregated Bike Lane	1	\$11,521,000
	Shared Use Path	2	\$21,761,000
	All Active Transportation Projects	29	\$195,640,000
Park & Ride	New Park and Ride Lots	14	\$73,094,000
Bridge	Replacement/Rehabilitation	16	\$294,408,000
All Modes		210	\$5,817,164,000

Note: Cost Estimate represents inflated cost for all modes including regional funds and SGR funds for bridges

Exhibit 41: Universe of Projects vs. Cost-Possible Project List

Travel Mode	Universe of Projects	Cost-Possible Projects	Percent Included in <i>ConnectRVA 2045</i>
Active	34	33	97%
Bridge	16	16	100%
Highway	191	147	77%
Park & Ride	14	14	100%
Rail	9	0	0%
Transit	13	8	62%

Note: Cost-possible = committed + constrained + private/local project list

Exhibit 42a: Constrained Project List by Type -Highways

Interstate Projects	Auxiliary Lane	Widening
New Interchange		
I-64 and N. Gayton Rd	I-295 - Southbound auxiliary lane in Chamberlayne Rd (Exit 41) off-ramp	I-64 widening from Exit 205 (Bottoms Bridge) to Exit 211 (VA-106) - 2 Projects
Interchange Modification		I-95 widening from Exit 62 (VA-288) to Exit 64 (Willis Rd)
I-295 & Creighton Rd	I-295 - Northbound auxiliary lane in Nuckols Road (Exit 51) on- ramp	Other Freeways Projects
I-295 & VA-1		Interchange Modification
I-64 & Ashland Rd (VA-623)		VA-150 & Dalebrook Dr - 2 Projects
I-64 & Gaskins Rd	I-64 - Eastbound and Westbound auxiliary lanes between Short Pump (Exit 178) to I-195 (Exit 186) - 6 Projects	VA-150 & Hopkins Rd
I-64 & Parham Rd		VA-150 & Strathmore Rd - 2 Projects
I-64 & US-33		VA-150 & US-1
I-95 & Belvidere St		VA-150 & US-360
I-95 & I-64	I-64 - Eastbound and Westbound auxiliary lanes between Welcome Center to Exit 214 (VA-155) in New Kent - 2 Projects	VA-150 & US-60
I-95 & Parham Rd		VA-288 & US-250 - 3 Projects
I-95 & VA-10		VA-288 & US-360
I-95 & VA-161		
I-95 & VA-54 - 2 Projects		
I-95 & Willis Rd	I-95 - Southbound auxiliary lane between Exit 67 (VA-150) and Exit 69 (Bells Rd)	
I-64 & Oilville Rd		

continued

Exhibit 42a: Constrained Project List by Type -Highways (Continued)

Auxiliary Lane	US-250 & Glenside Drive	Road Realignment/Relocation
VA- 288 - Northbound hard shoulder running auxiliary lane from VA-711 (Huguenot Tr) to VA-6	US-250 & Parham Rd	Hockett Rd in Goochland
VA- 288 - Southbound hard shoulder running auxiliary lane from West Creek Pkwy to VA-711 (Huguenot Tr)	US-250 & Pouncey Tract Rd	Red Lane Rd in Powhatan
VA- 288 - Southbound auxiliary lane from US-250 to Tuckahoe Creek Pkwy	US-360 & Broad Rock Blvd	Springfield Rd in Henrico
Road Extension	US-360 & Winterpock Road, Spring Run Road, Chital Drive, Deer Run Road, and Harbor Pointe Parkway	Road Extension
VA-76 (Powwhite Pkwy) extension from Charter Colony Pkwy to Magnolia Green Pkwy - 2 Projects	US-360, Midlothian Turnpike & Clopton St	Carter Gallier Blvd
Widening	US-60 & Dorset Rd	Judes Ferry Rd - 2 Projects
VA-288 widening from VA-76 (Powwhite Pkwy) to US-360	US-60 & Judes Ferry Rd	Manakin Town Ferry Rd
Other Arterials and Major Collectors Projects	US-60 & Stavemill Rd	New Ashcake Rd
Arterial Intersection Improvements	US-60 & US-522	Hockett Rd
Commerce Rd & Walmsley Blvd	US-60 & VA-13	Walmsley Blvd
Lewistown Rd & Ashcake Rd	VA-10 & Walmsley Blvd	Wilkes Ridge Parkway
Parham Rd & Patterson Ave	VA-161 & Broad Rock Blvd	Woodside Ln
US- 301 & VA-54	VA-161, Brookland Pkwy & Westwood Ave	Elmont Rd
US-1 & E Parham Rd	US-60 & Belt Blvd	New Road
US-1 & VA-30	New Overpass/Underpass	New Road from Hockett Rd to Future Wilkes Ridge Parkway Extension
US-1 & West Hundred Rd	Archie Cannon Dr bridge over CSX Railroad	
	Three Chopt Rd under VA-288	

continued

Exhibit 42a: Constrained Project List by Type -Highways (Continued)

Widening (Half of the projects include addition of bike/ped facilities or/and pedestrian accommodations)	Dickens Rd from Staples Mill Rd to Oconto Rd in Henrico	River Road from Sleepy Hollow Rd to E/O VA-150 in Henrico
	Greenwood Rd from Woodman Road to County Line in Henrico	Rural Point Rd from US-301 to Pole Green Rd in Hanover - 2 Projects
	Horsepen Rd from Three Chopt Rd to Dexter Rd in Henrico	South Airport Dr from Audubon Dr to Williamsburg Rd in Henrico
	Judes Ferry Rd from US-60 to Old Church Road in Powhatan	Shady Grove Rd from Nuckols Rd to Hanover County line in Henrico
	Lauderdale Dr from Westbriar Dr to Eadenbury Dr in Henrico	Springfield Rd from Staples Mill Rd to Francistown Rd in Henrico
	Masonic Ln/Brittles Ln from Nine Mile Rd to Williamsburg Rd in Henrico	Three Chopt Rd from Gaskins Rd to N Parham Rd in Henrico
	Meadowbridge Rd from Henrico Co. Line to Atlee Rd in Hanover	Three Chopt Rd from Skipwith Rd to Horsepen Rd in Henrico
	Mill Rd from Mill Place Dr to Mountain Rd in Henrico	US-1 from Ashcake Rd to Southern Town Limits in Ashland
	N Gayton Rd from US-250 to Lauderdale Dr in Henrico	US-1 from US-54 to Archie Cannon Dr in Ashland
	Nuckols Rd from Shady Grove Rd to Springfield Rd in Henrico	US-33 from Overhill Lake Ln to Ashland Rd in Hanover - 2 Projects
	Oilville Rd from Broad Street Road to I-64 in Goochland	US-360 from E. of Cosby Rd to Magnolia Green Pkwy in Chesterfield
	Old Hundred Road from US-60 to Mt Hermon Rd in Chesterfield	US-60 from Division Street to CSX RR in Richmond
	Pemberton Rd from Quioccasin Rd to US-250 in Henrico	VA-106 from I-64 EB On Ramp to I-64 WB Off Ramp in New Kent
	Pole Green Rd from Rural Point Rd to US-360 in Hanover - 2 Projects	VA-54 from Frances Rd to East Corporate Limits in Ashland
	Pouncey Tract Rd from Henrico Co. Line to Ashland Rd in Hanover	Woodman Rd from Hermitage Rd to Hilliard Rd in Henrico
	Pouncey Tract Rd from US-250 to Grey Oaks Park Dr in Henrico -3 Projects	Woodman Rd from Mountain Rd to Hungary Rd in Henrico
	Pump Rd from Walbrook Rd to Waltham Dr in Henrico	Woolridge Rd from Watermill Pkwy to Genito Rd in Chesterfield
	Richmond Henrico Tpk from Hanover County Line to Railroad Crossing in Henrico	
Ashland Rd from Broad Street Rd to I-64 in Goochland - 2 Projects		
Ashland Rd from Henrico Co. Line to Blanton Rd in Hanover - 2 Projects		
Atlee Station Rd from Kings Charter Dr to Sliding Hill Rd in Hanover		
Bethlehem Rd from Libbie Ave to Dickens Rd in Henrico		
Carolina Ave from Richmond Henrico Tpk to Laburnum Ave in Henrico		
Cauthorne Rd from Ashland Rd to Henrico Co. Line in Hanover		
Cedar Ln from US-1 to Elmont Rd in Hanover		
Charles City Rd from Williamsburg Rd to Eastport Blvd in Henrico		
Charles City Rd from Laburnum Ave to Monahan Rd in Henrico		
Church Rd from Three Chopt Rd to John Rolfe Pkwy in Henrico		
Courtney Rd from Staples Mill Rd to Mountain Rd in Henrico		
Creighton Rd from I-295 to Cold Harbor Rd in Hanover		
Creighton Rd from Cedar Fork Rd to Hanover County Line in Henrico		
Creighton Rd from Sandy Ln to City Limits in Henrico		
Darbytown Rd from S Laburnum Ave to Doran Rd in Henrico		

Exhibit 42b: Constrained Project List by Type -Active Transportation

Fall Line Trail - All non committed segments from Ashland to RRTPO Boundary in Southern Chesterfield - 21 Total Projects

West Creek Trail in Goochland

Cox Rd Bike Facility in Henrico

Multiuse trail connecting Fall Line Trail to Virginia Center Commons In Henrico

Virginia Capital Spur connecting Charles City and New Kent Courthouse

Nuckols Rd Multiuse Trail in Henrico

Mountain Rd Shared Used Path in Henrico

Wilton on the James Shared Used Path in Henrico

Shared Use Path connecting Stratton Park to Pocahontas State Park in Chesterfield

Exhibit 42c: Constrained Project List by Type -Transit

Bus Rapid Transit (BRT) Capital

BRT from Downtown Richmond to Ashland along US-1

Enhanced Transit Route Capital

High frequency service from downtown Richmond to Stonebridge and new service from Stonebridge to Chesterfield Town Center along US- 60 (Midlothian Trpk)

High frequency service from downtown Richmond to Richmond International Airport via US-60 (Williamsburg Rd)

High frequency service from Willow Lawn to Short Pump along US-250 (Broad Street)

High frequency service from downtown Richmond via Cary St/Main St and Patterson Ave (VA-6)and Three Chopt Rd to Regency Mall and extension to Gayton Crossing

Transit Centers

Downtown Transfer Center

Southside Transfer Center

23rd Street & Franklin Street Neighborhood Transfer Center

Exhibit 42d: Constrained Project List by Type -Park and Ride

New Park and Ride Lot - Midlothian @ Chippenham

New Park and Ride Lot-East End CBD at Pulse
Terminus-Rocketts Landing

New Park and Ride Lot- I-64/US-60 at Laburnum Rd

New Park and Ride Lot- I-295at US-60-Technology
Blvd/Elko Rd

New Park and Ride Lot- VA-10/VA- 288 at I-95/I-295

New Park and Ride Lot- US-250 at Willow Lawn/
Staples Mill (Pulse western terminus)

New Park and Ride Lot- Huguenot Rd at Forest Hill
Ave

New Park and Ride Lot- I-64 at I-295 in Short Pump

New Park and Ride Lot- VA- 76/US-60

New Park and Ride Lot- VA-76/Jahnke

New Park and Ride Lot- VA-288 at US-250

Relocating Existing Park and Ride lot - I-64 & VA- 623
(Ashland Rd)

Exhibit 42e: Constrained Project List by Type -Bridge

Replacement/Rehabilitation - Jeff Davis Hwy @ Ashton Creek

Replacement/Rehabilitation - Wbl I-64 @ Airport Drive (VA-156)

Replacement/Rehabilitation - Ebl I-64 @ Airport Drive (VA-156)

Replacement/Rehabilitation - I-195 @ VA- 197 & CSX

Replacement/Rehabilitation - Parham Road @ CSX Railway

Replacement/Rehabilitation - Ebl Pocahontas Tr @ Toe Ink Swamp

Replacement/Rehabilitation - Broad Street @ I-95

Replacement/Rehabilitation - Cary Street @ I-195 & CSX Railroad

Replacement/Rehabilitation - 14th Street @ James River South Div

Replacement/Rehabilitation - 14th Street @ James River North Div

Replacement/Rehabilitation - Broad Street @ CSX Abandoned
Spur Line

Replacement/Rehabilitation - Wbl I-64 @ I- 95

Replacement/Rehabilitation - Sbl I-195 @ VA- 76, CSX Rr & Ramp S

Replacement/Rehabilitation - Ramp To 5th & I-95S @ I-95

Replacement/Rehabilitation - North Boulevard @ CSX Railway

Replacement with Shared Used Path - Westover Hills Blvd (RMTA)
@ James River

Policy Needs

Not all outcomes of the long-range transportation planning process are specific to project-based solutions. Some of the most effective ways to enact change over such a long timeframe are to focus efforts at both a regional and local scale to assess and update policies that impact transportation decisions.

In addition to focusing efforts on adding lane miles or improving transit frequency, local governments in the Richmond Region should have open and transparent discussions about density of development, infrastructure resiliency, and housing opportunity, among many related topics working within the regional transportation network.

Action items for the RRTPO and local government agencies to consider for the life of *ConnectRVA 2045* include both immediate steps and long-term support. All action items in this section are critical to maintaining a successful planning process.

Unfunded Regional Needs

The regional needs identified through the planning process exceed the expected revenues available to improve the regional transportation system by approximately \$4.4 billion. This list of projects is included in the Vision List of Regional Projects in *Technical Report F* and are considered regional priorities as additional revenues are made available to the region.

Exhibit 43: General Action Guidance

Type of Proposed Action	Timeframe	Responsible Party
Adopt <i>ConnectRVA 2045</i>	2021	RRTPO
Work collaboratively with VDOT, DRPT, and the CVTA to secure funding and implement the vision and recommendations of <i>ConnectRVA 2045</i> .	2021-2045	Jurisdictions/ RRTPO/ VDOT
Use this plan as a tool to assist in the review of proposed development projects and plans through review, permitting, and implementation processes within the Richmond Region.	2021-2045	Jurisdictions Planning Staffs/ VDOT
Integrate the findings and recommendations of this plan into local Comprehensive Plans.	2022	Jurisdiction Planning Staffs
Use the RTC Travel Demand Model as a tool to review proposed development projects and plans as roadway improvements are planned to address capacity, safety and other issues.	2021-2045	RRTPO/Jurisdiction Planning Staffs
Work with the development and real estate community to increase public awareness of major proposed transportation investments such as major arterials, BRT, and regional trails.	2021-2045	RRTPO/Jurisdiction/ Advocates Planning Staffs
Consider adopting policies and dedicating funding to help implement traffic safety measures on existing streets.	2022	Jurisdiction and RRTPO Planning Staffs
Strongly consider policies and actions that support Virginia greenhouse gas reduction goals to achieve net zero emissions across all sectors of the economy—including transportation	2045	RRTPO/State Agencies/ Jurisdictions

Chapter 7

How Did We Do This Time and How Can We Do Better Next Time?

- Federal Performance Based Planning and Programming
- *ConnectRVA 2045* Performance Measures Evaluation
- Air Quality Conformity
- Public Engagement and Outreach
- Scenario Planning



How did we do this time and how can we do better next time?

Chapter 7 presents a summary of the evaluation of the *ConnectRVA 2045* plan given the constrained list of projects as approved by the RRTPO Policy Board on July 1, 2021. *ConnectRVA 2045* represents the first performance-based long-range transportation plan prepared by the RRTPO. The first step in this process was to consult federal guidance in setting performance targets and assessing past performance in meeting the targets. *ConnectRVA 2045* takes the additional steps to systematically evaluate the performance of its outcome, evaluating the financially constrained plan through quantitative metrics in five broad categories.

As part of *ConnectRVA 2045*, the Richmond Region was also required to demonstrate air quality conformity. This chapter also evaluates the overall long-range transportation planning process in terms of public engagement and outreach. Finally, the chapter introduces the next step of Scenario Planning, using *ConnectRVA 2045* as a foundation for subsequent long-range transportation plans.

Federal Performance Based Planning and Programming

The two most recent federal transportation laws, MAP-21 and the FAST Act, establish performance measure requirements to ensure states and MPOs are investing transportation funds in projects that collectively will contribute to the achievement of national goals. The USDOT has published rules for states and MPOs that govern the type of data and requirements for establishing performance targets to support performance-based investment decisions.

Specifically, this legislation requires MPOs to prepare and set targets for the following federally established performance measures:

- Roadway Safety
- Pavement Condition
- Bridge Condition
- Roadway Performance
- Freight Movement
- Transit Asset Management and Safety

An assessment of the targets selected and past performance monitoring by the RRTPO to comply with Federal guidance is included in *Technical Report K: Federal Compliance Report*.



ConnectRVA 2045 Performance Measures Evaluation

ConnectRVA 2045 focuses on systematically evaluating the performance of the plan through quantitative metrics in five broad performance areas or categories:

1. Systemwide Performances
2. Transportation Savings
3. Economic Impact Analysis
4. Environmental Justice Analysis
5. Accessibility Analysis

The data-driven GIS analysis and the network models established in this process can also be used as a regional resource to determine relative impacts on the economy, system performance, and benefits to existing and future populations.

Performance Area 1: Systemwide Performances

The analysis presents a comparative assessment of the systemwide transportation performance of three possible scenarios for the transportation system. For the highway system, only major collectors and above are included in this analysis. Minor collectors and local roads are not included. The three scenarios are:

1. Base Year 2017
2. No-Build 2045 (existing and committed projects phased for completion by 2026)
3. Build 2045 (full implementation of all constrained projects in the ConnectRVA 2045 plan)

Highway System - Total and Congested Lane Miles

The base year scenario indicates that 8 percent of the total lane miles are congested at a Level of Service (LOS) E or F. The No-Build shows an addition of 44 lane miles in the system, and 232 lane miles added in the Build scenario. Exhibit 39 shows the total lane miles added under each scenario and the resulting lane miles that would be considered congested. Overall, a decrease of 85 congested lane miles are estimated to result from the full implementation of projects by 2045.

Exhibit 44: Highway System Performance Summary

Scenario	Total Lane Miles	Lane Mile Added	Congested lane Miles	Percentage of Congested miles
Base	8,842		728	8%
No-Build	8,887	44	1,621	18%
Build	9,119	232	1,536	17%

Bridges - Major Rehabilitation and Replacement

A total of 16 structurally deficient bridges in the National Highway System are included in ConnectRVA 2045 as bridge replacement or major rehabilitation projects. An estimated 512,308 square feet of structurally deficient (poor condition) deck areas will be replaced or rehabilitated to good condition from the No-Build to Build Scenario.

Transit System - Transit Ridership and Passenger Miles Travelled (PMT)

As shown on Exhibit 45, the Base scenario shows a daily transit ridership of 28,749 persons on the GRTC transit system. The No-Build scenario is predicting a 35,507 daily transit ridership, increasing by 30 percent to 46,444 in the Build Scenario.

Exhibit 45: Transit System Ridership

Scenario	Daily ridership	Person Miles Traveled
Base	28,749	74,835
No-Build	35,507	88,115
Build	46,447	138,814

Transit System - Premium Transit Miles

The total mileage of enhanced transit service (15 minutes or less frequency) with more than 5,000 daily ridership, Bus Rapid Transit (BRT) and Light Rail Transit are considered “premium transit miles.” In the Richmond Region, the Pulse BRT mileage of 7.6 miles can be considered as premium transit miles. This is reflected in the Base and No-Build Scenarios. The implementation of a Route 1 North BRT is included in the constrained plan, increasing the premium transit miles in the Build Scenario to 23.3 miles.

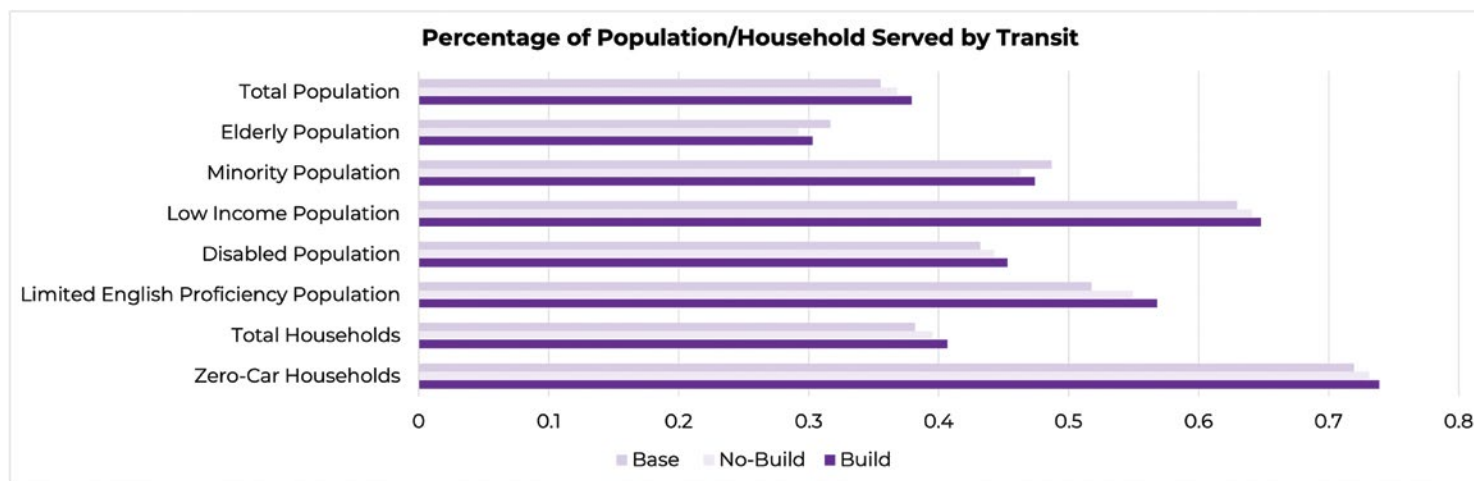
Exhibit 46: Transit System- Premium Transit Miles

Scenario	Miles
Base	7.6
No-Build	7.6
Build	23.3

Transit System - Transit Coverage

ConnectRVA 2045 expands the transit coverage in the Richmond Region with the addition of five enhanced transit routes and one additional BRT route. The transit coverage area is generally a “walk-shed” of one-half mile from a transit stop/station. It is estimated that approximately 35 percent of the total population resides in a transit coverage area in the Base scenario, increasing to around 38 percent in the 2045 Build scenario. Even though the transit coverage may expand geographically, the coverage for the total population does not improve significantly in relative terms because the population is increasing in the areas outside of existing coverage. As shown by Exhibit 47: Transit System Coverage, low income and zero-car households who are mainly living in the urban areas and along major corridors will see more significant coverage expansion, 65 percent and 74 percent respectively.

Exhibit 47: Transit System Coverage



Park and Ride Lots

According to the 2019 Richmond Regional Park & Ride study, the region is served by eight official lots with 1,659 parking spaces. Full implementation of *ConnectRVA 2045* is estimated to add 2,600 more parking spaces in 14 new Park and Ride lots.

Exhibit 48: Official Park and Ride Lots

Scenario	Official Lots	Parking Spaces
Base	8	1,659
No-Build	8	1,659
Build	22	4,256

Active Transportation - Dedicated Miles

Active transportation dedicated miles include the total mileage (measured as center-line lane miles) of bicycle infrastructure facilities, including shared use paths, bike lanes (buffered or unbuffered), cycle tracks, and bicycle accommodations on low-volume mixed-traffic roadways. The Base scenario shows 136.2 miles of dedicated active transportation in the Richmond Region. The No Build scenario adds 3.62 miles. *ConnectRVA 2045* includes 34 active transportation projects, adding 52.91 more miles and increasing the dedicated active transportation miles in the Richmond Region to 192.73 miles.

Exhibit 49: Active Transportation

Scenario	Lane Miles
Base	136.20
No-Build	139.82
Build	192.73

Performance Area 2: *ConnectRVA 2045* Annual Transportation Savings

The planned investment for the full implementation of the *ConnectRVA 2045* (Build Scenario) in the Richmond Region is around \$5.8 Billion. RRTPO staff calculated the net value of transportation related savings/benefits for this investment. Benefits were calculated for operations, safety, and environmental. The operations benefit consists of three components – savings in automobile delays, savings in truck delays, and Vehicle Miles Travelled (VMT) savings. Safety benefits are expressed in quantifiable terms representing the human benefit, as the Equivalent Property Damage (EPDO) savings are due to reduced fatal and severe injury crashes. Environmental Benefits include the savings due to the reduction in pollutants (VOC and NOx) emissions. The total annualized transportation savings are estimated to be approximately \$607 million.



Exhibit 50: Annualized Transportation Savings

Benefit Type	2030 Dollars
Operational	\$485,254,000
Safety	\$120,583,000
Environmental	\$348,000
Total	\$606,185,000

For a more detailed look at the methodology, see *Technical Report G: Constrained Plan Evaluation*.

Performance Area 3: Economic Impact Analysis

The Economic Impact Analysis (EIA) evaluates the cumulative economic growth estimated to be generated in the 2045 Build scenario due to changes in productivity and competitiveness that are attributable to changes in transportation conditions. The EIA helps to answer the question, “How do the transportation projects in *ConnectRVA 2045* as a whole impact Richmond Region’s economy?”

RRTPO staff used a tool to evaluate EIA based on findings from a recent and extensive study called *EconWorks*. [EconWorks](#) is a product of the second Strategic Highway Research Program (SHRP2), a national partnership of the Federal Highway Administration, AASHTO, and the Transportation Research Board.

The EIA tool quantifies and monetizes the expected economic benefit in the following terms:

- Number of jobs created
 - Direct project jobs
 - Supplier and wage jobs (indirect and induced)
- Income and wages from jobs
 - Income from direct project jobs
 - Income from supplier and wage jobs (indirect and induced)
- Business output and sales (economic footprint)

Direct jobs represent new jobs anticipated to be added as a result of a project because of improved access or enhanced travel conditions. Indirect jobs result from growth in local suppliers of goods and services to the directly growing businesses and the “induced” effects from income cycling into the market through consumer purchases by the additional workers. All benefits estimated from the EIA tool stem from the increase in jobs. The EIA tool estimates the number of jobs created and determines the economic footprint in terms of economic output for each project. The sum of these values for each constituent project provides an estimate of the jobs and economic impact expected from implementation of *ConnectRVA 2045*.

Projects from the *ConnectRVA 2045* Build scenario were evaluated using the EIA tool. Benefits for individual projects were calculated as prescribed in EconWorks. Benefits were scaled by a derived factor of 0.296 to avoid double-counting because of the overlap of project areas.

Based on the output generated by the EIA tool, the full implementation of the *ConnectRVA 2045* plan is projected to have the following positive impact on the Richmond Region’s economy:

- 56,223 direct jobs and 38,046 indirect jobs will be created, a total of 94,269 jobs.
- \$2.8 billion direct wages and \$1.9 billion of indirect wages because of the income and wages from direct and indirect jobs.
- A net economic impact of around \$15 billion to the Richmond Region’s Gross Domestic Product (GDP).

For a more detailed review of the methodology behind EIA, see *Technical Report G: Constrained Plan Evaluation*.

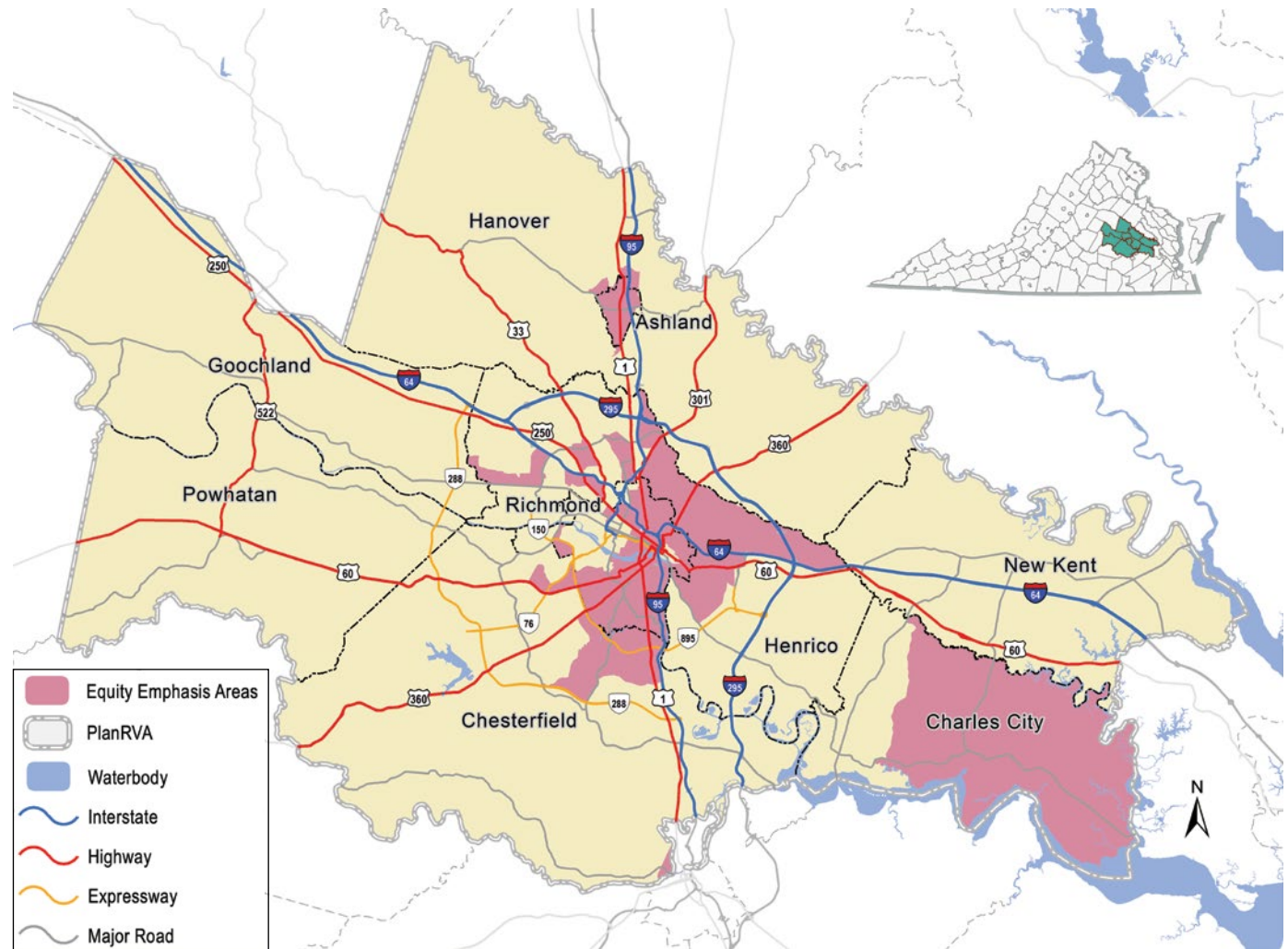
Performance Area 4: Environmental Justice Analysis

Environmental justice is defined as the fair treatment and meaningful involvement of all people, meaning that no group bears a disproportionate share of negative consequences of Federal action or investment. The Federal mandate for environmental justice comes from [Executive Order 12898](#) and focuses on people of color and low-income populations. This evaluation assesses the impacts of the proposed investments in *ConnectRVA 2045* on historically disadvantaged people in the region.

Identifying Equity Emphasis Areas

The RRTPO uses six indicators of disadvantaged populations drawing from federal nondiscrimination law and regional experience. These six indicators are combined in an overall index to identify communities of concern or Equity Emphasis Areas (EEA) which serve as the focus for the equity and environmental justice analysis. The process for identifying these equity emphasis

Exhibit 51: Equity Emphasis Areas for Environmental Justice



areas is described in the methodology included in *Technical Report G: Constrained Plan Evaluation* and depicted on Exhibit 51: Equity Emphasis Areas for Environmental Justice.

Equity Analysis Findings

In developing the project evaluation criteria for projects, *ConnectRVA 2045* uses a consistent tiered system to attribute benefits from projects based on the area that would be reasonably served by the project. The tiers were developed based on a review of the [practices of other MPOs in the state](#) and the buffers used for [economic development measures in the Smart Scale program](#). The full breakdown of project types and tiers can be found in *Technical Report E: Project Prioritization Process* and are introduced as follows:

- **Tier 1** projects are the projects expected to have the smallest area of impact (0.5 miles). This category includes non-Bus Rapid Transit (BRT) transit routes and active transportation projects.
- **Tier 2** projects are projects that have a broader impact but are located primarily on minor roadways. Example project types include intersection improvements, BRT routes, transit centers, increased capacity on existing roadways, and new roadways classified as minor arterials or below. These projects have an impacted area of one mile.
- **Tier 3** projects are the projects that serve the largest area and are expected to have the biggest impacts on the overall transportation network. Example project types include rail stations and major track improvements, improvements to intermodal facilities and corridors, park and ride lots, interchanges, and increased capacity on existing roadways and new roadways classified as major arterials or above. These projects have an impact area of two miles.

To evaluate the impacts of proposed investments on EEAs, each project was buffered according to its tier. If at least a third of a census tract was overlapped by the buffer, the tract was deemed to be served by the project. This methodology results in a high-level view of the proportion of planned investment expected to serve the residents of EEAs and which investments will not. The goal of this analysis is to determine whether investments in the region are equitably distributed between historically underserved communities and the rest of the region.

As shown on Exhibit 52, nearly 63 percent of the constrained projects are expected to serve an EEA. Likewise, more than 59 percent of the dollars proposed for investment are expected to serve the population in the EEAs. Since the population of EEAs represents less than 32 percent of the overall regional population, this analysis supports the finding that the proposed investments are equitably distributed throughout the region. This distribution can be seen most clearly when analyzing investments on a per capita basis. The per capita value of investments that serve EEAs is significantly higher relative to the EEA population (\$10,266) compared to the overall investment relative to the total population (\$5,478). This analysis excludes projects with committed funding included in the Six-Year Improvement Plan (SYIP) and private-local projects which were not scored through the *ConnectRVA 2045* evaluation process.

Exhibit 52: Equity Emphasis Areas Served

	Projects	Value of Investment
Does not Serve Equity Emphasis Area	78	\$2,356,988,000
Serves Equity Emphasis Area	132	\$3,460,176,000
Total	210	\$5,817,164,000

Performance Area 5: Accessibility Analysis

This analysis provides a comparative assessment of the benefits and burdens across the spectrum of EEAs and non-EAA populations. The analysis was performed for the same three scenarios employed to evaluate the transportation systemwide performance:

1. Base Year 2017
2. No-Build 2045 (existing and committed projects phased for completion by 2026)
3. Build 2045 (Full implementation of all constrained projects)

The following measures are covered by this accessibility analysis:

- Average number of work (jobs) and non-work (destinations) opportunities by different transportation modes within a reasonable specified travel time based on mode.
- Average travel times by trip purpose
- Access to transit within certain walking and biking travel times

Average number of work (jobs) and non-work (destinations)

This measure evaluates the average increase in accessibility within 30 minutes (45 minutes for transit) from the No-Build scenario to Build scenario. For job accessibility, the change is calculated per capita whereas for destination the change is calculated per 1000 person as illustrated by Exhibit 53.

Exhibit 53: Accessibility to Destinations

Mode (minutes)	Scenario	Average Weighted Destinations Accessible Per 1000 People		
		EEA Area	Non-EEA Area	Region-wide
Auto (30)	Build	41,002.14	34,016.65	36,692.64
	No-Build	40,677.58	33,644.19	36,338.53
	Difference	324.56	372.46	354.11
	Percentage	0.80%	1.11%	0.97%
Transit (45)	Build	19,068.74	14,191.32	16,059.76
	No-Build	14,158.45	11,308.81	12,400.44
	Difference	4,910.29	2,882.51	3,659.31
	Percentage	34.68%	25.49%	29.51%
Biking (30)	Build	5,041.51	2,481.72	3,435.43
	No-Build	2,600.79	1,805.76	2,101.97
	Difference	2,440.72	675.96	1,333.46
	Percentage	93.85%	37.43%	63.44%
Walking (30)	Build	461.61	2,222.98	1,247.74
	No-Build	342.86	2,204.78	1,173.86
	Difference	118.75	18.20	73.87
	Percentage	34.64%	0.83%	6.29%

Exhibit 54: Accessibility to Jobs

Mode (minutes)	Scenario	Average Jobs Accessible Per Capita		
		EEA Area	Non-EEA Area	Region- wide
Auto (30)	Build	2,717.28	2,208.82	2,403.60
	No-Build	2,691.02	2,179.05	2,375.17
	Difference	26.25	29.77	28.42
	Percentage	0.98%	1.37%	1.20%
Transit (45)	Build	1,507.81	1,096.08	1,253.81
	No-Build	1,147.58	872.13	977.65
	Difference	360.22	223.95	276.15
	Percentage	31.39%	25.68%	28.25%
Biking (30)	Build	595.06	212.60	355.09
	No-Build	249.54	165.25	196.65
	Difference	345.52	47.35	158.44
	Percentage	138.46%	28.65%	80.57%
Walking (30)	Build	63.58	402.45	214.83
	No-Build	49.09	371.20	192.85
	Difference	14.49	31.25	21.97
	Percentage	29.53%	8.42%	11.39%



Average Travel Times and Trip Length by Trip Purpose

This measure evaluates the average travel times and trip length by trip purpose for the EEA area, non-EEA area and the whole region for Base, No-Build, and Build scenarios. Trip Purpose includes home-based work, home-based shopping, home-based other, and non-home-based trips.



Exhibit 55: Travel Time by Trip Purpose

Scenarios	Areas	Trip Purpose	Home Based Work	Home Based Shopping	Home Based Other	Non-Home Based	All Trips
Base	EEA	Time (minutes)	13.45	11.91	11.88	15.375	13.265
		Distance (miles)	7.38	5.54	5.655	8.36	6.79
	Non-EEA	Time (minutes)	17.395	13.69	13.935	16.695	15.435
		Distance (miles)	10.88	7.25	7.415	9.78	8.8
	Region-wide	Time (minutes)	15.805	13.64	12.825	16.135	14.53
		Distance (miles)	9.675	7.375	6.71	9.38	8.185
No-Build	EEA	Time (minutes)	14.585	12.565	12.35	16.44	14.08
		Distance (miles)	7.68	5.63	5.61	8.645	6.935
	Non-EEA	Time (minutes)	18.885	14.6	14.62	17.81	16.45
		Distance (miles)	11.33	7.455	7.425	10.07	9.01
	Region-wide	Time (minutes)	17.225	14.395	13.55	17.24	15.525
		Distance (miles)	10.165	7.485	6.79	9.685	8.42
Build	EEA	Time (minutes)	14.495	12.51	12.335	16.315	14.01
		Distance (miles)	7.68	5.64	5.65	8.655	6.955
	Non-EEA	Time (minutes)	18.515	14.36	14.46	17.55	16.2
		Distance (miles)	11.275	7.43	7.475	10.09	9.015
	Region-wide	Time (minutes)	16.97	14.23	13.45	17.045	15.355
		Distance (miles)	10.135	7.47	6.835	9.7	8.435

Access to transit within certain walking and biking travel times

This measure evaluates the percentage of population within the EEA area and non-EEA area and the whole region that can access transit within certain travel times. For walking, five, 10, 15, 20, 25, and 30 minutes are considered. For biking, 10 and 30 minutes are considered. An average walking speed of three miles per hour and an average biking speed of 10 miles per hour were assumed.

Exhibit 56: Access to Transit for Active Transportation Mode

Mode	Scenario	No-Build			Build		
	Travel Time (Minutes)	Region-wide	EEA Area	Non-EEA Area	Region-wide	EEA Area	Non-EEA Area
Walking	5	27.6%	52.7%	12.9%	28.4%	53.5%	13.6%
	10	36.8%	67.1%	19.0%	37.9%	68.1%	20.2%
	15	42.6%	74.4%	23.9%	44.0%	75.3%	25.6%
	20	47.6%	79.2%	29.0%	49.1%	80.1%	31.0%
	25	52.1%	83.4%	33.7%	53.5%	84.1%	35.6%
	30	56.3%	86.9%	38.3%	57.6%	87.4%	40.1%
Biking	10	58.9%	88.7%	41.4%	60.1%	89.1%	43.1%
	30	86.1%	98.3%	78.9%	86.2%	98.3%	79.1%

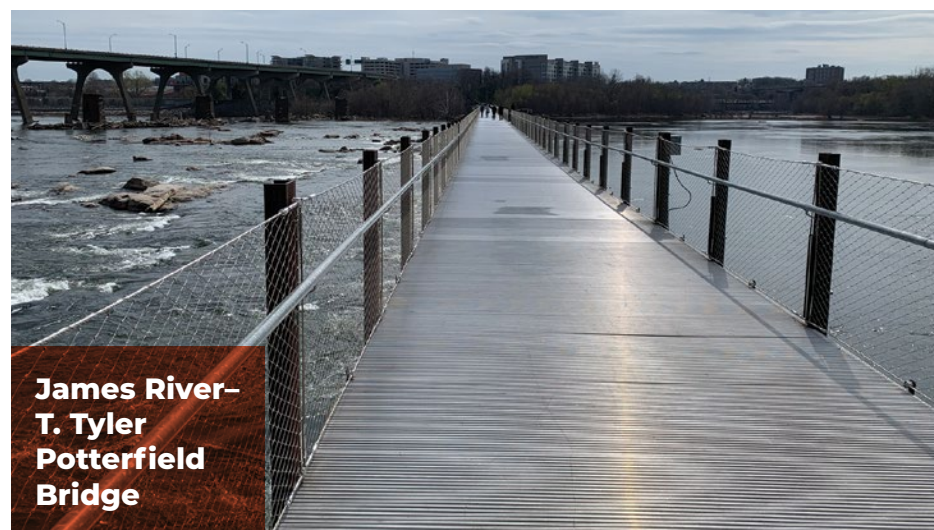
For a more detailed look at the methodology for accessibility analysis, see *Technical Report G: Constrained Plan Evaluation*.

Air Quality Conformity

Air quality conformity is a Federal requirement that requires RRTPO staff to ensure the projects from *ConnectRVA 2045* collectively contribute to the air quality improvement goals as stated in the Clean Air Act (CAA). In simple terms, it means that the transportation projects proposed by *ConnectRVA 2045* will not cause new air quality violations or worsen existing violations.

ConnectRVA 2045 specifically focuses on volatile organic compounds (VOCs) and Nitrogen Oxide (NOx), which are major contributors to ozone and have been identified by state and federal partners as specific triggers in the Richmond Region.

While 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



**James River–
T. Tyler
Potterfield
Bridge**

transportation plan and the Transportation Improvement Plan (TIP) even after having achieved attainment under the more stringent 2015 standards. The constrained list of projects in *ConnectRVA 2045* and the ungrouped projects in the FY 21-24 TIP constituted the RRTPO set of projects for purpose of this analysis.

An interagency consultation meeting was held on July 7, 2021 to review the process and methodology for the conformity analysis. The draft Air Quality Conformity Report was reviewed by the state, Federal, regional, and locality representatives as part of the interagency consultation. This report was advertised and invited public review from July 9, 2021 to July 24, 2021. Six comments were received from the public. All the public comments received are documented in *Technical Report H: Public Engagement & Outreach*. The Air Quality Conformity Report was approved on August 5, 2021 by the RRTPO Policy Board, and the approved report was submitted to FHWA on August 10, 2021. The Federal Conformity Determination will be received within 45 days of submittal to FHWA.

The Richmond Region is currently meeting all of EPA's air quality standards, including those for ozone and fine-particulate matter. *ConnectRVA 2045* is not anticipated to cause or contribute to a violation of any air quality standards. For a more detailed overview of the process, see *Technical Report J: Air Quality Conformity*.



Public Engagement and Outreach

The public engagement process for *ConnectRVA 2045* began in October 2019 with the appointment of the Long-Range Transportation Plan Advisory Committee (AC) by the RRTPO Policy Board, and the preparation of a Public Engagement Plan. In addition to representatives of the localities, transportation agencies, and advocacy groups, the plan called for concerted engagement of low-income populations, minorities, those with Limited English proficiency, and residents with no access to personal vehicles. RRTPO staff and the AC realized that much of the public engagement process would involve public education, sharing what the plan is intended to accomplish and how it can impact people's lives. A public facing website, along with media, email, and social media campaigns, was employed early in the process. Resources were posted and updated throughout the process.

The first phase of engagement focused on meeting people where they are, community events, meetings, and in people's living rooms. This effort started in the early part of 2020 working through regional stakeholders, local interest groups, and non-profit organizations. A toolkit of materials for distribution at all levels of input was developed to make the process nimble in its administration. Visions for the future, issues to be addressed, and evaluation of meetings were planned along with online tools for input for those who could not attend in person. Several meetings with the identified groups like the Virginia Conservation Network and the NAACP were held in February 2020. And then, in March 2020, the COVID-19 pandemic gripped the global community, cutting off immediate in-person access and forestalling the realization of the full plans for active public engagement.

The RRTPO Policy Board, the AC, and related committees moved to remote action, depending on the website for

education, resource sharing, and input through a variety of online surveys. The engaged list of 200 interested parties for regular updates grew over the 18-month planning period to nearly 500, and more than 2,700 individuals participated in online surveys and responded to requests to provide input during major phases of the plan.

A summary of the public engagement opportunities and the specific input received is shared in more detail in *Technical Report H: Public Engagement & Outreach*, and includes input received during the following phases of the process, as well as comments received on the draft *ConnectRVA 2045* plan:

Phase 1: Resource Base/Needs Assessment

- Community Outreach Meetings (in person)- February – March 2020
- Issues Interactive Mapping (Wikimaps)- March 12-April 15, 2020

Phase 2: Strategic Direction - Vision Goals, & Objectives

- Online Vision Survey (and AC participation)- March 2-April 15, 2020
- Online Goals & Priorities Survey-June 24-August 15, 2020
- Online Vision, Goals & Strategies Survey-August 25-October 11, 2020

Phase 3: Planning & Universe of Projects (AC, Project Champions, Public Review)

- AC, Project Champions, Public Review through website-March 8-April 15, 2021

Phase 4: Programming-Constrained Plan Development

- Online Budget Allocation Survey-April 15-May 15, 2021

Did we touch every corner of the Richmond Region to share the importance of the *ConnectRVA 2045* plan and receive input? We know we have more work to do to reach those who may not have access to online resources or the knowledge and desire to participate in the process. We have learned a lot and sharpened our skills through remote connections, but we are also eager to take what we have learned and more thoroughly meet people in their living rooms as we move forward toward implementation and refined planning. We continue to actively engage through our partners in all manner of planning efforts, all modes of travel, in related local comprehensive plans and corridor studies, and will take every opportunity given to connect.

Scenario Planning

FHWA recommends the use of scenario planning to guide regional planning and investment decisions. RRTPO intended to develop a Scenario Planning Project with *ConnectRVA 2045* to provide a staff-driven, relatively efficient trial run of regional exploratory scenario planning. With the onset of the COVID-19 pandemic and inability to plan for effective community planning opportunities, this project will instead be focused on the lead-in to the next long-range transportation plan. The intended approach to develop a scenario planning process is contained in the following section.

Scenario planning provides a framework for stakeholders to assess various factors that can impact the way in which a region develops. In transportation planning, scenario planning can be utilized to consider how changes in transportation, land use, demographics, or other factors such as climate change could affect connectivity, mobility, resiliency, and communities across the region.

The scenario planning process evaluates the effects of alternative policies, plans, and/or programs on the future of a community or region. This activity can provide information to decision-makers as they develop transportation plans. Scenarios may be used by stakeholders to explore and debate alternatives and trade-offs. By testing several scenarios against performance indicators, decisionmakers can select a preferred scenario and identify an appropriate set of actions that will lead toward that vision.

The scenario project will examine alternative future assumptions such as, but not limited to, the types of land use that may be prevalent in the future; the location preferences of future generations; the ways that transportation technology may affect demand, supply, and performance in the region's transportation network; environmental impacts of climate change and greenhouse gas emissions; alternative modal funding distribution; and potential variations on the region's growth forecast. The outcomes of the planning process will inform the 2050 plan with respect to the risk and opportunities that the future scenarios reveal. Through this detailed, multi-year planning exercise, the RRTPO will integrate scenario planning into the LRTP development cycle and ensure abundant opportunity for public involvement in the process.

The proposed process is called Exploratory Scenario Planning, which examines a range of potential futures associated with alternative assumptions about disruptive

trends that are difficult to forecast far into the future. It is not the intent of the process to select a “preferred” future scenario, but rather, to envision how to be prepared for the potential range of future conditions.

Over a two- to three-year period, the RRTPO staff will work with the RRTPO Technical Advisory Committee in a consultant-driven process to undertake scenario planning, highlighted by the following components:

1. Research, refine, and define the drivers of change and develop scenario narratives that incorporate varying assumptions about the drivers of change. The scenarios will be distinctly different and collectively will represent a spectrum of future possibilities for the region.
2. Identify desired performance measures for scenario planning in keeping with the *ConnectRVA 2045* vision, goals and objectives; the regional prioritization process; and the tools available for producing the measures.
3. Using available tools, such as GIS and the regional travel demand forecasting model, define a process for analyzing the regional scenarios in a data-driven process and producing performance measures that will allow meaningful evaluation of the scenarios.
4. Develop the tools and methods to produce the desired scenarios with development of the land use allocation and travel demand forecasting models
5. Develop the inputs representing the scenarios and run the established scenario modeling process to produce scenario results.
6. Develop a performance dashboard to highlight and contrast the results of the scenarios.
7. Identify insights from the scenario planning process that are relevant to the 2050 long-range transportation plan and incorporate these outcomes and insights into the planning framework for *ConnectRVA 2050*.

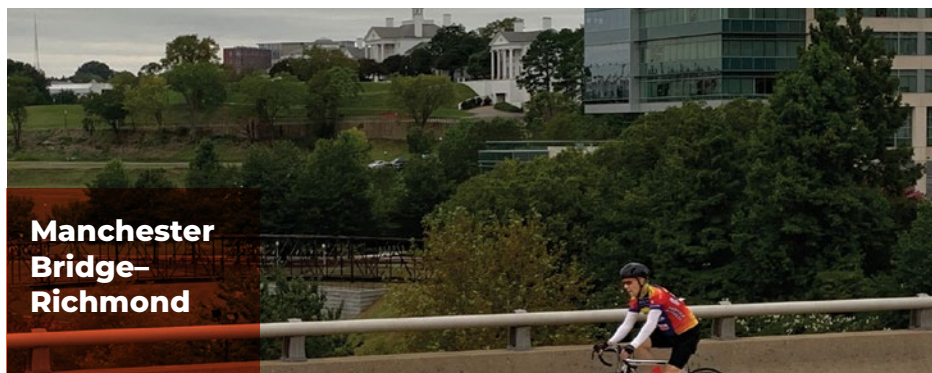
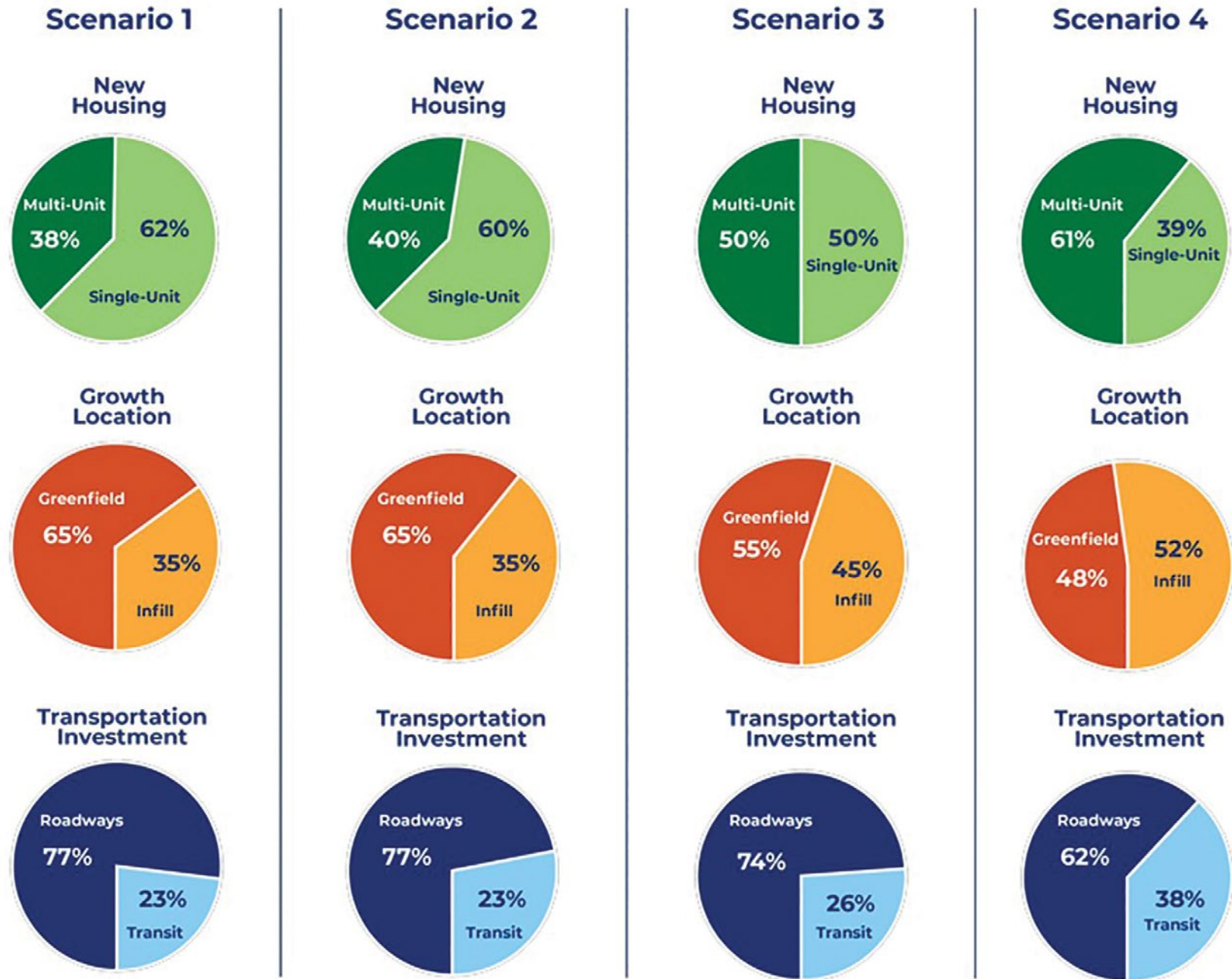


Exhibit 57: Illustrative Assessment of Trade-Offs in Scenario Planning



Technical Reports

- **Technical Report A: Socioeconomic Data Report for the 2017 Base Year and 2045 Forecast Year**
- **Technical Report B: 2045 Long-Range Growth Forecast Analysis**
- **Technical Report C: Richmond Regional Structural Inventory & Assessment Report 2020**
- **Technical Report D: Local and Regional Transportation Issues Report**
- **Technical Report E: Project Prioritization Process Report**
- **Technical Report F: Constrained Plan Development Report**
- **Technical Report G: Constrained Plan Evaluation Report**
- **Technical Report H: Public Participation and Outreach Report**
- **Technical Report I: Fiscal Year 2021 Congestion Management Process**
- **Technical Report J: Regional Air Quality Conformity Assessment**
- **Technical Report K: *ConnectRVA* 2045 Federal Compliance Report**



