plan2040

October 6, 2016

Amended March 2, 2017

Richmond Regional Transportation Planning Organization

ACKNOWLEDGEMENT

This plan was prepared in cooperation with the United States 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) 2040 Metropolitan Transportation Plan Advisory Committee.

DISCLAIMER

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The FHWA, FTA, VDRPT, or VDOT acceptance of this report as evidence of the fulfillment of the objectives of this planning study does not constitute endorsement or approval of the need of any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

As each of these projects in the MTP is implemented, coordination, agreement, and independent approval of the participating local jurisdiction is required. No part of this MTP is to be interpreted as to diminish the authority of local jurisdictions in the area of land use and transportation improvements.

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Richmond Regional Transportation Planning Organization Policy Board

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(A) - Alternate

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Established by the RRTPO Policy Board on January 29, 2015.

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Richmond Regional Planning District Commission

Metropolitan Planning Organization

Town of
Ashland
Counties of
Charles City
Chesterfield
Goochland
Hanover
Henrico
New Kent
Powhatan
City of
Richmond

RRTPO AGENDA 10/6/16; ITEM II.A.

***plan2040*, 2040 METROPOLITAN TRANSPORTATION PLAN (MTP): ADOPTION OF FINAL PLAN**

Richmond Regional Transportation Planning Organization

On motion of Kathy C. Graziano, seconded by Patricia S. O'Bannon, the Richmond Regional Transportation Planning Organization voted to approve the following resolution with all voting in favor except for one vote opposed:

RESOLVED, that the Richmond Regional Transportation Planning Organization (RRTPO) adopts ***plan2040***, the regional long-range Metropolitan Transportation Plan, as presented; and

BE IT FURTHER RESOLVED, that the RRTPO authorizes the transmittal of this plan to the Federal Highway Administration and the Federal Transit Administration.

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This is to certify that the Richmond Regional Transportation Planning Organization approved the above resolution at its meeting held October 6, 2016.

WITNESS:

Sharon E. Robeson
Administrative Secretary
Richmond Regional Planning
District Commission

BY:

Barbara Schoeb Nelson
Secretary
Richmond Regional Transportation
Planning Organization

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Richmond Regional Transportation Planning Organization

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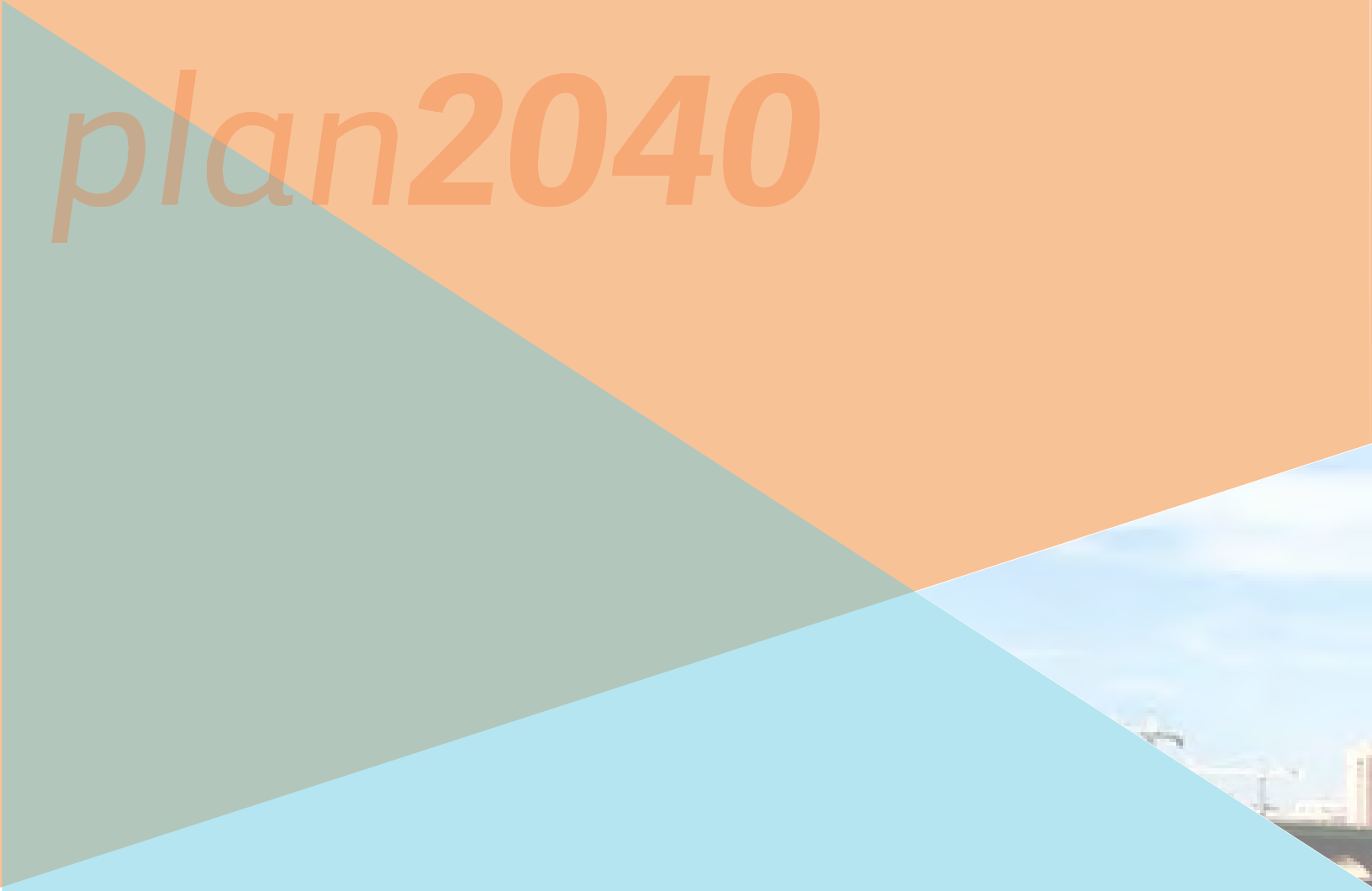

Executive Summary

The 2040 Metropolitan Transportation Plan (plan2040) is a regional, multi-modal transportation planning document that typically has a 20-year horizon and is updated on a five year cycle based on air quality conformity standards. plan2040 takes into account future needs for roads, bicycle and pedestrian facilities, transit, freight and passenger rail, ports and marine facilities, and air travel. This document was formerly known as the Long-Range Transportation Plan (LRTP) before federal legislation changed the name.

plan2040 is produced by the Richmond Regional Transportation Planning Organization (RRTPO), a regional policy-making organization made up of partner agencies and elected officials from nine member jurisdictions including the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent and Powhatan, the City of Richmond and Town of Ashland.

Planning Process

The long-range planning process utilized by the RRTPO is guided by the Fixing America's Surface Transportation (FAST) Act legislation signed on December 4, 2015 and its predecessor, the Moving America towards Progress in the 21st Century (MAP-21) Act. The FAST Act provides long-term funding certainty for surface transportation and largely maintains current program structures and funding shares between highway and transit as established in MAP-21. The FAST Act continues the requirement of "continuing, cooperative, and comprehensive" transportation decision making (known as the "3C" planning process). The process takes into account member jurisdictions' comprehensive plans, which are used to inform the 2012/2040 RRTPO Socioeconomic Data developed for plan2040, and the impacts of transportation decisions on the region as a whole. These decisions involve allocating transportation resources by the most cost-effective and efficient means possible, giving appropriate consideration to federal and state planning and programming regulations. The performance-based planning process established in MAP-21 also focuses on the inclusion of performance measures and development of a system performance report.

Public Participation

The RRTPO's process for conducting the plan2040 update included the formation of an MTP Advisory Committee, to provide guidance to RRTPO staff, and additional public participation through citizen input. Representatives were included from each member jurisdiction as well as from existing RRTPO advisory committees and local, state, and federal transportation agencies.

Input provided by the Capital Region Collaborative's (CRC) "Strawman" effort was used to guide the early development of the plan2040 update, followed by an initial series of presentations at meetings throughout the Richmond region to raise awareness of plan2040. A survey on the nine Goals of plan2040 was developed for public input, and updates and relevant information were shared through social media platforms and the plan2040 website.

[To be completed after formal public review of draft MTP document is completed]

Regional Demographics

The Richmond region is a vibrant and diverse area experiencing rapid growth that is expected to continue for the foreseeable future. To anticipate future transportation needs, population and employment densities within the RRTPO study area are examined by Transportation Analysis Zones (TAZs). The 2012/2040 RRTPO Socioeconomic Data was created with the cooperation of localities and partner agencies, providing data for the base year 2012 data and informing development scenarios for 2040 data projections. The Socioeconomic Data is used for creating population forecasts and in previous plans, for air quality conformity analysis.

According to the Socioeconomic Data, the total population in the Richmond region is forecasted to grow by 42%, reaching a total of approximately 1.5 million residents. The largest gains in population are projected in Henrico (132,000) and Chesterfield (187,000) Counties and out of the more rural areas, Hanover County (65,000). The number of automobiles in the region is forecast to increase by 53.7%, driven largely by rapid population growth in suburban areas.

Around 80% of the region's population lives in the City of Richmond and the Counties of Henrico and Chesterfield, forming the urban core and suburban ring of the region. These jurisdictions are also projected to hold 66% of the new households in 2040. The total number of automobiles is expected to increase by almost 50%, totaling over 370,000 between 2012 and 2040, and following similar trend lines for population and household growth.

The total employment growth is projected at 43% with suburban and rural employment growth projected to continue at a higher rate than urban growth as a result of westward development into rural jurisdictions. Henrico County is projected to remain the largest employer in the Richmond region, with a total of 255,266 total jobs by 2040 or 35% of all regional employment.

The Title VI/Environmental Justice section identifies disadvantaged population groups and analysis of regional transportation investments in areas with concentrations of these groups to reduce disproportional impacts of transportation projects. The special populations and Environmental Justice Areas were identified using the demographic index provided by the Environmental Protection Agency (EPA). The population groups include Minorities, Low-Income, and Zero Car households.

Land Use and Environmental Mitigation

As the Richmond region continues to grow, it becomes more critical that prudent land use and traffic infrastructure decisions are made that consider the impact on the natural environment. Like many American

urbanized areas, the region is expected to experience much of its population growth over the next two decades in areas outside the existing urban core based on the 2012/2040 RRTPO Socioeconomic Data.

A review of existing land use in the Richmond region reveals a different pattern of development in the more rural, rapidly developing jurisdictions as compared to the urban core. While the more urban areas have typically grown along major arterials such as Broad Street or Midlothian Turnpike, rural counties are approaching growth differently by designating "development centers" in their comprehensive land use plans. This change in development patterns comes from a desire to preserve rural areas, an attempt to curb traffic congestion before it becomes an issue, or the need to limit water, sewer and electrical infrastructure investment.

Transportation projects, especially the construction of new facilities, have the potential to negatively impact the natural and human environment. While **plan2040** is not required to address project-level environmental impacts due to the separate environmental review that is conducted prior to the construction of each project, it is still appropriate and necessary to discuss ways to mitigate environmental effects at a regional level. Details on potential environmental impacts are included in the Land Use and Environmental Mitigation section of the Technical Document.

Potential environmental mitigation activities may include:

- Avoiding adverse impacts as a result of construction or implementation of a project
- Minimizing a proposed activity/ project size or its involvement
- Rectifying impacts (restoring temporary impacts) such as noise or light impacts by only working during acceptable hours as an example
- Precautionary and/or abatement measures to reduce construction impacts
- Employing special features or operational management measures to reduce impacts
- Compensating for environmental impacts by providing suitable replacement or substitute environmental resources of equivalent or greater value, on or off-site

Regional Road Network

The primary focus of transportation in the Richmond region is the local road network. Because of heavy reliance on this network, road construction and improvement make up a significant portion of the **plan2040** list of projects. As the region moves toward greater diversity in transportation modes and options, roadways will continue to play a larger role in transportation infrastructure needs.

FHWA classifies roadways utilizing a federal roadway functional classification system. This classification system is based on a road's capacity and design parameters and determines, to a large degree, the source of federal funds which can be used for projects on that roadway. Roads are classified as either, interstate, other freeway and expressway, other principal arterial, minor arterial, major collector, minor collector, and local. These classifications are in order from highest mobility to greatest access. Interstates offer the highest mobility as they provide for the movement of high volumes of traffic between distant points while local roads provide the greatest access to individual parcels, whether, residential or commercial properties.

The RRTPO is charged under 23 CFR 450 with providing a regional forum through which the member localities and agencies decide how to allocate limited Federal highway funds. Road maintenance accounts for a large portion of the transportation dollars spent in the region. According to VDOT's 2015 "State of the Pavement" report, the Richmond Construction District includes more lane mileage to be maintained (18,769 lane miles) than any other Construction District in the state. For the interstate system that runs through counties in

the region, approximately 48% of the lane miles are designated deficient.

The Richmond Regional Bridge and Culvert Inventory and Structural Assessment Report, updated in 2015, provide an inventory of all structures in the region and identify structures with poor conditions. These poor conditions are classified as structurally deficient, functionally obsolete, and weight posted as examples. The following facts provide a brief summary of the report:

- Total Number of Structures: 1,412
- Total Number of Bridges: 815
- Total Number of Culverts: 597
- Total Number of Structurally Deficient Bridges: 110
- Total Number of Functionally Obsolete Bridges: 185
- Total Number of Deficient Bridges: 295
- Median Age of Structures: 30 years
- Number of Structures Eligible for Federal Bridge Replacement Funds: 77
- Number of Structures Eligible for Federal Bridge Rehabilitation Funds: 171

Regional Transit

From 1888 to 1949, the City of Richmond operated the first successful electric streetcar system in the U.S, providing a viable transportation alternative first to the horse and buggy and then to the automobile. The streetcar system was replaced with a limited bus system that is today run by the GRTC Transit System (GRTC). GRTC is co-owned by the City of Richmond and Chesterfield County and offers service primarily within the City, with limited service to Henrico County and an express route to Petersburg.

GRTC provides paratransit services for disabled and low-income residents within a ¾ mile of the fixed-route service areas in the City and Henrico County. Access Chesterfield provides paratransit service in Chesterfield County, and a number of private paratransit companies also help to provide transportation alternatives to the region's disadvantaged population.

Currently, transit in the Richmond region is limited to regular-route and express bus service; however, GRTC is currently pursuing bus rapid transit service, titled the Pulse, along the Broad Street corridor from Willow Lawn in Henrico County to Rocketts Landing in the City of Richmond.

The Greater RVA Transit Vision Plan is a long-term vision document for transit in the greater Richmond area. The Virginia Department of Rail and Public Transportation (DRPT), in cooperation with the RRTPO and GRTC, is developing the plan using current transit and demographic data, land use data and plans, transit and population forecasts, public opinion surveys, and stakeholder input to create a guide for transit development in the Richmond region through 2040. The plan is scheduled to be completed by early fall 2016 and the recommendations from the plan will be used to inform plan2045 or the 2045 Metropolitan Transportation Plan.

Transportation Demand Management

Transportation Demand Management (TDM) is a set of planning processes, strategies, and policies designed to relieve congestion, influence travel demand, improve efficiencies of the transportation network and redistribute demand in space or time. The benefits of TDM include cost effective alternatives to increasing highway capacity and coordinated efforts delivering better environmental outcomes, improved public health benefits, and higher quality of life.

The RRTPO serves as the Richmond region's lead agency responsible for developing TDM processes, strategies, and policies and coordinating and partnering with provider entities that implement TDM strategies and activities. TDM policies, plans

and programs supported by the TPO include:

- Intelligent Transportation Systems (ITS)
- Congestion Management Process (CMP) Planning
- Transit and Fare Incentives
- Carpool and Vanpooling
- Freight Diversion (I-64 Express)
- Flexible Work Hours and Teleworking
- Active Transportation: Bicycle and Pedestrian Connections
- Park and Ride Investments
- Parking Supply
- Other TDM Strategies for Alternative Transportation

Bicycle and Pedestrian Facilities

Biking and walking as daily transportation modes are increasing in the Richmond region as new facilities are constructed. These modes are tradionally considered recreational activities, but are becoming more integrated as a transportation alternative to the car as the costs of our expressways continues to rise and as more people become aware of the health and environmental benefits associated with these two transportation modes. Dedicated facilities providing multimodal connectivity in addition to first and last mile connections on existing roadways create biking and walking as a viable option for commuting.

The following should be considered when planning transportation facilities to make sure that bicycling and pedestrian connections are considered as part of the transportation solution:

- Include bicycle/pedestrian links to improve connectivity when planning for transportation projects
- Identify high concentrations of people and trip generators such as residential areas and key trip attractors to invest resources for improving existing infrastructure into appropriate facilities
- Provide connectivity to transit service
- Engage private sector entities such as developers or employers for collaboration and support of bicycle and pedestrian facilities
- Develop marketing and education strategies for public engagement and outreach

The foundation set by the Commonwealth began in 2004, when the Commonwealth Transportation Board (CTB) adopted a Policy for Integrating Bicycle and Pedestrian Accommodations (called simply Policy), formally requiring the consideration of bicycle and pedestrian accommodations in the planning, funding, design, construction, maintenance, and operation of Virginia's transportation network. Virginia also provides planning assistance to state and local transportation planners, supports various bicycle committees, and promotes bicycle and pedestrian education and safety.

In 2011, VDOT released the State Bicycle Policy Plan establishing a vision for the future of bicycling in the Commonwealth and to advance the CTB's policy on bicycle and pedestrian planning, aimed to advance the bicycle element of the 2004 CTB Policy "consistently, appropriately, and cost effectively." The State Pedestrian Policy Plan followed as a companion plan in 2014. Each plan has its own goals but maintains the same four core elements that outline each plan's more specific recommendations.

Core Elements of Policy Plans

Element 1: Clarify Policies with regard to bicycle/pedestrian accommodations

Element 2: Provide staff training and guidance to integrate the Policy requirements in projects and programs

Element 3: Improve outreach and coordination

Element 4: Measure and evaluate progress

Bicycle Policy Plan Goals

Goal 1: To increase the use of bicycling in Virginia to include a full and diverse range of the population for all trip purposes

Goal 2: To improve safety and comfort of bicyclists throughout Virginia and to reduce bicycle crashes

Pedestrian Policy Plan Goals

Goal 1: Improve the safety and comfort of pedestrians throughout Virginia and reduce pedestrian related crashes

Goal 2: Enhance mobility and accessibility for pedestrians

Goal 3: Achieve a more connected pedestrian network in Virginia

Goal 4: Better promote and educate planners, designers, advocates, and stakeholders on the requirements of the CTB Policy for Integrating Bicycle and Pedestrian Accommodations

Goal 5: Improve available guidance on pedestrian accommodations

Rail in the Richmond Region

Rail in the Richmond region provides critical links for the movement of people and goods, creating an efficient, cost effective and environmentally beneficial transportation mode choice for residents and businesses. The region is traversed by several key rail corridors and is shaped not only by federal and state policy, but also by CSX and Norfolk Southern, Virginia's Class I railroads, and limited short line railroads.

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 2013, Virginia's Department of Rail and Public Transportation (DRPT) completed its most recent rail plan. The Statewide Rail Plan provides the vision and strategies to address rail needs in the Commonwealth. 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 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.

Freight and Intermodal

Intermodal transportation enables cargo and/or goods to be consolidated into economically large units optimizing use of specialized intermodal handling equipment to effect high-speed cargo transfer between ships, barges, railcars, aircraft and truck chassis. The Richmond region is fortunate in that it has good connections to different modes of transportation and enjoys close proximity to major East Coast ports and large population centers. Richmond has also historically provided a major shipping route to bring products and raw materials to markets along the Eastern Seaboard and to world markets across the Atlantic.

CSX and Norfolk Southern currently both provide freight rail in the region, complimented by the Old Buckingham Branch line carrying primarily coal. Acca Yard serves as the largest rail yard in the region.

The Richmond Marine Terminal (RMT), an important inland port facility on the James River, provides the capability to link with international markets and the global economy. The port also offers significant logistical advantages enjoying relatively low roadway congestion and an excellent location along I-95 with easy access to I-64, I-85, I-295 and US 460 and Foreign Trade Zone #207.

Four airports (Richmond International Airport, Chesterfield County Airport, Hanover County Municipal

Airport, and New Kent County Airport) serve the Richmond region. Only Richmond International Airport provides scheduled commercial airline service and major air cargo operations. The other airports support general aviation activities of various levels.

The Central Virginia Emergency Management Alliance

The security of a region and well-being of its residents are of paramount importance to its continued economic, environmental and social health. The Central Virginia Emergency Management Alliance (CVEMA) originated with the Central Virginia Urban Areas Security Initiative (CVUASI), a Department of Homeland Security (DHS) program focused on enhancing regional preparedness in major metropolitan areas. Formed in 2008, it includes 20 localities in and around the Richmond region, all represented in the Central Virginia Urban Area Work Group (CVUAWG). The CVUAWG serves as the governing body for the CVUASI and meets monthly to develop projects to enhance regional preparedness, share information, discuss regional projects, allocate UASI funds, and track the progress of projects already underway.

When funding for the CVUASI was cut, the CVUAWG committed to continuing under a voluntary coalition of emergency management and public safety professionals with a dedicated staff position hosted by the RRPDC. The CVEMA includes local, state, federal, private sector and non-profit representatives with participants from multiple disciplines, including public safety, emergency management, fire/EMS, transportation, public works, social services, health districts, and others. Major work tasks for the CVEMA include Virginia's Secure Commonwealth Initiative Strategic Plan, Virginia Critical Infrastructure Protection and Resiliency Strategic Plan, and other items as part of the State's Emergency Management Program. These plans and program efforts assist in informing the RRTPO Unified Planning Work Program (UPWP) as staff provides technical assistance as needed.

Transportation Innovations

The introduction of technology into transportation has become a major factor in how people travel in the Richmond region. The introduction of alternative fuels and alternative fuel vehicles and alternative transportation modes, such as biking or walking, alleviated the strain on existing resources to accommodate the region's transportation network and development patterns. With technological advancements becoming more integrated into vehicles and modal choice, lower transportation costs, emissions reductions, safety improvements, and more efficient and reliable vehicles are some of the many benefits to system users.

In looking forward to 2040, it is difficult to anticipate the rate of growth for transportation technologies and its impact on the regional transportation system for the existing system and in the future. Intelligent Transportation Systems (ITS) and emerging transportation technologies will be researched and accounted for as they appear in future years and updates. Examples in addition to alternative fuels and electric vehicles include autonomous and connected vehicles, transportation network companies (TNCs) like Uber and Lyft, road sensor technology, telecommuting and e-commerce.

Travel Demand Forecasting

As part of plan2040, the RRTPO in conjunction with VDOT utilized a travel demand model to model road and transit networks and determine net effect of the transportation projects as identified in the Fiscally Constrained Plan. The travel demand model is also used as a tool to determine the emissions that will be generated by vehicles at different points in

the life of the plan but due to the changes in the RRTPO designation to an attainment area, air quality conformity analysis is not required.

The RRTPO hired an on-call consultant to assist in developing the regional travel demand model for further integration into its UPWP. A function added to the model will be a deficiency analysis and updates to the 2040 model network in preparation for plan2045 and a scenario planning/visioning process. The RRTPO hosted a Scenario Planning Peer Exchange Workshop on November 19-20, 2014 with FHWA sponsoring under its Scenario Planning Program to gather staff from peer MPOs and exchange experiences with scenario planning, all to develop an approach for scenario planning as part of the plan2045 update.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) is the integration of a broad range of information communications and control technologies in to the transportation system. The use of these technologies improves the safety, efficiency, and performance of the system. ITS technologies provide accurate, real-time travel information for trip planning and offer other benefits such as congestion reduction, optimization of existing infrastructure, and increased mobility.

Many forms of ITS are currently being used in the Richmond region. They include electronic tolling, traffic cameras, and variable message signs on highways, computerized traffic signal systems, emergency vehicle pre-emption devices on major roadways and automatic vehicle location and electronic fare boxes on the transit system.

Congestion Management Process

The Congestion Management Process (CMP) is required for transportation management area (TMA) MPOs with populations over 200,000. The CMP is a systematic and regionally-accepted approach for managing congestion that provides accurate and current information on transportation system performance and assess alternative strategies for congestion management that meet state and local needs. It assesses the level of roadway congestion in the Richmond region and proposes methods to either alleviate the congestion or to maintain current conditions if they are acceptable. The region is designated by EPA as an attainment area but should it move into non-attainment for air quality in future plans, the CMP is required to consider alternatives and mitigation measures for any roadway projects that increase capacity.

An assessment of traffic congestion in the Richmond region reveals a road network that is operating with short-lived pockets of congestion at peak travel times. The low-density development patterns of the region and low transit density may result in lower levels of service and operations on local roadways in future years. The network for analysis in the CMP includes 21 major roadways.

The performance measures identified and tracked in the CMP include means of transportation to work, travel time to work in minutes, distance to jobs, daily VMT, and annual hours of delay. A separate technical document is developed for the CMP and provides further detail on the performance of the region's transportation network.

Fiscally Constrained Plan

In accordance with federal regulations, plan2040 is produced as a fiscally-constrained plan with all funding sources forecasted to be available over the life of the plan. The funding levels were determined through allocation guidelines for each project type within four time bands, divided between 2016 and 2040. The allocation guidelines are taken into consideration during the selection of projects and the final "constrained list" of projects must not exceed the available

funding. The fiscally constrained plan displays the reality of transportation funding limitations as fewer transportation dollars were available for plan2040 in comparison to previous long range plans. plan2040 is a long-range planning document and given the variables associated with producing accurate 20-year revenue forecasts, allowed more fiscal latitude than shorter-range, programming oriented documents such as the four-year Transportation Improvement Program (TIP).

The RRTPO utilized the project ranking and selection process from plan2035 as the baseline for the plan2040 long range plan. With guidance from the 2040 MTP AC, the plan2035 process was updated and a set of project ranking criteria based on the nine Goals of plan2040 was developed. This action created a direct link between the selection of projects and the plan2040 Goals, which were developed through comparisons of common themes or topics from the federal planning factors, statewide transportation plans, MPO performance measures, and the 2031 LRTP.

Working with revenue forecasts from VDOT (October 2015), the 20-year annual forecast was aggregated into four time bands by fiscal year (FY) to simplify the funding process: FY 2016-2021, FY 2022-2027, FY 2028-2033 and FY 2034-2040. The FY 16-21 time band represents projects included in the RRTPO TIP and VDOT's Six Year Improvement Program (SYIP). Taking these projects into account, $2.2 billion was available for funding new projects in the remaining time bands.

The ranked projects were assigned to time bands based on local project priority and project cost. A further constraint is that certain types of projects were only eligible for certain fund sources (Interstate, bridge, etc.). The MTP AC funded as many projects as possible while still leaving a reserve for future project additions through plan amendments. Eighty-seven new candidate projects are funded, with 5 projects remaining unfunded.

Environmental Justice

Federal regulations dictate that plan2040 address the impact and benefits of transportation projects on disadvantaged population groups to ensure that areas with high concentrations of these populations receive at least a proportional level of transportation dollar investment and are not disproportionately affected by any negative impacts of the projects. The special populations and Environmental Justice Areas were identified using the demographic index provided by the Environmental Protection Agency (EPA). The groups include Minorities, Low-Income, and Zero Car households.

The Richmond region has 40% Minority population, 12% Low-Income population, and 7% Zero Car households out of the total population. The highest concentrations of Minority populations occur in the City of Richmond and Henrico County and the majority of predominantly Low-Income population areas are located within the City of Richmond. There are also several overlapping areas where Low-Income areas are also predominantly Minority areas.

Zero Car households are a new disadvantaged population group, identified as part

Special Population	Total Population/Households	Disadvantaged Group Population/Households	Percentage
Minority Population	1,015,619	407,218	40.1%
Low Income Households	988,487	114,169	11.5%
Zero Car Households	386,418	26,129	6.8%

of the Title VI/Environmental Justice analysis, who are transit dependent. Through overlaying Environmental Justice Areas and Zero Car household concentration areas, 77% of Zero Car household concentration areas were found in concentrated areas for Low-Income and Minority populations, indicating that concentrated areas of low auto ownership are almost all within the predominantly disadvantaged population areas. he disadvantaged population areas were mapped along with new candidate projects to determine areas of overlap. The total cost of projects outside of these areas was compared to the total cost of projects inside areas of high concentrations of disadvantaged populations.

The spatial analysis of transportation investments, as identified in the plan2040 Fiscally Constrained Plan, per capita found that approximately 42% of transportation projects fell entirely or partially within defined EJ areas.

plan2040 does not directly assess the impact of individual projects on disadvantaged populations. The National Environmental Policy Act (NEPA) requires that each project undergo environmental analysis prior to construction, typically performed by the agency or locality managing the project. The TPO does not possess the requisite expertise or specific project information (many projects in early planning stages) to perform an adequate project-level environmental analysis.

Regional Transportation and Land Use Performance Measures

During the Virginia General Assembly legislative session in 2009, a new state legislative requirement was enacted to ensure that MPOs within urbanized areas of over 200,000 persons develop and implement regional performance measures. As mentioned previously, the TPO performance measures were used in the project selection process to weight project scores.

The RRTPO performance measures include multiple metrics for the following categories: congestion reduction, safety, transit usage, HOV usage, jobs-to-housing ratio, job and housing access to transit, job and housing access to pedestrian facilities, air quality, movement of freight and daily vehicle miles travelled (VMT) per capita. Rather than specific targets, most measures instead include desired upward or downward trends. The 2015 annual report redesigned the format of the report and added future measures and connections to the RRTPO UPWP to the current performance measures.

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Part 1: plan 2040 Summary

Table of Contents

RRTPO
Metropolitan Transportation Planning and Development Process

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. The RRPDC 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 plan2040, 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.

MPOs 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).

In 2014, the Richmond MPO changed their name within the Richmond region to be the Richmond Regional Transportation Planning Organization (RRTPO) to clarify the organization's focus on transportation planning. 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.

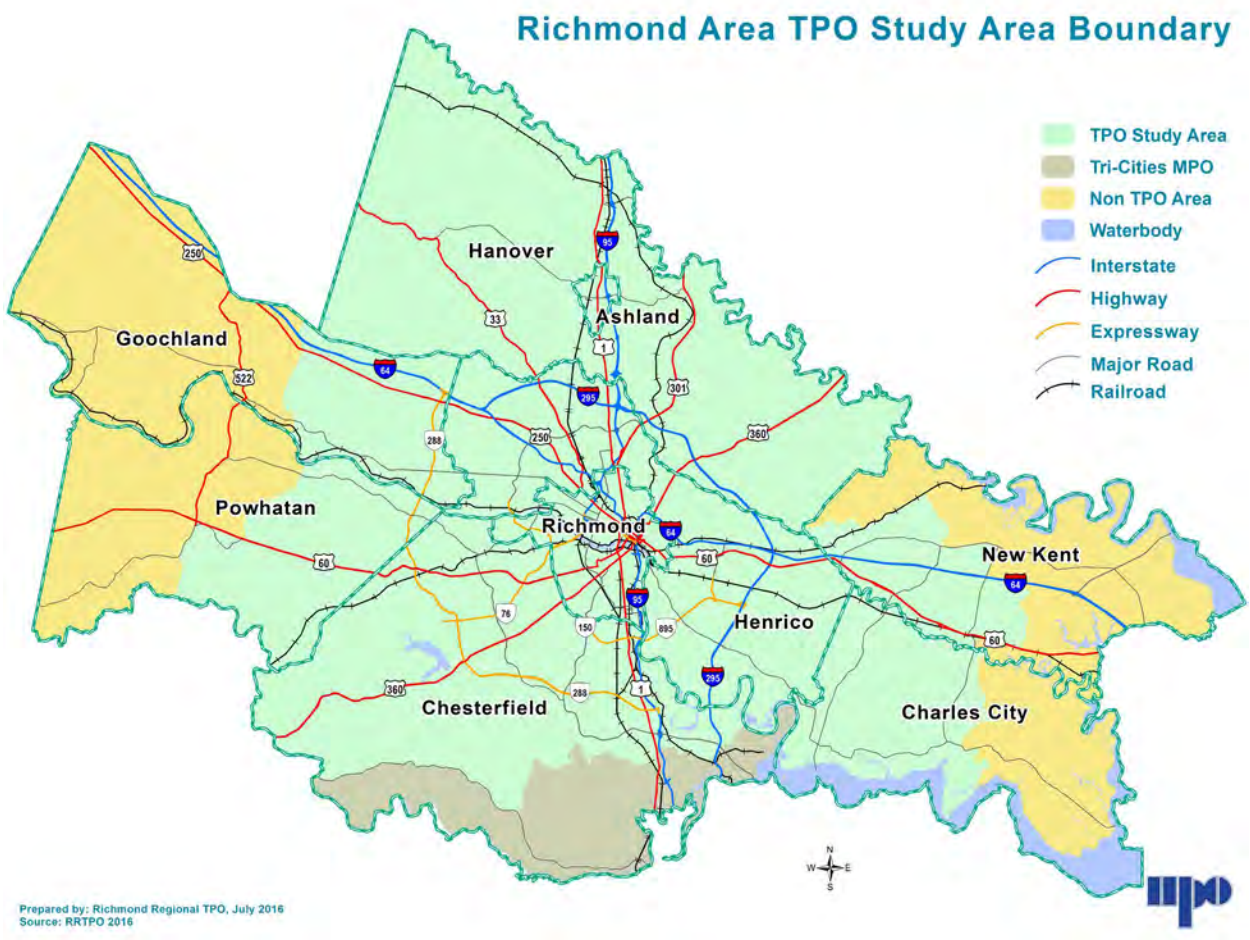
Member Jurisdictions and Partner Agencies

The following jurisdictions are voting members of the RRTPO with the number of votes 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 including:

- CTAC
- EDAC
- FHWA
- FTA
- TPO Chairman's Citizen Appointees (2)
- RideFinders
- DRPT
- Virginia Department of Aviation



MAP 1.1. RICHMOND TPO STUDY AREA BOUNDARY

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 **plan2040** (for this document the horizon year is 2040). 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 2040, the study area has been defined to include:

- Hanover County
- Henrico County
- Town of Ashland
- City of Richmond
- A portion of Charles City County
- A portion of Goochland County
- A portion of New Kent County
- A portion of Powhatan County
- 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 2040 study area and designated urbanized area boundaries are shown in the map.

plan2040 Development Process

Federal and State Legislation

During the development of **plan2040**, two different transportation acts were signed into law, requiring adaptations to regulations related to metropolitan transportation planning and MPOs. On July 6, 2012, the President signed into law the Moving Ahead for Progress in the 21st Century (MAP-21) Act legislation. MAP-21 was the first long-term highway authorization enacted since 2005, funding surface transportation programs at over $105 billion for fiscal years 2013 and 2014. It created performance-based planning and programming with a multimodal approach to address improving safety, maintaining the condition of infrastructure, reducing traffic congestion, improving system efficiency and freight movement, preserving environmental resources, and reducing delay in project delivery. The requirements for a long-range plan and short-term transportation improvement program continued from previous legislation and added the incorporation of performance plans, performance measures and targets, and monitoring progress toward performance targets.

On December 4, 2015, the President signed into law the Fixing America's Surface Transportation Act (FAST Act). USDOT identifies the FAST Act as the first in over ten years that provides long-term funding certainty for surface transportation. The FAST Act made no significant changes to the performance-based planning and programming policy requirements in MAP-21. Notable provisions include:

- Improving the resilience and reliability of the transportation system as part of the scope of the planning process
- Inclusion of intermodal facilities that support intercity transportation, including intercity buses and intercity bus facilities, as part of the metropolitan and statewide planning process. This additional content is part of the statewide transportation plan and transportation improvement program
- Clarifying the role of private providers of transportation
- Requiring State DOTs to incorporate performance measures of a transit agency not represented by a MPO into its long range transportation plan whether if it is in an urban or rural area

- Changing language to "shall" regarding the inclusion of performance measures and a system performance report in a State's long-range transportation

- Requiring the consideration of public ports and freight shippers in long-range transportation plans

To support performance-based planning, new provisions for data collection and management under various data analysis activities, such as travel demand model data and vehicle probe data, received $10 million per year in funding.

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. The FAST Act 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 is composed of the Highway Account, which funds highway and intermodal programs, and the Mass Transit Account. Federal motor fuel taxes are the major source of income 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. Authority to expend from the HTF for programs under the Act and previous authorization acts to [insert date]. After this date, expenditures may be made only to liquidate obligations made before that date.

The FAST Act provided for the continuation of metropolitan and statewide transportation planning processes, with changes made in the planning process for surface transportation. Some of these changes added flexibility and efficiency, while others added new consultation and environmental planning requirements. Safety and security are identified 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 disabled interests are also to be represented.

Metropolitan Planning

The policy for the metropolitan planning process is to promote consistency between transportation improvements and state and local planned growth and economic development patterns. The transportation improvement program (TIP) is to be updated at least every four years. The long-range transportation plan and the TIP are to remain separate documents.

Statewide Transportation Planning

The statewide planning process is to be coordinated with metropolitan planning and statewide trade and economic development planning activities. The statewide plan should include 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.

The FAST Act requires that ten planning factors be considered in the development and update of regional transportation plans. These factors are addressed in plan2040 and are as follows:

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
- Increase the safety of the transportation system for motorized and non-motorized users;
- Increase the security of the transportation system for motorized and non-motorized users;
- Increase accessibility and mobility of people and freight;
- 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;
- Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;
- Promote efficient system management and operation;
- Emphasize the preservation of the existing transportation system;
- Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation; and
- Enhance travel and tourism

In the project ranking process utilized by the RRTPO for the plan2040 update, the federal planning factors plus consistency with statewide transportation plans and local comprehensive land use plans act as the initial criteria for candidate project ranking and selection.

Significant Provisions of the FAST Act

Significant FAST Act provisions for the TPO planning process 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); the Governor and TPO approve the transportation improvement program (TIP)
- The Plan and TIP remain separate documents
- Requirements for a 20-year planning perspective, air quality conformity, fiscal constraint, environmental justice, and public involvement
- Plan 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
- The metropolitan planning process is to promote consistency between transportation improvements and state and local planned growth and economic development patterns

Significant FAST Act provisions for plan2040 include:

- Updated every 5 years (unless the TPO chooses to do so more frequently) in non-attainment and maintenance areas. Attainment areas are updated on a five-year cycle.
- Intermodal connectors are considered as transportation facilities.

- Potential environmental mitigation activities along with potential sites to carry out the activities are included and developed in consultation with federal, state, land management, and regulatory agencies.
- Transit operators are included in the cooperative development of funding estimates for the financial plan section.
- TPOs are required to consult with state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation concerning development of the plan.
- Representatives of users of pedestrian walkways, bicycle transportation facilities and the disabled are included as parties that participate in the planning process.
- Public meetings are to be conducted at convenient and accessible locations at convenient times and are to employ visualization techniques to describe plans, and public information is to be made available in an electronically accessible format, such as on the web.

RRTPO Planning and Programming Process

In compliance with the FAST Act, the RRTPO has developed a transportation planning and programming process that ensures all transportation plans, projects, and programs requiring federal approval or using federal funds are reviewed on the basis of consistent and constant evaluation criteria. In particular, this means that transportation decision-making is "continuing, cooperative, and comprehensive" (also known as the "3C" planning process).

FIG. 1.1. RRTPO BOARD MEETING

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 and its standing committees including the Citizens Transportation Advisory Committee (CTAC), Elderly and Disability Advisory Committee (EDAC), and Technical Advisory Committee (TAC). In addition, special purpose committees, sub-committees and work groups are established as needed and may include representatives from the TPO member organizations and various groups and organizations from throughout the region.

The participation of local elected officials on the TPO and technical staff on the TPO 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" because all member jurisdictions participate and all 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 comprehensive plan

Consideration of impacts and implications that decisions will have on the entire region

An improvement program designed to consider the region's various multimodal transportation needs and allocate available resources

by the most cost-effective and efficient means possible while giving 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:

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

The RRTPO planning process includes the responsibility to bring in participants to address issues such as environmental concerns, privately funded transportation projects, freight services, transit services, and strategies to increase efficiency, safety and security. Groups and advocates for each of these issues are part of the development process and the RRTPO has responded by developing a Metropolitan Transportation Plan Advisory Committee (MTP AC) that is comprised of transportation professionals, citizens, elderly, disabled and low income consumers and representatives, and transportation demand management advocates.

First introduced in earlier legislation, and then refined in the FAST Act, is the need to financially constrain the plan and meet air quality conformity goals. As the MTP AC makes decisions on projects, plans, and priorities, financial constraint and air quality conformity are two primary motivating factors in plan project selection and recommendations. The RRTPO and VDOT are responsible for developing a collaborative process, including public outreach and RRTPO Board involvement for updating the prioritization of transportation projects and strategies contained in **plan2040**.

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 updating transportation and socio-economic data, forecasting future conditions and needs, identifying proposed projects which are evaluated and ranked, evaluating financing, evaluating distribution of benefits/burdens, ensuring conformity with the State Implementation Plan (SIP) for ozone air quality standards, and selecting a preferred alternative if required. The RRTPO's current EPA designation as an attainment area allows for submission for information purposes to the Governor, FHWA, and FTA. The **plan2040** update process as conducted is illustrated in the figure on the next page.

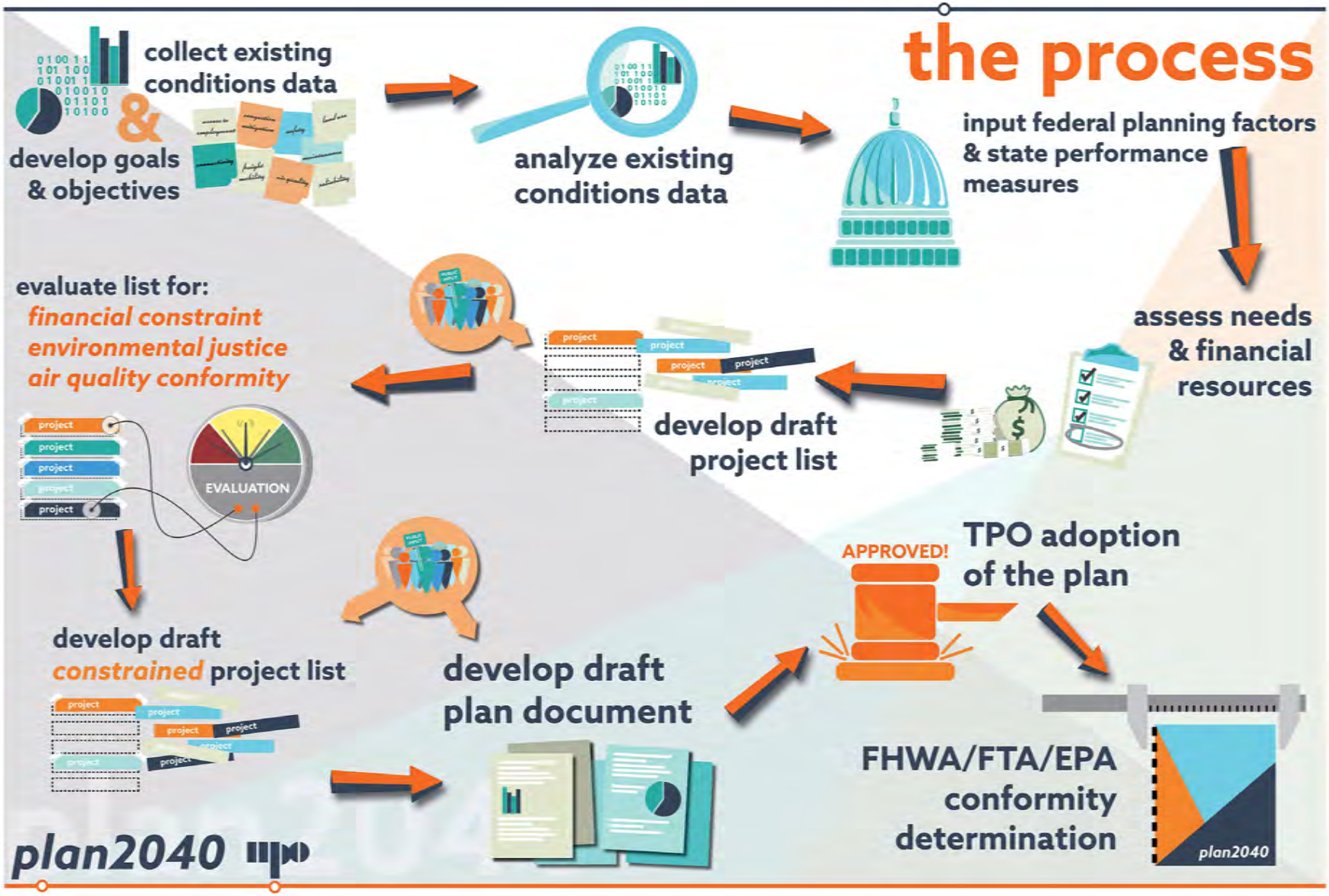


FIG. 1.2. RRTPO METROPOLITAN TRANSPORTATION PLAN UPDATE PROCESS

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. In the past, minority and low-income populations have been identified as the largest disenfranchised group, both in terms of equal access to transportation supply and citizen input. 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 as a group unto itself due to the rapidly rising numbers of this population in the 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. Under these requirements 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. Implementing ADA in the Richmond transportation sector is discussed later in this document. There are five Titles in the Act summarized below.

Title I – Employment

Discrimination against qualified persons with disabilities is prohibited in all aspects of employment. Reasonable accommodations must be made in regard to job site accessibility, communication devices such as telecommunications devices for the deaf (TDD), and modified work schedules or other changes that would allow that person to fulfill his or her job duties. Employers with 25 or more employees were required to comply with this law by July 26, 1992 and private businesses with 15 to 24 employees by July 1994.

Title II – Public Services

All services, programs, and activities provided by public entities or their agents are prohibited from discriminating against persons with disabilities. In general, if a person with disabilities can use the public transportation system, then the public entity may not deny the individual with disabilities the opportunity to use public transportation. In addition, it prohibits public entities from providing services that discriminate against individuals with disabilities. Specific requirements include the following:

- New or leased vehicles for fixed route service and demand responsive service must be accessible (unless equivalent service is provided to persons with disabilities)
- Public entities, which provide fixed route service, must also provide comparable paratransit service
- Remanufactured vehicles (structural changes) must be accessible

- New facilities must be accessible and alterations to transit facilities must include accessible features
- Rail systems must include a key station plan and be accessible
- Rapid and light rail systems must have at least one accessible car per train

Title III – Public Accommodations and Services Operated by Private Entities

Public accommodations must be accessible to persons with disabilities even if they are owned by the private sector. Access must be provided in such public places as theaters, hotels, stores, and public transit stations. Transportation provided for the public by private entities must also be accessible.

Title IV – Telecommunications Relay Services

Telephone companies must provide telecommunication relay devices for those persons with hearing or speech impairments. A TDD is a machine that employs graphic communication in the transmission of coded signals through a wire or radio communication system. A person with disabilities can use a TDD to call the operator who also has a TDD and communicates through a third party.

Title V – Miscellaneous Provisions

Every public entity operating fixed route transit (except for commuter bus, commuter rail, or intercity rail services) is required to submit a plan which includes an implementation schedule with annual updates detailing how paratransit services will be implemented and will be in full ADA compliance. There is a full public participation process throughout the entire planning process.

The following six criteria have been developed to define "comparable paratransit service":

- Operate in the same service areas as the fixed route system.
- Response time that is comparable to the fixed route system.
- Fares may not be more than two and a half times the fare of the fixed route system.
- Hours and days of paratransit service must be comparable to that of the fixed route service.
- Trip purpose may not be prioritized.
- Service availability may not be limited because of capacity constraints.

The Clean Air Act Amendments

The Clean Air Act Amendments (CAAA) were signed into law on November 15, 1990. The 1990 CAAA provided for a comprehensive revision of the 1977 CAAA. 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 that 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 the document.

EPA Region III responded on December 9, 2011 that it intended to designate the Richmond area as "unclassifiable/attainment" and EPA published final designations in the summer of 2012. The current design value for the three-year period from 2013-2015 in the Richmond area, according to DEQ, is 0.063, which is below the 0.07 standard established by EPA in October 2015.

The current designation of an attainment area has removed the requirement of the air quality conformity analysis of the Fiscally Constrained 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.

MAP 1.2. RICHMOND/TRI-CITIES AIR QUALITY MAINTENANCE AREA

plan2040

Public Participation and Outreach

"Each Transportation Planning Organization shall provide citizens, affected public agencies, representatives of public transportation employees, freight shippers, providers of freight transportation services, private providers of transportation, representatives of users of pedestrian walkways and bicycle transportation facilities, representatives of the disabled, and other interested parties with a reasonable opportunity to comment on the transportation plan." (Title VI of FAST ACT Section 134 (i)(5)(a))

Strengthened in the provisions of the Fixing America's Surface Transportation (FAST Act), public participation in the MPO planning process is an integral part of regional transportation plans.

This chapter provides a summary of the public participation and outreach process used during the plan2040 update. It is necessary to establish a free exchange of information and allow for public input at all stages of the planning process. In order for the public input process to be effective, it must be proactive; it must provide complete information to the public; there must be timely public notices to ensure the public's awareness of the opportunities; the public must be allowed to provide input toward decisions; the process must begin early and be continuing; and the process must involve a broad cross-section of the public.

MTP Advisory Committee

The primary mechanism for on-going public input to plan2040 is through the TPO's Metropolitan Transportation Plan Advisory Committee (MTP AC). The MTP AC is composed of voting members from the TPO's Technical Advisory Committee (TAC), Citizens Transportation Advisory Committee (CTAC) and the Elderly and Disability Advisory Committee (EDAC), as well as GRTC Transit System, VDOT and DRPT. There are nine TAC members (one from each TPO area local government), two CTAC members (recommended by CTAC- one Jurisdiction and one At-Large) and one EDAC member (recommended by EDAC). There are also non-voting transportation advisors on the committee composed of staffs from area state and regional transportation agencies and organizations as well as alternates for the TAC and CTAC and transportation agency members.

As a joint technical/citizen advisory committee, the MTP AC provided on-going citizen involvement for development of plan2040 with citizens empowered as voting members on the committee. Notices for all MTP AC meetings are posted on the RRPDC and plan2040 websites, with meeting agendas emailed to area news media and interested citizens.

Each MTP AC meeting had an open comment period at the beginning of the meeting.

A website (http://www.richmondregional.org/plan2040) was developed for the plan2040 update which included information about committee members, schedule, meeting agendas and meeting summaries, scope of work and information about public engagement. The website also provided contact information for more information or to submit comments throughout the public review period. The plan2040 website is nested within the RRPDC main website.

Public Outreach

Outreach for plan2040 was undertaken in two efforts, starting with initial presentations at various local government and community meetings and a formal public review period for the draft document held in August 2016.

Early Input: March – May 2016

The first public outreach effort focused on promotion and

FIG. 2.1. PLAN2040 WEBSITE

education on plan2040 and the RRTPO as an organization through presentations and the launch of an online survey. TPO staff engaged the MTP AC, TAC, CTAC, and EDAC for invitations to present at any upcoming meetings to speak about plan2040 and opportunities for people to participate in the update process. Over the months, staff delivered presentations at the following meetings or events:

- Richmond TPO Transportation Forum: March 4, 2016
- Active RVA Summit: March 7, 2016
- Ashland Town Council: March 15, 2016
- Constituents of Frank Thornton Henrico Community Meeting: March 24, 2016
- New Kent County Planning Commission: April 18, 2016
- New Kent Outreach Council: April 20, 2016
- Chesterfield County Board of Supervisors: April 27, 2016
- Goochland Community Partners: May 11, 2016
- Senior Connections Open House: May 24, 2016

As part of the presentation and early public outreach, TPO staff highlighted a survey asking for input on the nine Goals of plan2040 and prioritizing transportation investments in the Richmond region. The survey was available online through the RRPDC and plan2040 websites and in hard copies with pre-stamped envelopes at all staff presentations and presentations to the CTAC and EDAC at their May 2016 meetings. The survey received 56 responses and provided information on public opinion of transportation goals and priorities for funding and future projects. Details about the survey results may be found at the Appendix of the Summary Document.

The results of the survey found that the top three goals for improving transportation in the Richmond region, as identified by participants, are Multimodal Connectivity, Access to Employment, and Transportation and Land Use Integration. Respondents prioritized improvements fairly evenly across all options but the top three are maintaining and repairing highways, roads, and bridges, expanding and improving existing public transportation service, and creating new sidewalks and bicycle paths.

The survey provided a question allowed respondents to write in additional comments or questions about the regional transportation system. 22 responses covered a

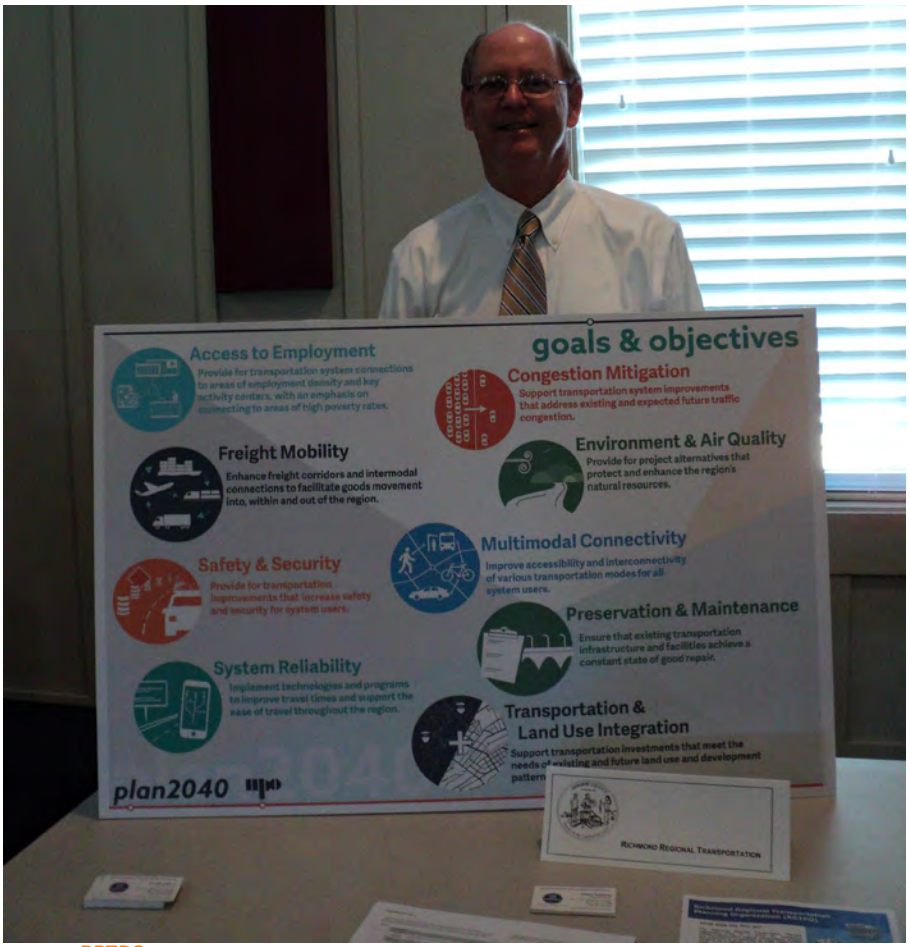


FIG. 2.2. RRTPO STAFF AT THE NEW KENT OUTREACH COUNCIL MEETING ON APRIL 20, 2016

FIG. 2.3. PLAN2040 SURVEY

range of topics including (but not all):

- Need for regional public transportation including the expansion of transit service and access to transit, especially related to access to employment
- Investing in multimodal planning in the region to move from auto centric travel
- Reduction in funding road widenings and expansions
- Transportation and land use that supports all modes of transportation
- More business location research to stimulate economic development
- Greater collaboration between the City of Richmond and its neighbors
- Addressing the needs of the transportation dependent population such as seniors and individuals with disabilities and the barriers that prevent these populations from being to walk to transit stops

Public Review of Draft Document: August 2016

The draft document in Word format was submitted to the MTP AC at their June 15, 2016 meeting and approved for formal public review by the TPO Board at the July 7, 2016 meeting. Bound copies of the draft plan were made available during the review period at selected community libraries, RideFinders offices and the RRPDC offices; the documents were also made available for review on the RRPDC and Capital Region Collaborative websites. Social media accounts (Facebook and Twitter) for the RRPDC and RRTPO were used to provide supplemental information on the public review period and upcoming public meetings.

Invitation for public comment and notice of public review was e-mailed and mailed on August 9, 2016 to the TPO, TAC, CTAC, and EDAC members, alternates, and interested parties. Other organizations notified include nonprofit, human service, social service agencies and organizations, miscellaneous public and private transportation providers, emergency management contacts, previous public review meeting attendees, and RRPDC staff. A separate e-mail was sent to resource agencies on August 10, 2016 to notify them of the public review period for the draft document and a request for comments.

Notice of the public review period was published in several area newspapers:

- Richmond Times-Dispatch – 3 col x 7-inch ad – August 1, 2016
- Richmond Free Press – 3 col x 5.25-inch ad – August 4, 2016
- Chesterfield Observer – 4.64 x 2.89-inch ad – August 3, 2016
- Goochland Gazette – 3 col x 4.5-inch ad – August 3, 2016
- Mechanicsville Local – 3 col x 4.5-inch ad – August 3, 2016
- Powhatan Today – 3 col x 6.75-inch ad – August 3, 2016
- Henrico Citizen – 2.4 x 1.5-inch ad for e-mail distribution, 4.167 x 2.431-inch for online posting, 4.75 x 2.85-inch ad for print – August 4, 2016
- Herald Progress – 3 col x 5.25-inch ad – August 4, 2016

Public Meetings

Three public meetings at three locations in the Richmond region, selected as part of the Environmental Justice analysis related to plan2040. The public engagement process aims to improve access to public meetings for populations that have historically faced barriers to participation in transportation planning. Using an interactive mapping strategy, meeting locations were identified that are convenient and accessible for vulnerable populations impacts by projects identified in the Fiscally Constrained Plan. Two of the three public meeting locations were selected based on critical criteria including proximity to proposed projects, a higher than average percentage of low-income residents, and higher than average percentage of residents of color.

A total of 32 attendees came to the three public meetings where display boards highlighting elements of plan2040 as well as a formal presentation were presented. Opportunities for questions and discussion were available throughout all meetings and comment forms were distributed to attendees.

August 16, 2016 from 6:00 – 7:30 PM

Varina Library, 1875 New Market Road, Henrico, VA 23231

August 17, 2016 from 6:00 – 7:30 PM

Ginter Park Library, 1200 Westbrook Avenue, Henrico, VA 23227

August 22, 2016 from 6:00 - 8:00 PM

Meadowdale Library, 4301 Meadowdale Boulevard, Richmond, VA 23234

This public engagement process aimed to improve access to public meetings for populations that have historically faced barriers to participation in transportation planning. Using an interactive mapping strategy, meeting locations were identified that are convenient and accessible for vulnerable populations impacted by projects identified in the constrained plan. Planning activities are informed by Executive Order 12898 on Environmental Justice. Two of three plan2040 public engagement locations were selected based on critical criteria including proximity to proposed projects, a higher than average percentage of low-income residents, and a higher than average percentage of residents of color.

A basic asset map was developed for this MTP public engagement process. Employing GIS and Google Maps, census tracts adjacent to proposed projects that fall above the regional threshold for low-income households or residents of color were selected for meeting siting. Libraries in these communities were identified to host meetings at which the plan2040 document will be reviewed in its entirety with an emphasis placed on informing the public about projects that are likely to impact identified communities. A third library location was selected at the request of a member of the RRTPO board.

This basic asset mapping activity using GIS and Google Maps will be documented in full as the RRTPO's Title VI and Environmental Justice Program continues to expand further to inform a broader array of work program activities.

plan2040 Public Review Comments

Public comments received during the August 2016 comment period were compiled by TPO staff and responses will be drafted and reviewed with the 2040 MTP Advisory Committee at their September 13, 2016 meeting.

Comment #1: Comment Form Filled Out at Public Meeting

More transit access for those who do not have transportation.

Staff Response

Emerging transit efforts are currently underway to explore more transit service and access in the Richmond region including the Greater RVA Transit Vision Plan, City of Richmond's Transit Network Plan, and GRTC Transit System's Transit Development Plan. The Greater RVA Transit Vision Plan, developed by the Virginia Department of Rail and Public Transportation with the RRTPO, is scheduled to finish in fall 2016 with a commitment of the recommendations from the plan to be used to inform the plan2045 update. Current transit and demographic data, land use data and plans, transit and population forecasts, and stakeholder inputs are used as part of the plan development to create a regional transit vision plan, which will help guide transit development through 2040. The study schedule has a Fall 2016 timeframe for a final draft of the plan.

The Richmond Transit Network Plan is a yearlong planning study starting back in April 2016, which is analyzing the GRTC Transit System current bus network within the City of Richmond's boundary and reconsidering the design of the bus routes. The plan will consider how to connect local routes to the GRTC Pulse and seek public and stakeholder input throughout the development of the plan. Three concepts are being explored as part of the plan development: Familiar Concept, High Coverage Concept, and High Ridership Concept. These three concepts are only for input and feedback from the public, stakeholders and elected officials before a proposal for a new network is developed.

GRTC Transit's Transit Development Plan (TDP), last updated in January 2016 for Fiscal Years 2012-2017, is a requirement from the Virginia Department of Rail and Public Transportation (VDRPT) for any public transit operator receiving state funding. VDRPT identifies TDPs as a way to help transit operators improve their efficiency and effectiveness by identifying the need and required resources for modifying and enhancing services provided to the general public. It also helps operators effectively execute planning, funding, and implementation of public transit services. These plans are updated every six years and must be adopted by the operator's governing body. The update to GRTC Transit System's TDP will contain elements including goals and objectives, an evaluation of existing service and system, transit service and facility needs, service and facility recommendations, a capital improvement program (CIP), financial plan, and monitoring and evaluation procedures.

Comment #2: Comment Form Filled Out at Public Meeting

Potholes on I-295, getting off at Varina-Enon Bridge heading north.

Staff Response

The Regional Road Network section in the Technical Document portion of **plan2040** provides information on the roadway surface conditions in the Richmond Construction District, highlighting how it maintains the most lane-miles in the state of Virginia at 18,769 lane-miles. Information on the pavement conditions of the interstate system can be found in the Virginia Department of Transportation's State of the Pavement report updated annually. Maintenance funding for the roads result in approximately 80% off the top of available funding for transportation projects in the Richmond region as a reflection of the state of Virginia as a state of good repair and prioritizing the maintenance of the existing transportation system before any new construction. The RRTPO will continue its coordination with the VDOT Richmond District on pavement conditions.

The State of Good Repair program, established under the 2015 Governor's Omnibus Transportation Bill, is another funding program that provides state and federal construction funds for the capital reconstruction of deteriorated bridges and pavements. State of Good Repair projects are programmed in the Six-Year Improvement Program, a list of projects that are completely funded for construction. The program, which is subject to a separate asset management process, is another option for addressing the pavement conditions of roads in the Richmond region.

Comment #3: Comment Form Filled Out at Public Meeting

Better road projects like the ones in the West End and Southside.

Staff Response

The RRTPO works with all of their partners to identify transportation investments that provide several benefits to the Richmond region including economic development, job access, and multimodal connectivity. Such benefits are highlighted in the nine Goals of **plan2040**, which guide the selection of candidate projects in the Fiscally Constrained Plan. On-time delivery and quality of road projects in the region are also priorities for the RRTPO through the administration of funding programs such as the Regional Surface Transportation Program (RSTP) and Congestion Mitigation and Air Quality Program (CMAQ).

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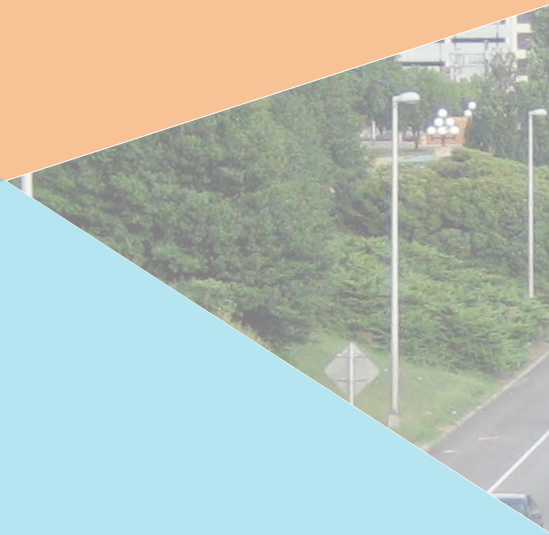

Performance Measures

After reviewing the federal and state legislation that directs the development of the RRTPO's Unified Planning Work Program and plan2040 under the RRTPO Metropolitan Transportation Planning and Development Process section, this section will look into performance measures on a regional scale and highlight the RRTPO Regional Performance Measures Annual Progress Report, recently updated for 2015. Performance-based planning and programming is also reflected in the plan2040 Goals, which are discussed in further detail in the next section of the Summary Document.

Background

During the Virginia General Assembly legislative session in 2009, a new state legislative requirement was enacted to ensure that Metropolitan Planning Organizations (MPOs) within urbanized areas of over 200,000 persons develop and implement regional performance measures. This legislative requirement affects the following Virginia MPOs:

- Fredericksburg Area MPO
- Hampton Roads TPO
- Northern Virginia MPO
- Richmond Regional TPO
- Roanoke Valley MPO
- Tri-Cities MPO (due to inclusion in the Richmond urbanized area)

The RRTPO received a letter from then Secretary of Transportation Pierce Homer on January 8, 2010 advising of the action taken during the 2009 General Assembly session to establish these performance measures (part of House Bill 2019/Senate Bill 1398, relating to the Statewide Transportation Plan and transportation corridors). Chapter 670 of House Bill 2019 and Chapter 690 of Senate Bill 1398 state that the implementation of performance measures may be required for MPOs to receive matching federal Surface Transportation Program funds. This legislation charged the Office of Intermodal Planning Investment (OIPI) of the Secretary of Transportation with the responsibility to (among other things), "develop quantifiable and achievable goals ... and transportation and land use performance measures and prepare an annual performance report on state and regional efforts."

The legislation further specifies under Section 33.1-23.03 "Board to Develop and Update Statewide Transportation Plan" that the Commonwealth Transportation Board (CTB) "may require that appropriate regional organizations develop as part of a long-range plan quantifiable measures and achievable goals for the urban region relating to , but not limited to, congestion reduction and safety, transit and high-occupancy vehicle (HOV) usage, job-to-housing ratios, job and housing access to transit and pedestrian facilities, air quality, movement of freight by rail, and per capita miles traveled."

The requirement to develop and implement these performance measures is enforced in Budget Bill Item 436: "Beginning July 1, 2011, in providing the required match for federal Regional Surface Transportation Program funds made available to Metropolitan Planning Organizations in urbanized areas greater than 200,000, the board shall only make allocations to those Metropolitan Planning Organizations that, in consultation with the Office of Intermodal Planning and Investment, have developed regional transportation and land use performance measures pursuant to Chapters 670 and 690 of the 2009 Acts of Assembly and have been approved by the board."

At the October 14, 2010 MPO meeting, staff reported on this matter, advising that the Secretary's Office had secured a consultant to assist MPOs with identification of the required measures. In view of the schedule noted for completion of work on these performance measures, staff recommended and the MPO authorized the MPO's TAC to take action on behalf of the MPO to review and approve regional transportation performance measures and also submit these approved measures to the CTB for its review and approval. Conference calls and discussions were held with staff from VDOT, OIPI, and other affected MPOs to develop proposed measures to meet the requirements of this legislation. In early January 2011, staff received from OIPI "Regional Performance Measures Guidelines" and was advised to submit its list of regional performance measures to OIPI by April 30, 2011.

Further direction contained in the guidelines from OIPI were that, going forward, all MPOs should update the regional performance measures before the end of October of each year and that the measures should be posted on each MPO's respective website. OIPI is to be notified when the measures are completed and posted.

In consultation with the MPO's TAC, and in consideration of the available data and performance measures most suitable for the Richmond area, the TAC at its meeting on March 17, 2011, approved a resolution that, acting on behalf of the MPO, approved a final draft list of Regional Performance Measures, and authorized its submission to the Office of Intermodal Planning (OIPI).

At its meeting in June, 2011 the CTB approved the performance measures as recommended by the various MPOs. The measures for the Richmond area are shown in the table as first introduced. Following notification of the CTB's approval of the Richmond area proposed regional performance measures; the next task was to collect the data for each measure to establish a baseline from which to track the trends in system performance.

Staff used the various data sources as suggested in the matrix shown, and developed the baseline for each measure. Upon completion of the data collection, the regional performance measures were posted on the RRPDC/TPO website by the due date of October 31, 2011. Staff was notified by the OIPI on November 1, 2011 that the Richmond TPO fulfilled its obligation to develop regional transportation and land use performance measures as set forth by the Virginia General Assembly. A partial list of the original regional performance measures is shown in the table.

Regional Performance Measures – Annual Progress Report 2015

The Regional Performance Measures – Annual Progress Report 2015 modified the format of the data report into a document with a summary overview of the performance measures tracked by the RRTPO and an analysis of the trends for the region's multimodal transportation system performance. The report provided comparisons of the Richmond region's performance versus peer and similarly sized regions and highlighted technical reports and work efforts related to the performance measures as part of the RRTPO's Unified Planning Work Program.

REGIONAL PERFORMANCE MEASURES FOR RICHMOND AREA MPO						
Rows that are shaded are categories of regional performance measures that are mandated by General Assembly legislation. Other rows are performance measures to fulfill the legislative requirements.						
Performance Measure Matrix						
Performance Measure	**Data Requirements**	**Data Source**	**Level of Data Collection**	**Desired Trend/Target**	**Reporting Format**	**Frequency of Update**
Congestion Reduction						
Annual Hours of Delay per Peak Period Traveler	Annual hours of delay and number of peak period travelers	Texas Transportation Institute Urban Mobility Report	Richmond Urbanized Area (Census)	Downwards	Table and Line Chart Graph	Annual
Annual Gallons of Fuel Lost Due to Congestion per Peak Period Traveler	Annual gallons of fuel lost to congestion and number of peak period travelers	Texas Transportation Institute Urban Mobility Report	Richmond Urbanized Area (Census)	Downwards	Table and Line Chart Graph	Annual
Safety						
Number of Highway Crashes	Number of Crashes on Highways	VDOT	PDC*	Downwards	Table and Bar Chart	Annual
Number of Highway Crashes per 100 million VMT	Number of Crashes on Highways and VMT	VDOT	PDC*	Downwards	Table and Bar Chart	Annual
Number of Highway Fatalities	Number of Fatalities on Highways	VDOT	PDC*	Downward (If 0 fatalities then Steady)	Table and Bar Chart	Annual
Number of Highway Fatalities per 100 million VMT	Number of Fatalities on Highways and VMT	VDOT	PDC*	Downward (If 0 fatalities then Steady)	Table and Bar Chart	Annual
Number of Transit Crashes	Number of transit crashes	FTA/NTDB	GRTC System	Downwards	Table and Bar Chart	Annual
Number of Transit Fatalities	Number of Transit Fatalities	FTA/NTDB	GRTC System	Downward (If 0 fatalities then Steady)	Table and Bar Chart	Annual
Annual Transit Crashes per 100 million PMT	Number of Collisions per 100 million Passenger Miles Travelled (PMT)	FTA/NTDB	GRTC System	Downwards	Table	Annual
Annual Transit Fatalities per 100 million PMT	Number of fatalities per 100 million PMT	FTA/NTDB	GRTC System	Downward (If 0 fatalities then Steady)	Table	Annual
Number of Bicycle and Pedestrian Crashes	Number of Bicycle and Pedestrian Crashes	DMV	PDC*	Downwards	Table and Bar Chart	Annual
Number of Bicycle and Pedestrian Fatalities	Number of Bicycle and Pedestrian Fatalities	DMV	PDC*	Downward (If 0 fatalities then Steady)	Table and Bar Chart	Annual
Transit Usage						
# of Transit Trips Per Capita	# of transit trips and service area population**	DRPT	GRTC System	Upwards	Table and Bar Graph	Annual
Annual Transit Passenger Miles Travelled per Capita	Transit Passenger Miles and service area population**	DRPT	GRTC System	Upwards	Table	Annual
Annual Transit Revenue Miles per Capita	Revenue miles and service area population**	DRPT	GRTC System	Upwards	Table	Annual
# of Annual Transit Revenue Miles	Transit Revenue Miles as reported by GRTC	DRPT	GRTC System	Upwards	Table and Bar Graph	Annual
Annual Passenger Rail Ridership	# of Amtrak boardings and alightings at rail stations	Amtrak	Ashland, Staples Mill Rd., Main St. stations	Upwards	Bar Graph	Annual
HOV Usage						
# of Park and Ride Lots and Spaces	Number of P-n-R lots and spaces	VDOT	PDC*	Upwards	Table and Line Chart Graph	LRTP Update
# of Registered Vanpools	TDM data	RideFinders	RideFinders Service Area	Upwards	Table and Line Chart Graph	Annual
Jobs-to-Housing Ratio						
Ratio of jobs to households at the regional and jurisdictional level	Jobs and Housing data	Richmond MPO Socioeconomic Data Report	By locality for PDC	Steady	Table and Line Chart Graph	LRTP Update
Regional Linear Jobs-Households Dissimilarity index (0.0 to 1.0) ***	Number of Jobs/ Households	Bureau of Economic Analysis for # of jobs; ACS Table 2501 Occupancy Characteristics of Households	By locality for PDC	Below 0.5	Table	LRTP Update
Inter and Intra regional commuting data	Commuting pattern data; % of workers working in the County in which they live	Census (ACS) Journey to Work data	By locality for PDC	Upwards	Table or Map at PDC level	LRTP Update

FIG. 3.1. ORIGINAL REGIONAL PERFORMANCE MEASURES MATRIX

Performance measures were used as part of the project evaluation process for the Fiscally Constrained Plan, and similar statistics and data were requested for project applications to determine how well projects met the nine Goals of **plan2040**. The last element of the report identifies new measures that either relate to a Goal from **plan2040** and has data readily available to TPO staff or should be considered for future updates to the annual report. The report can be found on the RRPDC website and is available upon request.

MAP-21 and the FAST Act emphasize performance measurement as part of the States and MPO process, coining the term "Performance-Based Planning and Programming (PBPP)".

"Performance-based planning and programming includes using transportation performance measures, setting targets, reporting performance, and programming transportation investments towards the achievement of transportation system performance outcomes" (FHWA, PBPP Guidebook)

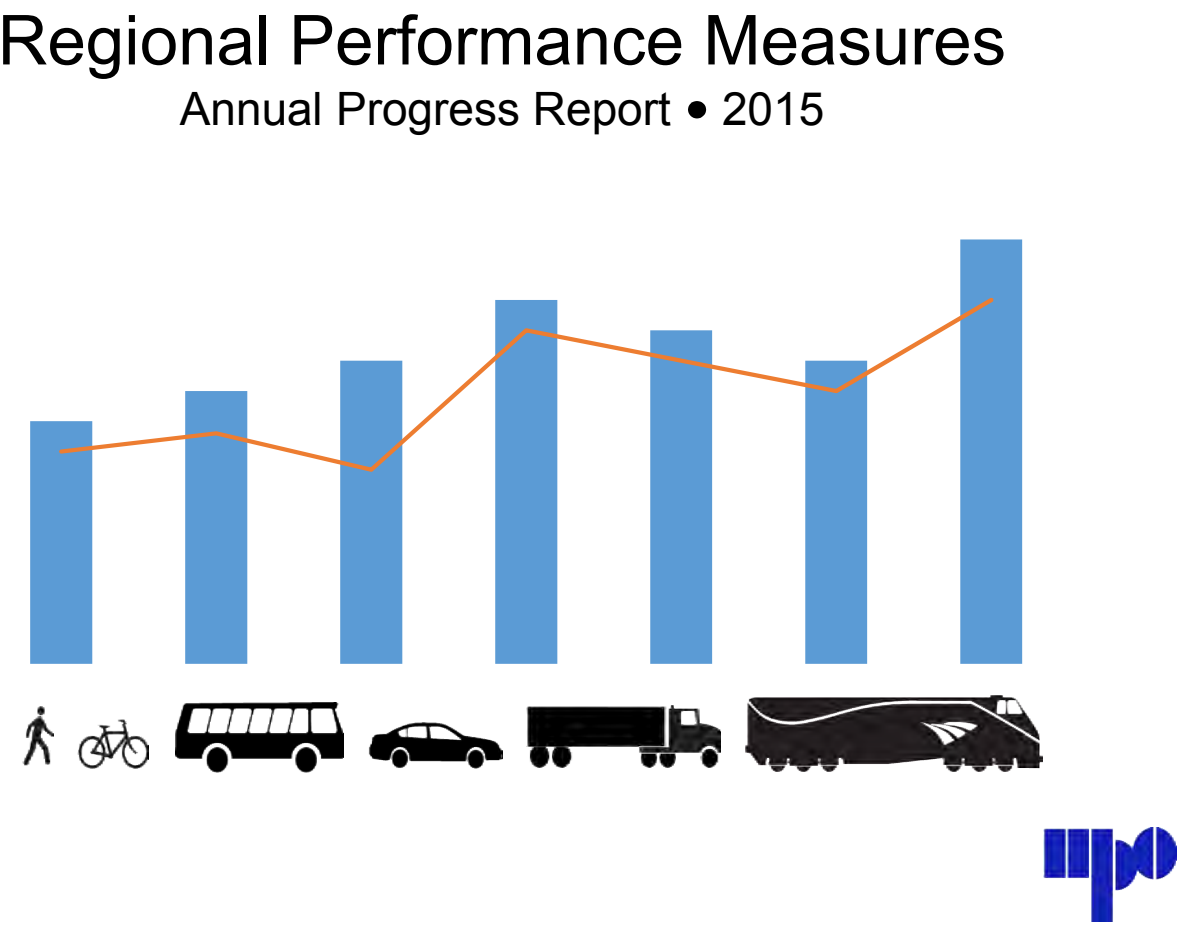

FIG. 3.2. RRTPO COVER OF REGIONAL PERFORMANCE MEASURES ANNUAL PROGRESS REPORT

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plan2040

Goals

One of the findings of the federal certification review of the RRTPO in September 2014 was the lack of goals and objectives in the 2035 Long-Range Transportation Plan. Without goals and objectives, there was no guidance in the implementation of plan2035 for projects and programs. This left a gap in establishing and monitoring performance measures, introduced in MAP-21 legislation and from VDOT in regional performance measures.

Staff worked with the MTP Advisory Committee to develop goals for plan2040 starting with a comparison across different sources to identify recurring themes or overlaps in goals. The table below was sent out to MTP Advisory Committee members with a request for input on the comparison and feedback on additional areas.

The sources include federal planning factors, MAP-21 goals, Virginia Multimodal Transportation Plan (VTrans2040), House Bill 2 (HB2) Weighting Factors, and 2031 LRTP Goals.

The federal planning factors issued by Congress continue through MAP-21 and FAST Act as an integrated element of the transportation planning processes for both statewide and metropolitan planning organizations. Up until the final planning rule was released for the FAST Act on May 27, 2016 by FHWA and FTA, there were eight planning factors to provide direction for a multimodal transportation plan and process:

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 the accessibility and mobility of people and for 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, people and freight

7. Promote efficient system management and operation

8. Emphasize the preservation of the existing transportation system

Two new federal planning factors introduced in the FAST Act address resiliency and reliability or reduction/mitigation of stormwater impacts and travel and tourism.

The national performance goals in MAP-21 focus on:

- Safety: to achieve a significant reduction in traffic fatalities and serious injuries on all public roads
- Infrastructure Condition: to maintain the highway infrastructure asset system in a state of good repair
- Congestion Reduction: to achieve a significant reduction in congestion on the National Highway System
- System Reliability: to improve the efficiency of the surface transportation system
- Freight Movement and Economic Vitality: to improve the National Freight Network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
- Environmental Sustainability: to enhance the performance of the transportation system while protecting and enhancing the natural environment
- Reduced Project Delivery Delays: to reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

VTrans2040 is currently under development but its Vision was adopted by the Commonwealth Transportation Board on December 9, 2015, serving as a policy framework to guide investment decisions over the next 25 years. The five goals are as follows:

Congestion Mitigation

Economic Development

Accessibility

Safety

Environmental Quality

Transportation & Land Use (for areas over 200,000 in population)

The last source of goals for plan2040 is the Richmond Area MPO's 2031 Long-Range Transportation Plan. These goals were short objectives for the plan, and describe initiatives for the transportation system in the Richmond region.

A safe and efficient regional transportation system

A regional transportation system that is well maintained and maximizes performance

A regional transportation system that promotes economic development and quality job creation

Air, rail, and port facilities to meet the region's growing needs

A sustainable regional transportation system that is environmentally compatible and ensures a high quality of life for all the region's citizens

A transportation planning process that is inclusive, comprehensive and flexible

A balanced transportation system that offers attractive modal choices and serves the needs of the region's diverse and changing population

A secure and resilient transportation system that meets Homeland Security and Emergency Preparedness needs

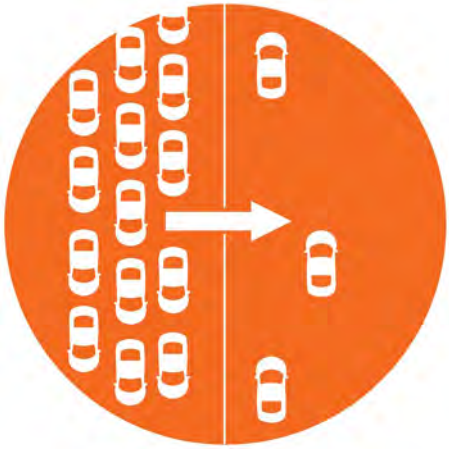
Through discussion with the MTP Advisory Committee, nine goals were developed for plan2040 and approved on August 26, 2015. The RRTPO Board reviewed and approved the goals at their September 24, 2015 meeting for inclusion in the plan2040 document as guidance for the development of the Project Ranking and Selection Process in the Fiscally Constrained Plan. Details of the relationship between the plan2040 Goals and the Project Ranking and Selection Process can be found in the Fiscally Constrained Plan section of the Summary Document. Each Goal features questions used in the Candidate Project Applications as part of the development of the Fiscally Constrained Plan, requesting information and data from applicants as to how the project met each of the nine Goals.

Access to Employment

Provide for transportation system connections to areas of employment density and key activity centers, with an emphasis on connecting to areas of high poverty rates

Will planned regional projects improve access to areas of employment density?

Will planned regional projects increase accessibility to key regional activity centers from areas with high poverty rates?



Congestion Mitigation

Support transportation system improvements that address existing and expected future traffic congestion

Will planned projects improve areas of localized congestion within the project area?

Will planned projects improve system functionality?

Environmental & Air Quality

Prioritize project alternatives that protect and enhance the region's natural resources

Will planned projects minimize air quality impacts?

Will planned projects minimize impacts on natural and cultural resources?

Freight Mobility

Enhance freight corridors and intermodal connections to facilitate goods movement into, within, and out of the region

Will planned projects improve the regional intermodal freight network?

Will planned projects improve access to freight-intensive facilities?

Multimodal Connectivity

Improve accessibility and interconnectivity of various transportation modes for all system users

Will planned projects introduce new connections between new or existing travel patterns?

Will planned projects eliminate barriers in key corridors?

Will planned projects implement Complete Street elements?

Preservation & Maintenance

Ensure that existing transportation infrastructure and facilities achieve a consistent state of good repair

Will planned projects prolong the useful life of the transportation system and infrastructure through reconstruction, rehabilitation, and preventative maintenance?

Prolong the useful life of bridge infrastructure or transportation facilities/fleet through reconstruction, rehabilitation, and preventative maintenance?

Safety & Security

Provide for transportation improvements that increase safety and security for all system users

Will planned projects reduce injury and fatality crash rates?

Reduce non-motorized crashes (bicycle and pedestrian)?

Improve transportation system security?

System Reliability

Implement technologies to improve travel times and support the ease of travel throughout the region

Will planned projects address high travel times or improve reliability?

Increase public transportation service frequency and capacity?

Incorporate travel demand management (TDM) strategies?

Transportation & Land Use Integration

Support transportation investments that meet the needs of existing and future land use and development patterns

Will planned projects promote in-fill development or redevelopment of brownfield sites? Reduce per capita vehicle miles traveled (VMT)?

Improve or support transportation infrastructure in existing and planned growth areas? Promote walking or bike-friendly, mixed-use development?

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plan2040

Fiscally Constrained Plan

According to federal metropolitan planning rules, plan2040 must include a financial plan that estimates how much funding will be needed to implement recommended improvements, as well as operate and maintain the system as a whole, over the life of the plan. This includes information on how the TPO reasonably expects to fund the projects included in the plan, including anticipated revenues from FHWA and FTA, state government, regional or local sources, the private sector, and user charges. plan2040 must demonstrate a balance between the expected revenue sources for transportation investments and the estimated costs of the projects and programs described in the plan. In other words, plan2040 must be fiscally (or financially) constrained.

Federal metropolitan planning rules require that the RRTPO, VDOT, and DRPT cooperatively develop transportation revenue forecasts. Forecasts are based on trends from existing and potential funding sources such as the gas tax or bond measures. In addition, project cost estimates in the financial plan must be shown in "year of expenditure" dollars based on reasonable inflation factors.

Given the long-term nature of plan2040, and the degree of uncertainty in estimating both costs and revenues, funding shown in plan2040 may not be available in exactly the same amounts or mix of sources indicated in the Plan. Actual funding amounts depend on the federal, state and local budget processes for any given year. Near term plans, such as the Transportation Improvement Program (TIP) which covers four years, must demonstrate stricter fiscal constraint, ensuring that as costs and revenue forecasts become more precise, and as projects move towards implementation, fiscal accountability is maintained.

Financial Resources

The FAST Act is the current federal legislation authorizing funding for state transportation programs. The FAST Act guarantees funding for each state, keyed to federal Highway Trust Fund (Highway Account) receipts.

The FAST Act has a range of distinct funding categories, but only a few provide the vast majority of federal funds for surface transportation projects in the Richmond area. These are the National Highway Performance Program (NHPP) funds, Surface Transportation Block Grant Program funds, Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds, Highway Safety Improvement Program (HSIP), and Transit Capital funds.

With regard to transit capital, the Federal Transit Administration (FTA) oversees the allocation of federal transit funds, which generally fall into two major categories: capital grants for transit operators that are apportioned to areas by national formula, and transit capital investment grants that are awarded on a "discretionary" basis, as determined by FTA on the basis of a series of evaluation criteria.

Most FAST Act funding programs require a 20 percent match to the federal dollars provided for a given project. Since there is no federal support for transit service operations, this 80-20 split provides a strong incentive to states and TPOs to use federal dollars for highway construction. The various sources of funding are discussed in more detail below:

The National Highway Performance Program

The National Highway Performance Program (NHPP) funds are intended for an interconnected system of routes which will serve major population centers, border crossings, ports, airports, public transportation facilities, other intermodal transportation facilities, meet defense requirements, and serve interstate and interregional travel. Federal participation is 80 percent. When NHPP funds are used for interstate projects, including high occupancy vehicle (HOV) and auxiliary lane projects, but not any other lanes, the federal share may be 90 percent.

Eligible projects include:

- Construction, reconstruction, resurfacing, restoration and rehabilitation of segments identified as part of the NHS
- Operational improvements for segments of the NHS
- Construction and operational improvements for roads and transit projects not on the NHS provided that the project is in the same corridor and in close proximity to the NHS route, improves the level of service on the NHS route, and is more cost-effective than work on the NHS route to provide the same benefits
- Safety improvements for the NHS
- Transportation planning
- Highway research and planning
- Highway related technology transfer activities
- Capital and operating costs for traffic monitoring, management, and control facilities and programs
- Fringe and corridor parking facilities
- Carpool and vanpool projects
- Bicycle transportation and pedestrian walkways
- Development and maintenance of management systems
- Natural habitat and wetlands mitigation efforts
- Publicly-owned bus terminals
- Infrastructure-based intelligent transportation system capital improvements

Surface Transportation Block Grant Program

The Surface Transportation Block Grant (STBG) Program is the largest and most flexible funding program under FAST Act and provides broad discretion for states and TPOs to fund a variety of activities. These include:

- Construction, reconstruction, rehabilitation, resurfacing, restoration, and operational improvements for roads and bridges, including any such construction or reconstruction necessary to accommodate other transportation modes
- Capital costs for transit projects including vehicles and facilities used to provide intercity passenger service by bus
- Carpool projects, fringe and corridor parking facilities and programs, bicycle and pedestrian facilities on any public road and the modification of sidewalks to comply with the Americans With Disabilities Act
- Highway and transit safety infrastructure improvements and programs, hazard eliminations, projects to mitigate hazards caused by wildlife, and railway-highway grade crossings
- Highway and transit research and development and technology transfer programs
- Capital and operating costs for traffic monitoring, management, and control facilities and programs
- Surface transportation planning programs
- Transportation enhancement activities (see enhancement section)
- Transportation control measures (see Clean Air Act section)
- Development and establishment of management systems
- Infrastructure-based intelligent transportation system capital improvements
- Habitat and wetland mitigation efforts
- Environmental restoration and pollution abatement
- Control of terrestrial and aquatic noxious weeds and establishment of native species

The Regional Surface Transportation Program (RSTP) fund is a percentage of the STBG funds distributed to qualified TPOs. Urbanized areas with a population of 200,000 or more (also called Transportation Management Areas (TMAs)), receive these funds which are flexible and can be used for roadway or transit projects (eligible activities same as STBG shown above).

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

As the name implies, Congestion Mitigation and Air Quality (CMAQ) funds are targeted for projects designed to reduce congestion and improve air quality in areas designated as non-attainment or maintenance under the Clean Air Act. The Richmond area is currently classified as an attainment area but its previous designation of maintenance area for ozone air quality standards allows it to remain eligible for CMAQ funding. Federal participation is 80 percent (80%) unless used on interstate facilities in which case the federal share is 90 percent (90%). Some projects and programs (e.g., rideshare match programs) require no state or local match funds. Transportation control measures (TCMs) programmed in the State Implementation Plan (SIP) receives priority for CMAQ funds.

Note that the SIP for the Richmond Nonattainment/Maintenance Area does not have TCM projects specifically programmed; however, many TCM-like projects are programmed and funded in the Richmond region. Projects are selected for CMAQ funding by the TPO, in coordination with the local representative to the Commonwealth Transportation Board. Eligible projects are:

- Transportation activities in an approved State Implementation Plan (SIP)
- Transportation control measures as defined in the Clean Air Act (see Clean Air Act section)
- Pedestrian and bicycle facilities
- Management and monitoring systems
- Traffic management/monitoring/congestion relief strategies
- Transit expansion
- Alternative fuel projects
- Public/private partnerships
- Inspection and maintenance programs

- Intermodal freight
- Telecommunications travel demand management strategies
- Project development activities for new services or programs that have air quality benefits
- Public education and outreach activities
- Rideshare programs
- Establishing/contracting with transportation management associations/organizations
- Fare/fee subsidy programs
- Experimental pilot projects with air quality benefits

Construction of projects adding new capacity for single-occupant vehicles IS NOT eligible. All projects proposed for CMAQ funding must include an analysis of the air quality benefits (i.e., the amount of reduction in emissions).

Transportation Alternatives

Formerly known in MAP-21 as the Transportation Alternatives Program (TAP), Transportation Alternatives is a set-aside of STBG funding for all projects and activities previously eligible under TAP. These projects and activities are intended to integrate the transportation network with the community or to mitigate visual or environmental impacts of the transportation facilities. Eligible projects include:

- Provision of safety and educational activities for pedestrians and bicyclists
- Acquisition of scenic easements and scenic or historic sites
- Scenic or historic highway programs including tourist and welcome center facilities
- Landscaping and other scenic beautification
- Historic preservation
- Rehabilitation of historic transportation buildings, structures, or facilities
- Preservation of abandoned rail corridors (including conversion for bicycle and pedestrian facilities)
- Control and removal of outdoor advertising
- Archaeological planning and research
- Environmental mitigation to address water pollution due to highway run-off or reduce vehicle-caused wildlife mortality while maintaining habitat connectivity
- Safe routes to school projects

Highway Safety Improvement Program (HSIP)

The FAST Act includes a core Highway Safety Improvement Program (HSIP) that is structured to significantly reduce highway fatalities and injuries. States are required to develop and implement an effective, integrated and coordinated Strategic Highway Safety Plan (SHSP) that involves a comprehensive, data driven approach to highway safety. The Highway-Rail Grade Crossing Safety Program is included with dedicated set-aside funding as part of the HSIP.

The VDOT Traffic Engineering Division (TED) serves as the focal point for administration of the Federal and State categorical safety programs (HSIP). VDOT has established a competitive application process for prioritizing and funding safety projects within the Commonwealth. Local governments, railroad companies, and VDOT Districts and Residencies submit applications for locations they recommend for improvement.

The applications are evaluated on a statewide basis rather than on a local or district basis, to ensure that locations in need of improvement have a better opportunity to be selected and funded. The candidate projects compete against their respective counterparts for funding, based on a benefit/cost analysis for motorized highway improvements and on risk assessments for non-motorized and highway-rail grade crossing improvements.

Revenue Sharing

VDOT administers the Revenue Sharing Program in cooperation with participating localities, under the authority of Section 33.2-357 of the Code of Virginia, effective October 1, 2014. According to VDOT's website, this program provides additional funding for use by a county, city, or town to construct

or improve the highway systems within such county, city, or town, with statutory limitations on the amount of state funds authorized per locality. Funds can also be requested for eligible additions in certain counties of the state and locality funds are matched with state funds for qualifying projects. An annual allocation of funds for this program is designated by the Commonwealth Transportation Board (CTB) and application for program funding must be made by resolution of the governing body with appropriate forms as outlined in the Revenue Sharing Guidelines.

High Priority Projects Program

One of the two grant programs established under House Bill 1887 in 2015, the High Priority Projects Program (HPPP) funds projects throughout the state of Virginia in a prioritization process known as SMART SCALE (formerly House Bill 2). Projects that qualify for HPPP address capacity needs on either Corridors of Statewide Significance (CoSS) or Regional Networks as defined through VTrans2040, the state's long-range multimodal transportation plan. The CTB then decides the projects to be funded under both HPPP and CDGP for inclusion in the Six-Year Improvement Program.

Funding sources such as the SMART SCALE High Priority Projects Program and federal funds like TIGER or FASTLane, are awarded through a competitive selection process. These types of funds cannot be included in the Revenue Projections of the Fiscally Constrained Plan since these funds are not part of a formula allocation process and cannot be calculated with certainty into the timeband projections.

Projects on the Unconstrained Projects List that are awarded SMART SCALE or similar competitive, non-formula funds are considered by the RRTPO to be consistent with the metropolitan transportation plan.

Construction District Grant Program

The other grant program under House Bill 1887 in 2015, the Construction District Grant Program (CDGP) is open only to localities and replaces the old "40-30-30" construction fund allocation model used in Virginia. A project applying for funds from the CDGP is prioritized with projects from the same construction district and submitted by a locality to be eligible. These projects address capacity needs on CoSS and Regional Networks as well as improvements to support Urban Development Areas (UDAs).

Revenue Projections

The amount of funds available to the Richmond area on an annual basis was estimated by VDOT and DRPT, based on the most recent federal and state legislation in regard to transportation allocations and trends in federal funds designated for transit capital. The most recent revenue forecast was provided by VDOT on October 30, 2015 and by DRPT on December 10, 2015. Administrative and Maintenance funding are separated from other revenue streams to indicate available funding for projects in the Fiscally Constrained Plan.

Identified revenue sources include CMAQ, RSTP, District Grant Program, High Priority Projects, State of Good Repair, and TAP. District Grant, High Priority, and State of Good Repair are all new programs introduced in House Bill 2 by the General Assembly and the CTB. For DRPT revenues, only transit revenues were identified and include portions as applicable to GRTC Transit System and different funding programs including Enhanced Mobility of Seniors and Individuals with Disabilities (Section 5310), Urbanized Area Formula Program (Section 5340), Rural Area Formula Program (Section 5307), Buses and Bus Facilities Grants Program (Section 5339), and Metropolitan Planning (Section 5303).

The inclusion of DRPT revenues only reflects transit funding as rail funding has no dedicated source and the Statewide Rail Plan only identifies rail projects with cost estimates for the Commonwealth. Developing a methodology for dividing rail projects for the Richmond region

was not in the original schedule and scope of work for **plan2040** but will be incorporated for **plan2045**. Rail projects and any identified revenues are only in the first time band.

Revenues by Time Band

The costs of projects included in each time band need to be balanced against the projected revenues available for each respective time band, for each funding category. The projected available funding aggregated for each timeband beginning with FY 2022. The totals for the VDOT and DRPT revenue projections are provided in Fig.5.1-5.4 on the next four pages. For **plan2040**, the following six-year time bands were used:

- Timeband One – FY17 - FY22
- Timeband Two – FY23 – FY28
- Timeband Three – FY29 – FY34
- Timeband Four – FY35 - FY40

FIG. 5.1. PLAN2040 REVENUE PROJECTIONS - TIMEBAND 1

plan2040 Revenue Projections

RRTPO - VDOT Revenues[1]	***TIMEBAND 1***						
	FY2017	**FY2018**	**FY2019**	**FY2020**	**FY2021**	**FY2022**	
Administrative	$ 8,556,593	$ 8,742,800	$ 8,937,147	$ 9,137,286	$ 9,335,041	$ 9,514,414	
Maintenance-Localities	$ 82,672,296	$ 84,077,461	$ 85,590,576	$ 87,216,501	$ 88,960,520	$ 90,739,419	
Maintenance-VDOT	$ 167,582,490	$ 170,458,653	$ 173,538,682	$ 176,835,772	$ 180,348,941	$ 183,934,490	
Total Off-the-TOP	$ 258,811,379	$ 263,278,914	$ 268,066,405	$ 273,189,559	$ 278,644,502	$ 284,188,323	
CMAQ	$ 6,577,446	$ 6,577,446	$ 6,577,446	$ 6,577,446	$ 6,577,446	$ 6,639,932	
CMAQ-Match	$ 1,644,362	$ 1,644,362	$ 1,644,362	$ 1,644,362	$ 1,644,362	$ 1,659,983	
District Grant Program	$ 5,457,232	$ 3,184,068	$ 2,885,654	$ 9,468,711	$ 26,903,574	$ 20,812,667	
High Priority Projects	$ 5,457,232	$ 3,184,068	$ 2,885,654	$ 9,468,711	$ 26,903,574	$ 20,812,667	
Other Discretionary Construction	$ 33,090,608	$ 25,859,264	$ 24,540,640	$ 21,469,878	$ 4,486,523	$ 7,986,371	
RSTP	$ 12,314,548	$ 12,314,548	$ 12,314,548	$ 12,314,548	$ 12,314,548	$ 12,420,453	
RSTP-Match	$ 3,078,637	$ 3,078,637	$ 3,078,637	$ 3,078,637	$ 3,078,637	$ 3,105,113	
State of Good Repair	$ -	$ -	$ -	$ -	$ 34,371,796	$ 34,057,091	
TAP	$ 972,004	$ 972,004	$ 972,004	$ 972,004	$ 972,004	$ 980,363	
Total VDOT Revenue Available for plan2040	**$ 68,592,069**	**$ 56,814,396**	**$ 54,898,945**	**$ 64,994,298**	**$ 117,252,465**	**$ 108,474,639**	**$ 471,026,812**
CLRP TOTAL	$ 327,403,448	$ 320,093,310	$ 322,965,350	$ 338,183,857	$ 395,896,967	$ 392,662,962	

RRTPO - DRPT Transit Revenues[2]	***TIMEBAND 1***						
	FY2017	**FY2018**	**FY2019**	**FY2020**	**FY2021**	**FY2022**	
Section 5303	$ 435,921	$ 435,921	$ 435,921				
Section 5307/5340	$ 14,311,376	$ 14,311,376	$ 14,311,376				
Section 5339	$ 1,582,547	$ 1,582,547	$ 1,582,547				
Section 5310	$ 972,517	$ 972,517	$ 972,517				
DRPT Capital MTTF (GRTC portion)	$ 13,823,000	$ 1,619,000	$ 3,739,071	$ 2,971,014	$ 3,032,442	$ 3,032,442	
Flexible STP & Equity Bonus (GRTC Portion)	$ -	$ -	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	
Special Projects and Paratransit, TDM & TMP	$ 25,837	$ 26,399	$ 26,961	$ 27,507	$ 28,266	$ 28,266	
Total DRPT Revenue Available for plan2040	**$ 31,151,198**	**$ 18,947,760**	**$ 22,179,926**	**$ 4,110,054**	**$ 4,172,241**	**$ 4,172,241**	**$ 84,733,420**

RRTPO - DRPT Rail Revenues[3]

Total FY 17-22 Revenues	**$ 555,760,232**

[1] VDOT Revenue Projections provided to RRTPO on October 30, 2015

[2] DRPT Revenue Projections provided to RRTPO on December 10, 2015

[3] DRPT Revenue Projections for Rail not provided to RRTPO

FIG. 5.2. PLAN2040 REVENUE PROJECTIONS - TIMEBAND 2

plan2040 Revenue Projections

RRTPO - VDOT Revenues[1]	***TIMEBAND 2***						
	FY2023	**FY2024**	**FY2025**	**FY2026**	**FY2027**	**FY2028**	
Administrative	$ 9,485,905	$ 9,701,715	$ 9,922,759	$ 10,149,169	$ 10,381,078	$ 10,618,628	
Maintenance-Localities	$ 92,553,897	$ 94,404,664	$ 96,292,446	$ 98,217,984	$ 100,182,032	$ 102,185,362	
Maintenance-VDOT	$ 187,592,753	$ 191,325,209	$ 195,133,368	$ 199,018,770	$ 202,982,989	$ 207,027,628	
Total Off-the-TOP	$ 289,632,555	$ 295,431,588	$ 301,348,573	$ 307,385,923	$ 313,546,099	$ 319,831,618	
CMAQ	$ 6,702,956	$ 6,766,522	$ 6,830,634	$ 6,895,298	$ 6,960,518	$ 7,026,299	
CMAQ-Match	$ 1,675,739	$ 1,691,631	$ 1,707,659	$ 1,723,825	$ 1,740,130	$ 1,756,575	
District Grant Program	$ 20,257,889	$ 19,459,390	$ 18,617,015	$ 17,802,888	$ 17,029,481	$ 16,932,550	
High Priority Projects	$ 20,257,889	$ 19,459,390	$ 18,617,015	$ 17,802,888	$ 17,029,481	$ 16,932,550	
Other Discretionary Construction	$ 8,041,839	$ 8,097,785	$ 8,154,212	$ 8,211,124	$ 8,268,525	$ 8,326,421	
RSTP	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	
RSTP-Match	$ 3,131,817	$ 3,158,751	$ 3,185,916	$ 3,213,315	$ 3,240,950	$ 3,268,822	
State of Good Repair	$ 33,149,273	$ 31,842,638	$ 30,464,206	$ 29,131,999	$ 27,866,424	$ 27,707,810	
TAP	$ 988,794	$ 997,298	$ 1,005,875	$ 1,014,525	$ 1,023,250	$ 1,032,050	
Total VDOT Revenue Available for plan2040	**$ 106,733,466**	**$ 104,000,675**	**$ 101,109,800**	**$ 98,323,132**	**$ 95,686,028**	**$ 95,510,347**	**$ 601,363,447**
CLRP TOTAL	$ 396,366,021	$ 399,432,263	$ 402,458,373	$ 405,709,055	$ 409,232,127	$ 415,341,965	

RRTPO - DRPT Transit Revenues[2]	***TIMEBAND 2***						
	FY2023	**FY2024**	**FY2025**	**FY2026**	**FY2027**	**FY2028**	
Section 5303							
Section 5307/5340							
Section 5339							
Section 5310							
DRPT Capital MTTF (GRTC portion)	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	
Flexible STP & Equity Bonus (GRTC Portion)	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	
Special Projects and Paratransit, TDM & TMP	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	
Total DRPT Revenue Available for plan2040	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 25,033,446**

RRTPO - DRPT Rail Revenues[3]		
	Total FY 23-28 Revenues	**$ 626,396,893**

[1] VDOT Revenue Projections provided to RRTPO on October 30, 2015

[2] DRPT Revenue Projections provided to RRTPO on December 10, 2015

[3] DRPT Revenue Projections for Rail not provided to RRTPO

FIG. 5.3. PLAN2040 REVENUE PROJECTIONS - TIMEBAND 3

plan2040 Revenue Projections

RRTPO - VDOT Revenues[1]	***TIMEBAND 3***						
	FY2029	**FY2030**	**FY2031**	**FY2032**	**FY2033**	**FY2034**	
Administrative	$ 10,861,961	$ 11,111,224	$ 11,366,568	$ 11,628,148	$ 11,896,126	$ 12,170,662	
Maintenance-Localities	$ 104,228,758	$ 106,313,023	$ 108,438,972	$ 110,607,441	$ 112,819,279	$ 115,075,354	
Maintenance-VDOT	$ 211,154,324	$ 215,364,747	$ 219,660,603	$ 224,043,631	$ 228,515,605	$ 233,078,338	
Total Off-the-TOP	$ 326,245,043	$ 332,788,994	$ 339,466,143	$ 346,279,220	$ 353,231,010	$ 360,324,354	
CMAQ	$ 7,092,645	$ 7,159,563	$ 7,227,055	$ 7,295,128	$ 7,363,787	$ 7,433,035	
CMAQ-Match	$ 1,773,161	$ 1,789,891	$ 1,806,764	$ 1,823,782	$ 1,840,947	$ 1,858,259	
District Grant Program	$ 17,290,581	$ 17,050,605	$ 16,645,556	$ 16,829,345	$ 16,832,153	$ 16,595,006	
High Priority Projects	$ 17,290,581	$ 17,050,605	$ 16,645,556	$ 16,829,345	$ 16,832,153	$ 16,595,006	
Other Discretionary Construction	$ 8,384,814	$ 8,443,709	$ 8,503,111	$ 8,563,024	$ 8,623,452	$ 8,684,399	
RSTP	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	
RSTP-Match	$ 3,296,934	$ 3,325,288	$ 3,353,885	$ 3,382,729	$ 3,411,820	$ 3,441,162	
State of Good Repair	$ 28,293,677	$ 27,900,990	$ 27,238,182	$ 27,538,928	$ 27,543,524	$ 27,155,464	
TAP	$ 1,040,926	$ 1,049,878	$ 1,058,907	$ 1,068,014	$ 1,077,199	$ 1,086,463	
Total VDOT Revenue Available for plan2040	**$ 96,990,588**	**$ 96,297,798**	**$ 95,006,285**	**$ 95,857,562**	**$ 96,052,304**	**$ 95,376,063**	**$ 575,580,600**
CLRP TOTAL	$ 423,235,631	$ 429,086,792	$ 434,472,428	$ 442,136,782	$ 449,283,314	$ 455,700,417	

RRTPO - DRPT Transit Revenues[2]	***TIMEBAND 3***						
	FY2029	**FY2030**	**FY2031**	**FY2032**	**FY2033**	**FY2034**	
Section 5303							
Section 5307/5340							
Section 5339							
Section 5310							
DRPT Capital MTTF (GRTC portion)	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	
Flexible STP & Equity Bonus (GRTC Portion)	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	
Special Projects and Paratransit, TDM & TMP	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	
Total DRPT Revenue Available for plan2040	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 25,033,446**

RRTPO - DRPT Rail Revenues[3]		
	Total FY 29-34 Revenues	**$ 600,614,046**

[1] VDOT Revenue Projections provided to RRTPO on October 30, 2015

[2] DRPT Revenue Projections provided to RRTPO on December 10, 2015

[3] DRPT Revenue Projections for Rail not provided to RRTPO

FIG. 5.4. PLAN2040 REVENUE PROJECTIONS - TIMEBAND 4

plan2040 Revenue Projections

RRTPO - VDOT Revenues[1]	***TIMEBAND 4***						
	FY2035	**FY2036**	**FY2037**	**FY2038**	**FY2039**	**FY2040**	
Administrative	$ 12,451,924	$ 12,740,085	$ 13,035,325	$ 13,337,823	$ 13,647,769	$ 13,965,354	
Maintenance-Localities	$ 117,376,550	$ 119,723,770	$ 122,117,934	$ 124,559,982	$ 127,050,871	$ 129,591,578	
Maintenance-VDOT	$ 237,733,677	$ 242,483,508	$ 247,329,756	$ 252,274,385	$ 257,319,400	$ 262,466,845	
Total Off-the-TOP	$ 367,562,151	$ 374,947,363	$ 382,483,015	$ 390,172,190	$ 398,018,040	$ 406,023,777	
CMAQ	$ 7,502,880	$ 7,573,325	$ 7,644,376	$ 7,716,038	$ 7,788,316	$ 7,861,216	
CMAQ-Match	$ 1,875,720	$ 1,893,331	$ 1,911,094	$ 1,929,010	$ 1,947,079	$ 1,965,304	
District Grant Program	$ 16,344,920	$ 16,215,191	$ 16,089,724	$ 15,734,841	$ 15,353,765	$ 14,987,884	
High Priority Projects	$ 16,344,920	$ 16,215,191	$ 16,089,724	$ 15,734,841	$ 15,353,765	$ 14,987,884	
Other Discretionary Construction	$ 8,745,871	$ 8,807,871	$ 8,870,405	$ 8,933,476	$ 8,997,090	$ 9,061,251	
RSTP	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	$ 12,527,269	
RSTP-Match	$ 3,470,756	$ 3,500,604	$ 3,530,710	$ 3,561,074	$ 3,591,699	$ 3,622,587	
State of Good Repair	$ 26,746,233	$ 26,533,949	$ 26,328,639	$ 25,747,921	$ 25,124,343	$ 24,525,628	
TAP	$ 1,095,807	$ 1,105,231	$ 1,114,736	$ 1,124,323	$ 1,133,992	$ 1,143,744	
Total VDOT Revenue Available for plan2040	**$ 94,654,375**	**$ 94,371,963**	**$ 94,106,677**	**$ 93,008,793**	**$ 91,817,318**	**$ 90,682,766**	**$ 558,641,892**
CLRP TOTAL	$ 462,216,526	$ 469,319,326	$ 476,589,692	$ 483,180,983	$ 489,835,358	$ 496,706,543	

RRTPO - DRPT Transit Revenues[2]	***TIMEBAND 4***						
	FY2035	**FY2036**	**FY2037**	**FY2038**	**FY2039**	**FY2040**	
Section 5303							
Section 5307/5340							
Section 5339							
Section 5310							
DRPT Capital MTTF (GRTC portion)	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	$ 3,032,442	
Flexible STP & Equity Bonus (GRTC Portion)	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	$ 1,111,533	
Special Projects and Paratransit, TDM & TMP	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	$ 28,266	
Total DRPT Revenue Available for plan2040	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 4,172,241**	**$ 25,033,446**

RRTPO - DRPT Rail Revenues[3]

Total FY 35-40 Revenues	**$ 583,675,338**

[1] VDOT Revenue Projections provided to RRTPO on October 30, 2015

[2] DRPT Revenue Projections provided to RRTPO on December 10, 2015

[3] DRPT Revenue Projections for Rail not provided to RRTPO

Allocation Guidelines

In addition to the revenue projections, staff worked with the MTP AC to develop Allocation Guidelines for each project type in the Fiscally Constrained Plan. The Allocation Guidelines provide funding levels for each project type by the four time bands, starting with the first time band (Fiscal Year 2017-2022) as the baseline from the current Six-Year Improvement Program. By identifying current funding levels, staff and the MTP AC focused on developing the fourth time band (FY 2035-2040) and using the second and third time bands as a straight line projection to the fourth time band.

The following figures show the plan2040 Allocation Guidelines used as part of the development of the Constrained Projects List. The funding levels helped identify the potential number of projects that could be funded as an initial point, and enabled modifications by staff and the MTP AC. The Allocation Guidelines were recommended by the MTP AC at their February 16, 2016 meeting and approved by the TPO Board at their April 7, 2016 meeting.

The initial cost estimates for the projects were provided by VDOT in conjunction with the local jurisdictions. The full Constrained Projects List is provided at the end of this section for further information and detail.

Federal regulations do not require minor projects to be individually listed in plan2040. Federal regulations do require, however, that plan2040 specifically list all projects that are "regionally significant" (i.e., projects on a facility that serves regional needs and would normally be included in the modeling of the area's transportation network, such as new roads, additional lanes, and interchanges.

At a minimum, all roads functionally classified as principal arterial or higher, and all fixed guide-way transit facilities that offer a significant alternative to regional highway travel are considered regionally significant). Therefore, the surpluses shown were not used in constraining plan2040 and are assumed to be available for these types of minor, non-regional improvement projects.

Constrained Projects List

plan2040, the Six Year Improvement Program (SYIP) and the Transportation Improvement Program (TIP) are similar documents in that they all show projects which can be reasonably expected in the future. The connection between plan2040, the SYIP, and the TIP is in the project lists. Major projects (those impacting air quality conformity) included in the TIP must also be included in the SYIP and plan2040.

An element of plan2040 is a master list of projects that the region anticipates it can fund over the long term. Projects listed in the TIP must be in conformance with plan2040 (i.e., specifically listed if regionally significant or accounted for as part of the financial capacity analysis if a minor project or program).

Funding resources and estimates for projects contained in plan2040 are not required to be identical to those in the TIP. It is reasonable to expect that many of the projects in plan2040 may be funded using different sources of funds when actually implemented in the TIP. Good planning practice is to make plan2040 funding and funding sources as realistic as possible based on current planning assumptions. plan2040 and its many components are planning level estimates. The metropolitan transportation plan is updated (at a minimum) every four years; as better planning assumptions are available for long-range planning, they are included in the updates. For the Richmond region, our EPA designation as an attainment area has extended the update cycle to every five years.

Cost Inflation Factor

As noted previously, the FAST Act legislation requires that projects and programs described in plan2040 must be financially constrained. plan2040 projects and programs also must account for costs in terms of

year-of-expenditure dollars (in other words, inflationary cost increases must be accounted for). The **plan2040** Constrained Projects List, presented later in this section, complies with this requirement.

As allowed by the FAST Act, projects in the outer years of **plan2040** can be grouped into "timebands." This enables an average inflation rate to be applied to projects that are grouped into one of the time bands. It also considerably eases the ability to estimate start and end dates for specific projects. In consultation with VDOT, a compound annual inflation rate of 2.5 percent per year was applied to initial cost estimates to arrive at an inflation-adjusted estimate of project construction costs.

For the first timeband, projects contained in the adopted FY17-22 SYIP (adopted June 2016) comprise of the list of projects, and for projects included in the adopted SYIP, the estimated project costs are shown in year-of-expenditure dollars, so an inflation factor is not necessary. The remaining three time bands have an average inflation factor applied.

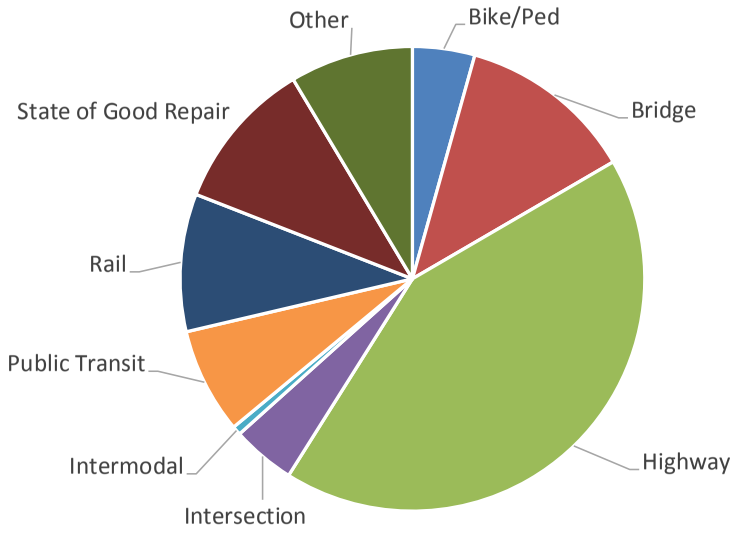
Please note that the first timeband in the Constrained Projects List reflects the FY17-22 SYIP due to the timing of its approval during the development process of **plan2040**. The FY16-21 SYIP is still the foundation for the development of the allocation guidelines presented. The Timeband 1 Allocation Guidelines were not used to define project type parameters for the Timeband 1 of the Constrained Projects List. The Timeband 1 Constrained Projects List is consistent with projects in the FY17-22 SYIP as approved by the CTB on June 14, 2016, and is constrained to the VDOT and DRPT revenue projections for Timeband 1.

FIG. 5.5. PLAN2040 ALLOCATION GUIDELINES- TIMEBAND 1

Timeband 1 (FY 17 - 22)

Project Type	*Allocation Amount (VDOT Revenues)*	*Allocation Guideline (VDOT Revenues)*	*Allocation Amount (DRPT Revenues)*	*Allocation Guideline (DRPT Revenues)*
Bike/Ped	$ 24,089,493	5.11%	$ -	
Bridge	$ 68,209,523	14.48%	$ -	
Highway	$ 235,295,476	49.95%	$ -	
Intersection	$ 24,545,785	5.21%	$ -	
Intermodal	$ 681,033	0.14%	$ 2,761,701	3.26%
Public Transit	$ 1,543,220	0.33%	$ 39,333,053	46.42%
Rail	$ 10,624,112	2.26%	$ 42,638,665	50.32%
State of Good Repair	$ 58,379,495	12.39%	$ -	
Other	$ 47,658,676	10.12%	$ -	
Total	**$ 471,026,812**	**100.00%**	**$ 84,733,420**	**100.00%**

Timeband 1 (FY 17 - 22)

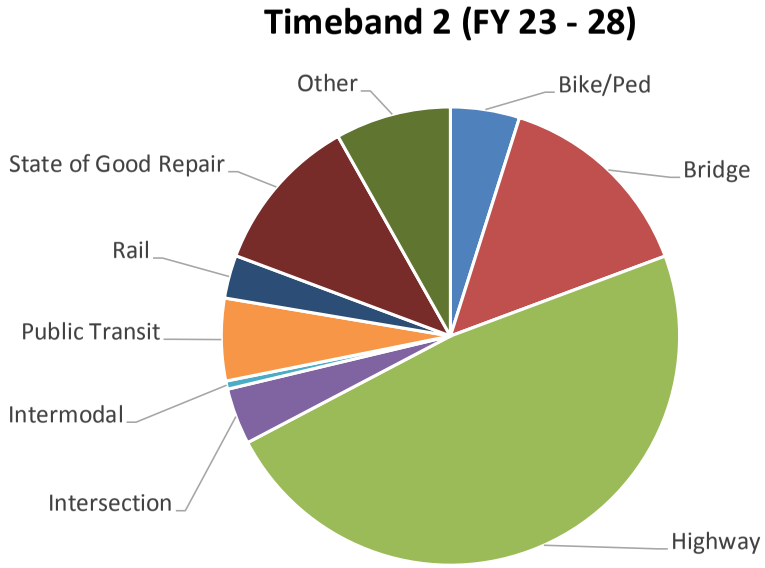


Note: Allocation Guideline percentages for Timeband 1 are based on actual allocations to RRTPO projects in VDOT and DRPT FY2016-2021 SYIP. This guideline was used as a baseline to inform the MTP Advisory Committee development of Allocation Guidelines for Timebands 2-4, which were approved by the RRTPO on April 7, 2016. The Timeband 1 Allocation Guidelines were not used to define project type parameters for the Timeband 1 Constrained Projects List. The Timeband 1 Constrained Project list is consistent with projects in the FY2017-2022 SYIP as approved by the CTB on June 14, 2016, and is constrained to the VDOT and DRPT revenue projections for Timeband 1.

FIG. 5.6. PLAN2040 ALLOCATION GUIDELINES- TIMEBAND 2

plan2040 Allocation Guidelines: Timeband 2 (FY 23 - 28)

Project Type	*Allocation Amount (VDOT Revenues)*	*Allocation Guideline (VDOT Revenues)*	*Allocation Amount (DRPT Revenues)*	*Allocation Guideline (DRPT Revenues)*
Bike/Ped	$ 30,549,263	5.08%		
Bridge	$ 90,505,199	15.05%		
Highway	$ 300,501,314	49.97%		
Intersection	$ 24,896,447	4.14%		
Intermodal	$ 3,608,181	0.60%		
Public Transit	$ 11,365,769	1.89%	$ 25,033,446	100%
Rail	$ 19,063,221	3.17%		
State of Good Repair	$ 69,758,160	11.60%		
Other	$ 51,115,893	8.50%		
Total	**$ 601,363,447**	**100.00%**	**$ 25,033,446**	**100.00%**

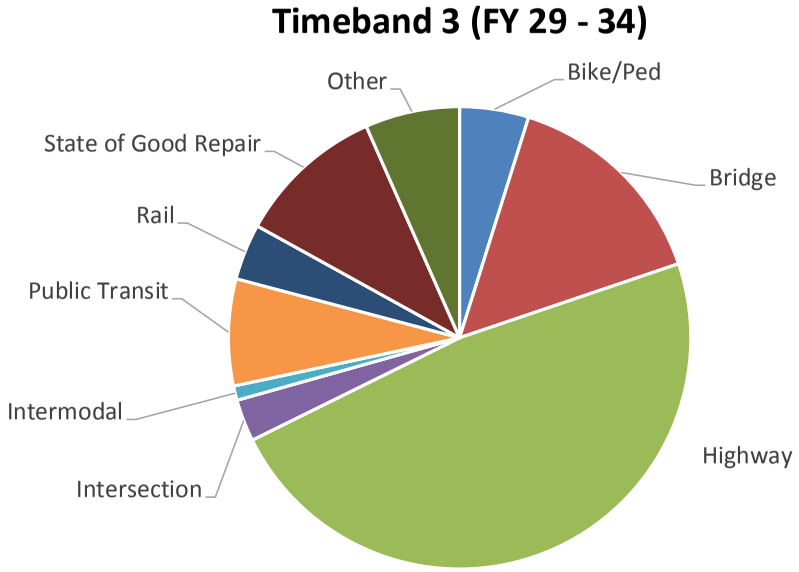


Note: Allocation guideline percentages for Timeband 2 as approved by RRTPO on April 7, 2016. Timeband 2 period amended from FY 22-27 to FY 23-28 to be approved by RRTPO on March 2, 2017. The pie chart is based on total percentage allocations including both VDOT and DRPT revenues

FIG. 5.7. PLAN2040 ALLOCATION GUIDELINES- TIMEBAND 3

plan2040 Allocation Guidelines: Timeband 3 (FY 29 - 34)

Project Type	*Allocation Amount (VDOT Revenues)*	*Allocation Guideline (VDOT Revenues)*	*Allocation Amount (DRPT Revenues)*	*Allocation Guideline (DRPT Revenues)*
Bike/Ped	$ 29,009,262	5.04%		
Bridge	$ 89,963,248	15.63%		
Highway	$ 287,675,184	49.98%		
Intersection	$ 17,670,324	3.07%		
Intermodal	$ 6,043,596	1.05%		
Public Transit	$ 19,799,973	3.44%	$ 25,033,446	100%
Rail	$ 23,541,247	4.09%		
State of Good Repair	$ 62,162,705	10.80%		
Other	$ 39,715,061	6.90%		
Total	**$ 575,580,600**	**100.00%**	**$ 25,033,446**	**100.00%**

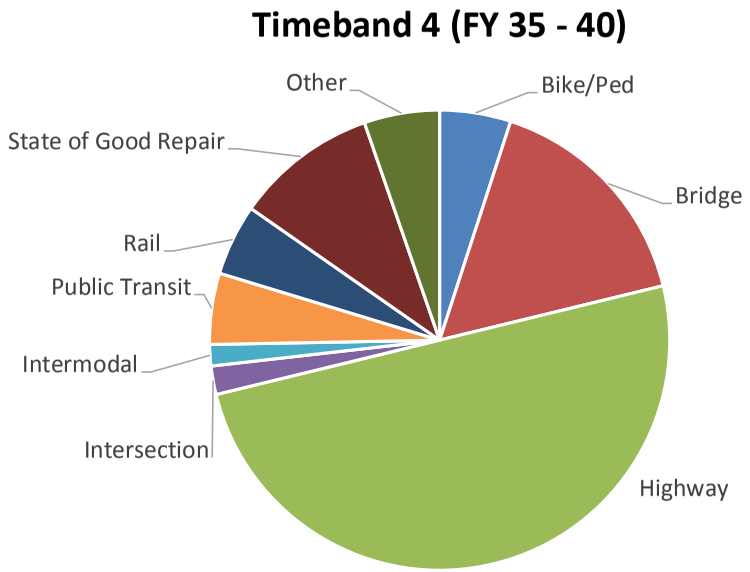


Note: Allocation guideline percentages for Timeband 3 as approved by RRTPO on April 7, 2016. Timeband 3 period amended from FY 28-33 to FY 29-34 to be approved by RRTPO on March 2, 2017. The pie chart is based on total percentage allocations including both VDOT and DRPT revenues

FIG. 5.8. PLAN2040 ALLOCATION GUIDELINES- TIMEBAND 4

plan2040 Allocation Guidelines: Timeband 4 (FY 35 - 40)

Project Type	*Allocation Amount (VDOT Revenues)*	*Allocation Guideline (VDOT Revenues)*	*Allocation Amount (DRPT Revenues)*	*Allocation Guideline (DRPT Revenues)*
Bike/Ped	$ 27,932,095	5.00%		
Bridge	$ 90,499,987	16.20%		
Highway	$ 279,320,946	50.00%		
Intersection	$ 11,172,838	2.00%		
Intermodal	$ 8,379,628	1.50%		
Public Transit	$ 27,932,095	5.00%	$ 25,033,446	100%
Rail	$ 27,932,095	5.00%		
State of Good Repair	$ 55,864,189	10.00%		
Other	$ 29,608,020	5.30%		
	$ 558,641,892	**100.00%**	**$ 25,033,446**	**100.00%**



Note: Allocation guideline percentages for Timeband 4 as approved by RRTPO on April 7, 2016. Timeband 4 period amended from FY 34-40 to FY 35-40 to be approved by RRTPO on March 2, 2017. The pie chart is based on total percentage allocations including both VDOT and DRPT revenues

Project Ranking and Selection Process

Prior to developing the list of projects, the MTP AC recommended a methodology to account for the various available funding sources and to link projects to the appropriate source of funds. This methodology was approved by the RRTPO Board at their April 7, 2016 meeting and works as follows:

- Transportation facilities maintenance cost (approximately 74 percent of projected revenue) is subtracted from the total available funds. This is in keeping with state law which requires assigning top priority to the maintenance of existing roads.
- All projects contained in the adopted SYIP are assumed to be completed as soon as possible. The total cost of these projects, including preliminary engineering, right-of-way and construction (as shown in the adopted SYIP) is subtracted from the revenue forecast for the FY16-21 time band. The balance to complete for these projects after FY21 is then subtracted from the revenue forecast for the FY22-27 time band. This is in keeping with the accepted practice of assigning top funding priority to the projects already shown in the adopted SYIP
- Remaining funds from the revenue forecast are available to fund new projects beginning in FY-2022

The plan2035 list of projects was used as a starting point to develop the necessary initial project lists for plan2040. Localities and State and local transit agencies were requested to review the initial project lists and add or remove projects from the list as necessary. The scale and type of projects eligible to be specifically listed in the plan are detailed in the plan2040 Project Inclusion Criteria, focusing on projects of regional significance and those potentially receiving federal funding. The Project Inclusion Criteria for the plan2040 Constrained Projects List is available in the Appendix of the plan2040 Project Evaluation Tool Methodology Report at the end of this section, as reviewed and approved at the August 26, 2015 MTP AC meeting.

The plan2040 project selection process followed the recommendation of the 2035 LRTP Advisory Committee and revised the project application and evaluation criteria to reflect the nine Goals of plan2040, which closely align with federal and state transportation goals. The nine Goals serve as an organizing framework and assess the degree to which any given candidate project will advance one or multiple Goals. TPO staff developed the plan2040 Project Evaluation Tool Methodology Report to provide transparency in the evaluation of project applications and scoring weights. The report is included at the Appendix of the plan2040 Summary Document for further information.

The raw scores from the ranking process then were weighted using the newly developed evaluation criteria based on the nine Goals. The development of the plan2040 Goals include federal planning factors and TPO performance measures to ensure that the initial ranked list would feature projects that aligned with both federal and state transportation objectives.

The preliminary results of this ranking process were reviewed by the MTP AC at their February 2, 2016 meeting and provided direction in the refinement of the Constrained Projects List. The list includes the following:

Current state (FY2017-2022) Six-Year Improvement Program (SYIP) and TPO Transportation Improvement Program (TIP) projects

Newly submitted candidate projects (some carried from plan2035)

Unconstrained Projects (projects that did not receive any funding)

Local/Private Projects (do not use federal or state funds, but must be included for air quality conformity purposes)

Local/Private Project Lists

Additional transportation system improvements are included in **plan2040** besides those funded through federal and state highway sources. For instance, Local/Private funded projects also are included in **plan2040**, with a documentation of funding availability from such sources as developer funds and cash proffers, public/private partnerships, bond issues, and local general funds.

Demonstration of Fiscal Constraint

In **plan2040**, $7.8 billion of forecasted revenue (FY2017-2040) has been reserved and taken off the top for anticipated maintenance needs across the Richmond region. For advancing new projects, **plan2040** commits approximately $2.36 billion in funding from FY2017-2040 to be resourced by $2.37 billion of forecasted revenue available from FY2017-2040. The total allocated to projects and region-wide initiatives in **plan2040** is less than the forecasted revenues to the Richmond region; therefore, fiscal constrained is demonstrated in **plan2040**.

Approved Fiscally Constrained Projects List

At its March 15, 2016 meeting, the MTP AC recommended the list of proposed projects to the RRTPO for review and approval. The RRTPO took action at its April 7, 2016 meeting to approve the MTP AC's list of proposed projects as the **plan2040** Constrained Projects List.

As part of the March 2, 2017 amendment to the **plan2040** document, the RRTPO approved a revised Constrained Projects List, which included the transfer of two projects to the Unconstrained Projects List. The revisions were a result of the modifications to the first Timeband throughout all components of the Fiscally Constrained Plan to ensure consistency. Details of the amendment and its changes may be found in the Amendments Section in the Summary Document Appendix of the **plan2040** document.

The SYIP and TIP projects are shown on the maps by quadrants. The Constrained Projects List maps are shown from the regional view.

FIG. 5.9. PLAN2040 CONSTRAINED PROJECTS LIST – TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
103393	ASHLAND TROLLEY LINE TRAIL	Ashland	Bike/Ped	$0	$1,100,000	$1,100,000
97688	RTE 155 - SHARED-USE PATH	Charles City County	Bike/Ped	$351,000	$1,000,000	$1,351,000
102507	ROUTE 618 - MULTI-USE TRAIL	Charles City County	Bike/Ped	$890,000	$0	$890,000
106296	RTE 155 - CONSTRUCT TRAIL	Charles City County	Bike/Ped	$0	$400,000	$400,000
107085	RTE 641 - ADD SIDEWALK & PEDESTRIAN BRIDGE	Chesterfield County	Bike/Ped	$619,000	$5,400,000	$6,019,000
108647	RTE 1703 - PED SIGNAL/SIDEWALK INSTALLATION	Chesterfield County	Bike/Ped	$0	$200,000	$200,000
16086	LOWER FALLING CREEK GREENWAY ENHANCEMENT	Chesterfield County	Bike/Ped	$897,000	$0	$897,000
93386	RTE 360 - ADD SIDEWALK	Chesterfield County	Bike/Ped	$971,000	$0	$971,000
96733	RTE 604 - ADD SIDEWALK	Chesterfield County	Bike/Ped	$318,000	$0	$318,000
102957	RTE 10 - UPGRADE CROSSWALKS	Chesterfield County	Bike/Ped	$814,000	$0	$814,000
104285	RTE 4700 - CONSTRUCT CURB, GUTTER AND SIDEWALK	Chesterfield County	Bike/Ped	$2,135,000	$0	$2,135,000
104287	RTE 678 - CONSTRUCT CURB, GUTTER & SIDEWALK	Chesterfield County	Bike/Ped	$3,600,000	$0	$3,600,000
104288	RTE 609 - INSTALL SIDEWALK	Chesterfield County	Bike/Ped	$712,000	$0	$712,000
104291	RTE 144 - CONSTRUCT CURB, GUTTER & SIDEWALK	Chesterfield County	Bike/Ped	$565,000	$0	$565,000
104662	RTE 10 - PROVIDE BICYCLE ACCOMMODATIONS	Chesterfield County	Bike/Ped	$2,500,000	$0	$2,500,000
107082	RTE 651 - ADD SIDEWALK	Chesterfield County	Bike/Ped	$550,000	$0	$550,000
107130	HORNER PARK TRAIL	Chesterfield County	Bike/Ped	$400,000	$0	$400,000
108978	RTE 662 (SPRING RUN ROAD) SIDEWALK	Chesterfield County	Bike/Ped	$0	$126,000	$126,000
109082	RTE 654 (BAILEY BRIDGE ROAD) SIDEWALK	Chesterfield County	Bike/Ped	$630,000	$270,000	$900,000
T17814	SIDEWALK/PEDESTRIAN ACCOMODATIONS - RTE 144 CHESTERFIELD CO	Chesterfield County	Bike/Ped	$0	$622,000	$622,000
T17818	INSTALL SIDEWALK - HOPKINS ROAD - CHESTERFIELD	Chesterfield County	Bike/Ped	$0	$627,000	$627,000
T17820	INSTALL SIDEWALK - DEER RUN ROAD - CHESTERFIELD	Chesterfield County	Bike/Ped	$0	$550,000	$550,000
91207	PATRICK HENRY- ROAD TO REVOLUTION TRAIL, SIGNAGE & BROCHURES	Hanover County	Bike/Ped	$231,000	$0	$231,000
108640	SIDEWALK NEW CONSTRUCTION	Henrico County	Bike/Ped	$0	$246,000	$246,000
108642	CONSTRUCT SIDEWALK	Henrico County	Bike/Ped	$0	$172,000	$172,000
108643	CONSTRUCT NEW SIDEWALK	Henrico County	Bike/Ped	$0	$443,000	$443,000
108645	CONSTRUCT NEW SIDEWALK	Henrico County	Bike/Ped	$0	$554,000	$554,000
108696	QUIOCASSIN ROAD - CONSTRUCT NEW SIDEWALK	Henrico County	Bike/Ped	$0	$820,000	$820,000
54758	RTE 5 - SCENIC BYWAYS - INTERPRETIVE SITE	Henrico County	Bike/Ped	$469,000	$0	$469,000
86280	RTE 5 - VIRGINIA CAPITAL TRAIL - VARINA PHASE	Henrico County	Bike/Ped	$15,593,000	$0	$15,593,000
100561	RTE 73 - INSTALL SIDEWALK AND CURB AND GUTTER	Henrico County	Bike/Ped	$599,000	$0	$599,000
103665	RTE 5 - VIRGINIA CAPITAL TRAIL - PARK PHASE	Henrico County	Bike/Ped	$8,435,000	$0	$8,435,000
104277	SHADY GROVE RD, OLD NUCKOLS RD - ADD SIDEWALK	Henrico County	Bike/Ped	$163,000	$0	$163,000
104665	RTE 1 - UPGRADE SIGNALS TO PROVIDE PEDESTRIAN ACCOMMODATION	Henrico County	Bike/Ped	$1,480,000	$0	$1,480,000
104666	RTE 250 - PROVIDE PEDESTRIAN ACCOMMODATIONS	Henrico County	Bike/Ped	$1,014,000	$1,000,000	$2,014,000
104880	RIDGEFIELD PKWY - CONSTRUCT SIDEWALK	Henrico County	Bike/Ped	$175,000	$425,000	$600,000
104881	JOHN ROLFE PKWY - ADD SIDEWALK	Henrico County	Bike/Ped	$540,000	$0	$540,000
105647	WISTAR RD - ADD SIDEWALK	Henrico County	Bike/Ped	$1,428,000	$0	$1,428,000
105657	PRINCE HENRY DR - ADD SIDEWALK	Henrico County	Bike/Ped	$170,000	$0	$170,000
105658	BEULAH RD - ADD SIDEWALK	Henrico County	Bike/Ped	$122,000	$0	$122,000
105660	RTE 271 - ADD SIDEWALK	Henrico County	Bike/Ped	$815,000	$0	$815,000
106299	PEDESTRIAN & SIGNAL IMPROVEMENTS - VARIOUS LOCATIONS	Henrico County	Bike/Ped	$130,000	$1,485,000	$1,615,000
106468	VA CAPITAL TRAIL - HENRICO RIVERFRONT	Henrico County	Bike/Ped	$294,000	$0	$294,000
107037	RTE 147 - INSTALL PEDESTRIAN LIGHTING - HUGUENOT BRIDGE	Henrico County	Bike/Ped	$0	$900,000	$900,000
107173	WATTS LN - ADD SIDEWALK	Henrico County	Bike/Ped	$126,000	$0	$126,000
107174	N RIDGE RD - ADD SIDEWALK	Henrico County	Bike/Ped	$107,000	$0	$107,000
107175	OLD NUCKOLS RD - ADD SIDEWALK	Henrico County	Bike/Ped	$127,000	$0	$127,000
107176	GLENSIDE DR - ADD SIDEWALK	Henrico County	Bike/Ped	$267,000	$0	$267,000
107177	ST. CLAIRE LN - ADD SIDEWALK	Henrico County	Bike/Ped	$752,000	$0	$752,000
109084	SHORT PUMP PARK TRAILS	Henrico County	Bike/Ped	$0	$310,000	$310,000
109190	LABURNUM AVENUE SIDEWALK	Henrico County	Bike/Ped	$0	$293,000	$293,000
109194	PARHAM RD TRAFFIC SIGNAL AND SIDEWALK PROJECT	Henrico County	Bike/Ped	$0	$3,125,000	$3,125,000
81762	NEW KENT COUNTY - SIGNAGE FOR 7 BICYCLE RTES	New Kent County	Bike/Ped	$38,000	$0	$38,000
108650	PEDESTRIAN PATH AND LIGHTING	Richmond	Bike/Ped	$0	$533,000	$533,000
108653	CITY WIDE SIDEWALK IMPROVEMENTS	Richmond	Bike/Ped	$0	$1,100,000	$1,100,000
108713	PEDESTRIAN CROSSING IMPROVEMENTS CITYWIDE	Richmond	Bike/Ped	$0	$154,000	$154,000

FIG. 5.10. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
56419	LANDSCAPE, CONST SIDEWALK, CROSSWALK & LIGHTING IMPROVEMENTS	Richmond	Bike/Ped	$2,077,000	$0	$2,077,000
100490	CITY OF RICHMOND BIKE SHARED LANE PAVEMENT MARKINGS-E/W RTE	Richmond	Bike/Ped	$237,000	$0	$237,000
100491	CITY OF RICHMOND BIKE SHARED LANE PVMT MARKINGS-BICYCLE RT 1	Richmond	Bike/Ped	$150,000	$0	$150,000
103899	MULTIMODAL IMPROVEMENT TO FRANKLIN ST	Richmond	Bike/Ped	$2,500,000	$0	$2,500,000
104215	CITYWIDE - INSTALL SIDEWALK	Richmond	Bike/Ped	$1,300,000	$0	$1,300,000
104218	INSTALL SIDEWALK & CROSSWALK - CITYWIDE	Richmond	Bike/Ped	$1,940,000	$0	$1,940,000
105209	FLOYD AVE BIKE BOULEVARD	Richmond	Bike/Ped	$830,000	$0	$830,000
105235	CITY OF RICHMOND - SRTS - FOX ES/MUNFORD ES - BIKE/PED IMP	Richmond	Bike/Ped	$190,000	$0	$190,000
105649	IMPROVE SIDEWALK - VARIOUS LOCATIONS	Richmond	Bike/Ped	$1,200,000	$0	$1,200,000
105680	MULTI-USE TRAIL	Richmond	Bike/Ped	$6,854,000	$0	$6,854,000
105709	TERMINAL AVE/E BELT BLVD - ADD SIDEWALK	Richmond	Bike/Ped	$400,000	$0	$400,000
105889	BIKE SHARE SYSTEM - CITYWIDE	Richmond	Bike/Ped	$2,146,000	$854,000	$3,000,000
106246	CANNON CREEK GREENWAY	Richmond	Bike/Ped	$973,000	$0	$973,000
107103	IMPROVE SIDEWALKS - CITYWIDE	Richmond	Bike/Ped	$2,000,000	$0	$2,000,000
107104	INSTALL BIKE LANES - CITYWIDE	Richmond	Bike/Ped	$1,000,000	$0	$1,000,000
107111	RICHMOND CANAL WALK - CONSTRUCT TRAIL	Richmond	Bike/Ped	$1,000,000	$0	$1,000,000
109294	1ST & 2ND STREET BIKE LANES	Richmond	Bike/Ped	$0	$300,000	$300,000
109295	29TH STREET BIKE-WALK BOULEVARD	Richmond	Bike/Ped	$0	$650,000	$650,000
T17824	PEDESTRIAN IMPROVEMENTS AT SIGNALIZED INTERSECTONS - DW	Richmond	Bike/Ped	$453,000	$3,000,000	$3,453,000
T17827	ROAD DIETS - IMPROVE BICYCLE ACCOMDATIONS - CITY OF RICHMOND	Richmond	Bike/Ped	$137,000	$1,365,000	$1,502,000
93199	ARRA CHARLES CITY/HENRICO 5 VA CAPITAL TRAIL CONSTRUCTION	Richmond District-wide	Bike/Ped	$15,120,000	$0	$15,120,000
106240	INSTALL PEDESTRIAN ACCOMMODATIONS - DISTRICTWIDE	Richmond District-wide	Bike/Ped	$450,000	$1,000,000	$1,450,000
15988	RTE 1 - BR REPL & MOD LTL @ DSCR (FED ID 4896)	Chesterfield County	Bridge	$15,641,000	$3,421,000	$19,062,000
101243	RTE 604 - REPLACE BRIDGE OVER TOMAHAWK CREEK (FED ID 30028)	Chesterfield County	Bridge	$1,029,000	$2,234,000	$3,263,000
103469	RTE 636 - BRIDGE REPLACEMENT (FED ID 5271)	Chesterfield County	Bridge	$852,000	$2,504,000	$3,356,000
51261	RTE 651 (GEORGETOWN RD) - BRIDGE REPLACEMENT	Hanover County	Bridge	$2,520,000	$0	$2,520,000
82378	RTE 689 - BRIDGE REPLACEMENT OVER LITTLE RIVER	Hanover County	Bridge	$2,027,000	$359,000	$2,386,000
82399	RTE 625 - BRIDGE REPLACEMENT	Hanover County	Bridge	$862,000	$2,252,000	$3,114,000
90347	RTE 802/I95 - REPL BRIDGE, RAMPS & AIRPARK RD (FED ID 9596)	Hanover County	Bridge	$20,225,000	$9,942,000	$30,167,000
105107	RTE 301 - REPLACE BRIDGE	Hanover County	Bridge	$6,000	$3,264,000	$3,270,000
T11964	BRIDGE (FED ID 9578) RTE 715 OVER NEW FOUND RIVER	Hanover County	Bridge	$727,000	$1,198,000	$1,925,000
T11967	BRIDGE (FED ID 9492) RTE. 617 OVER SOUTH ANNA RIVER	Hanover County	Bridge	$0	$3,800,000	$3,800,000
97565	RTE 64 - REPLACE BRIDGES OVER RTE 156 (FED ID 9760 & 9762)	Henrico County	Bridge	$1,250,000	$28,906,000	$30,156,000
104274	RTE 615 - REPLACE BRIDGE	Henrico County	Bridge	$9,382,000	$0	$9,382,000
105141	RTE 64-REPLACE BRIDGES OVER RTE 33 NINE MILE RD(FED ID 9756)	Henrico County	Bridge	$7,353,000	$2,182,000	$9,535,000
108631	BRIDGE REPLACEMENT	Richmond	Bridge	$0	$600,000	$600,000
108712	RMA PLAZA BRIDGE OVER EXPRESSWAY	Richmond	Bridge	$0	$923,000	$923,000
82110	CONDUCT PLANNING & ENGINEERING FOR MAYO BRIDGE	Richmond	Bridge	$1,791,000	$0	$1,791,000
93087	RTE195 - REPL BRIDGE OVER RTE 76, CSX, RAMP S (FED ID 21552)	Richmond	Bridge	$1,163,000	$17,638,000	$18,801,000
102961	MILL AND OVERLAY BELVIDERE ST OVER CSXT AND BROOK RD	Richmond	Bridge	$2,200,000	$0	$2,200,000
102962	7TH ST - REPLACE BRIDGE	Richmond	Bridge	$2,099,000	$0	$2,099,000
102963	5TH ST - REPLACE BRIDGE	Richmond	Bridge	$2,100,000	$0	$2,100,000
104216	LOMBARDY ST - BRIDGE IMPROVEMENTS	Richmond	Bridge	$1,500,000	$0	$1,500,000
104217	LYNNHAVEN ST - BRIDGE IMPROVEMENTS	Richmond	Bridge	$601,000	$0	$601,000
104887	RTE 60 - BRIDGE REHABILITATION	Richmond	Bridge	$2,028,000	$0	$2,028,000
104888	RTE 360 - REHAB MAYO BRIDGE	Richmond	Bridge	$0	$6,000,000	$6,000,000
105678	REHABILITATE BRIDGE	Richmond	Bridge	$1,100,000	$1,400,000	$2,500,000
107108	RTE 33 - REHABILITATE BRIDGE	Richmond	Bridge	$500,000	$0	$500,000
107867	RTE 5 (MAIN ST) - REPLACE BRIDGE	Richmond	Bridge	$958,000	$2,942,000	$3,900,000
17959	ROUTE 360 - BRIDGE REPLACEMENT	Richmond District-wide	Bridge	$14,799,000	$0	$14,799,000
8651	RTE 1 - WIDEN TO 6 LANES	Ashland	Highway	$571,000	$0	$571,000
106215	RTE 95 - INTERCHANGE ALTERNATIVES ANALYSIS AT RTE 54	Ashland	Highway	$450,000	$0	$450,000
59166	RTE 607 - MINOR WIDENING	Charles City County	Highway	$2,433,000	$0	$2,433,000
85337	RTE 609 - RECONSTRUCTION	Charles City County	Highway	$2,224,000	$0	$2,224,000
104290	RTE 720 - WIDEN TO 4 LANES	Chesterfield County	Highway	$3,971,000	$4,281,000	$8,252,000
107083	RTE 672 - MAJOR WIDENING	Chesterfield County	Highway	$9,019,000	$2,800,000	$11,819,000

FIG. 5.11. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
107086	RTE 647 - RECONSTRUCTION	Chesterfield County	Highway	$631,000	$1,388,000	$2,019,000
107087	RTE 652 - CONSTRUCT ROUNDABOUT	Chesterfield County	Highway	$1,480,000	$531,000	$2,011,000
107088	RTE 655 - MAJOR WIDENING	Chesterfield County	Highway	$13,220,000	$2,100,000	$15,320,000
107089	RTE 711 - MAJOR WIDENING	Chesterfield County	Highway	$4,019,000	$2,200,000	$6,219,000
108638	RTE 1502 - SPOT WIDENING	Chesterfield County	Highway	$0	$1,100,000	$1,100,000
108639	RTE 663 - RECONSTRUCTION	Chesterfield County	Highway	$0	$62,000	$62,000
108641	RTE 654 - SPOT WIDENING	Chesterfield County	Highway	$0	$615,000	$615,000
108644	RTE 651 - RECONSTRUCTION	Chesterfield County	Highway	$0	$1,438,000	$1,438,000
17179	RTE 649 - RECONSTRUCTION	Chesterfield County	Highway	$2,952,000	$0	$2,952,000
90346	RTE 147 (HUGUENOT RD) - SPOT WIDENING	Chesterfield County	Highway	$4,019,000	$0	$4,019,000
97687	RTE 360 - WIDENING	Chesterfield County	Highway	$12,500,000	$0	$12,500,000
101020	#HB2.FY17 RTE 10 (BERMUDA TRIANGLE RD TO MEADOWVILLE RD)	Chesterfield County	Highway	$21,260,000	$32,932,000	$54,192,000
102945	WALTON PARK LANE IMPROVEMENTS	Chesterfield County	Highway	$1,265,000	$0	$1,265,000
102952	RTE 10 - WIDEN TO 6 LANES	Chesterfield County	Highway	$4,500,000	$3,500,000	$8,000,000
102959	RTE 60 - WIDEN TO 6 LANES	Chesterfield County	Highway	$17,002,000	$0	$17,002,000
104286	RTE 618 - RECONSTRUCT SHOULDER AND DITCHES	Chesterfield County	Highway	$3,284,000	$0	$3,284,000
104289	RTE 649 - MINOR WIDENING	Chesterfield County	Highway	$4,035,000	$0	$4,035,000
104862	RTE 288 - IMPROVE INTERCHANGE AT RTE 360 (PE ONLY)	Chesterfield County	Highway	$1,500,000	$0	$1,500,000
104884	RTE 711 - PAVE SHOULDER	Chesterfield County	Highway	$500,000	$0	$500,000
104889	RT 10 - WIDENING	Chesterfield County	Highway	$0	$9,670,000	$9,670,000
104890	RTE 360 - WIDENING	Chesterfield County	Highway	$0	$6,400,000	$6,400,000
105673	RTE 641 - RECONSTRUCTION	Chesterfield County	Highway	$2,500,000	$0	$2,500,000
105674	RTE 720 - MAJOR WIDENING	Chesterfield County	Highway	$6,500,000	$0	$6,500,000
105676	RTE 672 - ROUNDABOUT	Chesterfield County	Highway	$2,500,000	$0	$2,500,000
106238	RTE 604 - REPLACE GUARDRAILS	Chesterfield County	Highway	$443,000	$0	$443,000
106536	RTE 95 - INSTALL BARRIER SERVICE	Chesterfield County	Highway	$315,000	$0	$315,000
107059	RTE 604 - CONSTRUCT ROUNDABOUT	Chesterfield County	Highway	$2,300,000	$0	$2,300,000
107084	RTE 641 - RECONSTRUCTION	Chesterfield County	Highway	$619,000	$0	$619,000
107868	RTE 604 - INSTALL SIGNALS	Chesterfield County	Highway	$220,000	$0	$220,000
T17414	#HB2.FY17 RTE 95 - IMPROVE INTERCHANGE AT RTE 10	Chesterfield County	Highway	$0	$9,500,000	$9,500,000
109313	#HB2.FY17 RTE 64 - INSTALL SIGNAL AT RTE 623	Goochland County	Highway	$0	$767,000	$767,000
109315	#HB2.FY17 RTE 288 - IMPROVE INTERCHANGE AT RTE 250	Goochland County	Highway	$0	$4,270,000	$4,270,000
109317	#HB2.FY17 RTE 6 - INSTALL SIGNAL	Goochland County	Highway	$0	$869,000	$869,000
98236	RTE 638 - EXTEND ATLEE RD TO CONNECT TO ATLEE STATION RD	Hanover County	Highway	$13,440,000	$3,993,000	$17,433,000
104957	#HB2.FY17 RTE 656 - SLIDING HILL ROAD CORRIDOR	Hanover County	Highway	$500,000	$10,538,000	$11,038,000
108636	RTE 2380 - NEW SIGNAL	Hanover County	Highway	$0	$308,000	$308,000
13551	RTE 360 WIDENING	Hanover County	Highway	$7,984,000	$8,780,000	$16,764,000
17768	RTE 360 - WIDENING FROM 4 TO 6 & 8 LANES	Hanover County	Highway	$14,164,000	$0	$14,164,000
71354	RTE 656 - INSTALL LEFT TURN LANE ONTO RTE 813	Hanover County	Highway	$2,535,000	$0	$2,535,000
77121	RTE 638 - CONSTRUCT LTL & ADD SB REC. LN	Hanover County	Highway	$2,188,000	$900,000	$3,088,000
107071	RTE 54 - INSTALL FLASHING SIGNALS	Hanover County	Highway	$87,000	$0	$87,000
109260	POLE GREEN RD WIDENING - PE ONLY	Hanover County	Highway	$0	$720,000	$720,000
108654	ADD TURN LANES	Henrico County	Highway	$0	$1,355,000	$1,355,000
16153	RTE 7555 - LABURNUM AVENUE - WIDENING	Henrico County	Highway	$835,000	$0	$835,000
18122	RTE 627 - MEADOWBRIDGE ROAD - RECONSTRUCTION	Henrico County	Highway	$63,000	$0	$63,000
50525	RTE 9999 (THREE CHOPT ROAD) WIDEN TO 4 LANES	Henrico County	Highway	$6,938,000	$308,000	$7,246,000
50528	THREE CHOPT ROAD - WIDENING - PE ONLY	Henrico County	Highway	$2,583,000	$0	$2,583,000
50529	RTE 9999 (THREE CHOPT ROAD) WIDEN TO 4 LANES	Henrico County	Highway	$6,772,000	$126,000	$6,898,000
60933	RTE 9999 - DABBS HOUSE RD; RECONSTRUCTION	Henrico County	Highway	$8,990,000	$4,300,000	$13,290,000
60934	RTE 9999 - SADLER RD; WIDEN & RECONSTRUCT; FED ESCROW PROJ	Henrico County	Highway	$2,500,000	$0	$2,500,000

FIG. 5.12. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
104148	SADLER RD - RECONSTRUCTION	Henrico County	Highway	$10,170,000	$5,600,000	$15,770,000
107458	#HB2.FY17 RTE 64 - MAJOR WIDENING	Henrico County	Highway	$50,110,000	$9,800,000	$59,910,000
107459	#HB2.FY17 RTE 64 - EXTEND ACCELERATION/DECELERATION LANES	Henrico County	Highway	$450,000	$3,650,000	$4,100,000
108574	RTE 157 SPRINGFIELD RD TEMP. SIGNAL AT FRANCISTOWN RD	Henrico County	Highway	$115,000	$0	$115,000
92652	RTE 155 - WIDEN SHOULDERS	New Kent County	Highway	$1,121,000	$0	$1,121,000
8216	RTE 1343 - NEW ROADWAY CONSTRUCTION	Powhatan County	Highway	$4,379,000	$2,624,000	$7,003,000
86442	RTE 711 - MAJOR WIDENING (FED ID 13865)	Powhatan County	Highway	$2,702,000	$15,477,000	$18,179,000
108649	RTE 5 (MAIN STREET) - NEW ROAD	Richmond	Highway	$0	$1,415,000	$1,415,000
15954	WHITEHEAD ROAD - MAJOR WIDENING	Richmond	Highway	$417,000	$0	$417,000
15955	RTE 1 - MAJOR WIDENING	Richmond	Highway	$7,892,000	$0	$7,892,000
15958	COMMERCE ROAD - WIDENING	Richmond	Highway	$13,610,000	$2,050,000	$15,660,000
15959	RTE 360 - MAJOR WIDENING	Richmond	Highway	$5,015,000	$0	$5,015,000
19035	JAHNKE ROAD - 2 LANE IMPROVEMENTS	Richmond	Highway	$6,729,000	$7,300,000	$14,029,000
19036	FOREST HILL AVENUE IMPROVEMENTS	Richmond	Highway	$12,701,000	$0	$12,701,000
81253	FRANKLIN STREET-UPGRADE EXIST SIGNAL, ENHANCE PVMT MARKINGS	Richmond	Highway	$281,000	$0	$281,000
86733	HSIP PROACTIVE SAFETY PROJECTS CITY OF RICHMOND	Richmond	Highway	$1,585,000	$0	$1,585,000
88477	BERKLEY PROJECT	Richmond	Highway	$784,000	$0	$784,000
92609	POCAHONTAS PARKWAY - T895 - VDOT OVERSIGHT	Richmond	Highway	$150,000	$0	$150,000
101854	SHOCKOE STREET REVERSAL	Richmond	Highway	$639,000	$0	$639,000
104281	DEEPWATER TERMINAL RD - EXTEND EXISTING ROADWAY	Richmond	Highway	$2,250,000	$0	$2,250,000
104282	SOUTH KINSLEY - IMPROVE DRAINAGE	Richmond	Highway	$1,200,000	$0	$1,200,000
104283	WILLOW OAKS - IMPROVE DRAINAGE	Richmond	Highway	$260,000	$0	$260,000
104284	FRANKLIN ST - STREETSCAPE	Richmond	Highway	$4,850,000	$0	$4,850,000
104882	DEEPWATER TERMINAL RD - EXTEND EXISTING ROADWAY	Richmond	Highway	$0	$1,750,000	$1,750,000
104959	RTE 147 - HUGUENOT ROAD CORRIDOR IMPROVEMENTS	Richmond	Highway	$870,000	$0	$870,000
105682	FRANKLIN ST - RECONSTRUCTION	Richmond	Highway	$1,000,000	$0	$1,000,000
105684	YORKTOWN AVE - IMPROVE DRAINAGE	Richmond	Highway	$370,000	$0	$370,000
105686	BURTWOOD LN - IMPROVE DRAINAGE	Richmond	Highway	$920,000	$0	$920,000
105687	IMPROVE DRAINAGE - VARIOUS LOCATIONS	Richmond	Highway	$410,000	$0	$410,000
105691	EAST 37TH ST - RECONSTRUCTION	Richmond	Highway	$500,000	$0	$500,000
105693	RIVERSIDE DR - INSTALL GUARDRAIL	Richmond	Highway	$540,000	$0	$540,000
105890	SIGNAL SYSTEM	Richmond	Highway	$0	$6,312,000	$6,312,000
107109	WEST CLAY ST - IMPROVE LIGHTING	Richmond	Highway	$700,000	$0	$700,000
107110	JARVIS RD - IMPROVE DRAINAGE	Richmond	Highway	$850,000	$0	$850,000
107795	#HB2.FY17 RTE 95 - IMPROVE RAMP AREA AT FRANKLIN ST	Richmond	Highway	$650,000	$2,498,000	$3,148,000
107796	#HB2.FY17 RTE 95 - EXTEND NB DECEL LANE AT HERMITAGE RD	Richmond	Highway	$550,000	$2,170,000	$2,720,000
107797	#HB2.FY17 RTE 95 - EXTEND NB ACCEL LANE AT BELVIDERE ST	Richmond	Highway	$850,000	$4,933,000	$5,783,000
109311	#HB2.FY17 LABURNUM AVE - IMPROVE INTERCHANGE AT RTE 195	Richmond	Highway	$0	$2,436,000	$2,436,000
109320	#HB2.FY17 RTE 95 - RECONFIGURE RAMPS	Richmond	Highway	$0	$10,229,000	$10,229,000
109321	#HB2.FY17 RTE 95 - IMPROVE INTERCHANGE AT MAURY ST	Richmond	Highway	$0	$9,192,000	$9,192,000
T17416	#HB2.FY17 IMPROVE BROAD ST EXIT AREA	Richmond	Highway	$0	$28,043,000	$28,043,000
70542	I-64 - WIDEN FROM 4 TO 6 LANES AND IMPROVE RTE 623 INTERCHNG	Richmond District-wide	Highway	$36,809,000	$420,000	$37,229,000
81373	HSIP DISTRICTWIDE ROADWAY SAFETY ASSESSMENT	Richmond District-wide	Highway	$2,257,000	$0	$2,257,000
86684	HSIP DISTRICTWIDE HIGH RISK RURAL ROADS - RICHMOND	Richmond District-wide	Highway	$920,000	$0	$920,000
104664	REPLACE SIGNALS - VARIOUS INTERSECTIONS	Richmond District-wide	Highway	$4,390,000	$2,100,000	$6,490,000
105444	RTE 60 - (RTE 64 CORRIDOR TECH) SCC - JAMES CTY TO HENRICO	Richmond District-wide	Highway	$180,000	$0	$180,000
106953	DDMS AROUND RICHMOND - VARIOUS INTERSTATE LOCATIONS	Richmond District-wide	Highway	$805,000	$0	$805,000
107040	ROADWAY DEPARTURE COUNTERMEASURES - DISTRICTWIDE	Richmond District-wide	Highway	$0	$1,070,000	$1,070,000
107042	ROADWAY DEPARTURE COUNTERMEASURES - DISTRICTWIDE	Richmond District-wide	Highway	$0	$1,150,000	$1,150,000
107045	SYSTEMIC UNSIGNALIZED INTERSECTION TREATMENTS - DISTRICTWIDE	Richmond District-wide	Highway	$0	$2,960,000	$2,960,000
T6521	HSIP RICHMOND DISTRICTWIDE	Richmond District-wide	Highway	$2,168,000	$0	$2,168,000
104891	VIRGINIA PORT AUTHORITY - CRANE PROCUREMENT	Richmond	Intermodal	$4,184,000	$0	$4,184,000
104892	PORT OF VIRGINIA GREEN OPERATOR (GO) PROGRAM	Richmond	Intermodal	$1,043,000	$500,000	$1,543,000
109266	RICHMOND MARINE TERMINAL - INTERMODAL TRANSFER IMPROVEMENTS	Richmond	Intermodal	$0	$2,050,000	$2,050,000

FIG. 5.13. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
105677	RTE 1 - IMPROVE INTERSECTION	Ashland	Intersection	$700,000	$250,000	$950,000
13463	RTE 1 - IMPROVE INTERSECTION AT RTE 54	Ashland	Intersection	$7,535,000	$0	$7,535,000
70092	RTE 647 (REAMS RD) - INTERSECTION IMPROVEMENTS	Chesterfield County	Intersection	$4,252,000	$0	$4,252,000
77071	RTE 10 - UPGRADE SIGNALS - 4 INT	Chesterfield County	Intersection	$415,000	$0	$415,000
101021	RTE 1 - IMPROVE INTERSECTION	Chesterfield County	Intersection	$5,706,000	$0	$5,706,000
104886	RTE 360 - INTERSECTION IMPROVEMENTS	Chesterfield County	Intersection	$0	$3,600,000	$3,600,000
105733	RTE 623 - IMPROVE INTERSECTION	Goochland County	Intersection	$900,000	$1,000,000	$1,900,000
107081	RTE 250 - CONSTRUCT ROUNDABOUT	Goochland County	Intersection	$0	$2,100,000	$2,100,000
104275	RTE 54 - IMPROVE INTERSECTION	Hanover County	Intersection	$2,302,000	$650,000	$2,952,000
107178	RTE 641 - IMPROVE INTERSECTION	Hanover County	Intersection	$800,000	$1,700,000	$2,500,000
18962	RTE 360 - INTERSECTION RELOCATION	Hanover County	Intersection	$7,880,000	$0	$7,880,000
56181	RTE 33 - ADD LEFT TURN LANES AT THE INTERSECTION OF RTE 623	Hanover County	Intersection	$5,650,000	$2,093,000	$7,743,000
81667	RTE 615 (CREIGHTON RD) - IMPROVE INTERSECTION	Hanover County	Intersection	$5,932,000	$1,927,000	$7,859,000
97685	RT 627 (POLE GREEN RD) - INT IMPR @RTE 615 (WALNUT GROVE RD)	Hanover County	Intersection	$1,398,000	$0	$1,398,000
97686	RTE 627 (POLE GREEN RD) - IMPROVE INTERSECTION	Hanover County	Intersection	$743,000	$0	$743,000
103014	RT 623 - IMPROVE INTERSECTION	Hanover County	Intersection	$5,001,000	$934,000	$5,935,000
104875	RTE 606 - ROUNDABOUT	Hanover County	Intersection	$708,000	$1,120,000	$1,828,000
101023	RTE 157 (SPRINGFIELD RD) FRANCISTOWN RD INTERSECTION IMP.	Henrico County	Intersection	$2,285,000	$0	$2,285,000
101034	#HB2.FY17 RTE 6 PATTERSON AVE AT PARHAM RD INTERSECTION	Henrico County	Intersection	$2,450,000	$11,550,000	$14,000,000
52414	RTE 249 - CONSTRUCT ROUNDABOUT	New Kent County	Intersection	$3,208,000	$0	$3,208,000
108629	ROUNDABOUT AT BELMONT AND W. BELMONT RD. INTERSECTION	Richmond	Intersection	$0	$277,000	$277,000
108630	RELOCATE DOCK ST ROUNDABOUT AT MAIN ST W/INT IMPROVEMENTS	Richmond	Intersection	$0	$4,483,000	$4,483,000
108652	ROUNDABOUT AT CHAMBERLAYNE PKY, DUVAL AND JACKSON ST.	Richmond	Intersection	$0	$332,000	$332,000
93350	CONSTRUCT ROUNDABOUT AT NINE MILE RD, 25TH ST. AND FARIMOUNT	Richmond	Intersection	$1,222,000	$0	$1,222,000
105653	MONUMENT AVE - IMPROVE INTERSECTION	Richmond	Intersection	$600,000	$0	$600,000
106293	REPLACE SIGNALS - 3 INTERSECTIONS	Richmond District-wide	Intersection	$930,000	$0	$930,000
80330	ELECTRONIC TOLL CUSTOMER SERV. & VIOLATION ENFORCEMENT SYS.	Chesterfield County	Other	$1,047,000	$0	$1,047,000
109191	RTE 288/COMMONWEALTH CTR PKWY & BAILEY BRIDGE CONNECTOR IMR	Chesterfield County	Other	$500,000	$0	$500,000
109231	I-64/ASHLAND RD INTERCHANGE IMR	Goochland County	Other	$310,000	$90,000	$400,000
107047	RTE 654-UPGRADE FLASHING LIGHTS & GATES & ADD CWT PREDICTORS	Hanover County	Other	$260,000	$0	$260,000
T17759	RT.54-INSTALL NEW FLASHING LIGHTS & GATES ADD CWT PREDICTORS	Hanover County	Other	$260,000	$0	$260,000
12945	HENRICO COUNTY TRAFFIC SIGNAL SYSTEM	Henrico County	Other	$470,000	$0	$470,000
13553	COMPUTERIZED SIGNAL SYSTEM	Henrico County	Other	$2,877,000	$0	$2,877,000
58911	IMPROVE TRAFFIC OPERATIONS	Henrico County	Other	$1,081,000	$0	$1,081,000
84348	CRAC "CELL LOTS"	Henrico County	Other	$308,000	$0	$308,000
86683	HSIP PROACTIVE SAFETY - HENRICO COUNTY	Henrico County	Other	$2,855,000	$0	$2,855,000
105569	DILL RD - INSTALL FLASHING LIGHTS AND GATES	Henrico County	Other	$295,000	$0	$295,000
106938	RTE 95 - INSTALL ITS DEVICES	Henrico County	Other	$3,000,000	$0	$3,000,000
107939	HENRICO COUNTY AUTOMATIC TRAFFIC MANAGEMENT SYSTEM (ATMS)	Henrico County	Other	$2,909,000	$5,618,000	$8,527,000
109261	INSTALL FIBER OPTIC, CCTV AND DMS - I-64	Henrico County	Other	$4,563,000	$0	$4,563,000
86357	RAMPO TRAVEL DEMAND MODELING ON-CALL CONSULTANT SUPPORT	Multi-jurisdictional: Richmond MPO	Other	$300,000	$0	$300,000
101492	RICHMOND REGION-WIDE IMPROVEMENTS	Multi-jurisdictional: Richmond MPO	Other	$132,000	$24,051,000	$24,183,000
106216	RTE 106 - ARTERIAL ACCESS MANAGEMENT PLAN	New Kent County	Other	$130,000	$0	$130,000
106300	RTE 604 - CONSTRUCT PARK AND RIDE LOT	New Kent County	Other	$400,000	$0	$400,000
107460	RTE 64 - INTERCHANGE MODIFICATION STUDY	New Kent County	Other	$250,000	$0	$250,000
106217	RTE 60 CORRIDOR EAST SPECIAL AREA PLAN	Powhatan County	Other	$150,000	$0	$150,000
108698	REPLACE EXISTING ROADWAY LIGHTING	Richmond	Other	$0	$615,000	$615,000
108703	TRAFFIC CALMING INSTALLATIONS AT VARIOUS LOCATIONS	Richmond	Other	$0	$246,000	$246,000
108714	TRAFFIC CONTROL INSTALLATIONS	Richmond	Other	$0	$246,000	$246,000
19001	RTE 60 - INTERCHANGE STUDY	Richmond	Other	$300,000	$0	$300,000
70591	CITY OF RICHMOND - TRAFFIC CONTROL & SAFETY ENHANCEMENTS	Richmond	Other	$5,315,000	$0	$5,315,000
70593	CITY OF RICHMOND - SIGNAL SYSTEM ENHANCEMENT	Richmond	Other	$3,251,000	$0	$3,251,000
71786	CITY OF RICHMOND - FORMULA CITY PAYMENT	Richmond	Other	$0	$0	$0
97840	LANDSCAPE INTERSTATE I-95 GATEWAYS INTO THE CITY OF RICHMOND	Richmond	Other	$2,794,000	$0	$2,794,000

FIG. 5.14. PLAN2040 CONSTRAINED PROJECTS LIST – TIMEBAND 1

plan2040 Constrained Projects List: Timeband 1 (FY2017-2022 SYIP and DRPT Transit in Richmond Region)

UPC	Description	Jurisdiction	Project Type	Previous Allocations	FY17-22 Allocations	Total Allocations
100498	CITY SIGNAL SYSTEMS SOUTH OF JAMES RIVER	Richmond	Other	$9,488,000	$1,822,000	$11,310,000
100564	CITY OF RICHMOND - UPGRADE SIGNALS	Richmond	Other	$1,195,000	$0	$1,195,000
104279	CITYWIDE - TRAFFIC CALMING	Richmond	Other	$400,000	$0	$400,000
104280	CITYWIDE - INSTALL TRAFFIC CONTROL	Richmond	Other	$400,000	$0	$400,000
105652	INSTALL SIGNALS - VARIOUS LOCATIONS	Richmond	Other	$200,000	$0	$200,000
105668	INSTALL TRAFFIC CONTROL - VARIOUS LOCATIONS	Richmond	Other	$400,000	$0	$400,000
107105	TRAFFIC CONTROLS - CITYWIDE	Richmond	Other	$400,000	$0	$400,000
107106	INSTALL TRAFFIC CALMING - CITYWIDE	Richmond	Other	$400,000	$0	$400,000
107987	HERMITAGE RD - UPGRADE CANTILEVER FLASHING LIGHTS AND GATES	Richmond	Other	$200,000	$0	$200,000
109319	#HB2.FY17 RTE 95 - ITS LOW BRIDGE WARNING SYSTEM	Richmond	Other	$0	$822,000	$822,000
T17407	#HB2.FY17 RTE 250 - STREETSCAPE	Richmond	Other	$0	$6,020,000	$6,020,000
T17751	PEAR ST. - UPGRADE FLASHING LIGHTS AND ADD GATES	Richmond	Other	$275,000	$0	$275,000
T17753	HOSPITAL ST.- NEW FLASHING LIGHTS & GATES ADD CWT PREDICTORS	Richmond	Other	$260,000	$0	$260,000
T1811	CITY OF RICHMOND: EMPLOYEE TRIPREDUCTION PROGRAM	Richmond	Other	$2,696,000	$500,000	$3,196,000
81388	HSIP DISTRICTWIDE TRAFFIC SIGNALS AND ITS	Richmond District-wide	Other	$3,494,000	$0	$3,494,000
99581	PROJECT PRESCOPING - RICHMOND	Richmond District-wide	Other	$4,624,000	$8,252,000	$12,876,000
106304	PARK AND RIDE LOTS AT PRIORITY LOCATIONS - PE ONLY	Richmond District-wide	Other	$125,000	$0	$125,000
107034	INSTALL FLASHING YELLOW ARROWS - DISTRICTWIDE	Richmond District-wide	Other	$0	$6,500,000	$6,500,000
107036	INSTALL PEDESTRIAN SIGNALS - DISTRICTWIDE	Richmond District-wide	Other	$0	$1,500,000	$1,500,000
107038	UPGRADE TRAFFIC SIGNALS - DISTRICTWIDE	Richmond District-wide	Other	$0	$4,000,000	$4,000,000
107102	DISTRICTWIDE BUCKLE-UP SIGNING SAFETY IMPROVEMENT - RICHMOND	Richmond District-wide	Other	$378,000	$0	$378,000
T18016	GRTC REPLACEMENT OF ROLLING STOCK CNG BUSES	Richmond	Public Transportation	$0	$589,000	$589,000
T18033	GRTC TRANSIT DEVELOPMENT PLAN	Richmond	Public Transportation	$0	$156,000	$156,000
T18054	BUS RAPID TRANSIT (BRT)	Richmond	Public Transportation	$4,599,000	$4,401,000	$9,000,000
T198	MARKETING CAMPAIGN TO ATTRACT CHOICE RIDERS	Richmond	Public Transportation	$1,017,000	$0	$1,017,000
T201	VANPOOL FLEET EXPANSION	Richmond	Public Transportation	$50,000	$0	$50,000
T203	REGIONWIDE AIR POLLUTION REDUCTION PROGRAM - RIDEFINDERS	Richmond	Public Transportation	$13,118,000	$1,006,000	$14,124,000
T206	ALTERNATIVE FUEL TROLLEY VEHICLE REPLACEMENT	Richmond	Public Transportation	$180,000	$0	$180,000
T240	TRANSIT INFORMATION SOFTWARE	Richmond	Public Transportation	$300,000	$0	$300,000
T39	BUS TRANSFER STATION ON BROAD STREET BETWEEN 7TH AND 8TH ST	Richmond	Public Transportation	$100,000	$0	$100,000
T40	EXPANSION OF CURRENT MAINTENANCE FACILITY	Richmond	Public Transportation	$14,785,000	$0	$14,785,000
T41	RENOVATION OF TRANSPORTATION FACILITY	Richmond	Public Transportation	$3,786,000	$0	$3,786,000
50650	RIDEFINDERS - REGIONWIDE	Richmond District-wide	Public Transportation	$4,446,000	$0	$4,446,000
T4314	RICHMOND GRTC - PURCHASE 15 TRANSIT BUSES	Richmond District-wide	Public Transportation	$5,300,000	$0	$5,300,000
	DRPT TRANSIT IN RICHMOND REGION	Richmond District-wide	Public Transportation		$82,269,232	$84,733,420
57008	MAIN STREET STATION	Richmond	Rail	$4,485,000	$0	$4,485,000
64219	CITY OF RICHMOND - MAIN STREET STATION CAPITAL FUNDS	Richmond	Rail	$36,904,000	$5,000,000	$41,904,000
66857	CITY OF RICHMOND - MAIN STREET STATION OPERATIONS	Richmond	Rail	$2,275,000	$0	$2,275,000
105701	MAIN STREET STATION SITE IMPROVEMENTS	Richmond	Rail	$3,500,000	$0	$3,500,000
104482	2014 PLANT MIX SCHEDULE CHESTERFIELD RESIDENCY (PRIMARY)	Chesterfield County	State of Good Repair	$2,208,000	$51,000	$2,259,000
106233	RTE 76 SB - RESTORE EXIST PAVEMENT	Chesterfield County	State of Good Repair	$0	$2,438,000	$2,438,000
104476	2014 PLANT MIX SCHEDULE ASHLAND NORTH RESIDENCY (PRIMARY)	Hanover County	State of Good Repair	$2,918,000	$0	$2,918,000
106206	RTE 657 - SHOULDER WEDGE & OVERLAY	Hanover County	State of Good Repair	$600,000	$0	$600,000
104511	GASKINS ROAD PARK AND RIDE FACILITY - RESURFACE	Henrico County	State of Good Repair	$228,000	$0	$228,000
107461	#HB2.FY17 RTE 64 EB - PAVEMENT MARKING	Henrico County	State of Good Repair	$50,000	$1,450,000	$1,500,000
104499	I-64 EB REHAB EXISTING PAVEMENT	New Kent County	State of Good Repair	$7,931,000	$6,033,000	$13,964,000
72706	CITY OF RICHMOND - PAINTING & REHABILITATION	Richmond	State of Good Repair	$9,000,000	$0	$9,000,000
104507	CITYWIDE - OVERLAY PAVEMENT	Richmond	State of Good Repair	$10,000,000	$0	$10,000,000
105666	PAVEMENT OVERLAY - VARIOUS LOCATIONS	Richmond	State of Good Repair	$5,500,000	$0	$5,500,000
107107	PAVEMENT OVERLAY - CITYWIDE	Richmond	State of Good Repair	$8,500,000	$0	$8,500,000
107837	RTE 360E - RESURFACING	Richmond	State of Good Repair	$340,000	$0	$340,000
				Total FY17-22 Allocations	**$555,760,232**	

*Note: The Timeband 1 Allocation Guidelines (see page 67) were not used to define project type parameters for the Timeband 1 Constrained Projects List. The Timeband 1 Constrained Projects List is consistent with projects in the FY2017-2022 SYIP as approved by the CTB on June 14, 2016, and is constrained to the VDOT and DRPT revenue projections for Timeband 1 (see page 61).

FIG. 5.15. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 2 (FY2023-2028)

Project Name	Jurisdiction	Project Type	Cost Estimate
Bicycle and Pedestrian Improvements	Chesterfield	Bicycle/Pedestrian	$ 2,000,000
Homeview Road Improvements	Henrico	Bicycle/Pedestrian	$ 2,400,000
Parham Road Improvements	Henrico	Bicycle/Pedestrian	$ 5,000,000
Regionwide Bicycle and Pedestrian Improvements	TPO	Bicycle/Pedestrian	$ 21,149,263
Bridge Replacement	Chesterfield	Bridge	$ 4,000,000
Cox Rd Bridge Replacement at I-64	Henrico	Bridge	$ 15,000,000
Major Rehabilitation of Robert E. Lee Bridge	Richmond	Bridge	$ 25,000,000
Regionwide Bridge Improvements	TPO	Bridge	$ 46,505,199
Rte 1 Widening Arbor Oak to Ashcake	Ashland	Highway	$ 4,000,000
England St Enhancements	Ashland	Highway	$ 2,000,000
N Enon Church Rd (Meadowville Tech Pkwy-Rich/TC Boundary) Widening	Chesterfield	Highway	$ 1,000,000
Bailey Bridge (Bailey Bridge Connector - Spring Run Road)	Chesterfield	Highway	$ 2,000,000
Woolridge Road (Genito Road to Simonsbath) Widening	Chesterfield	Highway	$ 8,000,000
I-95/Route 10 Interchange Improvements	Chesterfield	Highway	$ 10,000,000
Route 288/Route 360: 30/Brad McNeer Continuous Green-T*	Chesterfield	Highway	$ 10,800,000
Winterpock Rd (Rt. 360 - Springford Pkwy) Widening	Chesterfield	Highway	$ 12,000,000
Route 288/Route 360: 288S to 360W Off-Ramp Improvements*	Chesterfield	Highway	$ 13,700,000
Route 288/Route 360: Bailey Bridge Connector (2-lane segment)*	Chesterfield	Highway	$ 15,000,000
Beach Road (Rt 10-Nash) Widening or Nash Rd Extension (Beach-Rt 10)	Chesterfield	Highway	$ 15,000,000
Meadowville Technology Parkway at I-295	Chesterfield	Highway	$ 20,000,000
Woolridge Rd (Reservoir to Otterdale Road) Widening	Chesterfield	Highway	$ 21,000,000
Route 288/Route 360: 288 NB Off-Ramp to Bailey Bridge Connector*	Chesterfield	Highway	$ 28,900,000
Route 288/Route 360: Bailey Bridge Connector (4-lane segment) and Brad McNeer Connector*	Chesterfield	Highway	$ 40,600,000
I-95/Willis Road Interchange	Chesterfield	Highway	$ 43,000,000
Hockett Rd (Rte 623) Realignment	Goochland	Highway	$ 1,500,000
E. Patrick Henry Rd Widening	Hanover	Highway	$ 5,520,000
Pole Green Rd Widening	Hanover	Highway	$ 13,500,000
Atlee Station Rd Widening	Hanover	Highway	$ 31,200,000
Regionwide Highway Improvements	TPO	Highway	$ 1,781,314
Regionwide Intermodal Improvements	TPO	Intermodal	$ 3,608,181

FIG. 5.16. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 1

plan2040 Constrained Projects List: Timeband 2 (FY2023-2028)

Project Name	Jurisdiction	Project Type	Cost Estimate
Route 288/Route 360: 288 SB Off-Ramp to Commonwealth Ctr Pkwy*	Chesterfield	Intersection	$ 3,900,000
Rt 54/Goddins Hill Rd Left Turn Lane	Hanover	Intersection	$ 1,600,000
Countywide ATMS Phase III	Henrico	Intersection	$ 11,000,000
Midlothian Turnpike and Roanoke St Roundabout	Richmond	Intersection	$ 610,000
Three Chopt Rd and Boatwright Dr Roundabout	Richmond	Intersection	$ 700,000
Broad Rock Rd and Holly Springs Ave and Stockton St Roundabout	Richmond	Intersection	$ 900,000
Traffic Signal Modernizations	Richmond	Intersection	$ 1,000,000
Broad Rock Rd, Belt Blvd, Deloak Ave and McGuire Hospital Roundabout	Richmond	Intersection	$ 1,000,000
Regionwide Intersection Improvements	TPO	Intersection	$ 4,186,447
Park and Ride Facilities	Chesterfield	Other	$ 1,000,000
Rt 288/West Creek Interchange Justification Report	Goochland	Other	$ 220,000
Ashland Rd. at I-64 Interchange Modification Report	Goochland	Other	$ 250,000
Oilville Rd/I-64 Interchange Modification Report	Goochland	Other	$ 250,000
Park and Ride Project	GRTC	Other	$ 3,208,800
Regionwide Other Improvements	TPO	Other	$ 46,187,093
Replacement Compressed Natural Gas Specialized Transportation Vehicles	GRTC	Public Transportation	$ 9,129,784
Regionwide Public Transportation Improvements	TPO	Public Transportation	$ 27,269,431
Vaughan Rd Grade Separated Crossing	Ashland	Rail	$ 2,000,000
Amtrak Station Improvements	Ashland	Rail	$ 2,000,000
Staples Mill Amtrak Station Improvements	Henrico	Rail	$ 9,500,000
Regionwide Rail Improvements	TPO	Rail	$ 5,563,221
Replacement Compressed Natural Gas Rolling Stock - Buses	GRTC	State of Good Repair	$ 37,627,504
Williamsburg Rd Improvements and Streetscape	Henrico	State of Good Repair	$ 24,000,000
Regionwide State of Good Repair Improvements	TPO	State of Good Repair	$ 8,130,656
		Total Amount	**$ 626,396,893**

FIG. 5.17. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 2

plan2040 Constrained Projects List: Timeband 3 (FY2029-2034)

Project Name	Jurisdiction	Project Type	Cost Estimate
Regionwide Bicycle and Pedestrian Improvements	TPO	Bike/Ped	$ 29,009,262
Regionwide Bridge Improvements	TPO	Bridge	$ 89,963,248
Rte 1 Reconstruction- 54 to Archie	Ashland	Highway	$ 33,396,000
Rte 1 Reconstruction- Archie to NCL	Ashland	Highway	$ 21,780,000
Rte 1 Widening Ashcake to SCL	Ashland	Highway	$ 36,300,000
Route 288/Route 360: 360 Superstreet Intersections (Mockingbird/Harbour Pointe to Winterpock)*	Chesterfield	Highway	$ 53,800,000
Route 360 (Woodlake Village Pkwy to Otterdale)	Chesterfield	Highway	$ 25,000,000
Charter Colony Pkwy (N. Woolridge Road - Center Pointe)	Chesterfield	Highway	$ 16,000,000
Otterdale Road (Rt 360 - Woolridge Road) Widening	Chesterfield	Highway	$ 10,000,000
Watkins Centre Pkwy (East West Rd to Rt 288) Widening	Chesterfield	Highway	$ 8,200,000
Ashland Rd (Rte 623) Widening	Goochland	Highway	$ 11,600,000
Blair Rd (Rte 649) Reconstruction	Goochland	Highway	$ 2,500,000
Woodman Rd Extension	Henrico	Highway	$ 18,210,000
New Market Rd Widening	Henrico	Highway	$ 18,400,000
Pouncey Tract Rd Widening	Henrico	Highway	$ 18,000,000
Gaskins Rd Interchange Modification at I-64	Henrico	Highway	$ 12,000,000
Regionwide Highway Improvements	TPO	Highway	$ 2,489,184
Regionwide Intermodal Improvements	TPO	Intermodal	$ 6,043,596
Hull St and Commerce Rd Intersection Improvement	Richmond	Intersection	$ 900,000
Hull St and Cowardin Ave Intersection Improvement	Richmond	Intersection	$ 1,120,000
Hermitage Rd, Boulevard, Westwood Ave and Brookland Pkwy Roundabout	Richmond	Intersection	$ 1,000,000
Regionwide Intersection Improvements	TPO	Intersection	$ 14,650,324
Citywide ITS Integrations	Richmond	Other	$ 3,000,000
Regionwide Other Improvements	TPO	Other	$ 36,715,061
Replacement Compressed Natural Gas Specialized Transportation Vehicles	GRTC	Public Transportation	$ 9,548,405
Regionwide Public Transportation Improvements	TPO	Public Transportation	$ 35,285,014
Regionwide Rail Improvements	TPO	Rail	$ 23,541,247
Replacement Compressed Natural Gas Rolling Stock - Buses	GRTC	State of Good Repair	$ 39,352,808
Regionwide State of Good Repair Improvements	TPO	State of Good Repair	$ 22,809,897
		Total Amount	**$ 600,614,046**

FIG. 5.18. PLAN2040 CONSTRAINED PROJECTS LIST - TIMEBAND 4

plan2040 Constrained Projects List: Timeband 4 (FY2035-2040)

Project Name	Jurisdiction	Project Type	Cost Estimate
Regionwide Bicycle and Pedestrian Improvements	TPO	Bike/Ped	$ 27,932,095
Regionwide Bridge Improvements	TPO	Bridge	$ 90,499,987
Route 288/Route 360: 360/Commonwealth Ctr Pkwy/Old Hundred Diverging Diamond Interchange*	Chesterfield	Highway	$ 147,300,000
Powhite Pkwy (City/County Limits to Rt. 60) Widening	Chesterfield	Highway	$ 43,000,000
Centralia Rd (Memory-Chester) Reconstruction and Turn Lanes	Chesterfield	Highway	$ 25,000,000
Powhite Pkwy Ext (Watermill Pkwy to N Woolridge Rd. Ext) New Alignment	Chesterfield	Highway	$ 22,325,000
Route 60 (Westchester Commons to Huguenot Springs Road)	Chesterfield	Highway	$ 12,000,000
N Gayton Rd Improvements	Henrico	Highway	$ 10,335,000
Dispatch Road (VA 613) Safety and Shoulder Improvements	New Kent	Highway	$ 6,240,000
I-95 and Maury St Interchange Improvements	Richmond	Highway	$ 9,000,000
I-95 and I-64 East Junction Interchange Improvements - PE Only	Richmond	Highway	$ 500,000
I-95 and I-64 Overlap - Interchange Improvement Typical Section - PE Only	Richmond	Highway	$ 500,000
I-95 and I-64 West Junction Interchange Improvements - PE Only	Richmond	Highway	$ 500,000
New Interchange at I-95 and Port of Richmond - PE Only	Richmond	Highway	$ 250,000
New Ramps Connecting New Interchange at I-95 and Bellemeade Rd/Commerce Rd - PE Only	Richmond	Highway	$ 250,000
Maury St - Improvement Between I-95 Ramps and E. 16th St - PE Only	Richmond	Highway	$ 100,000
Regionwide Highway Improvements	TPO	Highway	$ 2,020,946
Regionwide Intermodal Improvements	TPO	Intermodal	$ 8,379,628
Regionwide Intersection Improvements	TPO	Intersection	$ 11,172,838
Regionwide Other Improvements	TPO	Other	$ 29,608,020
Replacement Compressed Natural Gas Specialized Transportation Vehicles	GRTC	Public Transportation	$ 11,694,552
Regionwide Public Transportation Improvements	TPO	Public Transportation	$ 41,270,989
Regionwide Rail Improvements	TPO	Rail	$ 27,932,095
Replacement Compressed Natural Gas Rolling Stock - Buses	GRTC	State of Good Repair	$ 48,197,944
Regionwide State of Good Repair improvements	TPO	State of Good Repair	$ 7,666,245
		Total Amount	**$ 583,675,338**

FIG. 5.19. PLAN2040 LOCAL-PRIVATE PROJECTS

plan2040 Local-Private Projects

Jurisdiction	Route	Road Name	Description	Termini	Estimate (x1000)	Funding Source	Completion Date
Henrico County							
	5	Rte 5	Widening (2L to 4L)	Osborne Tpke to Richmond City Limits	$10,500	Private	2025
		Bacova Drive	Realignment	Pouncey Tract Rd to Kain Rd	$5,500	Private/Local	2022
		Cedar Fork Rd Bridge	New facility	at Meadowview	$5,200	Local	2030
		Charles City Road	Widening (2L to 4L)	Lisle Rd to Monahan Road	$2,100	Local	2022
		Charles City Road	Widening (3L to 4L)	Laburnum Ave to Miller Rd	$600	Private	2022
		Concept Rd 26(Riverfront Pkwy)	New 4 lane Facility	Old Osborne Tpke(Rte 5) to Route 895	$18,000	Private	2025
		Concept Road 80	New 2 lane Facility	Portugee Rd to Memorial Dr	$8,530	Private	2030
		Courtney Road	Widening (Improved 2 lane road)	Staples Mill Rd to Mountain Rd	$2,600	Private/Local	2022
		Creighton Road	Widening/Realignment (2L to 4L)	Laburnum Ave to Sandy Lane	$4,200	Local	2019
		Creighton Road	Widening/Realignment (2L to 4L)	Sandy Lane to Richmond CL	$2,900	Private	2030
		Dabbs House Rd	New 2 lane Facility	E. Richmond Rd to Creighton Rd	$2,100	Private	2030
		Kain Rd	Widening (2L to 4L)	Pouncey Tract Rd to Ax Handle Ln	$11,000	Private	2025
		Library Road extension	New 2 lane Facility	Messer Rd to Midview Rd	$2,900	Private	2025
		Memorial Drive extension	New 4 lane Facility	Technology Blvd to Williamsburg Rd	$4,800	Private/Local	2030
		Midview Road extension (Concept Road 25)	New 2 lane Facility	Osborne Tpke to Concept Rd 26 (Riverfront	$4,200	Private	2025
		Oakland Rd extension	New 2 lane Facility	Osborne Tpke (Rte 5) to Concept Rd 26	$2,500	Private	2025
		St. Charles Road Ext.	New 2 lane Facility	St. Charles Rd to Magellan Pkwy	$2,400	Private	2022
		Technology Blvd Ext.	New 2 lane Facility	Williamsburg Rd to Dead End	$2,600	Private	2030
		Three Chopt Road Ext.	New 4 lane Facility	Lauderdale Dr to N. Gayton Rd	$2,200	Private	2020
		White Oak Road	Widening (Improved 2 lane road)	Elko Rd to Rt 60	$9,900	Private/Local	2035
		Wilton Pkwy (Concept Rd 34)	New facility (4L)	Rt 5 to Osborne Tpk	$7,200	Private	2030
	295	I-295 slip ramp	Interchange modification	I-95/I-295	$5,200	Private	2022
	295	I-295 Portugee Road Interchange	New Interchange	at Portugee Rd	$50,000	Private/Local	2035
	295	I-295 Varina Road Interchange	New Interchange	Varina Rd	$45,000	Private/Local	2035
		Darbytown Road	Widening (2L to 4L)	Richmond CL to Laburnum Ave	$17,500	Private/Local	2030
		Charles City Road	Widening (2L to 4L)	Williamsburg Rd to Laburnum Ave	$14,500	Private/Local	2030
		Lauderdale Drive	Widening (2L to 4L)	Westbriar Dr to Edenbury Dr	$10,500	Local	2030
		Memorial Dr/Poplar Springs Rd	Widening (2L to 4L)	Charles City Rd to Technology Dr	$12,000	Private/Local	2030
		Willson Rd Extension (Concept Road 180)	New 2 lane Facility	Midview Rd to Messer Rd	$2,100	Private	2025
Goochland County							
	TBD	Wilkes Ridge Ct	New (4L Undivided)	Wilkes Ridge Pkwy to Wilkes Ridge Pkwy (Loop)	$2,000	Private	2017
	1034	Wilkes Ridge Pkwy Ext.	New (4L Divided)	Wilkes Ridge Pkwy to Termini	$1,500	Private	2019
	TBD	TBD	New (4L Divided)	Broad Street Rd. (at Rte. 288 Ramp) to Termini	$2,000	Private	2018

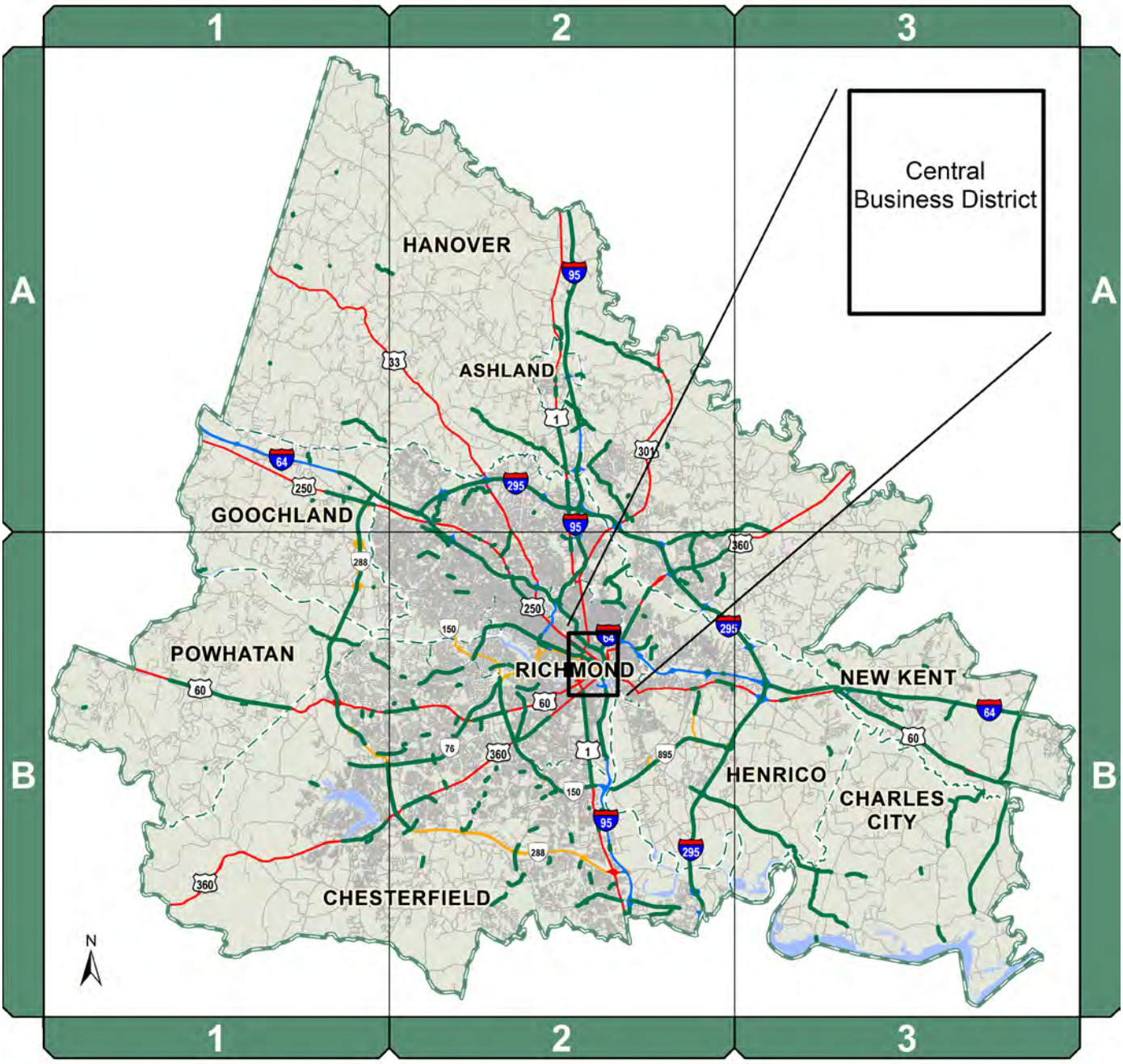
FIG. 5.20. PLAN2040 CONSTRAINED PROJECTS LIST - UNFUNDED REGIONAL NEEDS

plan2040 Unconstrained Projects

Project Name	Jurisdiction	Project Type	Cost Estimate
Route 288/Route 360: 288S CD Roads, 360E to 288N Ramp, 288 Widening*	Chesterfield	Highway	$ 115,900,000
N Woolridge Road (Simonsbath to Rt 288) New Alignment	Chesterfield	Highway	$ 123,000,000
HMK Access Roads	Chesterfield	Highway	$ 40,000,000
Interstate 95 Auxiliary Lanes Between Route 288 and Route 10	Chesterfield	Highway	
Interstate 95 Capacity and Operational Improvements at I-295	Hanover	Highway	
Magellan Parkway Extension	Henrico	Highway	$ 59,300,000
Richmond-Henrico Tpke/Meadowbridge Rd Improvements	Henrico	Highway	$ 19,000,000
N Gayton Interchange at I-64	Henrico	Highway	$ 80,000,000
I-64 Capacity Increase from Bottoms Bridge to Route 106	New Kent	Highway	
Henpeck Road (VA 665) Safety and Shoulder Improvements	New Kent	Highway	$ 4,100,000
Interstate 95 Capacity and Operational Improvements at Shockoe Valley Bridge to Route 10	Richmond	Highway	
I-95/I-64 Overlap Study Area Emergency Pull-Offs	Richmond	Highway	
VA Route 288 ITS Investments, Phase 1	Powhatan/Goochland	Other	
VA Route 288 ITS Investments, Phase 2	Chesterfield	Other	
		Total Amount	**$ 441,300,000**

plan2040: Metropolitan Transportation Plan

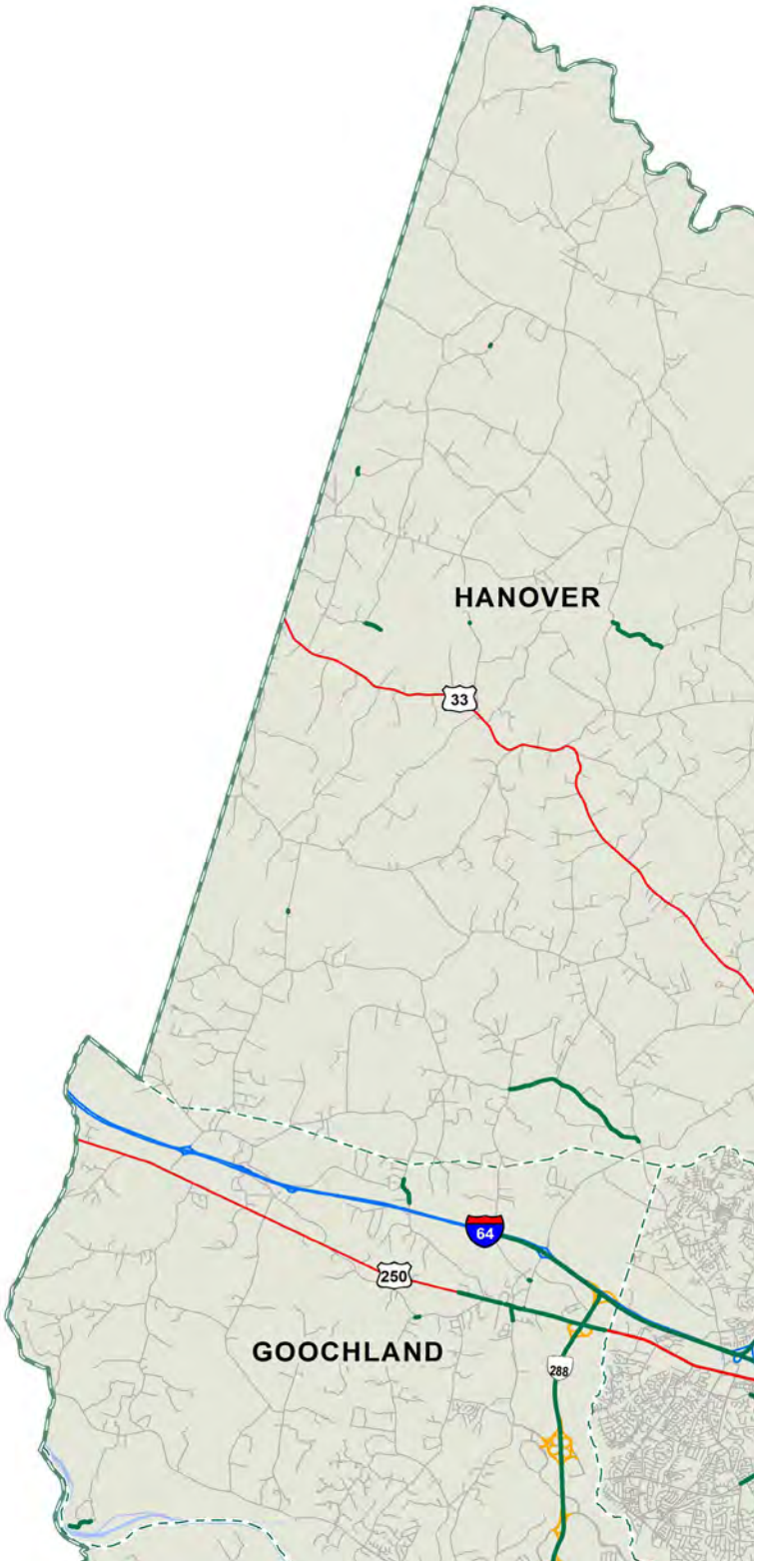
Index Map SYIP- TIP Projects



Source : Local Jurisdictions, VDOT, RRPDC

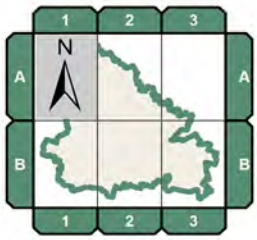
FIG. 5.21. SYIP-TIP PROJECTS

SYIP and TIP Projects - A1

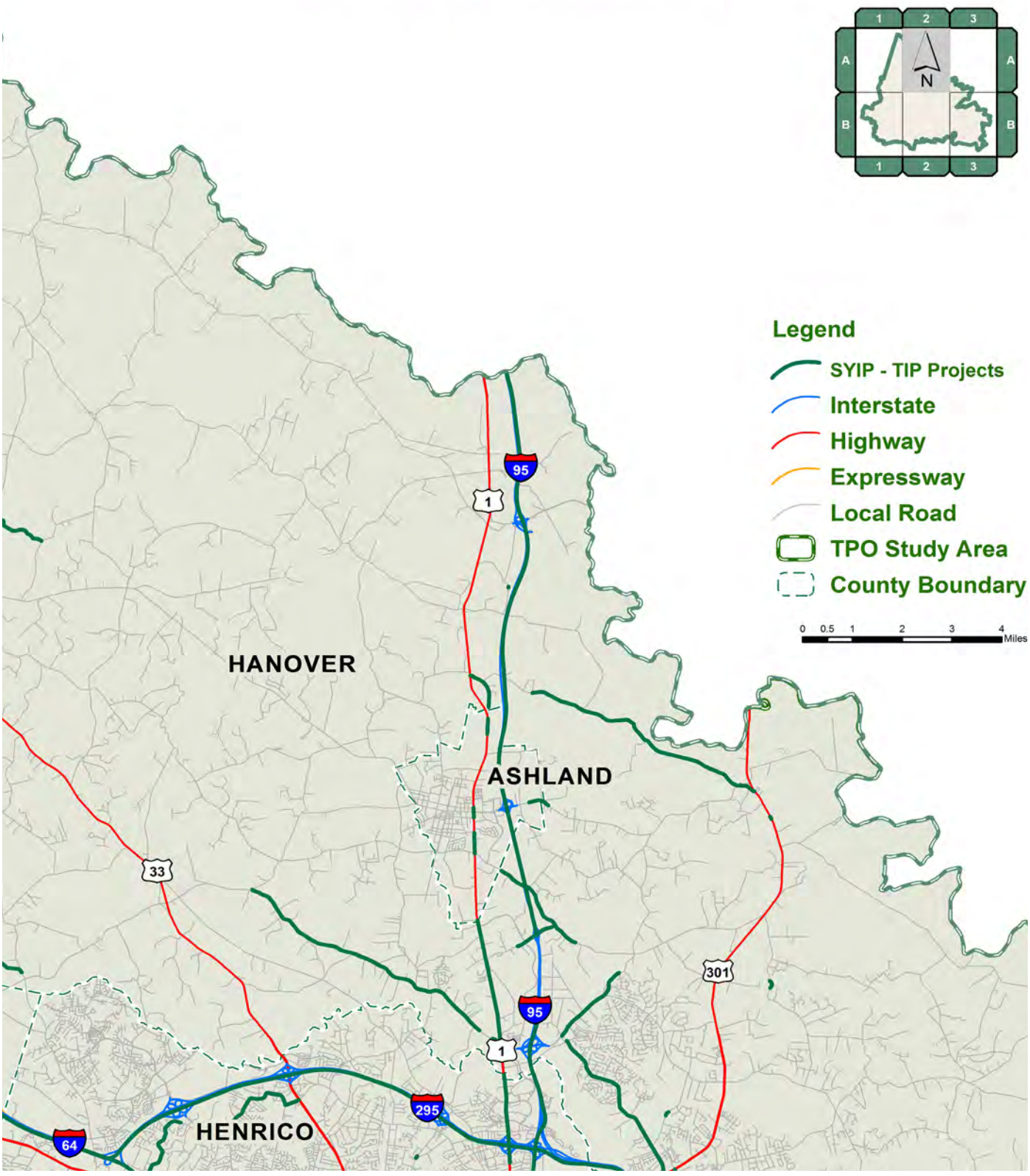


Legend

- SYIP - TIP Projects
- Interstate
- Highway
- Expressway
- Local Road
- TPO Study Area
- County Boundary

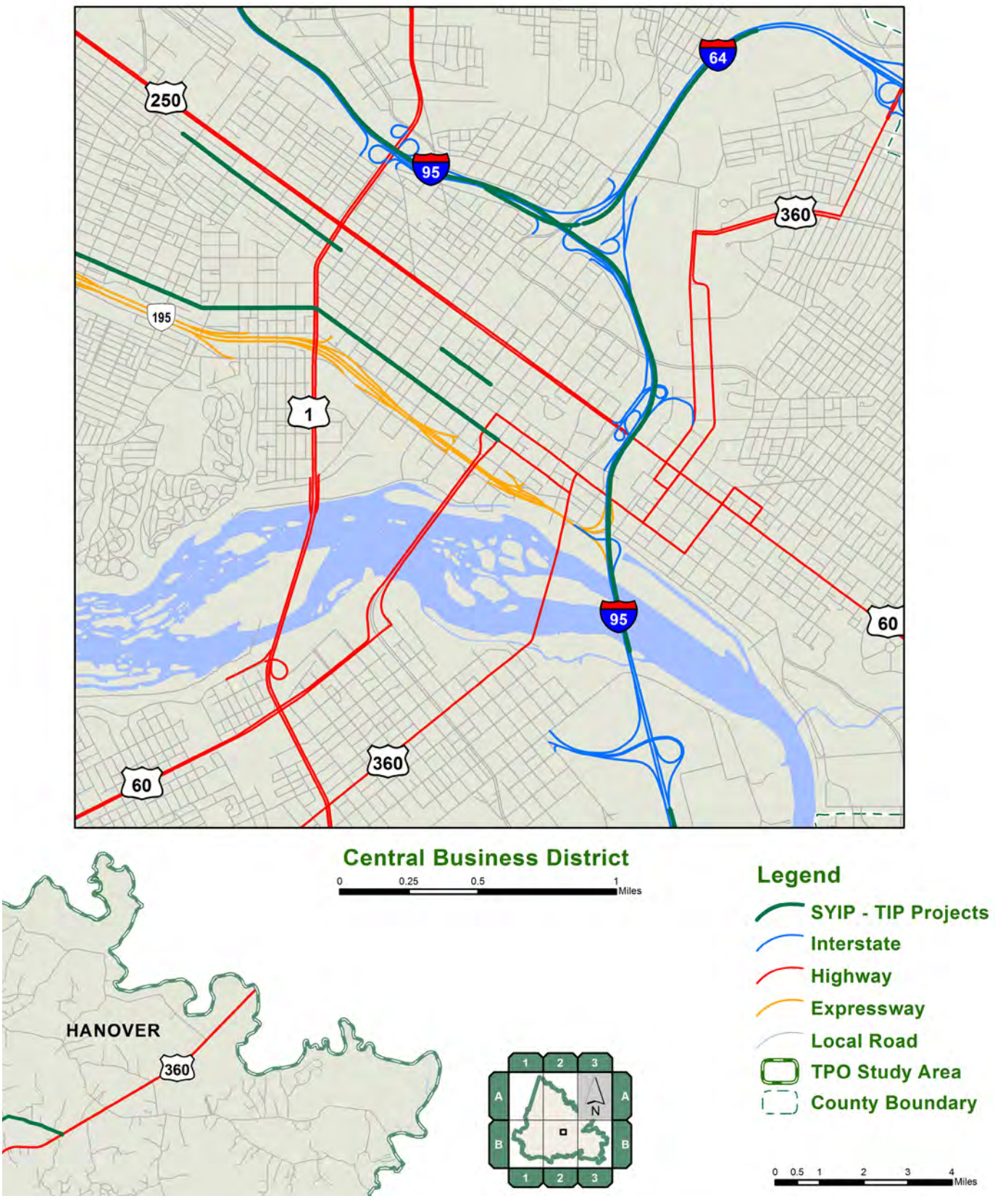


MAP 5.3. SYIP-TIP PROJECTS



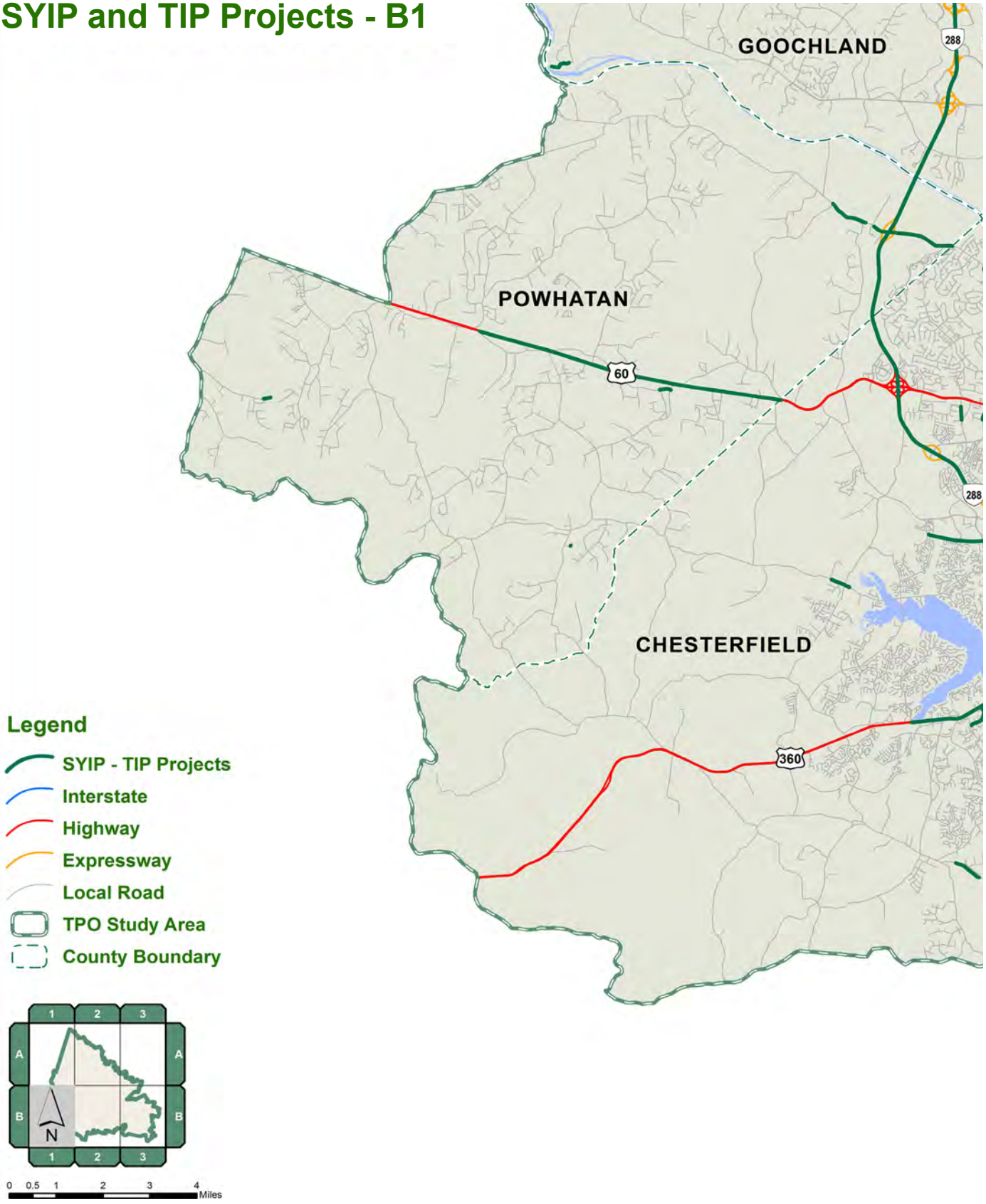
MAP 5.4. SYIP-TIP PROJECTS

SYIP and TIP Projects - A3

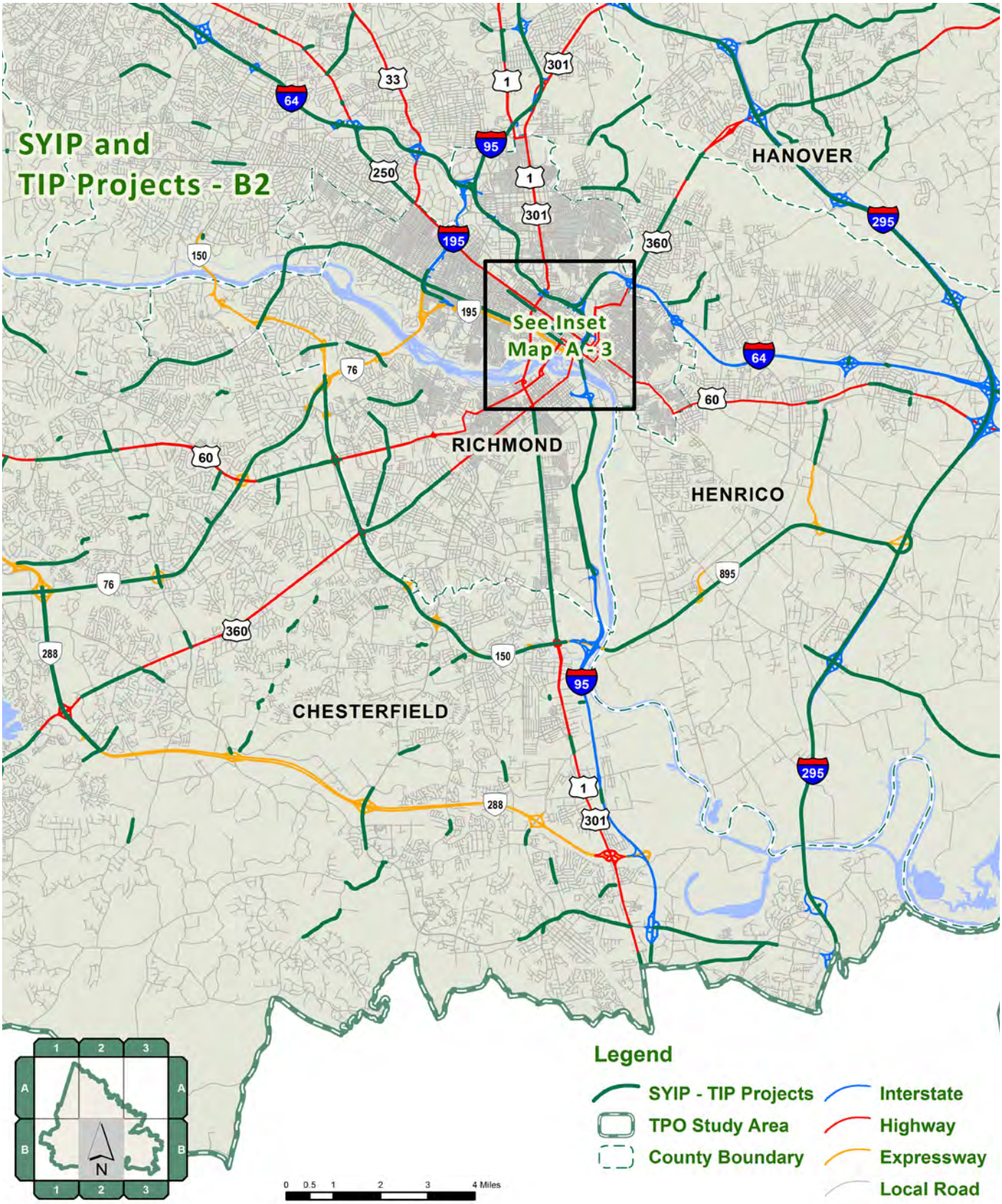


MAP 5.5. SYIP-TIP PROJECTS

SYIP and TIP Projects - B1



MAP 5.6. SYIP-TIP PROJECTS

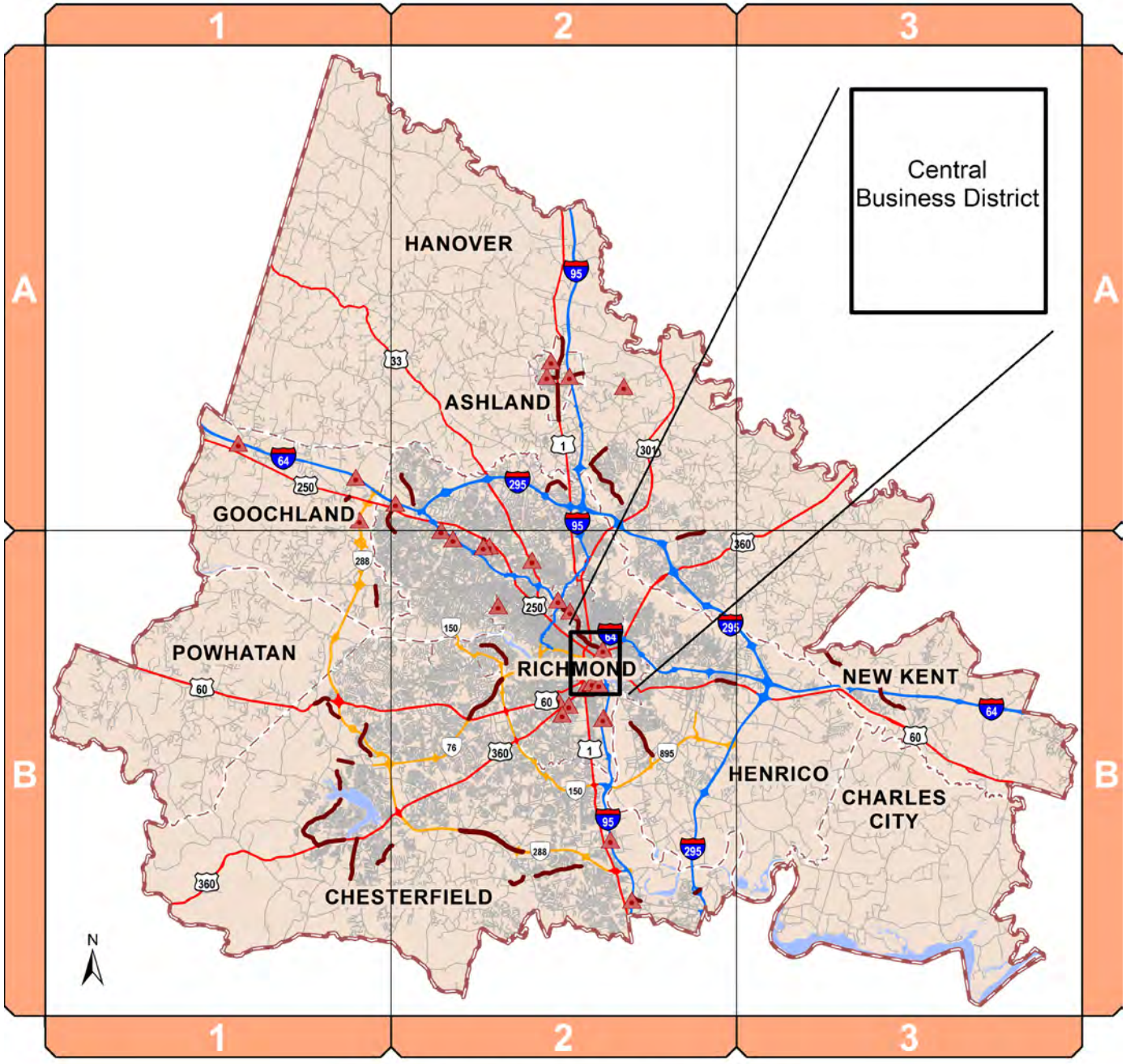


MAP 5.7. SYIP-TIP PROJECTS

MAP 5.8. SYIP-TIP PROJECTS

plan2040: Metropolitan Transportation Plan

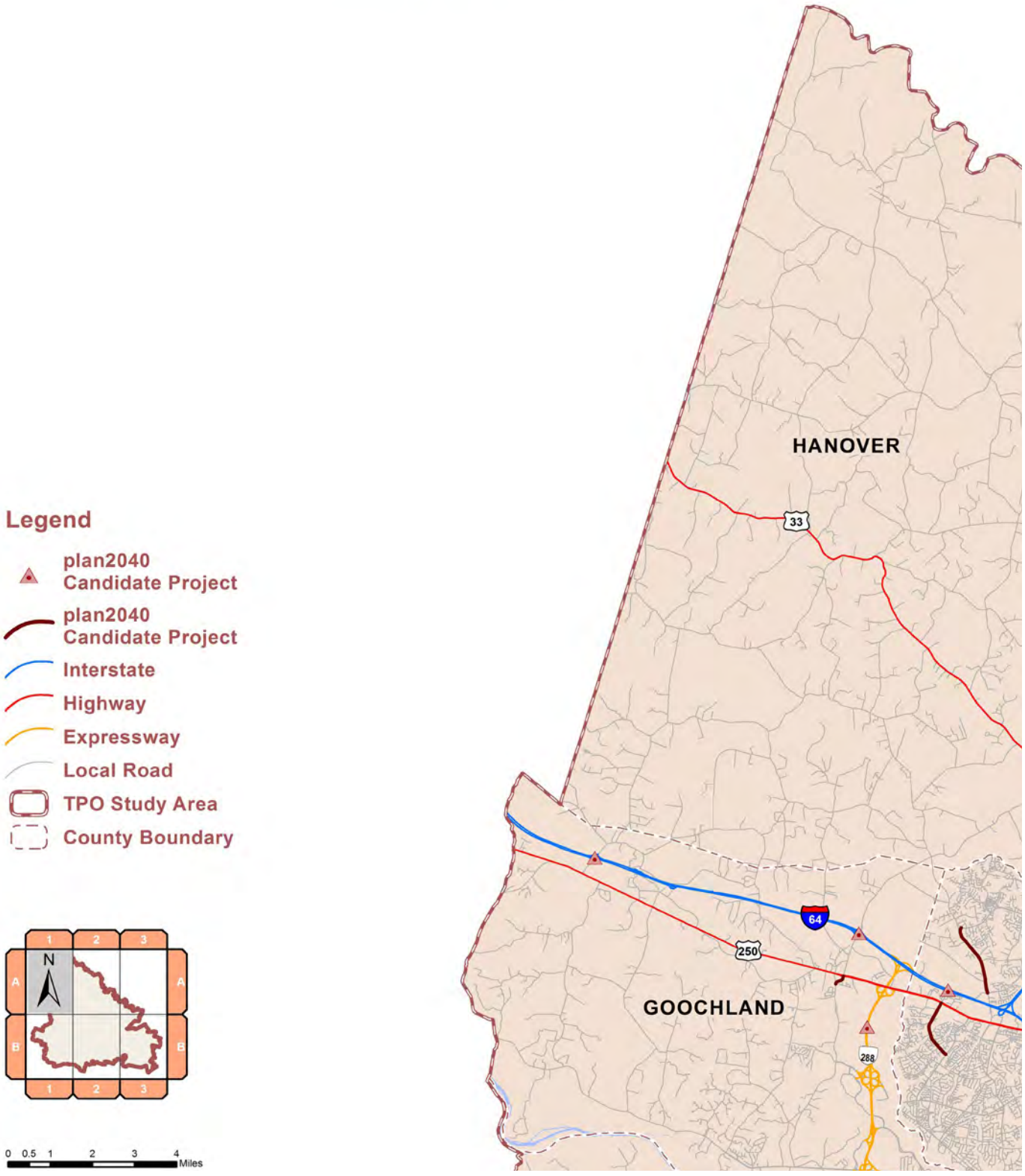
Candidate Projects



Source : Local Jurisdictions, VDOT, RRPDC

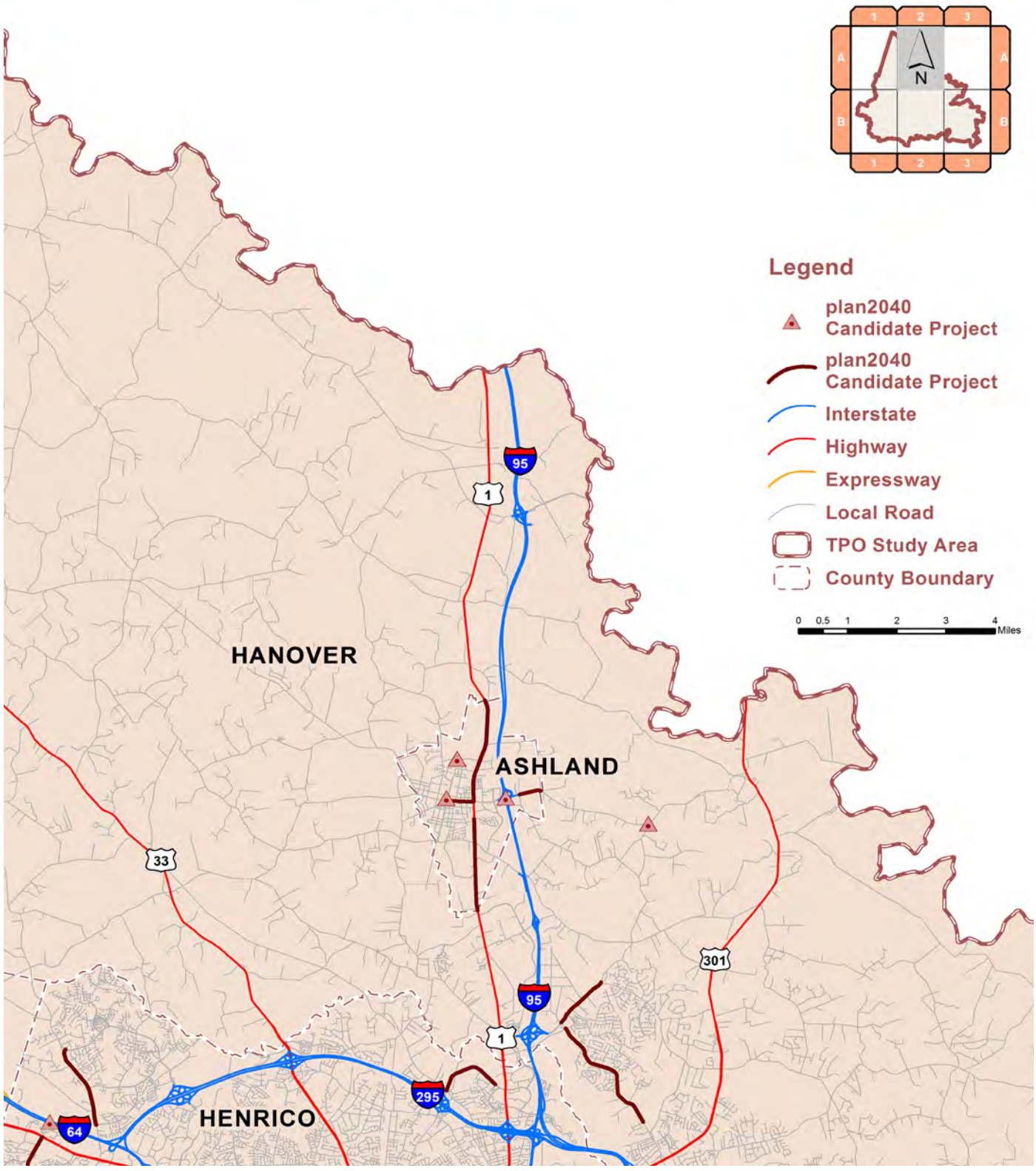
MAP 5.9. PLAN2040 CANDIDATE PROJECTS

Candidate Projects - A1



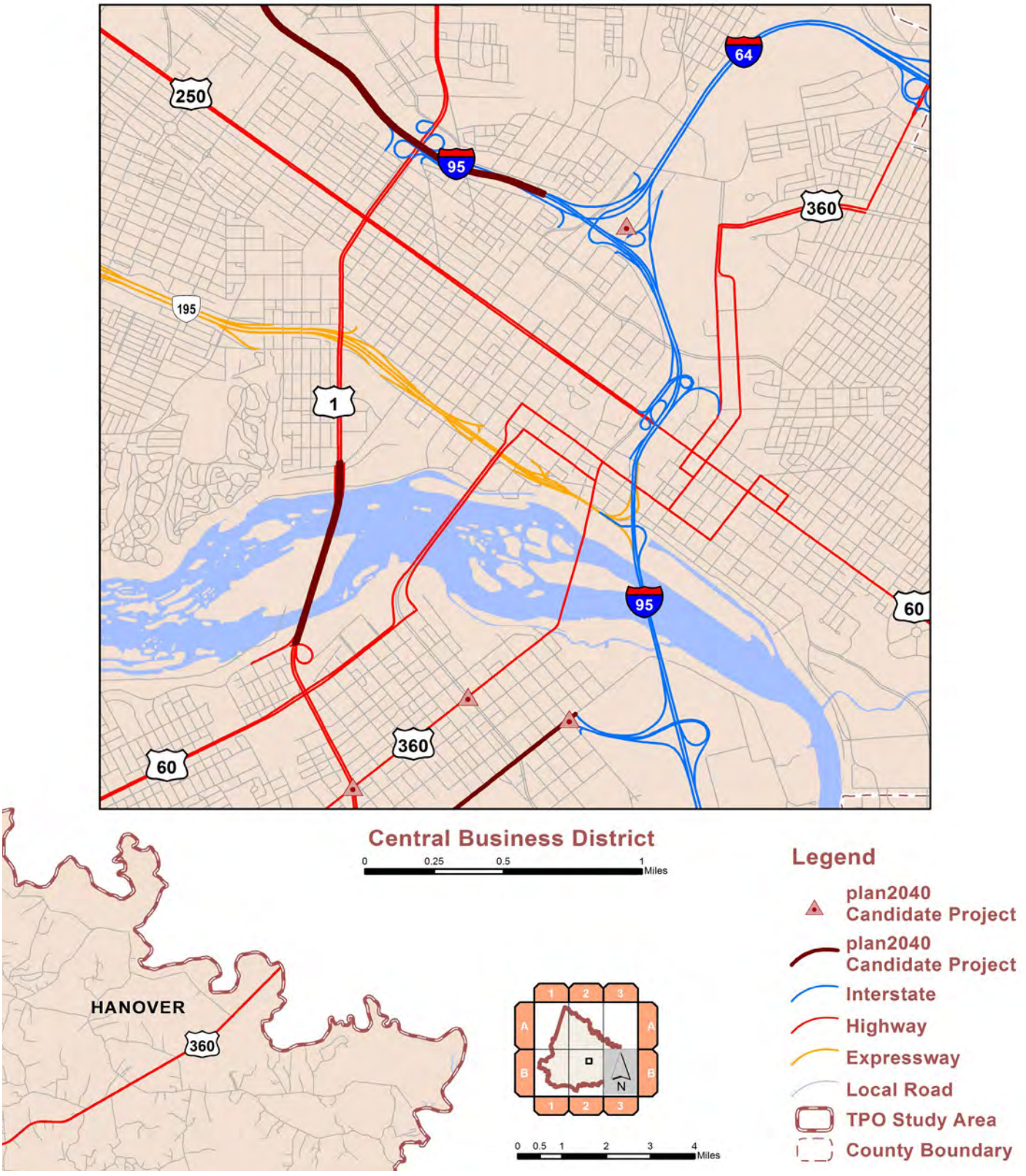
MAP 5.10. PLAN2040 CANDIDATE PROJECTS - A1

Candidate Projects - A2



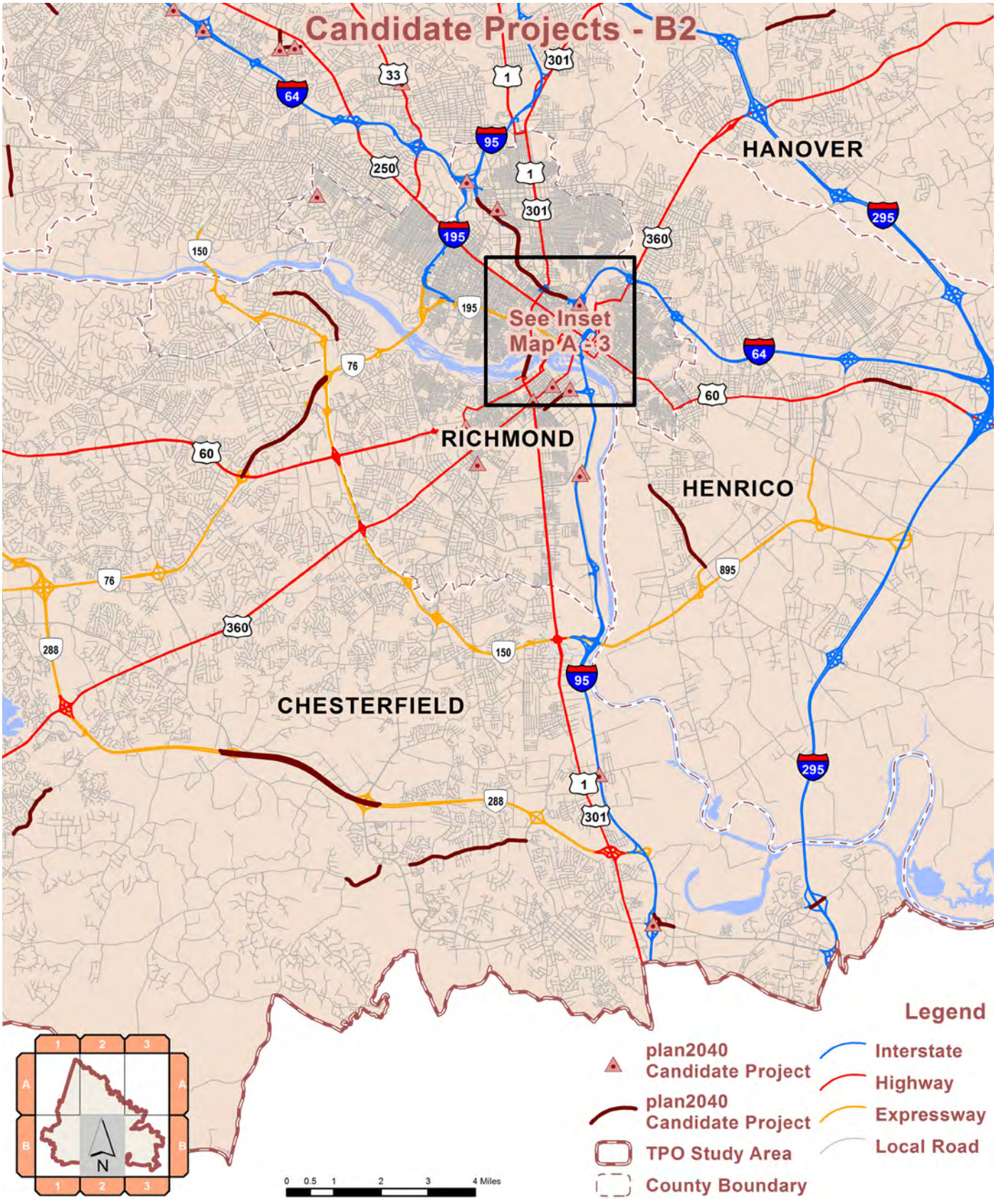
MAP 5.11. PLAN2040 CANDIDATE PROJECTS - A2

Candidate Projects - A3

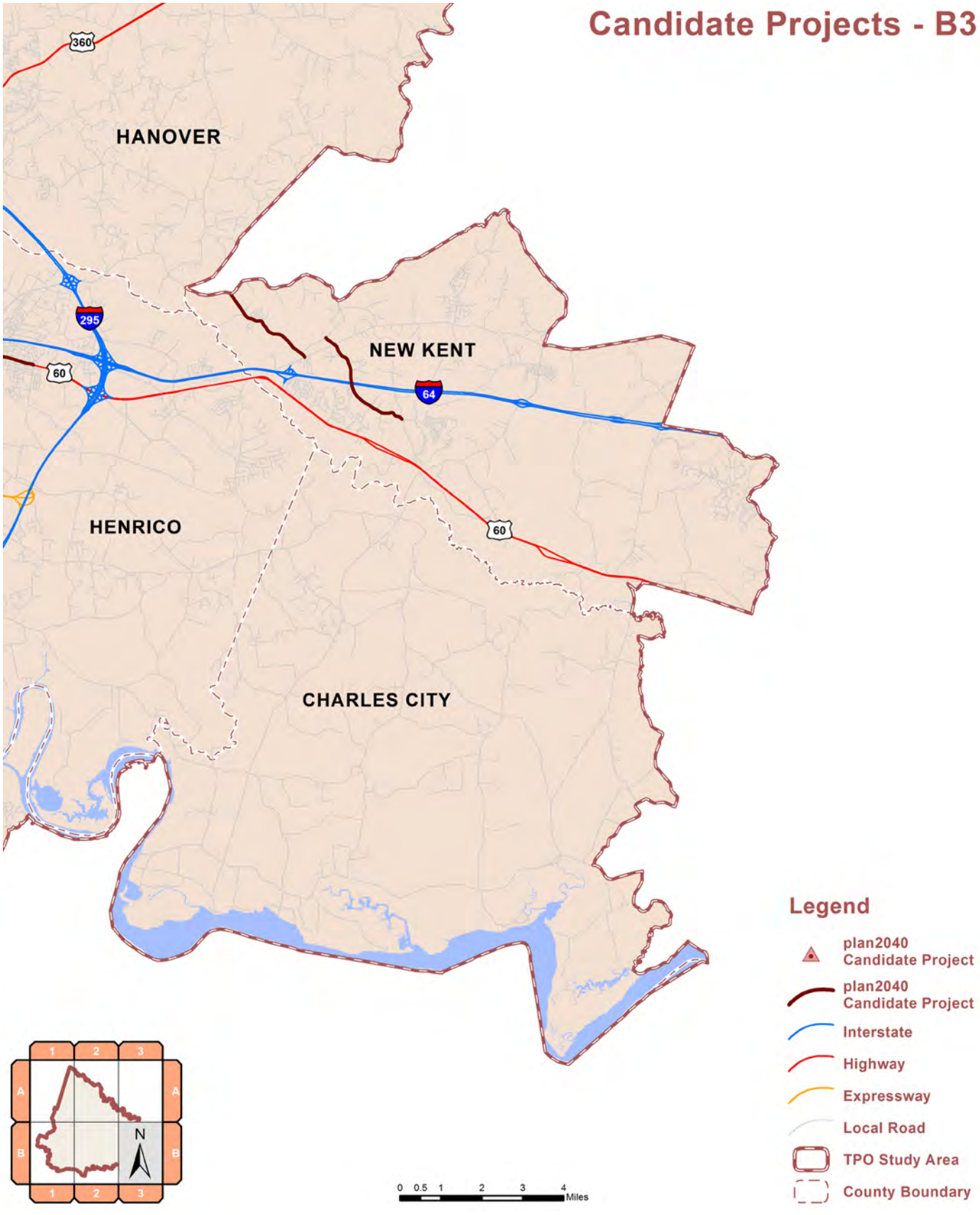


MAP 5.12. PLAN2040 CANDIDATE PROJECTS - A3

MAP 5.13. PLAN2040 CANDIDATE PROJECTS - B1



MAP 5.14. PLAN2040 CANDIDATE PROJECTS - B2



MAP 5.15. PLAN2040 CANDIDATE PROJECTS - B3

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plan2040

Environmental Justice Analysis

One of the key elements of plan2040 is a look at the growth of our disadvantaged populations and how the transportation investments and development projected in the Fiscally Constrained Plan impacts these populations, whether beneficial or adverse. Environmental Justice is defined by the US Environmental Protection Agency as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of laws, regulations, and policies."

Regulatory Framework for Environmental Justice

In 1994, President Clinton extended the provisions of Title VI of the Civil Rights Act of 1964, issuing Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations. Title VI of the Civil Rights Act aims to prevent discrimination in programs, policies, and activities receiving federal funding. Environmental Justice reinforced the legal requirements and rights established by Title VI, directing each Federal agency to make achieving environmental justice principles part of its mission.

The Environmental Justice (EJ) Order extends Title VI regulations to evaluate the impacts of federal programs and activities on affected groups. In the past, minority and low-income populations have been identified as the largest disenfranchised group, both in terms of equal access to transportation supply and citizen input.

Each MPO receiving federal funds needs to examine that all future transportation plans address the following environmental justice principles:

- To ensure the level and quality of transportation service is provided without regard to race, color or national origin
- To avoid or minimize high and adverse human health and environmental effects on low income and minority population

- To prevent the denial of benefit, reduction in, or significant delay in the receipt of benefits by low income and minority populations
- To ensure the full and fair participation by low income and minority population and ensure meaningful access to programs and activities by persons with limited English proficiency

Identification of Selected Populations and Concentration Areas

Disadvantaged population concentration areas (defined as having a concentration of Low-Income and/or Minority populations) have been identified in the Regional Demographics section of the Technical Document of plan2040. To protect people from being excluded in the course of regional transportation planning, special populations are identified to reduce disproportional impacts of transportation projects.

Identification is the first step in the Environmental Justice process for preparing transportation plans. Special populations include Minorities, Low-Income, and Zero Car households. Further, Environmental Justice Areas were identified using the demographic index provided by the Environmental Protection Agency.

Demographic data regarding these special populations were collected to identify areas of concentration in the Richmond Region. The selected data were evaluated by Census tract, and averages of regional totals for all tracts for the various target populations were calculated to establish a point of comparison or threshold. Tracts are designated concentration areas if the percentage of the sensitive population in that tract exceeds the regional threshold for the target population. Using that point of comparison to establish which areas fall above or below the average for the study area alerts planners to special areas of consideration when analyzing the effects of changes to the transportation system.

Environmental Justice Areas have been designated using the EPA's demographic index, and concentration areas are identified based on the average of both the percentage of minority and low-income populations. Environmental Justice Areas were evaluated in addition to Low-Income and Minority concentration areas. Environmental Justice Areas are evaluated in relationship to Zero-Car households. The Environmental Justice analysis resulted in a report of the allocation of funds to predominantly disadvantaged population concentration areas and a plan for communication with disadvantaged populations.

Demographics

Disadvantaged population (Low income and Minority) concentration areas in addition to Environmental Justice Areas based on the EPA's demographic index have been identified for the EJ analysis. Based on the calculations in these tables the Richmond Region has 40 percent Minority Population, 12 percent Low Income Population and 7 percent Zero Car households. This information is summarized in the table below.

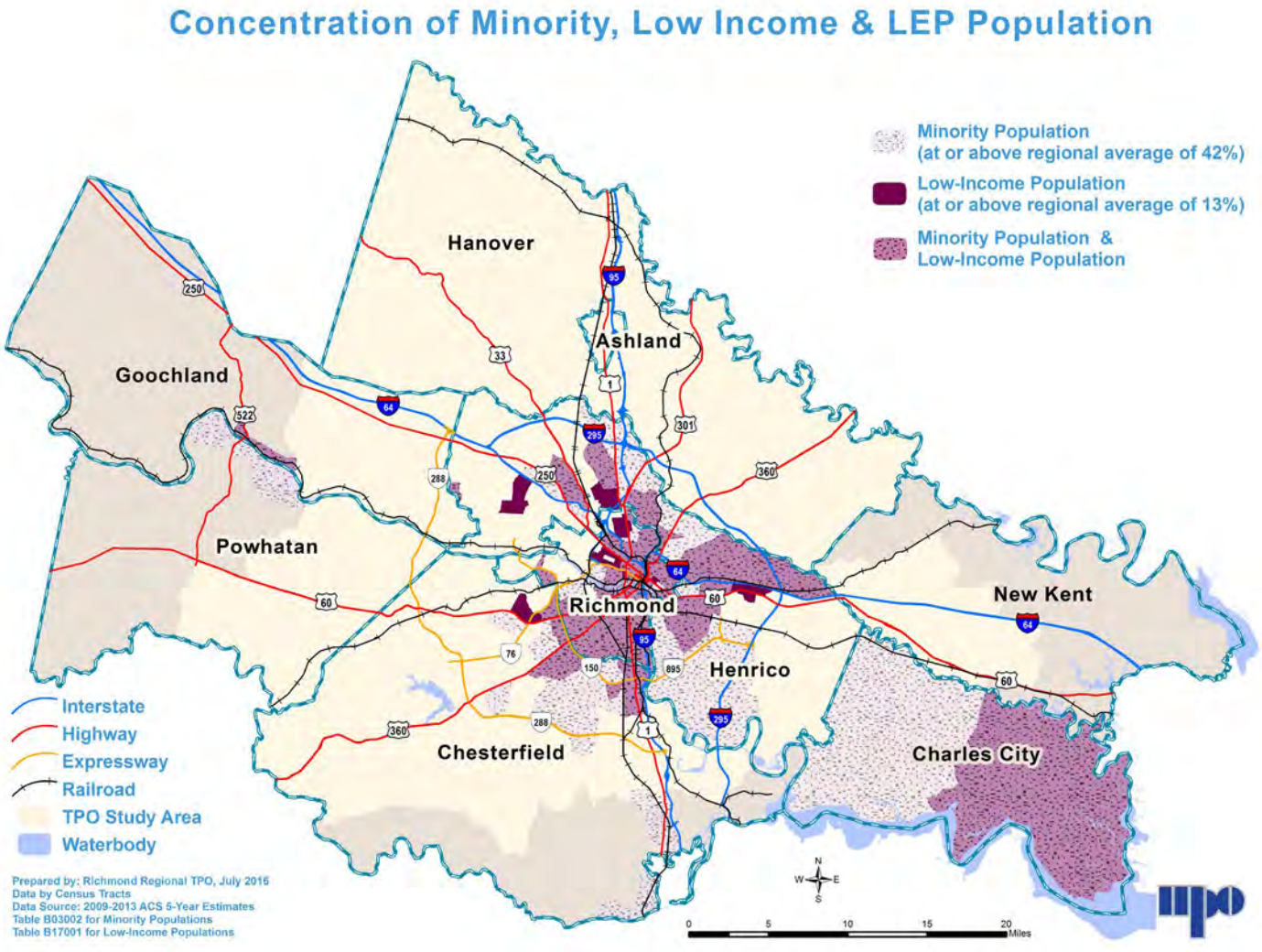
Special Population	Total Population/Households	Disadvantaged Group Population/Households	Percentage
Minority Population	1,015,619	407,218	40.1%
Low Income Households	**988,487**	**114,169**	**11.5%**
Zero Car Households	386,418	26,129	6.8%

FIG. 6.1. ENVIRONMENTAL JUSTICE SPECIAL POPULATIONS PER HOUSEHOLD IN THE RICHMOND REGION

Location of Minority and Low Income Concentration Areas

Map 6.1 shows the concentration of all disadvantaged population in the Richmond region. On the map, solid red areas illustrate Low Income population concentration areas and grey dotted areas are Minority Population concentration areas. Most census tracts that have predominantly minority population are located in the City and its adjacent census tracts, especially to the north and east. The map indicates that the highest concentrations of minority populations occur in the City of Richmond and Henrico County. Tracts in northern Chesterfield County adjoining Richmond are also Minority Concentration Areas. All tracts in Charles City County are identified Minority Population concentration areas.

Similarly, the majority of predominantly low-income areas are located within the City of Richmond. With the exception of the area west of downtown, most census tracts within the City show a concentration of low-income Population. Portions of eastern and western Henrico County and areas immediately around I-95 in Chesterfield County also show a high concentration of low-income population. Most of the predominantly minority areas are also low-income areas.



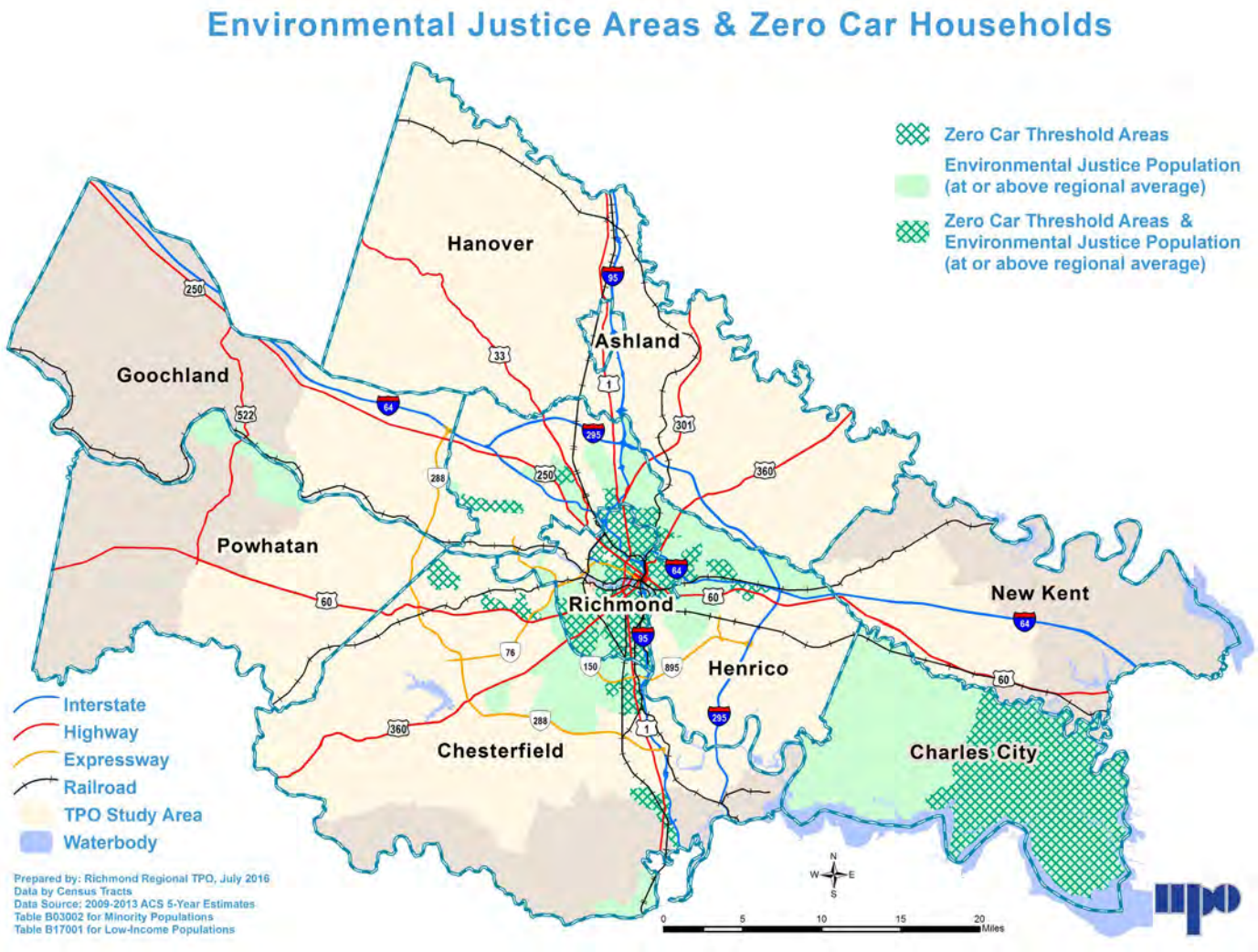
MAP 6.16. MINORITY AND LOW-INCOME POPULATIONS IN THE RICHMOND REGION

Environmental Justice Areas and Zero Car Households

The majority of areas with a high percentage of transit depend households are located in low-income and minority neighborhoods. In order to see the relationship between Environmental Justice Areas and Zero Car Household concentration areas in the Richmond Region, both the categories were overlaid and mapped. The map here shows this spatial analysis.

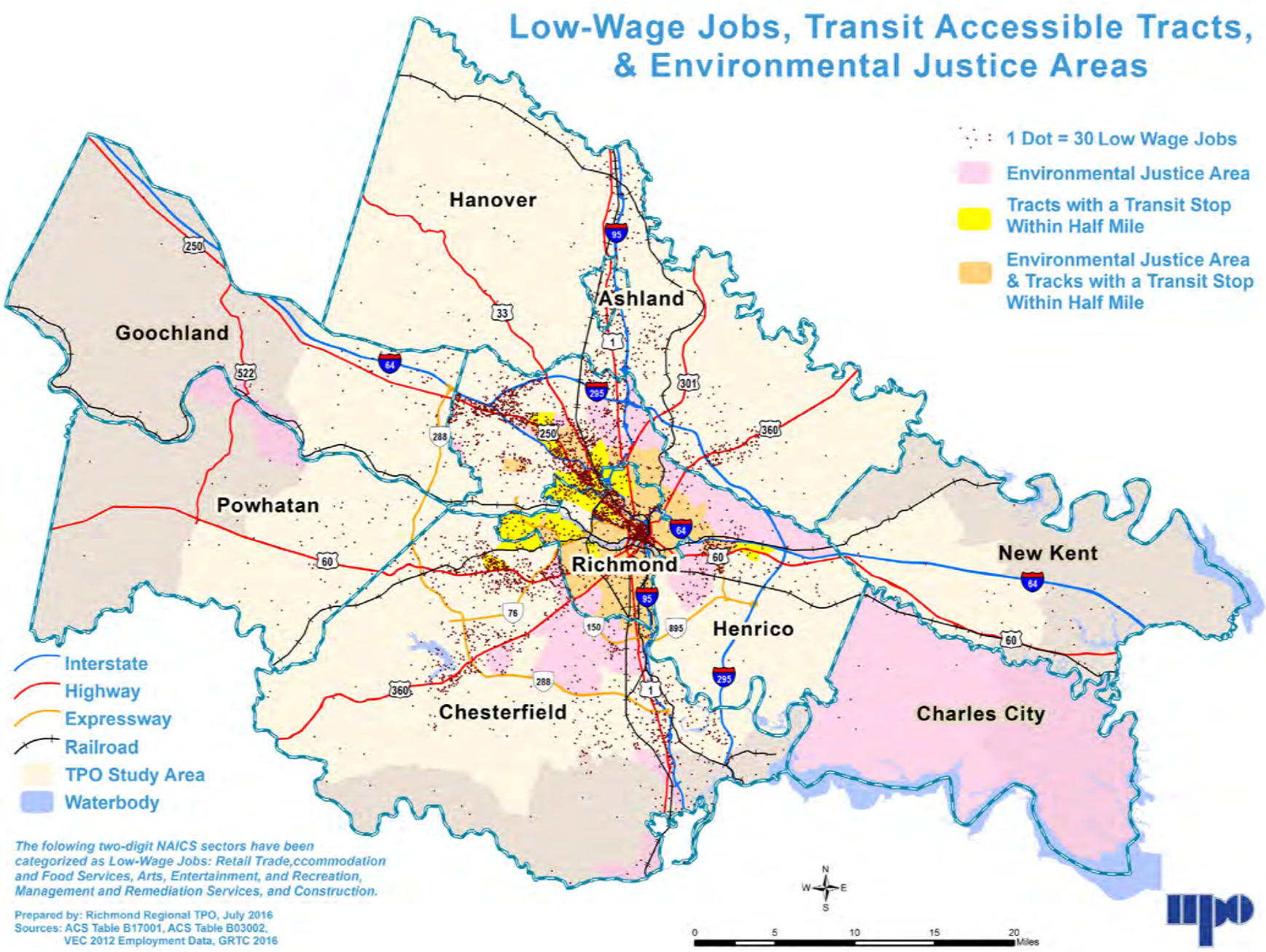
Environmental Justice Areas (over the threshold for the Low Income and Minority populations combined as an average using the EPA's standard demographic index) are displayed in purple, and yellow hatched areas are Zero Car Household areas. Seventy-seven percent of Zero Car Household concentration areas are also considered concentrated low-income and minority areas, designated Environmental Justice Areas. Map 6.2 indicates that concentrated areas of low auto ownership are almost within the predominantly disadvantaged group areas.

Map 6.3 provides a comparison of low-wage jobs and transit accessible tracts relative to Environmental Justice Areas in the region, showing an overlap with Zero Car Households.



MAP 6.17. MINORITY AND LOW-INCOME POPULATIONS IN THE RICHMOND REGION

MAP 6.18. LOW-WAGE JOBS, TRANSIT ACCESSIBLE TRACTS, AND ENVIRONMENTAL JUSTICE AREAS IN THE RICHMOND REGION



Allocation of Funds to Predominantly Disadvantaged Population Concentration Areas

To conduct the spatial analysis portion of the environmental justice funding analysis, all regionally significant transportation projects were mapped. See the following lists on pages 106-108 for the location of all transportation projects in Environmental Justice communities listed in plan2040. Approximately 42 percent of transportation projects fell entirely or partially within defined EJ areas. The lists show which projects are located in each disadvantaged group area, or would serve each area, and what spending would be accounted for in each area. Funding amounts included on this list have not been adjusted for inflation.

Examination of transportation investment per capita offers another view of the distribution of transportation benefits and impacts. The amount of funding forecast to be available in the Richmond area from state and federal sources during the time period FY17 to FY40 is approximately $1.8 billion. Transportation investment per capita was calculated by dividing the total inflation-adjusted cost of projects within a particular area by the number of people living in that area. Investment per capita was calculated for both EJ And Non-EJ areas in the RRTPO region, and is displayed in the table below.

Fig. 6.2 and Fig. 6.3 below indicates that minority and low-income groups (identified as EJ areas) are receiving less transportation investment funds per capita than non-minority and non-low-income populations. The Environmental Justice Executive Order does not mandate proportionate outcomes with respect to transportation funding, but instead focuses on enhanced public involvement and the distribution of benefits and impacts. They also indicate what percentage of MTP funding is allocated to areas with disadvantaged population concentrations.

	EJ Areas	Non-EJ Areas	Total
Population in EJ Tracts	362,687	652,932	1,015,619
Percent of Total Population	36%	64%	100%
Total Project Funds in Plan2040	$391,783,856	$1,364,787,895	$1,756,571,750
Percent of Total Project Funds in Plan 2040	22%	78%	100%
Per Capita Funding	$1,080	$2,090	$1,730

FIG. 6.2. COMPARISON OF ENVIRONMENTAL JUSTICE AREAS FOR TRANSPORTATION INVESTMENTS PER CAPITA

Disadvantaged Group	Regional Disadvantaged Population (As % of Total Regional Population)	Total MTP Funding (x$1,000)	MTP Funding Estimate Allocated to Area with Disadvantaged Population Concentrations (x$1,000)	MTP Funding Estimate Allocated to Areas with Disadvantaged Population Concentrations (%)
Minority	40%	$1,756,572	$441,000	25%
Low-Income	12%		$285,548	16%
Environmental Justice	36%		$391,784	22%

FIG. 6.3. PERCENTAGE OF ENVIRONMENTAL JUSTICE POPULATIONS RECEIVING MTP FUNDING ALLOCATIONS

plan2040 Constrained Projects in Low-Income Areas				
Project ID	Project Name	County	Project Type	Cost Estimate (x $1,000)
GRTC1	Replacement Compressed Natural Gas Rolling Stock - Buses	GRTC	Public Transportation	$15,600,000
GRTC2	**Replacement Compressed Natural Gas Specialized Transportation Vehicles**	**GRTC**	**Public Transportation**	**$19,600,000**
CH1	HMK Access Roads	Chesterfield	Highway	$40,000,000
CH6	**I-95/Willis Road Interchange**	**Chesterfield**	**Highway**	**$43,000,000**
GRTC3	Park and Ride Project	GRTC	Public Transportation	$3,208,800
HE10	**Woodman Rd Extension**	**Henrico**	**Highway**	**$18,210,000**
HE11	Staples Mill Amtrak Station Improvements	Henrico	Rail	$9,500,000
HE12	**Parham Road Improvements**	**Henrico**	**Bicycle/Ped Facility**	**$5,000,000**
HE13	Homeview Road Improvements	Henrico	Bicycle/Ped Facility	$2,400,000
HE14	**Magellan Parkway Extension**	**Henrico**	**Highway**	**$59,300,000**
HE3	Gaskins Rd Interchange Modification at I-64	Henrico	Highway	$12,000,000
HE7	**Richmond-Henrico Tpke/Meadowbridge Rd Improvements**	**Henrico**	**Highway**	**$19,000,000**
HE8	New Market Rd Widening	Henrico	Highway	$18,400,000
HE9	**Williamsburg Rd Improvements and Streetscape**	**Henrico**	**State of Good Repair**	**$24,000,000**
NK1	Dispatch Road (VA 613) Safety and Shoulder Improvements	New Kent	Highway	$4,800,000
RI1	**Broad Rock Rd, Belt Blvd, Deloak Ave and McGuire Hospital Roundabout**	**Richmond**	**Intersection**	**$1,000,000**
RI11	Traffic Signal Modernizations	Richmond	Intersection	$1,000,000
RI17	**Major Rehabilitation of Robert E. Lee Bridge**	**Richmond**	**Bridge**	**$25,000,000**
RI2	Broad Rock Rd and Holly Springs Ave and Stockton St Roundabout	Richmond	Intersection	$900,000
RI4	**Midlothian Turnpike and Roanoke St Roundabout**	**Richmond**	**Intersection**	**$610,000**
CH21	Powhite Pkwy (City/County Limits to Rt. 60) Widening	Chesterfield	Highway	$43,000,000
RI10	**Citywide ITS Integrations**	**Richmond**	**Other**	**$3,000,000**
RI3	Hermitage Rd, Boulevard, Westwood Ave and Brookland Pkwy Roundabout	Richmond	Intersection	$1,000,000
RI7	**Hull St and Commerce Rd Intersection Improvement**	**Richmond**	**Intersection**	**$900,000**
RI8	Hull St and Cowardin Ave Intersection Improvement	Richmond	Intersection	$1,120,000
RI12	**New Interchange at I-95 and Port of Richmond**	**Richmond**	**Highway**	**$250,000**
RI13	New Ramps Connecting New Interchange at I-95 and Bellemeade Rd/Commerce Rd	Richmond	Highway	$250,000
RI14	**I-95 and I-64 East Junction Interchange Improvements**	**Richmond**	**Highway**	**$500,000**
RI15	I-95 and I-64 West Junction Interchange Improvements	Richmond	Highway	$500,000
RI16	**I-95 and Maury St Interchange Improvements**	**Richmond**	**Highway**	**$9,000,000**
RI18	I-95 and I-64 Overlap - Interchange Improvement Typical Section	Richmond	Highway	$500,000
RI19	**I-95 and I-64 Overlap - Lighting Improvements**	**Richmond**	**Highway**	**$10,290,000**
RI6	Cherokee Rd - Improvement Between Huguenot Rd and Forest Hill Avenue	Richmond	Highway	$7,800,000
RI9	**Maury St - Improvement Between I-95 Ramps and E. 16th St**	**Richmond**	**Highway**	**$100,000**
			LRTP Funding Allocated to Low-Income Areas Adjusted for Inflation	$285,548,447
			Regionwide LRTP Project Cost Estimate	**$1,756,571,750**
			Percentage of Project Funding Allocated to Low-Income Areas	16%

plan2040 Constrained Projects in Minority Areas

Project ID	Project Name	County	Project Type	Cost Estimate (x $1,000)
CH1	HMK Access Roads	Chesterfield	Highway	$40,000,000
CH11	**Beach Road (Rt 10-Nash) Widening or Nash Rd Extension (Beach-Rt 10)**	**Chesterfield**	**Highway**	**$15,000,000**
CH14	Centralia Rd (Memory-Chester) Reconstruction and Turn Lanes	Chesterfield	Highway	$25,000,000
CH21	**Powhite Pkwy (City/County Limits to Rt. 60) Widening**	**Chesterfield**	**Highway**	**$43,000,000**
CH7	Route 288 (Route 10 to Courthouse Road)	Chesterfield	Highway	$56,000,000
GRTC1	**Replacement Compressed Natural Gas Rolling Stock - Buses**	**GRTC**	**Public Transportation**	**$15,600,000**
GRTC2	Replacement Compressed Natural Gas Specialized Transportation Vehicles	GRTC	Public Transportation	$19,600,000
GRTC3	**Park and Ride Project**	**GRTC**	**Public Transportation**	**$3,208,800**
HE10	Woodman Rd Extension	Henrico	Highway	$18,210,000
HE11	**Staples Mill Amtrak Station Improvements**	**Henrico**	**Rail**	**$9,500,000**
HE12	Parham Road Improvements	Henrico	Bicycle/Ped Facility	$5,000,000
HE13	**Homeview Road Improvements**	**Henrico**	**Bicycle/Ped Facility**	**$2,400,000**
HE14	Magellan Parkway Extension	Henrico	Highway	$59,300,000
HE7	**Richmond-Henrico Tpke/Meadowbridge Rd Improvements**	**Henrico**	**Highway**	**$19,000,000**
HE8	New Market Rd Widening	Henrico	Highway	$18,400,000
HE9	**Williamsburg Rd Improvements and Streetscape**	**Henrico**	**State of Good Repair**	**$24,000,000**
RI1	Broad Rock Rd, Belt Blvd, Deloak Ave and McGuire Hospital Roundabout	Richmond	Intersection	$1,000,000
RI10	**Citywide ITS Integrations**	**Richmond**	**Other**	**$3,000,000**
RI11	Traffic Signal Modernizations	Richmond	Intersection	$1,000,000
RI12	**New Interchange at I-95 and Port of Richmond**	**Richmond**	**Highway**	**$250,000**
RI13	New Ramps Connecting New Interchange at I-95 and Bellemeade Rd/Commerce Rd	Richmond	Highway	$250,000
RI14	**I-95 and I-64 East Junction Interchange Improvements**	**Richmond**	**Highway**	**$500,000**
RI16	I-95 and Maury St Interchange Improvements	Richmond	Highway	$9,000,000
RI17	**Major Rehabilitation of Robert E. Lee Bridge**	**Richmond**	**Bridge**	**$25,000,000**
RI18	I-95 and I-64 Overlap - Interchange Improvement Typical Section	Richmond	Highway	$500,000
RI19	**I-95 and I-64 Overlap - Lighting Improvements**	**Richmond**	**Highway**	**$10,290,000**
RI2	Broad Rock Rd and Holly Springs Ave and Stockton St Roundabout	Richmond	Intersection	$900,000
RI3	**Hermitage Rd, Boulevard, Westwood Ave and Brookland Pkwy Roundabout**	**Richmond**	**Intersection**	**$1,000,000**
RI4	Midlothian Turnpike and Roanoke St Roundabout	Richmond	Intersection	$610,000
RI6	**Cherokee Rd - Improvement Between Huguenot Rd and Forest Hill Avenue**	**Richmond**	**Highway**	**$7,800,000**
RI7	Hull St and Commerce Rd Intersection Improvement	Richmond	Intersection	$900,000
RI8	**Hull St and Cowardin Ave Intersection Improvement**	**Richmond**	**Intersection**	**$1,120,000**
RI9	Maury St - Improvement Between I-95 Ramps and E. 16th St	Richmond	Highway	$100,000
			LRTP Funding Allocated to Minority Areas Adjusted for Inflation	**$436,438,800**
			Regionwide LRTP Project Cost Estimate	$1,756,571,750
			Percentage of Project Funding Allocated to Minority Areas	**25%**

plan2040 Constrained Projects in Environmental Justice Areas				
Project ID	Project Name	County	Project Type	Cost Estimate (x $1,000)
CH6	I-95/Willis Road Interchange	Chesterfield	Highway	$40,000,000
CH1	**HMK Access Roads**	**Chesterfield**	**Highway**	**$43,000,000**
CH21	Powhite Pkwy (City/County Limits to Rt. 60) Widening	Chesterfield	Highway	$56,000,000
CH7	**Route 288 (Route 10 to Courthouse Road)**	**Chesterfield**	**Highway**	**$15,600,000**
GRTC1	Replacement Compressed Natural Gas Rolling Stock - Buses	GRTC	Public Transportation	$19,600,000
GRTC2	**Replacement Compressed Natural Gas Specialized Transportation Vehicles**	**GRTC**	**Public Transportation**	**$3,208,800**
GRTC3	Park and Ride Project	GRTC	Public Transportation	$11,400,204
HA6	**Sliding Hill Rd Widening (UPC #104957)**	**Hanover**	**Highway**	**$31,200,000**
HA1	Atlee Station Rd Widening	Hanover	Highway	$18,210,000
HE10	**Woodman Rd Extension**	**Henrico**	**Highway**	**$24,000,000**
HE9	Williamsburg Rd Improvements and Streetscape	Henrico	State of Good Repair	$9,500,000
HE11	**Staples Mill Amtrak Station Improvements**	**Henrico**	**Rail**	**$5,000,000**
HE12	Parham Road Improvements	Henrico	Bicycle/Ped Facility	$2,400,000
HE13	**Homeview Road Improvements**	**Henrico**	**Bicycle/Ped Facility**	**$59,300,000**
HE14	Magellan Parkway Extension	Henrico	Highway	$19,000,000
HE7	**Richmond-Henrico Tpke/Meadowbridge Rd Improvements**	**Henrico**	**Highway**	**$18,400,000**
HE8	New Market Rd Widening	Henrico	Highway	$4,800,000
NK1	**Dispatch Road (VA 613) Safety and Shoulder Improvements**	**New Kent**	**Highway**	**$1,000,000**
RI11	Traffic Signal Modernizations	Richmond	Intersection	$1,000,000
RI1	**Broad Rock Rd, Belt Blvd, Deloak Ave and McGuire Hospital Roundabout**	**Richmond**	**Intersection**	**$25,000,000**
RI17	Major Rehabilitation of Robert E. Lee Bridge	Richmond	Bridge	$900,000
RI2	**Broad Rock Rd and Holly Springs Ave and Stockton St Roundabout**	**Richmond**	**Intersection**	**$610,000**
RI4	Midlothian Turnpike and Roanoke St Roundabout	Richmond	Intersection	$3,000,000
RI10	**Citywide ITS Integrations**	**Richmond**	**Other**	**$900,000**
RI7	Hull St and Commerce Rd Intersection Improvement	Richmond	Intersection	$1,120,000
RI8	**Hull St and Cowardin Ave Intersection Improvement**	**Richmond**	**Intersection**	**$7,800,000**
RI6	Cherokee Rd - Improvement Between Huguenot Rd and Forest Hill Avenue	Richmond	Highway	$250,000
RI12	**New Interchange at I-95 and Port of Richmond**	**Richmond**	**Highway**	**$250,000**
RI13	New Ramps Connecting New Interchange at I-95 and Bellemeade Rd/Commerce	Richmond	Highway	$500,000
RI14	**I-95 and I-64 East Junction Interchange Improvements**	**Richmond**	**Highway**	**$9,000,000**
RI16	I-95 and Maury St Interchange Improvements	Richmond	Highway	$500,000
RI18	**I-95 and I-64 Overlap - Interchange Improvement Typical Section**	**Richmond**	**Highway**	**10290000**
RI19	I-95 and I-64 Overlap - Lighting Improvements	Richmond	Highway	$100,000
RI9	**Maury St - Improvement Between I-95 Ramps and E. 16th St**	**Richmond**	**Highway**	**$100,000**
			LRTP Funding Allocated to EJ Areas Adjusted for Inflation	**$391,783,856**
			Regionwide LRTP Project Cost Estimate	$1,756,571,750
			Percentage of Project Funding Allocated to EJ Areas	**22%**

Communication with the Disadvantaged Population

One of the major elements of environmental justice is communication with the disadvantaged population. The whole process of the plan2040 update was done keeping in mind the principles and objectives of environmental justice. Special efforts have been made to reach out to minority, low-income, and LEP population groups identified within the Richmond Region. These outreach efforts were focused on local community newspapers.

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plan 2040 Appendices

Table of Contents

Appendix A: plan2040

Frequently Used Terms and Abbreviations

FREQUENTLY USED TERMS AD ABBEVIATIONS

Attainment A term that means an area is in compliance with the National Ambient Air Quality Standards (NAAQS) and/or the Clean Air Act (CAA). The NAAQS establish the maximum pollutant concentrations that are allowed in the outside ambient air. The Richmond area (i.e., Cities of Richmond, Colonial Heights, Hopewell, and Petersburg, and the counties of Charles City, Chesterfield, Hanover, Henrico and Prince George) is designated as an attainment area (EPA designation made on April 30, 2012; area previously designated as a maintenance area for air quality standards).

Highway Trust Fund (HTF)
Provides dedicated funding for federal highway and mass transit programs. Revenues placed in the HTF come from the federal gasoline tax plus other user fees. The HTF consists of separate highway and mass transit accounts.

RRTPO (TPO)
Richmond Regional Transportation Planning Organization. The following local governments and agencies comprise the voting members of the RRTPO: Ashland, Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, Richmond, CRAC, GRTC, RMTA, RRPDC, and VDOT. The RRTPO serves as the forum for cooperative transportation decision making in the Richmond area.

NAAQS National Ambient Air Quality Standards; defined by EPA.

Obligations Commitments made by USDOT agencies to pay out money for federal-aid transportation projects. The TIP serves as the MPO's program of transportation projects for which federal funds have been obligated.

Regionally Significant
Term used for air quality conformity analysis to categorize highway and rail facilities covered by this analysis. Regionally significant projects are projects on facilities that serve regional transportation needs and would normally be included in the modeling of a metropolitan area's transportation network. This includes, as a minimum, all principal arterial highways and all fixed guide-way transit facilities that offer a significant alternative to regional highway travel.

SIP State Implementation Plan; identifies control measures and process for achieving and maintaining NAAQS; eligible for CMAQ funding.

Study Area The geographic area projected to become urbanized within the next 20 years; defines the area for MPO plans, programs, and studies (referred to as "Metropolitan Planning Area" in federal regulations).

"3-C" Process ("Continuing, Cooperative and Comprehensive") Language from federal legislation establishing MPOs and used in reference to the regional transportation planning and programming process.

TCM Transportation Control Measures (for air quality control); eligible for CMAQ funding.

TDM Transportation Demand Management; various transportation control strategies and measures used in managing highway demand.

TIP Transportation Improvement Program; a staged, multiyear, intermodal program of transportation projects that is consistent with the regional long-range transportation plan.

MTP The TPO's Metropolitan Transportation Plan; serves as the initial step and framework in developing a regionally based network of transportation facilities and services that meets travel needs in the most efficient and effective manner possible.

TAZ (Transportation or Traffic Analysis Zone)
Generally defined as areas of homogeneous activity served by one or two major highways. TAZs serve as the base unit for socioeconomic data characteristics used in transportation computer models and for various plans and studies.

Urbanized Area Term used by the U.S. Census Bureau to designate urban areas. These areas generally contain population densities of at least 1,000 persons per square mile in a continuously built-up area of at least 50,000 persons. Factors such as commercial and industrial development, and other types and forms of urban activity centers are also considered.

UWP Unified Work Program; MPO's program of work activities noting planning priorities, assigned staffs, work products, budgets, and funding sources.

VOC Volatile Organic Compounds; emissions from cars, power plants, etc; when VOCs react with oxides of nitrogen (NOx) in the presence of heat and sunlight to produce ground level ozone or smog.

TPO STANDING COMMITTEES

CTAC Citizens Transportation Advisory Committee

EDAC	Elderly and Disability Advisory Committee
TAC	Technical Advisory Committee

FEDERAL STATE AND REGIONAL AGENCIES

CRAC	Capital Region Airport Commission
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GRTC	GRTC Transit System (formerly Greater Richmond Transit Company)
MRAQC	Metropolitan Richmond Air Quality Committee
RideFinders	A division of GRTC that provides carpool/vanpool matching and other commuter and transportation services.
MARAD	Maritime Administration
RMA	Richmond Metropolitan Authority
RRPDC	Richmond Regional Planning District Commission
USDOT	United States Department of Transportation
VDA	Virginia Department of Aviation
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VDRPT	Virginia Department of Rail and Public Transportation
VCTIR	Virginia Center for Transportation Innovation and Research

FEDERAL LEGISLATION

ADA Americans with Disabilities Act

CAAA Clean Air Act Amendments

SAFETEA-LU Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users; federal transportation reauthorization signed into law on August 10, 2005. Reauthorized federal surface transportation programs for highways, highway safety and transit for the four-year period 2005-2009 (several short-term extensions have been enacted by Congress).

FUNDING PROGRAMS

SPR State Planning and Research**;** federal funds allocated to VDOT in support of MPO, rural and other planning program activities.

Local Match Funds required by recipients (i.e. RRPDC or other designated agency or local government) of PL and Section 5303 funds for matching federal and state grant funds. Section 5303 and PL funds require a 10% match, with VDOT/VDRPT providing 10% and the remaining 80% provided by the federal source.

RRPDC Funds from the RRPDC (state appropriations and local dues) provided as the local match.

PL Planning funds available from FHWA for MPO program activities.

CMAQ Congestion Mitigation/Air Quality; federal funding program that directs funding to projects which contribute to meeting NAAQS. CMAQ funds generally may not be used for projects that result in the construction of new highway capacity for single occupant vehicles. CMAQ funds may be available for eligible planning activities that lead to and result in project implementation.

Section 5303 Planning funds available from the FTA for MPO program activities.

Multimodal Planning
Multimodal Planning Grant; VDOT discretionary grant program (state funds matched by local funds) providing assistance and support for innovative multimodal transportation planning initiatives.

TEIF Transportation Efficiency Improvement Fund; purpose of program is to reduce traffic congestion by supporting transportation demand management programs designed to reduce use of single occupant vehicles

and increase use of high occupancy vehicle modes; administered by the Commonwealth Transportation Board.

OTHER TERMS AND ABBREVIATIONS

ACG Address Coding Guide

ADT Average Daily Traffic; used in conjunction with current and projected traffic volumes.

CAO Chief Administrative Officer

CARE Community Assisted Ride Enterprise; program operated by GRTC providing ADA related demand-response paratransit service for the elderly and disabled in the City of Richmond and Henrico County.

CMP Congestion Management Process

COA Comprehensive Operational Analysis (for transit studies)

CTB Commonwealth Transportation Board

EJ Environmental Justice

FFY Federal Fiscal Year (October 1 to September 30)

FY Fiscal Year (July 1 to June 30).

GIS Geographic Information System

I/M Inspection and Maintenance

MSA Metropolitan Statistical Area. The Richmond/Petersburg MSA includes the cities of Colonial Heights, Hopewell, Petersburg, and Richmond; the counties of Charles City, Chesterfield, Dinwiddie, Goochland, Hanover, Henrico, New Kent, Powhatan, and Prince George; and the Town of Ashland.

NHS National Highway System

NOx Nitrogen Oxides

SIP State Implementation Plan (for attainment and maintenance of air quality standards)

SOV Single Occupant Vehicles

STP	Surface Transportation Program
SYIP	Six Year Improvement Program; annual document approved by the CTB. Provides the state's list of federal and state funded transportation projects and programs administered by VDOT and VDRPT for which funds have been allocated or are scheduled to be allocated.
TDP	Transit Development Program
TMA	Transportation Management Area (i.e. MPO's greater than 200,000 in population).
VMT	Vehicle Miles Traveled

plan2040

Appendix B : plan2040

Project Evaluation Tool - Methodology

Introduction

The purpose of this document is to describe the methodology built-in to the '2040 MTP Project Evaluation Tool.xls' which RRTPO staff will employ in the evaluation of candidate project applications submitted by eligible localities and agencies for consideration and inclusion in the fiscally-constrained 2040 Metropolitan Transportation Plan (MTP). The scale and type of projects eligible to be specifically listed in the plan are described in the '2040 MTP Project Inclusion Criteria' (included here in Appendix) and are generally thought of as projects of regional significance which will potentially be funded with federal funding sources. Once projects have been submitted, RRTPO staff will apply the 'Project Evaluation Tool' as described in the following methodology.

An overall objective of the 2040 MTP project evaluation exercise is to move the RRTPO planning process in the direction of a 'Performance-Based Planning and Programming (PBPP)' approach. PBPP is a core component of the *Moving Ahead with Progress in the 21st Century (MAP-21)* federal transportation authorization bill, which calls on metropolitan planning organizations, like the RRTPO, to establish a performance and outcome-based program for federal funding sources, and to invest resources in projects that collectively make progress toward seven national goals: Safety; Infrastructure Condition; Congestion Reduction; System Reliability; Freight Movement & Economic Vitality; and Project Delivery.

A first step in applying PBPP principles was taken by the MTP Advisory Committee (MTP AC) and TPO Board in development and endorsement of nine *2040 MTP Goals,* which closely align with federal and state transportation goals. In order to tie planning and programming priorities to the goals, the MTP AC developed and approved a candidate project application process for the 2040 MTP with the nine goals as an organizing framework. The resulting application materials and evaluation criteria are foundational pieces of a goals-based evaluation method; assessing the degree to which any given candidate project will advance the region toward achieving one or multiple of transportation system goals. Any project not specifically listed in the plan, but which has a logical connection or potential impact on advancing one or multiple 2040 MTP goals will be considered in the future to be 'consistent with the 2040 MTP'.

Specific to the 'Project Evaluation Tool', the purpose of the tool is to provide staff with a guide for the quantitative evaluation of project benefits to the extent possible given data constraints, and as necessary to score using qualitative information in a way that is logically considered, uniform and consistent. Candidate projects are to be scored and ranked relative only to projects of the same type and relative to projects expected to take place in a similar time horizon, or "timeband". Candidate projects will be scored for each goal criteria where some logical connection exists; for example the criteria of 'Freight Mobility' as they are conceived in the application disqualify certain project types such as Transit or Bike/Ped to be eligible for points.

Finally, RRTPO staff has developed the 'Project Evaluation Tool' and Methodology Report to assist project applicants by providing transparency prior to evaluation about how each application question and the information provided by the applicant will be considered, and also to provide for an easily shareable and sortable format after evaluation to allow applicants to review how each question for each project was scored and how each data input impacted the composite score. Ultimately, the evaluation of projects employing the tool and methodology as described in this report is one component of the process undertaken by the MTP AC and TPO Board that will result in the fiscally-constrained project list for the 2040 MTP.

Project Readiness

The Project Readiness component is intended to provide an additional criteria for the MTP Advisory Committee to evaluate the relative merits of similar scoring projects, and be used to determine which timeband a projects falls into if the applicant does not provide anticipated project schedule dates. Project Readiness will not directly factor into an evaluated projects composite score.

Additionally, the information requested for 'Project Readiness', specifically on the level of planning/ROW acquisition completed and consistency with (or inclusion in) regional and locality planning documents will provide TPO staff necessary background on the degree to which 2040 MTP candidate projects have be vetted through a local public input process. The projects ultimately included in the fiscally constrained 2040 MTP must undergo public review; an understanding of each project's development through local planning or otherwise will assist TPO staff in communicating the relative benefits of projects and the degree to which a project is and has been a priority in the applicant locality.

Q1 – Do you believe this project <u>will be consistent with</u> the following documents?

Applicant is instructed to provide the following:

A.) County Comprehensive Plan Yes/No/N.A.
B.) Regional Comprehensive Plan Yes/No/N.A.
(Note: Examples include previous TPO Long-Range Plans or the Regional Comprehensive Economic Development Strategy with which the project is consistent.)
C.) Municipal Comprehensive Plan Yes/No/N.A.
D.) Municipal Zoning Ordinance Yes/No/N.A.
E.) Municipal Official Map Yes/No/N.A.
(Note: Thoroughfare Map, Future Growth Areas Map, or other map approved by council or board of supervisors with which the project is consistent)

If yes to any of above, document where in plans.

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes/no/n.a.) into 'Project Evaluation Tool' for each of the five requested documents. Staff will validate against locality or regional documents as necessary and confer/resolve discrepancy with project applicant in any cases where review of documents differ from what applicant has reported.

Q2 – Do you believe this project has made progress with environmental processes?

Applicant is instructed to provide the following:

Made progress with environmental process? Yes/No/N.A.

If yes, please explain: (Narrative box provided)

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes/no/n.a.) into 'Project Evaluation Tool'. If applicant responds "N/A", indicating that no environmental documentation is required, staff will validate that no

environmental documentation is required and award full readiness points for this question if confirmed. If the applicant responds "Yes", Staff evaluator will review the narrative provided by the applicant and analyze the degree to which environmental documentation has been completed applying the following five-category subjective scale:

5 – Excellent Progress
4 – Very Good Progress
3 – Good Progress
2 – Some Progress
1 – Little Progress

Q3 – Do you believe this project has obtained necessary ROW and/or coordinated utilities for the project area?

Applicant is instructed to provide the following:

Obtained ROW and/or coordinate utilities? Yes/No/N.A.

If yes, please explain: (Narrative box provided)

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes/no/n.a.) into 'Project Evaluation Tool', and validate/confer with applicant if necessary.

Q4 – How much of the project details have been defined such as cost estimates, timeframe for project?

Applicant is instructed to provide the following:

Identify what timeband the project will be implemented:

- ☐ FY 2022 – 2027
- ☐ FY 2028 – 2033
- ☐ FY 2034 – 2040

RRTPO Staff Evaluation Method:

Staff will input applicant response for timeband into 'Project Evaluation Tool'. If no timeband or schedule is provided by the applicant, staff will tier these projects into timebands by applying rough project readiness scores as determined by Q1, Q2 and Q3 of the project readiness section.

Congestion Mitigation

Congestion Mitigation is weighted at 15% of the project score. Each question (2) is valued at 7.5 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types'

Q1 – Do you believe this project improve areas of localized congestion within the project area?

Applicant is instructed to provide the following:

Improve areas of localized congestion within the project area? Yes/No/N.A.

If yes, please explain and provide any of the following information:

- ☐ Level of Service (LOS)
- ☐ Traffic Volumes
- ☐ Person hours of delay
- ☐ Person throughput

RRTPO Staff Evaluation Method:

Staff will review applicant response (yes/no/n.a.) and input supporting congestion data into 'Project Evaluation Tool'. If applicant checkbox "No" or "N/A and no congestion data is provided the resulting score for this question will be 0.

If applicant checkbox yes and no congestion data is provided, staff will work with locality and/or VDOT to develop data to populate at least one of the necessary data fields as feasible. If checkbox yes and data provided, staff will input data into the 'Project Evaluation Tool' using the following scales (with upper limits of scale indicating increasing levels of existing traffic severity):

Level of Service Scale:
0 – LOS A
1 – LOS B
2 – LOS C
3 – LOS D
4 – LOS E
5 – LOS F

Traffic Volume (AADT) Scale:
0 – <1,999 AADT
1 – 2,000 - 9,999 AADT
2 – 10,000 - 34,999 AADT
3 – 35,000 - 84,999 AADT
4 – 85,000 - 174,999 AADT
5 – >175,000 AADT

Person Hours of Delay Scale:
1 – 0 - 4.9
2 – 5 - 9.9
3 – 10 - 14.9
4 – 15 - 19.9

5 – >20

Person Throughput Scale:
0 – <99
1 – 100 - 419.9
2 – 420 - 1459.9
3 – 1460 - 3541.9
4 – 3542 - 7291.9
5 – >7292

Note: The formula for Congestion Mitigation Question 1 in the 'Project Evaluation Tool' is programmed to provide a scaled average for each data point provided; therefore if an applicant can only provide LOS data for example, the project score will not be penalized relative to another application which provides multiple data points (LOS, Traffic Volumes, Person Throughput, etc.). However, failure to provide at least one data point will result in a score of zero; TPO staff will be available to work with project applicants on developing at least one data point as feasible.

Q2 – Do you believe this project improve system functionality through improvements?

Applicant is instructed to provide the following:

Improve system functionality through improvements? Yes/No/N.A.

If yes, please identify and explain:

- ☐ Signal Upgrades
- ☐ ITS Applications
- ☐ Access management approaches (change of use, approach spacing, sight distance, channelization)
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will review applicant response (yes/no/n.a.), improvement checkboxes and supporting narrative provided by applicant. If checkbox "no" or "n.a.", a score of zero will be applied. If checkbox "yes", staff evaluator will input yes into evaluation tool and analyze checkboxes, narrative and project description to apply the following scale of potential for system functionality improvement:

0 – No Improvement to system functionality expected as result of the project
1 – Little Improvement to system functionality expected as result of the project as described
2 – Some Improvement to system functionality expected as result of the project as described
3 – Good Improvement to system functionality expected as result of the project as described
4 – Very Good Improvement to system functionality expected as result of the project as described
5 – Great Improvement to system functionality expected as result of the project as described

Freight Mobility

Freight Mobility is weighted at 10% of the project score. Each question (2) is valued at 5 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types' with the exception of Bike/Ped and Public Transportation projects.

Q1 – Do you believe this project will improve the Regional Intermodal Freight Network (as identified in Richmond/Tri-Cities Regional Intermodal Strategies Study)?

Applicant is instructed to provide the following:

Improve the Regional Intermodal Freight Network? Yes/No/N.A.

If yes, please explain and provide the following information:

- ☐ Improvements to regional freight network
- ☐ Impact on truck movement
- ☐ Increase in travel time reliability
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool, and validate by checking project location against Regional Intermodal Freight Network map (see page S-3 of "Richmond/Tri-Cities Regional Intermodal Strategies Study"). If result of staff validation differs from application, staff will follow-up to discuss with applicant as necessary. For validated "yes" responses, staff will review the narrative explanation and checkboxes, and apply the following subjective scale:

0 – No Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network expected as result of this project

1 – Little Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network is expected as result of this project

2 – Some Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network is expected as result of this project

3 – Good Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network is expected as result of this project

4 – Very Good Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network is expected as result of this project

5 – Great Improvement, in terms of impact on freight movement and travel time reliability, to Regional Intermodal Freight Network is expected as result of this project

Q2 – Do you believe this project will improve access to freight-intensive facilities?

Applicant is instructed to provide the following:

Improve access to freight-intensive facilities? Yes/No/N.A.

If yes, please explain and provide information on increased access to air, improvements to flow of rail, and if project provides better access to key freight-intensive facilities such as:

- ☐ Port of Richmond
- ☐ Richmond International Airport
- ☐ Regional or municipal airports
- ☐ Freight distribution facilities
- ☐ Commercial districts
- ☐ Industrial districts

RRTPO Staff Evaluation Method:

Staff will review applicant response (yes, no, n.a.) and validate by checking project location relative to the freight-intensive facilities reported as improving access to. If result of staff validation differs from application, staff will follow-up to discuss with applicant as necessary. Staff will input validated "yes" responses into 'Project Evaluation Tool'. Score for question is scaled to the number of checkboxes, i.e. the number of different freight-intensive facility types that the project provides improved access to.

System Reliability

System Reliability is weighted at 10% of the project score. Each question (3) is valued at 3.33 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types' with the exception of Bike/Ped projects.

Q1 – Do you believe this project will address high travel times or improve reliability?

Applicant is instructed to provide the following:

Address high travel times or improve reliability? Yes/No/N.A.

If yes, please explain and provide any of the following information:

- ☐ Travel Time Index
- ☐ Planning Time Index
- ☐ Buffer Time Index
- ☐ Real-time traveler information or wayfinding technology
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.). Staff will then review supporting documentation, data provided and project description and apply the following subjective scale:

0 – Applicant checkbox 'No' or 'N/A'

1 – Applicant checkbox 'Yes' but no data or evidence provided

2 – Applicant checkbox 'Yes'; data provided and project description indicate little potential for project improvement to travel time index, planning travel time and/or buffer time index (existing condition indicates very good reliability at present); project does not include real time traveler info or wayfinding technology or other technology as part of its scope.

3 – Applicant checkbox 'Yes'; data provided and project description indicate some potential for project improvement to travel time index, planning travel time and/or buffer time index (existing condition indicates good reliability at present); project includes or does not include some element of real time traveler info or wayfinding technology or other technology as part of its scope.

4 - Checkbox 'Yes'; data provided and project description indicate good potential for improvement to travel time index, planning travel time and/or buffer time index (existing condition indicates below average reliability at present); project includes or does not include some element of real time traveler info or wayfinding technology or other technology as part of its scope.

5 - Checkbox 'Yes'; data provided and project description indicate very good potential for improvement to travel time index, planning travel time and/or buffer time index (existing condition indicates poor reliability at present); project includes some element of real time traveler info or wayfinding technology or other technology as part of its scope.

Q2 – Do you believe this project will increase public transportation service frequency and capacity?

Applicant is instructed to provide the following:

Increase public transportation service frequency and capacity? Yes/No/N.A.

If yes, please explain through examples:

- ☐ Transit System Improvements
- ☐ Reduction of delay on a roadway with scheduled peak service of 1 transit vehicle per hour
- ☐ Smartphone applications and/or ITS
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon staff validation against supporting documentation, checkboxes/data provided and project description. If staff opinion differs from applicant on potential for impact on public transportation service frequency and capacity, staff will follow-up with applicant to clarify. No scale applied.

Q3 – Do you believe this project will incorporate travel demand management (TDM) strategies?

Applicant is instructed to provide the following:

Incorporate travel demand management (TDM) strategies? Yes/No/N.A.

If yes, please explain by identifying what TDM strategies:

- ☐ Improved transport options
- ☐ Incentives to use alternative modes and reduce driving
- ☐ Parking and land use management
- ☐ Policy and Institutional Reforms
- ☐ TDM Programs and Program Support

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool. If applicant checkbox no or n.a. then zero points will be available. If applicant checkbox yes, but provides no information on which TDM strategies are components of the project, staff will follow-up to clarify with applicant. If applicant checkbox yes and provides supporting information the following scale will be applied.

0 - No TDM strategy boxes checked or explained in narrative or project description

1 - One TDM strategy box checked and/or explained in narrative or project description

2 - Two TDM strategy boxes checked and/or explained in narrative or project description

3 - Three TDM strategy boxes checked and/or explained in narrative or project description

4 - Four TDM strategy boxes checked and/or explained in narrative or project description

5 - Five or more TDM strategy boxes checked and/or explained in narrative or project description

Access to Employment

Access to Employment is weighted at 10% of the project score. Each question (2) is valued at 5 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types'.

Q1 – Do you believe this project will improve access to areas of employment density?

Applicant is instructed to provide the following:

> Improve access to areas of employment? Yes/No/N.A.
>
> If yes, please explain and provide map of average employment density within a ½ mile buffer of the project area:
>
> *(Note: See PDC 2012 Employment Density map on next page. GIS layer available upon request.)*

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description and location. If yes, staff will apply following scale of employment density within ½ mile buffer of project area:

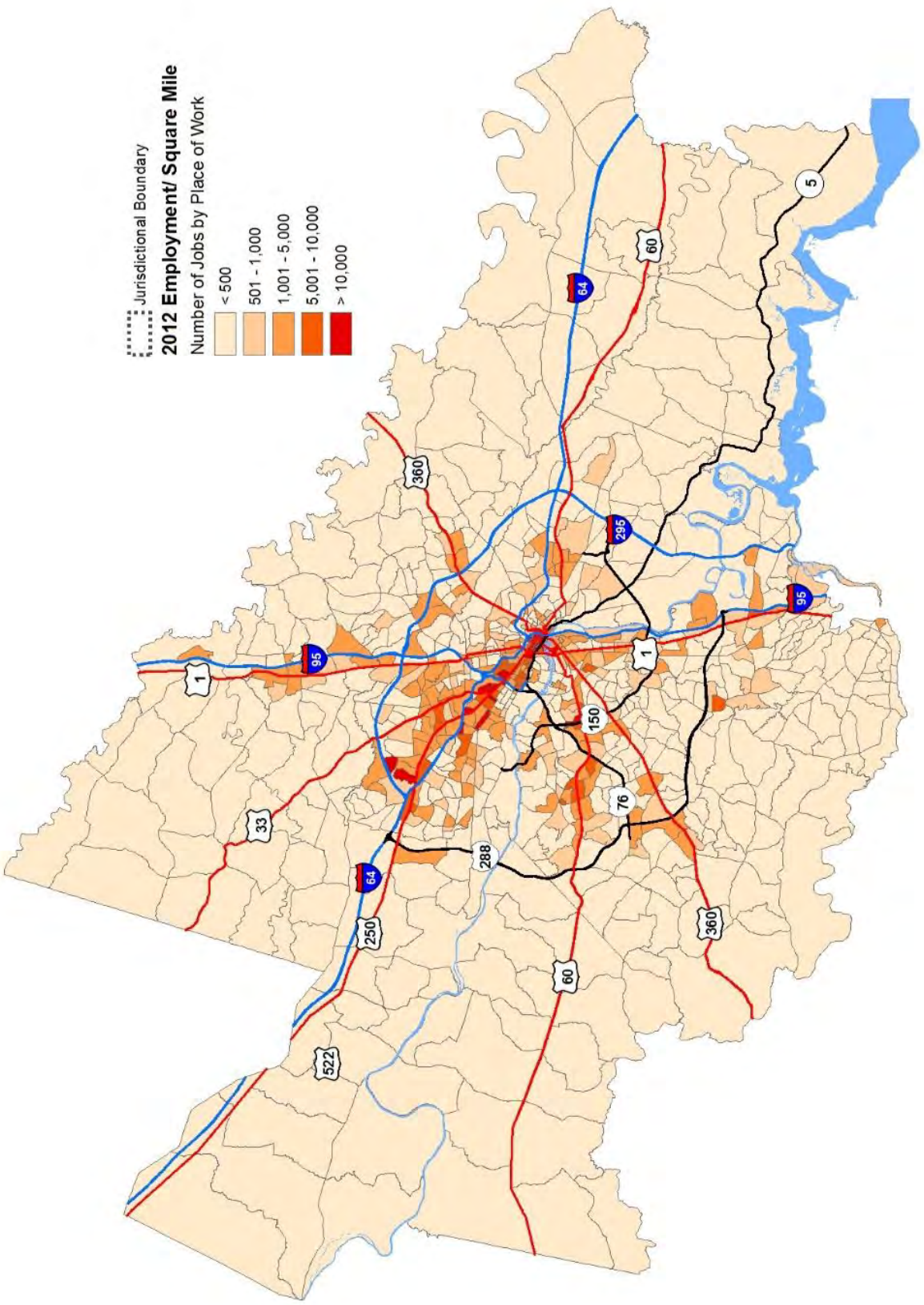
1 - <500 Average Employment Density (Employment per Square Mile) within 1/2 mile buffer of project area

2 - 501 - 1,000 Average Employment Density (Employment per Square Mile) within 1/2 mile buffer of project area

3 - 1,001 - 5,000 Average Employment Density (Employment per Square Mile) within 1/2 mile buffer of project area

4 - 5,001 - 10,000 Average Employment Density (Employment per Square Mile) within 1/2 mile buffer of project area

5 - >10,000 Average Employment Density (Employment per Square Mile) within 1/2 mile buffer of project area


Jurisdictional Boundary
2012 Employment/ Square Mile
Number of Jobs by Place of Work
< 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
> 10,000
5
60
64
360
295
95
1
150
76
33
288
250
522

Q2 – Do you believe project will increase accessibility to key regional activity centers with an emphasis on areas with high poverty rates?

Applicant is instructed to provide the following:

Increase accessibility to key activity centers? Yes/No/N.A.

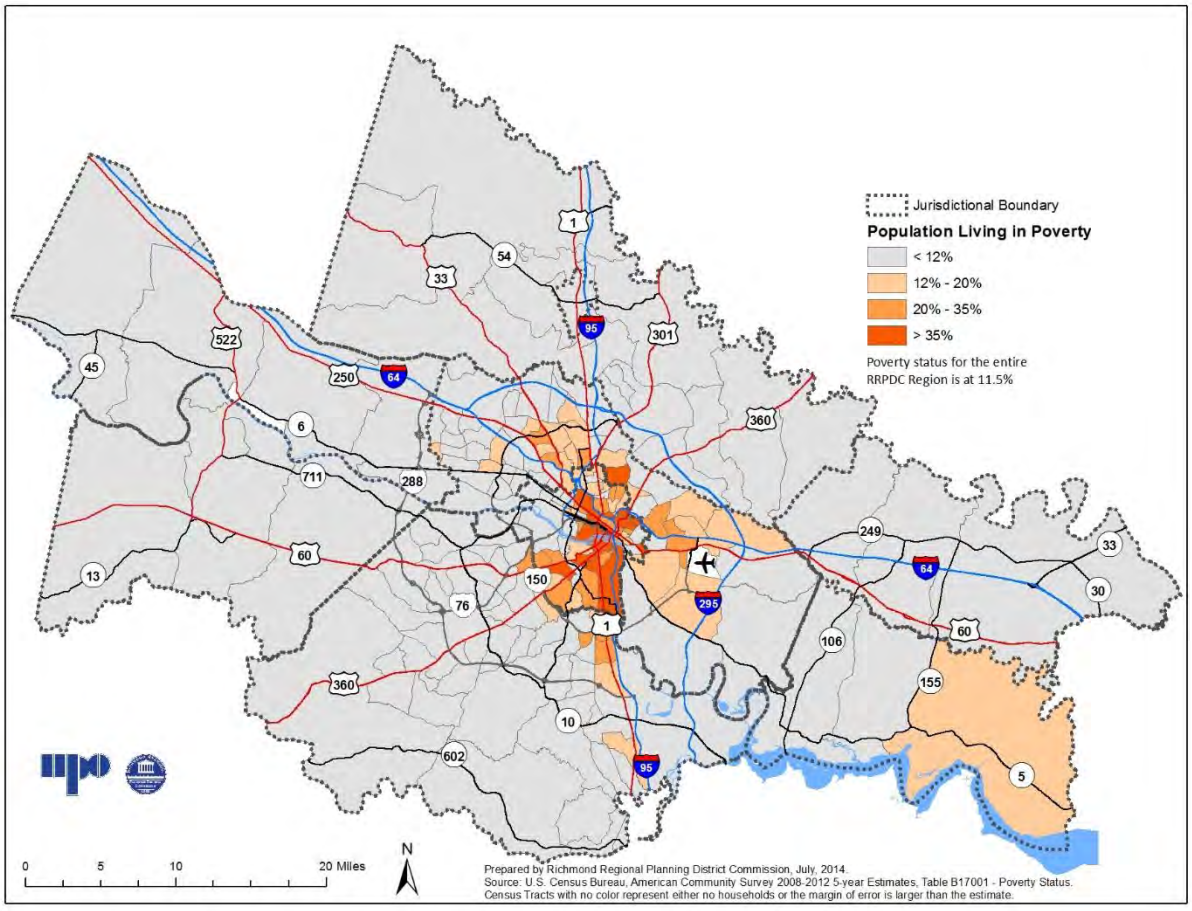
If yes, please explain and provide map of proposed project's proximity to key activity centers as identified through VTrans 2040 (page 7) or the RRPDC CEDS and proximity to areas with high poverty rates with a ½ mile buffer:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description and location. If yes, staff will first confirm that project provides access to key activity centers (yes, no). Secondly, staff will evaluate (yes, no) if the project increases accessibility for areas of "High Poverty"; high poverty defined as those areas above the regional average poverty of 11.5% in a TAZ. Staff will apply the following to determine (yes, no):

No - Poverty levels are less than 12% in all TAZ's surrounding project area and/or all TAZ's with increased accessibility as result of project.

Yes - Poverty levels greater than 12% in at least one TAZ surrounding project area and/or at least one TAZ with increased accessibility as result of project.



Multimodal Connectivity

Multimodal Connectivity is weighted at 10% of the project score. Each question (4) is valued at 2.5 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types'.

Q1- Do you believe this project will introduce new connections between new or existing travel patterns?

Applicant is instructed to provide the following:

Introduce new connections between travel patterns? Yes/No/N.A.

If yes, please explain:

- ☐ Street Connectivity
- ☐ Linking bicycle/pedestrian routes
- ☐ Connections between transit routes and providers
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description, location and narrative explanation provided. If staff opinion on potential to introduce new connections differs from applicant, staff will follow-up with applicant to clarify. No scale applied.

Q2 – Do you believe this project will eliminate/overcome barriers in key corridors?

Applicant is instructed to provide the following:

Eliminate/overcome barriers in key corridors? Yes/No/N.A.

If yes, please explain and note official detour distance based on factors such as weight restrictions:

- ☐ Closures
- ☐ Detours and delays (detour distances)
- ☐ Weight restrictions
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description, location and narrative explanation provided. If staff opinion on potential to introduce new connections differs from applicant, staff will follow-up with applicant to clarify. No scale applied.

Q3 – Do you believe the project will implement Complete Streets elements?

Applicant is instructed to provide the following:

Implement Complete Streets elements? Yes/No/N.A.

If yes, please explain:

- ☐ Sidewalks
- ☐ Bike Lanes
- ☐ Wide paved shoulders
- ☐ Bus Lanes
- ☐ Improvements to Transit Stops
- ☐ Crossing Improvements
- ☐ Median Islands
- ☐ Pedestrian Signals
- ☐ Curb Extensions
- ☐ Narrowing of travel lanes
- ☐ Roundabouts
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description, and narrative explanation provided. Additionally, staff evaluator will review narrative provided and checkboxes to determine relative degree of complete streets elements to be implemented in the project by applying the following scale:

0 - No Complete Streets element boxes checked or Complete Streets elements explained in narrative and/or project description

1 - One Complete Street element box checked and/or Complete Streets elements explained in narrative and/or project description

2 - Two Complete Street element boxes checked and/or Complete Streets elements explained in narrative and/or project description

3 - Three Complete Street element boxes checked and/or Complete Streets elements explained in narrative and/or project description

4 - Four Complete Street element boxes checked and/or Complete Streets elements explained in narrative and/or project description

5 - Five or more Complete Street element boxes checked and/or Complete Streets elements explained in narrative and/or project description

Q4 – Do you believe this project will improve public transportation services?

Applicant is instructed to provide the following:

Improves public transportation services? Yes/No/N.A.

If yes, please explain:

- ☐ Routes
- ☐ Rideshare Opportunities
- ☐ Vanpools
- ☐ Park and ride lots
- ☐ Increase in frequency of service
- ☐ Increase in travel time reliability
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation against project description, location and narrative explanation provided. If staff opinion on potential to improve public transportation services differs from applicant, staff will follow-up with applicant to clarify. No scale applied.

Safety and Security

Safety and Security is weighted at 10% of the project score. Each question (3) is valued at 3.33 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types'.

Q1- Do you believe this project will reduce injury and fatality crash rates?

Applicant is instructed to provide the following:

Reduce injury and fatality crash rates? Yes/No/N.A.

If yes, please provide information for the following:

- Number/rate of fatalities in the project area
- Number/rate of injuries in the project area

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described provides an actual safety improvement based on project description, and narrative explanation provided. Additionally, staff will input data for 'number/rate of fatalities' and 'number/rate of injuries' in project area by applying the following scales:

Number/rate of fatality scale:

0 - No Fatality Data provided

1 - Project provides for limited safety improvements to address/reduce fatalities, but Applicant provided data reporting no fatalities or 0.0 fatality rate in the project area.

2 - Project provides for limited safety improvements to address/reduce fatalities, and Applicant provided data reporting at least one fatality or fatality rate >0.0 in the project area.

3 - Project provides for high degree of safety improvements to address/reduce fatalities, but Applicant provided data reporting no fatalities or 0.0 fatality rate in the project area.

4 - Project provides for high degree of safety improvements to address/reduce fatalities, and Applicant provided data reporting at least one fatality or fatality rate >0.0 in the project area.

5 - Project provides for high degree of safety improvements to address/reduce fatalities, and Applicant provided data reporting more than one fatality in the project area.

Number/rate of injuries scale:

0 - No Injury Data or explanation provided

1 - Project provides for limited safety improvements to address/reduce injury accidents, but Applicant provided data reporting no injuries or 0.0 injury rate in the project area.

2 - Project provides for limited safety improvements to address/reduce injury accidents, and Applicant provided data reporting at least one injury or injury rate >0.0 in the project area.

3 - Project provides for high degree of safety improvements to address/reduce injury accidents, but Applicant provided data reporting no injuries or 0.0 injury rate in the project area.

4 - Project provides for high degree of safety improvements to address/reduce injury accidents, and Applicant provided data reporting at least one injury or injury rate >0.0 in the project area.

5 - Project provides for high degree of safety improvements to address/reduce injury accidents, and Applicant provided data reporting more than one injury accident in the project area.

Q2- Do you believe the project will reduce non-motorized crashes (pedestrian/bicycle)?

Applicant is instructed to provide the following:

Reduce non-motorized crashes (pedestrian/bicycle)? Yes/No/N.A.

If yes, please provide information for the following:

- Number/rate of reported bicycle and pedestrian accidents
- If available, anticipated reduction

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described provides an actual safety improvement for non-motorized transportation based on project description, and narrative explanation provided. Additionally, staff will input data for 'number/rate of reported bicycle and pedestrian accidents' by applying the following scale:

0 - No non-motorized accident data or explanation provided

1 - Project provides for limited safety improvements to address/reduce non-motorized accidents, but Applicant provided data reporting no non-motorized crashes or 0.0 non-motorized crash rate in the project area.

2 - Project provides for limited safety improvements to address/reduce non-motorized accidents, and Applicant provided data reporting at least one non-motorized crashes or >0.0 non-motorized crash rate in the project area.

3 - Project provides for high degree of safety improvements to address/reduce non-motorized accidents, but Applicant provided data reporting no non-motorized crashes or 0.0 non-motorized crash rate in the project area.

4 - Project provides for high degree of safety improvements to address/reduce non-motorized accidents, and Applicant provided data reporting at least one non-motorized crashes or >0.0 non-motorized crash rate in the project area.

5 - Project provides for high degree of safety improvements to address/reduce non-motorized accidents, and Applicant provided data reporting more than one non-motorized accident in the project area.

Q3 – Do you believe the project will improve transportation system security?

Applicant is instructed to provide the following:

Improve transportation system security? Yes/No/N.A.

If yes, please identify what security factors are being improved by the project:

- ☐ Incident response
- ☐ Movement of essential services in time of emergency
- ☐ Evacuation routes
- ☐ Security features to public transportation facilities or vehicles
- ☐ EMT signal pre-emption technology
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described provides improvement to transportation system security based on project description, and narrative explanation provided. Additionally, staff will apply the following scale to account for the relative degree to which the project improves transportation system security:

0 - No 'security' element boxes checked or explained in narrative

1 - One 'security' element box checked and/or explained in narrative

2 - Two 'security' element boxes checked and/or explained in narrative

3 - Three 'security' element boxes checked and/or explained in narrative

4 - Four 'security' element boxes checked and/or explained in narrative

5 - Five or more 'security' element boxes checked and/or explained in narrative

Preservation and Maintenance

Preservation and Maintenance is weighted at 10% of the project score. Each question (3) is valued at 3.33 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types' with the exception of Bike/Ped.

Q1 – Do you believe this project will prolong the useful life of transportation system and infrastructure through reconstruction, rehabilitation and preventative maintenance?

Applicant is instructed to provide the following:

> Prolong the useful life of transportation system? Yes/No/N.A.
>
> If yes, where applicable please provide the pavement condition (roughness index) and/or narrative explanation:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not provide for prolonged useful life of transportation system based on project description, location, and narrative explanation provided. Additionally, the staff evaluator will consider the degree to which the project area is in need of preservation and maintenance through consideration of pavement condition (roughness index) and/or applicant narrative describing the maintenance need in the project area by applying the following scale:

1 - No supporting data or narrative provided

2 - Pavement Condition Roughness Index 76 - 100; and/or project as described provides for little prolonging of useful life of transportation system in an area of little preservation and maintenance need.

3 - Pavement Condition Roughness Index 51 - 75; and/or project as described provides for some prolonging of useful life of transportation system in an area of some preservation and maintenance need.

4 - Pavement Condition Roughness Index 26 - 50; and/or project as described provides for good prolonging of useful life of transportation system in an area of high preservation and maintenance need.

5 - Pavement Condition Roughness Index 0 - 25; and/or project as described provides for very good prolonging of useful life of transportation system in an area of very high preservation and maintenance need.

Q2 – Do you believe this project will prolong the useful life of bridge infrastructure through reconstruction, rehabilitation and preventative maintenance?

Applicant is instructed to provide the following:

Prolong the useful life of bridge infrastructure? Yes/No/N.A.

If yes, please explain and provide the bridge condition (bridge sufficiency rating) and health index of the facility:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not provide for prolonged useful life of bridge infrastructure based on project description, location, and narrative explanation provided. Per federal regulation, bridges with a sufficiency rating 0-49.9 are eligible to receive federal funds for replacement and bridges with a sufficiency rating 50-80 are eligible to receive federal funds for rehabilitation; staff will use bridge condition data provided by the applicant and apply the following scale to assess degree of project need:

1 - No Data Provided

2 - Bridge Sufficiency Rating 90.1 - 100

3 - Bridge Sufficiency Rating 80.1 - 90

4 - Bridge Sufficiency Rating 50 - 80

5 - Bridge Sufficiency Rating 0 - 49.9

Q3 - Do you believe this project will prolong the useful life of transportation facilities or fleet through reconstruction, rehabilitation and preventative maintenance?

Applicant is instructed to provide the following:

Prolong the useful life of transportation facilities or fleet? Yes/No/N.A.

If yes, please explain and provide if available:

- Age of fleet
- Vehicle fuel type
- Rehabilitation to stops and/or stations

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not provide for prolonged useful life of transportation facilities or fleet based on project description, location, and narrative explanation provided. No scale applied.

Environmental and Air Quality

Environmental and Air Quality is weighted at 10% of the project score. Each question (2) is valued at 5 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types'.

Q1- Do you believe this project will minimize air quality impacts?

Applicant is instructed to provide the following:

Minimize air quality impacts? Yes/No/N.A.

If yes, please explain and provide any of the following information:

- Vehicle hours of delay
- Emissions (CO2, NoX, VOC)
- Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not provide for minimized air quality impacts or air quality benefits based on project description, location, and narrative explanation provided. Additionally, staff will apply the following scale to assess the degree to which project is likely to minimize air quality impacts:

0 – Applicant checkbox 'No' or 'N/A'

1 – Applicant checkbox 'Yes' but no data or narrative provided to explain potential impact of project on Vehicle Hours of Delay and resulting reduction in emissions.

2 – Applicant checkbox 'Yes' and data or narrative provided shows little potential to minimize air quality impacts in project area due to very low reported vehicle hours of delay (existing) and/or very low expected reduction in vehicle hours of delay (or future emissions) resulting from the project; and/or project shows little potential to divert passenger trips to non-emitting or low-emitting modes.

3 - Checkbox 'Yes' and data or narrative provided shows some potential to minimize air quality impacts in project area due to low reported vehicle hours of delay (existing) and/or low expected reduction in vehicle hours of delay (or future emissions) resulting from the project; and/or project shows some potential to divert passenger trips to non-emitting or low-emitting modes.

4 - Checkbox 'Yes' and data or narrative provided shows good potential to minimize air quality impacts in project area due to average reported vehicle hours of delay (existing) and/or average expected reduction in vehicle hours of delay (or future emissions) resulting from the project; and/or project shows good potential to divert passenger trips to non-emitting or low-emitting modes.

5 - Checkbox 'Yes' and data or narrative provided shows very good potential to minimize air quality impacts in project area due to above average reported vehicle hours of delay (existing) and/or above average expected reduction in vehicle hours of delay (or future emissions) resulting from the project; and/or project shows very good potential to divert passenger trips to non-emitting or low-emitting modes.

Q2- Do you believe this project will minimize impacts on natural and cultural resources?

Applicant is instructed to provide the following:

Minimize impacts on natural and cultural resources? Yes/No/N.A.

If yes, please explain and identify known project impacts such as:

- ☐ Endangered or threatened species
- ☐ Designated wildlife areas
- ☐ Agricultural lands
- ☐ Water resources (water recharge areas, exceptional value/quality streams)
- ☐ Historical and cultural resources
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not provide for minimized impacts on natural and cultural resources based on project description, location, and narrative explanation provided. Additionally, staff will apply the following scale to assess the degree to which project is likely to minimize natural and cultural resource impacts:

5 - No impact on natural or cultural resources expected as a result of this project

4 - Little impact on natural or cultural resources expected as a result of this project; and/or some impact expected but project includes satisfactory remediation/mitigation strategies

3 - Some impact on natural or cultural resources expected as a result of this project; and/or high impact expected but project includes satisfactory remediation/mitigation strategies

2 - High impact on natural or cultural resources expected as a result of this project; and/or very high impact expected but project includes satisfactory remediation/mitigation strategies

1 - Very High impact on natural or cultural resources expected as a result of this project; very high impact expected and project includes non-satisfactory remediation/mitigation strategies

0 - Extreme impact on natural or cultural resources expected as a result of this project; project is fatally flawed.

Transportation and Land Use Integration

Transportation and Land Use Integration is weighted at 15% of the project score. Each question (4) is valued at 3.75 points.

Note: This goal evaluation criteria applies to all candidate 'Project Types' with the exception of Bridge and Rail projects.

Q1- Do you believe this project will promote in-fill development or redevelopment of brownfield sites?

Applicant is instructed to provide the following:

Promotes in-fill development or redevelopment of brownfield sites? Yes/No/N.A.

If yes, please explain:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not promote in-fill development or brownfield redevelopment based on project description, location, and narrative explanation provided. Additionally, staff will apply the following scale to assess the level of potential development impact of the project:

0 - Applicant checkbox "No" or "N/A" and indicated no potential for project to promote infill development

1 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate little potential for project to promote infill development.

2 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate some potential for project to promote infill development.

3 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate good potential for project to promote infill development.

4 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate very good potential for project to promote infill development.

5 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate great potential for project to promote infill development.

Q2- Do you believe this project will reduce per capita vehicle miles traveled (VMT)?

Applicant is instructed to provide the following:

Reduces per capita vehicle miles traveled (VMT)? Yes/No/N.A.

If yes, please explain:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not have potential to reduce per capita vehicle miles traveled based on project description, location, and narrative explanation provided. Additionally, staff will apply the following scale to assess the level of potential impact of the project on per capita VMT:

0 - Applicant checkbox "No" or "N/A" and indicated no potential for project to reduce per capita VMT

1 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate little potential for project to reduce per capita vehicle miles traveled through diversion of passenger trips to non-SOV modes or otherwise reducing the length of auto trips required to reach destinations in the project area.

2 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate some potential for project to reduce per capita vehicle miles traveled through diversion of passenger trips to non-SOV modes or otherwise reducing the length of auto trips required to reach destinations in the project area.

3 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate good potential for project to reduce per capita vehicle miles traveled through diversion of passenger trips to non-SOV modes or otherwise reducing the length of auto trips required to reach destinations in the project area.

4 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate very good potential for project to reduce per capita vehicle miles traveled through diversion of passenger trips to non-SOV modes or otherwise reducing the length of auto trips required to reach destinations in the project area.

5 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate great potential for project to reduce per capita vehicle miles traveled through diversion of passenger trips to non-SOV modes or otherwise reducing the length of auto trips required to reach destinations in the project area

Q3- Do you believe this project improves or supports transportation infrastructure in existing and planned growth areas?

Applicant is instructed to provide the following:

Improves or supports trans. infrastructure in existing or planned growth areas? Yes/No/N.A.

If yes, please explain:

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project will in fact support or improve locally designated (existing or planned) growth area as designated in locality comprehensive plan, and/or as identified as a Urban Development Area (UDA) or UDA-Like area in the VTrans 2040 VMTP Needs Assessment. In cases of staff validation differing from applicant response, staff will follow-up with applicant for clarification. No scale applied.

Q4- Do you believe this project promotes walking and bike-friendly, mixed-use development?

Applicant is instructed to provide the following:

Promotes walking or bike-friendly, mixed-use development? Yes/No/N.A.

If yes, please explain:

- ☐ VDOT Access Management Policies
- ☐ Other

RRTPO Staff Evaluation Method:

Staff will input applicant response (yes, no, n.a.) into evaluation tool upon validation that project as described does or does not promote walking or bike-friendly, mixed-use development based on project description, location, and narrative explanation provided. Additionally, staff will apply the following scale to assess the level of potential for the project to promote walking/bike-friendly development:

0 - Applicant checkbox "No" or "N/A" and indicated no potential for project to promote walking or bike-friendly, mixed-use development

1 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate little potential for project to promote walking or bike-friendly, mixed-use development.

2 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate some potential for project to promote walking or bike-friendly, mixed-use development

3 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate good potential for project to promote walking or bike-friendly, mixed-use development

4 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate very good potential for project to promote walking or bike-friendly, mixed-use development

5 - Applicant checkbox "Yes", narrative provided by applicant and staff review of project location and description indicate great potential for project to promote walking or bike-friendly, mixed-use development

Project Inclusion Guidance for 2040 MTP Project List

Federal air quality conformity regulations dictate what projects, at a minimum must be included in the fiscally constrained project list of the Metropolitan Transportation Plan (MTP) document.

The following description of what constitutes a "regionally significant" project is from Part 93, Title 40 of the Code of Federal Regulations:

"Regionally Significant Project means a transportation project (other than an exempt project) that is on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel."

To build upon the requirements outlined above, staff proposes two levels of projects to be included: 1) those projects that must be specifically listed in the plan, and 2) those projects that must be consistent with the plan.

Please note that newly submitted or existing candidate projects from the 2035 LRTP will be subject to the project ranking process. Projects that are in the SYIP/TIP and local/private projects that are regionally significant will be individually listed but will not be subject to the project ranking process.

Those projects that must be specifically listed would include the following:

1. **Regionally Significant**- capacity increases on principal arterials & above and/or on modeled network including fixed guideway transit projects.
2. **SYIP/TIP Projects**- projects in the current Six Year Improvement Plan and Transportation Improvement Program.
3. **Locally Preferred Alternatives**- selected from an alternatives analysis under the FTA Capital Investment Grants Program.
4. **New Bicycle/Pedestrian Projects**- Standalone projects, does not include bicycle/pedestrian facilities that are included as part of a highway project.
5. **New Public Transit Projects**- new routes and significant route expansion, significant service area expansion, vehicle replacement and major equipment purchases.
6. **Rail Projects**- more than $3 million.
7. **Reconstruction, Safety, Enhancement and Other Projects**- more than $3 million.

Those projects that must be consistent with the plan include the following:

1. **Reconstruction, Safety, Enhancement and Other Projects**- less than $3 million. These projects are accounted for through the MTP's revenue projections and the establishment of a certain amount of this future revenue for such projects.

These guidelines are not meant to exclude projects from being specifically listed against the wishes of a submitting jurisdiction/agency. The decision whether or not to specifically list a project in the MTP ultimately rests with the associated jurisdiction/agency.

plan 2040 Weighting and Project Scoring Framework (as Approved by MTP AC 9/30/15)

HB2 Criteria and Weighting		plan 2040 Goals	Application Questions related to plan 2040 Goals	Points Available Per Question
Congestion Mitigation	15%	Congestion Mitigation	Q1. Improve areas of localized congestion within project area?	7.5
			Q2. Improves system functionality through improvements?	7.5
Economic Development	20%	Freight Mobility	Q1. Improve the Regional Multimodal Freight Network?	5
			Q2. Improve access to freight-intensive facilities?	5
		System Reliability	Q1. Reduce travel times within the project area?	3.33
			Q2. Increase public transportation service frequency and capacity?	3.33
			Q3. Incorporate travel demand management (TDM) strategies?	3.33
Accessibility	20%	Access to Employment	Q1. Improve access to areas of employment?	5.00
			Q2. Increase acccessibility to key regional activity centers with emphasis on areas with high poverty rates?	5.00
		Multimodal Connectivity	Q1. Introduce new connections between existing travel patterns?	2.50
			Q2. Eliminate/overcome barriers?	2.50
			Q3. Implement Complete Streets elements?	2.50
			Q4. Improves public transportation services?	2.50
Safety	20%	Safety and Security	Q1. Reduce injury and fatality crash rates?	3.33
			Q2. Reduce non-motorized crashes?	3.33
			Q3. Improve transportation system security?	3.33
		Preservation & Maintenance	Q1. Prolong the useful life of transportation system and infrastructure?	3.33
			Q2. Prolong the useful life of bridge infrastructure?	3.33
			Q3. Prolong the useful life of transportation facilities or fleet?	3.33
Environmental Quality	10%	Environmental and Air Quality	Q1. Minimize Air Quality Impacts?	5
			Q2. Minimize impacts on natural and cultural resources?	5
Land Use	15%	Transportation and Land Use Integration	Q1. Promotes in-fill development or redevelopment of brownfield sites?	3.75
			Q2. Reduces per capita vehicle miles traveled (VMT)?	3.75
			Q3. Improves or supports transportation infrastructure in existing and planned growth areas?	3.75
			Q4. Promotes walking or bike-friendly, mixed-use development?	3.75
				100.00 Total Points

Note: TPO Staff Methodology for scoring each question based on data provided in application is under development

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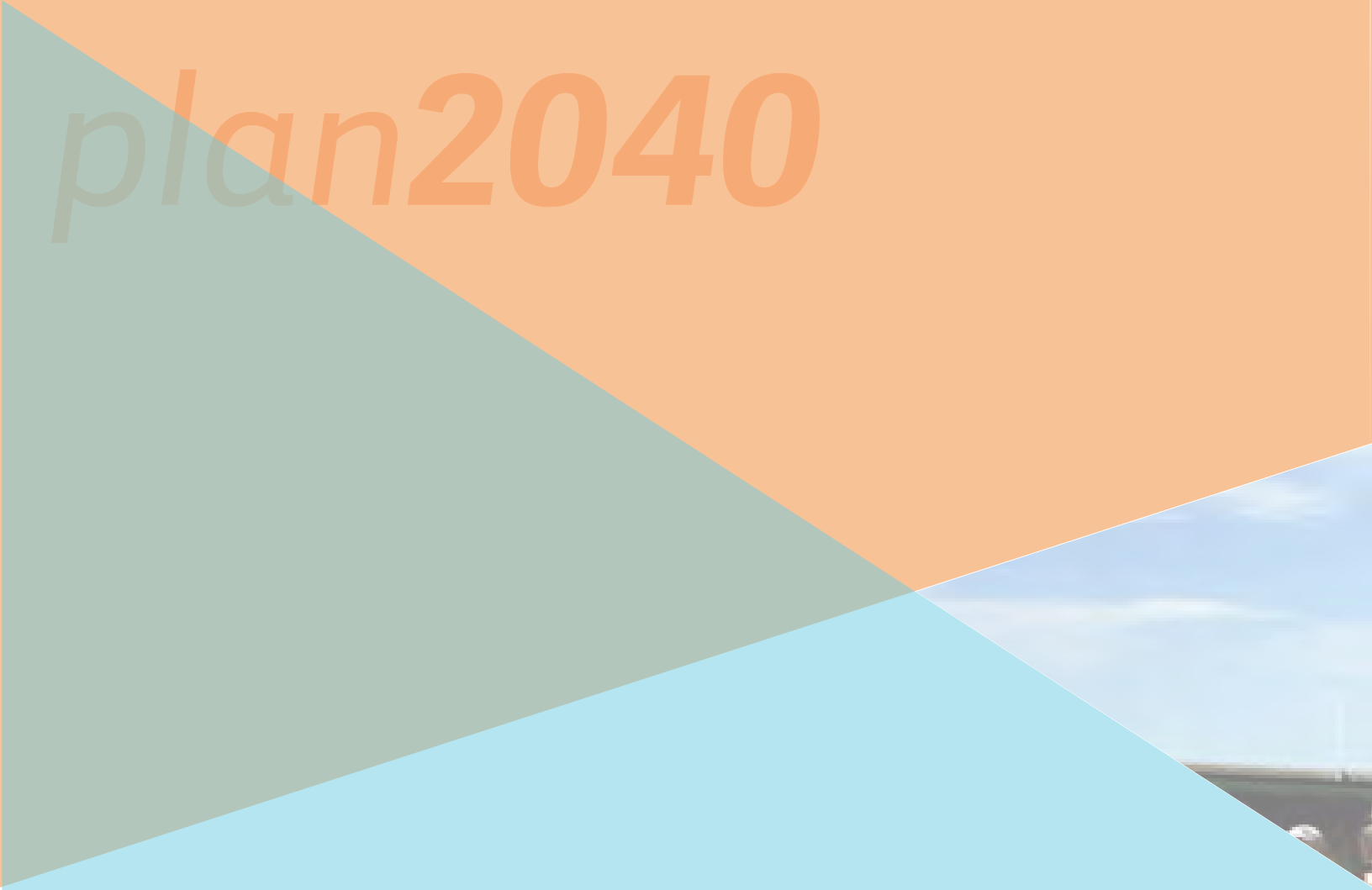
plan2040

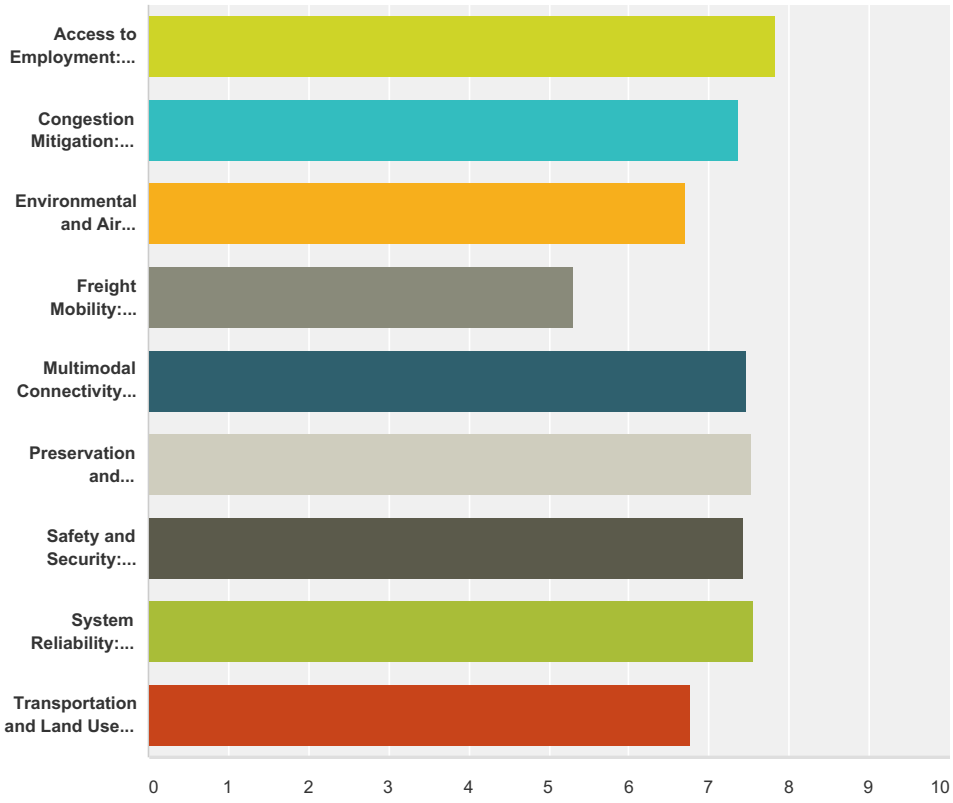


Appendix C : plan2040

Survey Results

Q1 What are your top three goals for improving transportation in the Richmond Region? Please select only three goals and use the drop down boxes to indicate your first, second, and third most important goals with #1 being your most important goal.

Answered: 48 Skipped: 2

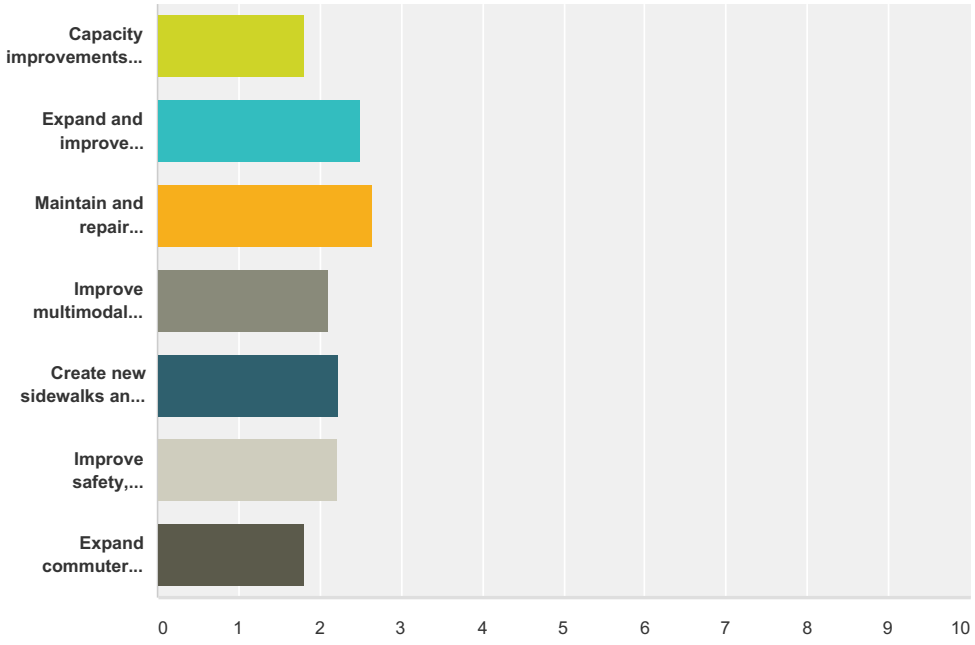


	1	2	3	4	5	6	7	8	9	Total	Score
Access to Employment: Provide connections to job centers, with an emphasis on connections to high poverty areas	**29.17%** 7	**37.50%** 9	**25.00%** 6	**4.17%** 1	**4.17%** 1	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	24	7.83
Congestion Mitigation: Support improvements that address existing and expected traffic congestion	**36.84%** 7	**31.58%** 6	**15.79%** 3	**0.00%** 0	**0.00%** 0	**0.00%** 0	**10.53%** 2	**5.26%** 1	**0.00%** 0	19	7.37
Environmental and Air Quality: Promote projects that protect and enhance the region's natural resources	**20.00%** 2	**30.00%** 3	**20.00%** 2	**0.00%** 0	**10.00%** 1	**10.00%** 1	**0.00%** 0	**10.00%** 1	**0.00%** 0	10	6.70
Freight Mobility: Enhance freight corridors to facilitate the movement of goods in the region	**20.00%** 2	**0.00%** 0	**40.00%** 4	**0.00%** 0	**0.00%** 0	**0.00%** 0	**10.00%** 1	**10.00%** 1	**20.00%** 2	10	5.30

Multimodal Connectivity: Improve access to transportation options, including public transit, bicycle, and pedestrian alternatives	**33.33%** 9	**18.52%** 5	**37.04%** 10	**0.00%** 0	**3.70%** 1	**3.70%** 1	**0.00%** 0	**3.70%** 1	**0.00%** 0	27	7.48
Preservation and Maintenance: Ensure that existing infrastructure is maintained in a consistent state of good repair	**31.58%** 6	**26.32%** 5	**26.32%** 5	**5.26%** 1	**5.26%** 1	**0.00%** 0	**5.26%** 1	**0.00%** 0	**0.00%** 0	19	7.53
Safety and Security: Provide improvements that increase safety and security for system users	**27.78%** 5	**38.89%** 7	**22.22%** 4	**0.00%** 0	**0.00%** 0	**5.56%** 1	**0.00%** 0	**0.00%** 0	**5.56%** 1	18	7.44
System Reliability: Implement technologies and programs to improve travel times and support the ease of travel	**27.78%** 5	**33.33%** 6	**22.22%** 4	**5.56%** 1	**5.56%** 1	**5.56%** 1	**0.00%** 0	**0.00%** 0	**0.00%** 0	18	7.56
Transportation and Land Use Integration: Support investments that meet the needs of existing and future development	**18.18%** 4	**22.73%** 5	**40.91%** 9	**4.55%** 1	**0.00%** 0	**0.00%** 0	**0.00%** 0	**4.55%** 1	**9.09%** 2	22	6.77

Q2 With limited financial resources, how would you prioritize these improvements based on the needs of the Richmond Region?

Answered: 50 Skipped: 0



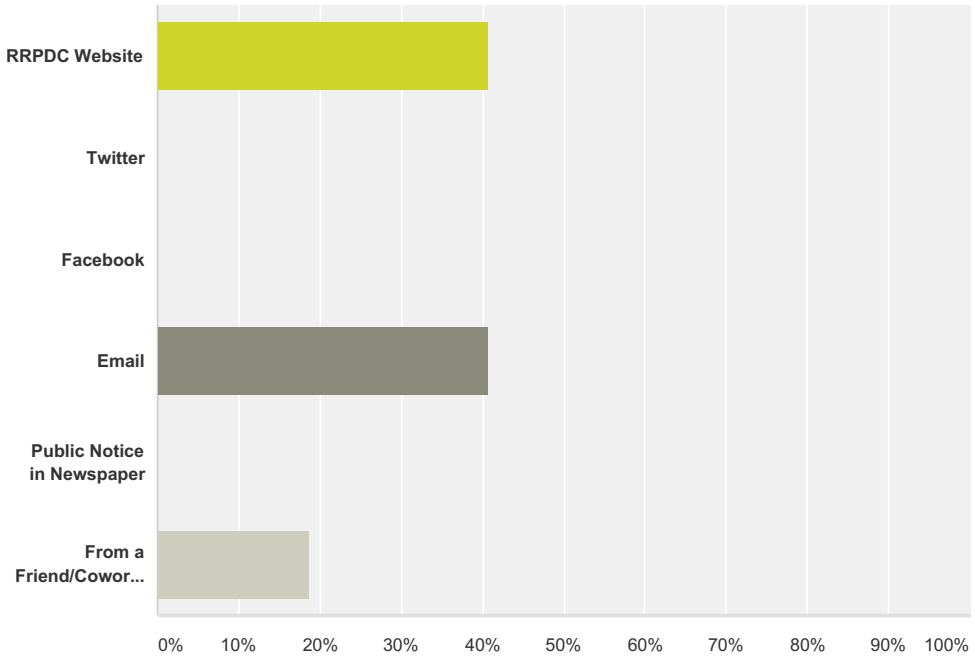
	Low	Medium	High	Total	Weighted Average
Capacity improvements (adding lanes) to roads and/or highways	**38.78%** 19	**40.82%** 20	**20.41%** 10	49	1.82
Expand and improve existing public transportation service	**14.58%** 7	**20.83%** 10	**64.58%** 31	48	2.50
Maintain and repair highways, roads, and bridges	**6.38%** 3	**21.28%** 10	**72.34%** 34	47	2.66
Improve multimodal connections for freight and passenger train traffic	**25.00%** 12	**39.58%** 19	**35.42%** 17	48	2.10
Create new sidewalks and bicycle paths	**19.15%** 9	**38.30%** 18	**42.55%** 20	47	2.23
Improve safety, operations, and system reliability (such as signal improvements, accident clearance, and mobile technology integration)	**12.50%** 6	**54.17%** 26	**33.33%** 16	48	2.21
Expand commuter service programs (such as carpool and park and ride lots)	**37.50%** 18	**43.75%** 21	**18.75%** 9	48	1.81

Q3 Do you have any other comments, questions, or concerns about the regional transportation system?

Answered: 17 Skipped: 33

Q4 Thank you for participating in developing plan2040! How did you hear about the plan or this survey?

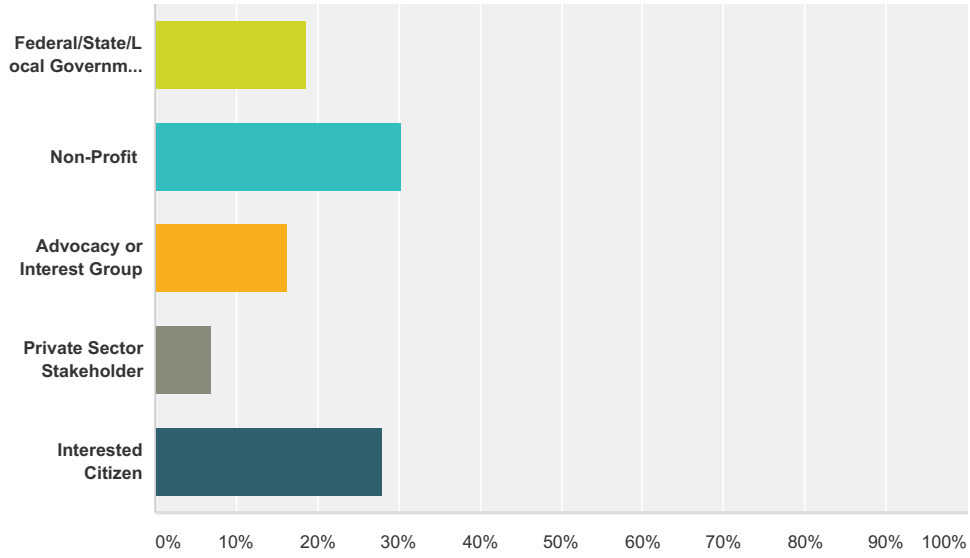
Answered: 32 Skipped: 18



Answer Choices	Responses	
RRPDC Website	**40.63%**	13
Twitter	**0.00%**	0
Facebook	**0.00%**	0
Email	**40.63%**	13
Public Notice in Newspaper	**0.00%**	0
From a Friend/Coworker/Community Leader	**18.75%**	6
Total		**32**

Q5 Let us know who you are! I am with... (Choose one)

Answered: 43 Skipped: 7



Answer Choices	Responses	
Federal/State/Local Government	**18.60%**	8
Non-Profit	**30.23%**	13
Advocacy or Interest Group	**16.28%**	7
Private Sector Stakeholder	**6.98%**	3
Interested Citizen	**27.91%**	12
Total		**43**

Q6 If you would like to be notified of upcoming activity related to plan2040, please provide your contact information.

Answered: 15 Skipped: 35

Answer Choices	Responses	
Name	93.33%	14
Company	66.67%	10
Address	73.33%	11
Address 2	13.33%	2
City/Town	80.00%	12
State/Province	80.00%	12
ZIP/Postal Code	80.00%	12
Country	26.67%	4
Email Address	46.67%	7
Phone Number	33.33%	5

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Appendix D : plan2040

Amendments Documentation

2040 Metropolitan Transportation Plan Update

Amendments Documentation

Definition of Amendment

Revisions to the 2040 MTP update that have been submitted for public review, air quality conformity analysis if applicable, and TPO action. Amendments primarily involve projects noted in the Constrained Projects List of the Fiscally Constrained Plan (i.e. projects added or deleted and changes to project schedules, scope, etc.). Federal regulations for the TPO's planning and programming process define "amendment" as follows (see 23 CFR Part 450, Subpart A – Transportation Planning and Programming Definitions; Section 450.104, Definitions):

"Amendment" means a minor revision to a long-range statewide or metropolitan transportation plan, TIP or STIP that involves a major change to a project included in a metropolitan transportation plan, TIP, or STIP, including the addition or deletion of a project or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment, redemonstration of fiscal constraint, or a conformity determination (for metropolitan transportation plans and TIPs involving "non-exempt" projects in non-attainment and maintenance areas)…

2040 MTP Update Amendments Documentation

March 2, 2017

On December 13, 2016, the RRTPO and the MTP Advisory Committee were provided a memo from Barbara Nelson, RRPDC Transportation Director, which detailed a formatting error found in the plan2040 Constrained Project List for Timeband 1 and the correction action. As stated in the memo, the proposed correction was consistent with the RRTPO approval of the plan document on October 6, 2016, and it did not materially impact the Constrained Projects List.

In response to the formatting correction, FHWA requested that the RRTPO clarify three additional discrepancies through an amendment to plan2040. Through email correspondence on January 3, 2017, FHWA stated that resolving the discrepancies with an amendment will ensure that the validity of plan2040 is not called into question as VDOT and FHWA take action to advance projects. The TAC was briefed on this item at the January 10, 2017 meeting and additional information was included in the TAC meeting agenda under the RRPDC Transportation Director's Report. Initial action was taken at the February 2, 2017 meeting to authorize the plan amendment and public review period. Final action to approve the amendment was taken on March 2, 2017.

The three discrepancies identified by FHWA are listed below, with staff response and actions taken as part of the amendment:

FHWA: Project allocations contained in the online LRTP (Timeband #1) are different from project allocations contained in the LRTP (Timeband #1) received. RRTPO staff indicated that the cause for this change was the "Previous Allocation" column being inadvertently omitted. Other discrepancies do not appear to be related to the omission of the "Previous Allocation" column.

Response: The FY17-FY22 Allocations and Total Allocations Columns have been added to Constrained Projects List Timeband 1 to reflect the FY17-FY22 SYIP. The online document was updated in December 2016. Following final approval of the proposed amendment to the plan, the revised document will be posted online.

FHWA: The plan2040 Allocation Guideline Timeband 1 (FY16-FY21) is inconsistent with the plan2040 Constrained Project list: Timeband 1 (FY17-FY22 SYIP).

Response: The time periods for the Revenue Projections, Allocation Guidelines, and Constrained Project Lists have been updated for consistency, as follows:

Timeband 1 (FY17- FY22)
Timeband 2 (FY23- FY28)
Timeband 3 (FY29- FY34)
Timeband 4 (FY35- FY40)

FHWA: Revenue projections in the LRTP Constrained Project list: Timeband 1 (FY17-FY22 SYIP) considers an additional year worth of projects and allocations.

Response: The Revenue Projections have been adjusted to reflect the same Timebands as the Constrained Projects List, starting with FY17- FY22 in Timeband 1. This adjustment resulted in the removal of approximately $122 million in FY16 revenues that were originally included in the constrained long range plan. The revenue projections by Timeband resulting from this change are summarized in the table to the right.

In order to account for revenue decreases, two projects have moved from the Constrained Projects List to the Unconstrained Projects List in order to maintain fiscal constraint in plan2040. To identify these two projects, procedures consistent with the development of the Constrained Projects List were followed using the criteria of total project scores and available revenue to maximize the number of projects included in the Constrained Projects List.

The two projects proposed to be moved to the Unconstrained Projects List are as follows:

Henpeck Road (VA 665) Safety and Shoulder Improvements in New Kent County

N Gayton Interchange at I-64 in Henrico County

To complete the proposed amendment, the Fiscally Constrained Plan chapter of the plan2040 document was amended with the changes outlined in the responses to the noted FHWA concerns. Additionally, narrative edits were made to ensure consistency between the text of the plan and the proposed changes to the Revenue Projections and Constrained Projects List.

Public Review

The public review process for the plan2040 amendment is listed in Appendix E of the RRTPO Public Participation Plan (June 2016). The public review was held for two weeks from February 6 to February 21, 2017. No public comments were received on the proposed amendment.

plan2040 Revenues (RRTPO Approved 4-10-16)		plan2040 Revenues (RRTPO Amended 3-2-17)		Revenue Change
FY 16-21	$ 565,282,543	FY 17-22	$ 555,760,232	$ (9,522,310)
FY 22-27	$ 639,361,185	FY 23-28	$ 626,396,893	$ (12,964,293)
FY 28-33	$ 600,748,329	FY 29-34	$ 600,614,046	$ (134,283)
FY 34-40	$ 683,223,643	FY 35-40	$ 583,675,338	$ (99,548,304)
Total	$ 2,488,615,700		$ 2,366,446,509	$ (122,169,190)

Richmond Regional Planning District Commission

Metropolitan Planning Organization

Town of
Ashland
Counties of
Charles City
Chesterfield
Goochland
Hanover
Henrico
New Kent
Powhatan
City of
Richmond

RRTPO AGENDA 3/2/17; ITEM II.A.

***plan2040*, 2040 METROPOLITAN TRANSPORTATION PLAN (MTP) AMENDMENT**

Richmond Regional Transportation Planning Organization

On motion of Patricia S. O'Bannon, seconded by James M. Holland, the Richmond Regional Transportation Planning Organization unanimously approved the following resolution:

RESOLVED, that the Richmond Regional Transportation Planning Organization (RRTPO) approves the ***plan2040*** amendment to align the timebands in the revenue projections and allocations guidelines to the timebands in the constrained project list with two projects moving from the constrained project list to the unconstrained project list.

BE IT FURTHER RESOLVED, that the RRTPO authorizes the transmittal of this plan to the Federal Highway Administration and the Federal Transit Administration.

****

This is to certify that the Richmond Regional Transportation Planning Organization approved the above resolution at its meeting held March 2, 2017.

WITNESS:

Sharon E. Robeson
Program Assistant
Richmond Regional Planning
District Commission

BY:

Barbara Schoeb Nelson
Secretary
Richmond Regional Transportation
Planning Organization

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Part 2: plan2040 Technical Document

Table of Contents

Regional Demographics

To anticipate the future transportation needs in the Richmond region, it is essential to anticipate demands on the system. Development patterns and future population size, including demographic and socioeconomic characteristics, affect people's modes of travel. The transportation network of an area influences where people live and work, and employment patterns are identified and considered in order to address changing commuting patterns and habits of the region's population. The planning process relies on current residential patterns and projections of future population trends to identify the magnitude of anticipated travel demand.

Data Sources and Methods

To evaluate the study area, population and employment densities will be examined. The density patterns enable a more accurate representation of conditions within the study area due to the varying sizes of the transportation analysis zones (TAZs). TAZs are defined as areas of activity served by one or two major roadways. TAZs serve as the base unit for socioeconomic data characteristics used in various plans and studies.

The 2012 base year for housing and population data was collected with the cooperation of localities tracking local residential development. All localities track growth through a Continuing, Cooperative, and Comprehensive (3-C) data collection process. The base year 2012 data population estimates for localities were derived from a combination of July 1, 2010 U.S. Census estimates and local 3-C Reports. Base year data cannot be more than 10 years old.

To create 3-C data, jurisdictions estimate housing unit totals and local population by tracking monthly building and demolition permit activity. The population distribution was developed by working closely with each jurisdiction to inform development scenarios. These relied on a combination of local residential development pipeline activity, existing and future land use, and comprehensive local land use plans for multiple horizon years.

In many cases, the locality's population estimates varied from the 2012 U.S. Census estimates. All jurisdictions developed 3-C data using regional standards to create the 2012 base year housing and population estimates. Future year 2040 projections are based on the 3-C base year of 2012 and not the decennial Census year 2010. This document uses base year 2012 data for population, households, automobiles and employment data in the TAZ geography.

Uses

The socioeconomic data developed by the RRTPO is mainly used for air quality conformity analysis and creating population forecasts. Title VI/Environmental Justice Analysis compliance of plan2040 requires identification of traditionally disadvantaged groups including minority, low income, elderly, those with a disability, and Limited English Proficiency populations. US Decennial Census 2010 and American Community Survey 2008 – 2013 5-year estimates have been used as the source for these data. The Title VI/Environmental Justice Analysis uses data for the census tract geography.

Study Area

The Richmond region consists of nine jurisdictions: The Town of Ashland, the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent and Powhatan and city of Richmond. Portions of Charles City, Goochland, New Kent, and Powhatan counties fall outside of the TPO's study area. A portion of southern Chesterfield falls into neighboring Tri-Cities MPO. The town of Ashland is included in Hanover County. The RRTPO encompasses an important crossroads for the Mid-Atlantic states.

Interstate 95 (I-95) passes through the Richmond region and is the major north-south connector on the east coast. Interstate 64 (I-64) passes through the region and intersects I-95 near downtown Richmond. I-64 is an important east-west connector that provides access to Hampton Roads as well as to points across the country. Other important highways within the region include Interstate 295, which forms a bypass for the northern and eastern portions of the region, connecting I-64 to I-95 near Ashland on the north and to I-95 on the south side of Petersburg. Virginia Route 288 forms a bypass for the southern and western portions of the region, connecting I-64 to I-95 through Goochland, Powhatan and Chesterfield counties. In the City of Richmond, Interstate 195 connects I-64 and I-95 to the Powhite Parkway and the Downtown Expressway. In Henrico County, Route 895 provides an east-west link between I-95 and I-295. In Chesterfield County, the Powhite Parkway and Chippenham Parkway serve as major linkage highways connecting the county to the City of Richmond, Henrico County, and to I-95. U.S. primary routes, including U.S. Routes 1, 33, 60, 250, 301 and U.S Route 360, are an integral part of the region's roadway network.

The Richmond region is served by an inland deepwater port on the James River that connects regional goods with global markets. Passenger and air cargo service is offered through the Richmond International Airport located in eastern Henrico County. Major rail facilities are owned and operated by CSX and Norfolk Southern and radiate out in all directions connecting Richmond with major U.S. markets including Washington, D.C. and other northeast corridor cities, as well as Chicago and Atlanta.

Amtrak provides passenger train service to Washington, D.C. and points north to Boston, east to Newport News, west to Chicago, and south to Florida. Higher speed rail service from Main Street Station in downtown Richmond to Union Station in Washington, D.C. is currently under review, as is high-speed service from Richmond south to Raleigh, North Carolina.

Population and Household Change

Between 2012 and 2040, the Richmond region is expected to see continued strong population growth, as it did in the previous forty year period. The total population is forecasted to grow by 42 percent to around 1,500,000 residents. The City of Richmond and the Counties of Henrico and Chesterfield form the region's urban core and suburban ring. Around 80 percent of the region's population lives in these three jurisdictions, and this is projected to remain stable in 2040. These jurisdictions are forecasted to house a total of 340,000 of the Richmond region's projected 429,000 new residents, 66 percent of its new households. Figure 1.1 and 1.2 demonstrates the distribution of population growth by jurisdiction in 2012 and 2040. The majority of the population increases in these core jurisdictions are driven by growth in the suburban ring formed by Henrico and Chesterfield counties.

The largest gains in population are projected in Henrico and Chesterfield, which are forecasted to add 132,000 and 187,000 new residents respectively. Richmond is projected to grow by around 22,000 residents. The greatest total population increase in a rural area is forecasted to occur in Hanover (65,000 new residents).

The percent change in population and percent change in number of households are shown in Figurefig. 1.2.3 and Figurefig. 1.3.4. Growth rates for the population and total number of households follow similar patterns. Jurisdictions are classified by projected population growth rate below:

- High growth rates are forecasted in the suburb of Chesterfield (58%) and the rural counties of Hanover (54%) and Powhatan (52%)
- Moderate growth rates are forecasted in the rural counties of New Kent (43%) and Goochland (38%) the suburb of Henrico
- Low growth rates are forecasted in the City of Richmond (10%) and Charles City County (33%)

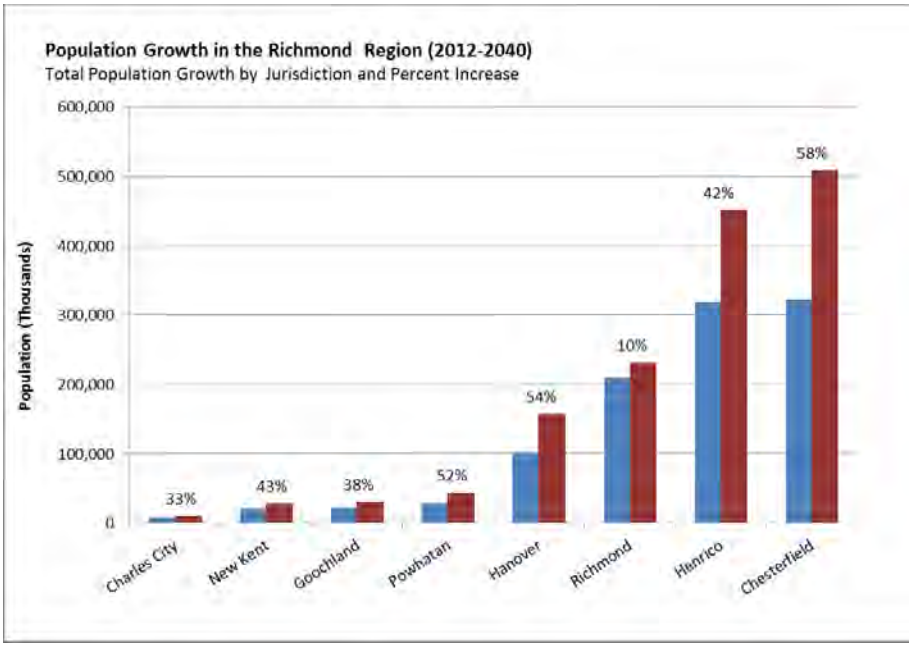


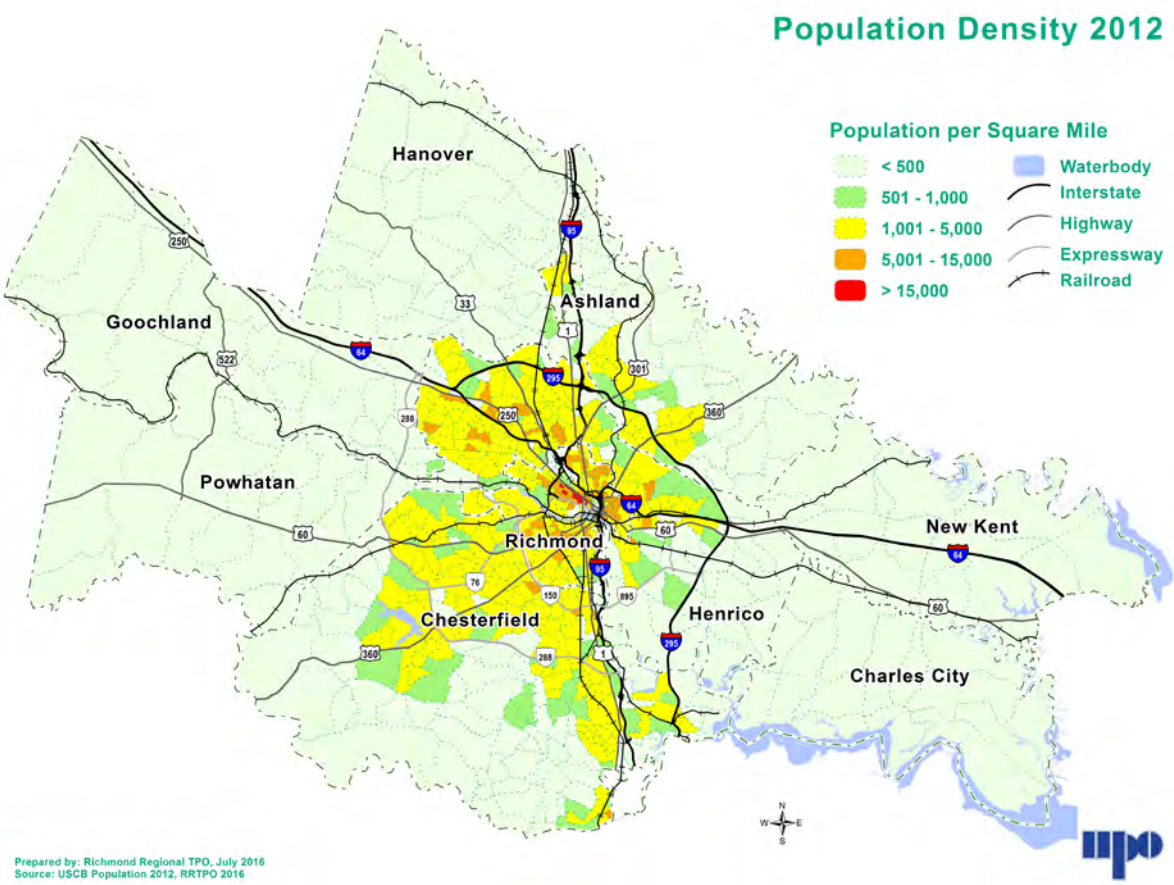
FIG. 1.1. DISTRIBUTION OF POPULATION GROWTH IN THE RICHMOND REGION BY JURISDICTION

Jurisdiction	Households 2012	Percent Share of Regional Households 2012	Households 2040	Percent Share Regional Households 2040	Household Change 2012-2040 (%)
Charles City	2,979	1%	3,949	1%	33%
New Kent	7,149	2%	10,303	2%	44%
Goochland	8,081	2%	11,353	2%	40%
Powhatan	9,635	2%	15,141	3%	57%
Hanover	37,234	9%	56,352	10%	51%
Richmond	90,266	23%	100,114	18%	11%
Henrico	127,720	32%	182,010	32%	43%
Chesterfield	116,981	29%	185,833	33%	59%
Region Total	400,045		565,055		41%

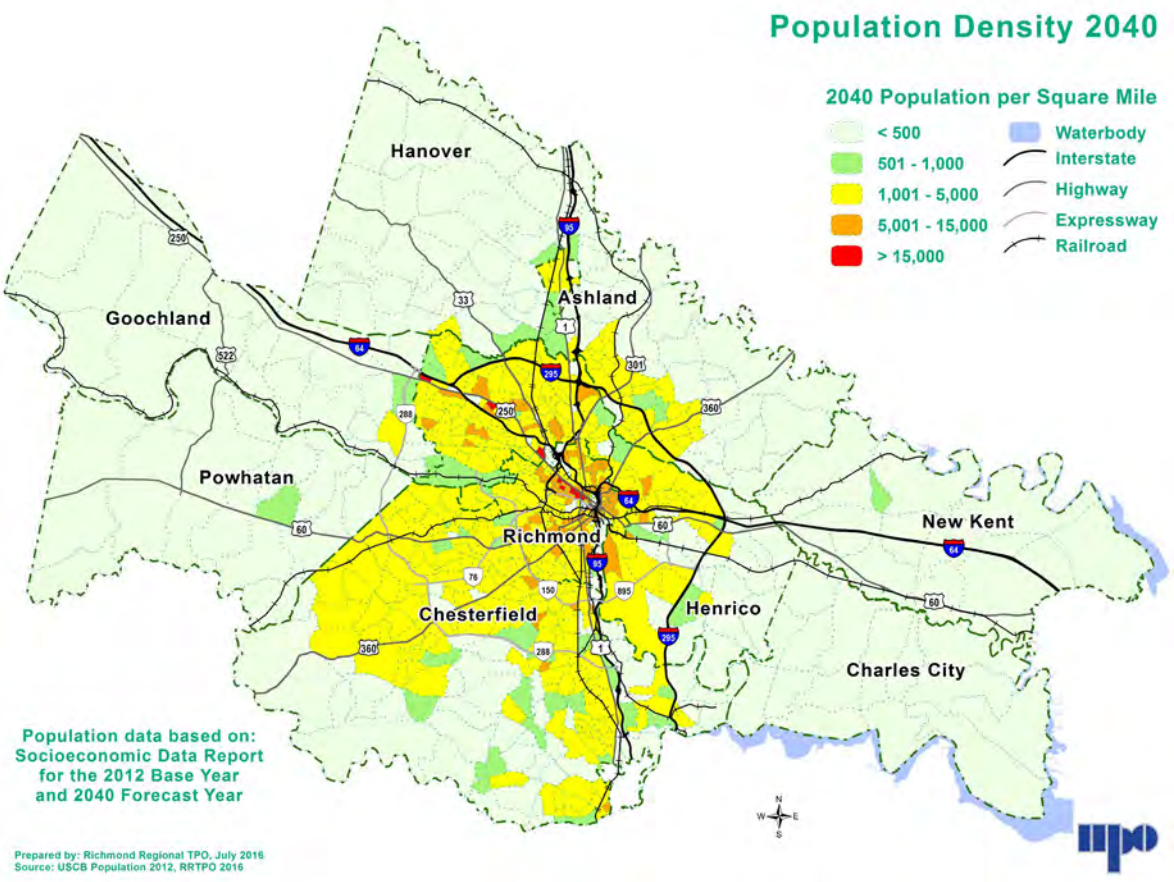
FIG. 1.2. POPULATION AND HOUSEHOLD SIZE BY JURISDICTION, RANKED FROM SMALLEST TO LARGEST BY PROJECTED POPULATION SIZE IN 2040

Regional Population Density and Growth

Maps 1.1 and 1.2 show population density in 2012 and 2040, illustrating that the greatest population density is forecasted in and beyond the I-295/Route



MAP 1.1. 2012 POPULATION DENSITY IN THE RICHMOND REGION



MAP 1.2. 2040 POPULATION DENSITY IN THE RICHMOND REGION

288 beltway. At the present time, the density in this beltway is generally above 1,000 persons per square mile. However, higher levels of population density also exist beyond the beltway, stretching southwest along Route 360, south of Route 288 along Route 1 and I-95, near Mechanicsville along Route 360, near Atlee along Route 301, the Town of Ashland, and near Wyndham in western Henrico. Refer to Map 1.1 for 2012 population density.

For 2040, Map 1.2 illustrates forecasted population density, highlighting where density is expected to occur. As depicted in the map, the regional population is projected to grow within and beyond the I-295/Route 288 beltway in the southwest and southeastern portions of Chesterfield. Also, growth into eastern Henrico, southern parts of Hanover, and eastern Goochland is projected over the next 28 years based on past trends and knowledge of local plans in the development pipeline.

Automobile Ownership

The region as a whole is expected to increase its total number of automobiles by almost 50 percent between 2012 and 2040, an increase of over 370,000. Chesterfield is projected to experience the largest increase in total number of vehicles, representing the greatest portion of vehicles owned in the region (Ffig. 1.4). The City of Richmond and Charles City are projected to increase the least. These trends are in line with population and household growth, and Chesterfield and Henrico are expected to experience substantial gains, while Richmond is forecasted to experience minimal gains.

Richmond and Goochland are projected to decrease their shares of the overall number of automobiles while Hanover and Chesterfield are projected to increase from 2012 to 2040 (Ffig. 1.5). All other jurisdictions will remain proportionally the same while the total number of automobiles increases throughout.

Jurisdiction	Total Automobiles 2012	Total Automobiles 2040	% Change
Charles City	6,670	8,783	32%
New Kent	17,815	25,602	44%
Goochland	19,614	27,863	42%
Powhatan	23,567	36,947	57%
Hanover	87,146	132,844	52%
Richmond	124,865	138,726	11%
Henrico	236,826	358,763	51%
Chesterfield	248,418	406,872	64%
Region Total	764,921	1,136,400	49%

FIG. 1.3. AUTOMOBILES 2012 AND 2040 IN THE RICHMOND REGION BY JURISDICTION, RANKED FROM SMALLEST TO LARGEST BY PROJECTED TOTALS IN 2040

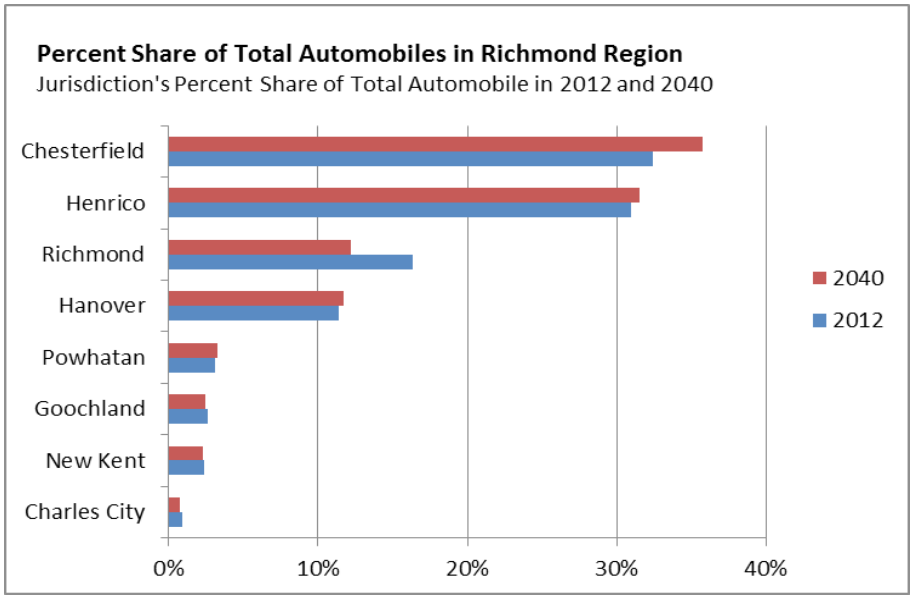


FIG. 1.4. PERCENT SHARE OF TOTAL AUTOMOBILES IN THE RICHMOND REGION BY JURISDICTION

Chesterfield and Henrico will remain the jurisdictions with the highest number of automobiles, both proportionally and in absolute terms.

Employment

Suburban and rural employment growth is projected to continue at a higher rate than urban growth. Westward development into rural jurisdictions is evident in Powhatan and Goochland's significant projected employment increases (183% and 111% respectively). Employment in Hanover and Chesterfield is expected to increase by 56 percent in both localities. Henrico is projected to remain the largest employer in the region, with a total of 255,266 total jobs by 2040 or 35 percent of all regional employment (Ffig. 1.6 and Ffig. 1.7).

As defined by North American Industry Classification System (NAICS), the top three industries are Retail, Accommodation & Food Services, Other Services (except Public Amin), Health Care and Social Assistance, and Educational Services (fig. 1.8). The largest health care providers are VCU Health System, Bon Secours Richmond Health System, and HCA of Virginia. The largest employers in education are Virginia Commonwealth University, and the school boards of Henrico, Chesterfield, Richmond and Hanover. Finance and Insurance, the fifth largest industry in the region, is

Jurisdiction	Employment 2012	Employment 2040	Change 2012-2040 (%)
Charles City	1,419	1,643	16%
New Kent	3,653	6,289	72%
Powhatan	5,406	15,307	183%
Goochland	12,509	26,450	111%
Hanover	45,888	72,087	57%
Richmond	146,268	172,290	18%
Chesterfield	116,434	181,391	56%
Henrico	178,665	255,266	43%
Region Total	510,242	730,683	43%

FIG. 1.5. EMPLOYMENT BY JURISDICTION

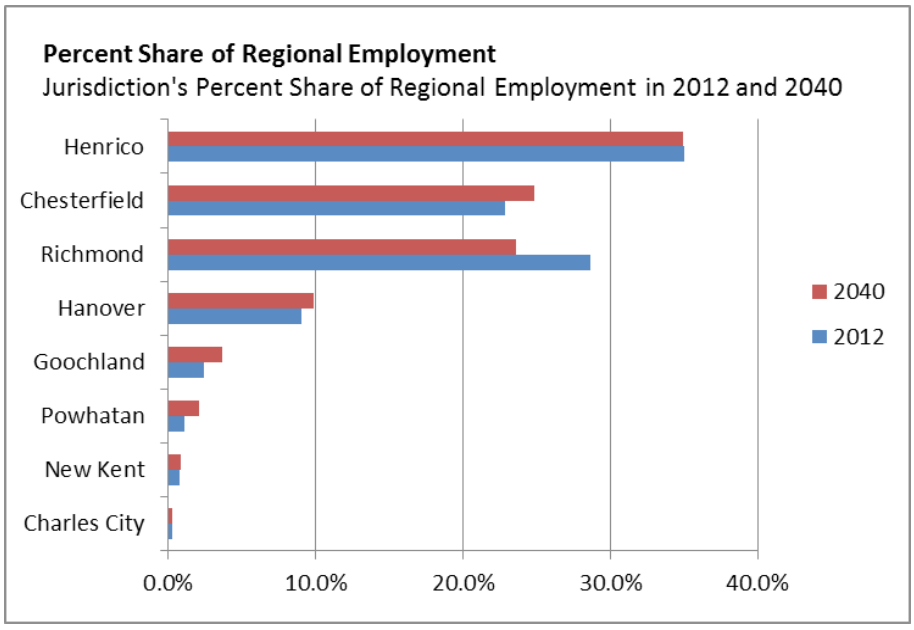


FIG. 1.6. PERCENT SHARE OF TOTAL JOBS IN THE RICHMOND REGION BY JURISDICTION

Industry	Employment	%
Retail, Accommodation & Food Services	111,774	22%
Health Care and Social Assistance	70,899	14%
Educational Services	49,530	10%
Finance and Insurance	35,633	7%
Professional, Scientific, and Technical Services	34,378	7%
Administrative and support and waste management and remediation services	34,285	7%
Public Administration	34,477	7%
Construction	29,171	6%
Manufacturing	24,499	5%
Management of Companies and Enterprises	21,343	4%

FIG. 1.7. EMPLOYMENT BY NAICS SECTOR

also worth noting as Anthem, SunTrust, and Capital One are top 20 employers, and Capital One is the largest employer in the region (Ffig. 1.9). The top ten industries comprise 87 percent of the region's economy. Such a diverse regional economy avoids over exposure during economic downturns, or employment losses

Top 20 Employers	
1	Capital One
2	Virginia Commonwealth University
3	Henrico School Board
4	Chesterfield School Board
5	VCU Health System
6	Bon Secours Richmond Health System
7	HCA of Virginia
8	City of Richmond
9	City of Richmond School Board
10	County of Henrico
11	County of Chesterfield
12	Altria
13	Wal Mart
14	Hanover School Board
15	Martin's
16	Department of Defense
17	Veterans Affairs
18	Suntrust
19	Anthem
20	Kroger

FIG. 1.8. LARGEST REGIONAL EMPLOYERS

that occur when a single major company leaves the region. This was most evident when, during the peak of the recession in 2008 and 2009, a number of large employers relocated or dissolved.

Employment Density

The concentration of employment in the region is expected to increase in areas beyond the I-295/Route 288 beltway. Employment density, based on location of jobs per square mile, is currently greatest in downtown and along major corridors within the region, as illustrated in Mmap 1.3 and Mmap 1.34. Similar to existing population density, most of the employment concentration is within the I-295/Route 288 beltway, with exceptions in Ashland and southern Hanover, and near Mechanicsville, Chester, Swift Creek, and Wyndham.

As indicated in Mmap 1.4 significant concentration of employment is expanding to areas beyond the beltway along these same corridors in 2040. Based on current development activity, employment is expected to expand into areas southwest of Magnolia Green along Route 360, Meadowville Technology Park along the James River, White Oak Technology Park adjacent to Route 60, and East Creek Business Park in eastern Goochland.

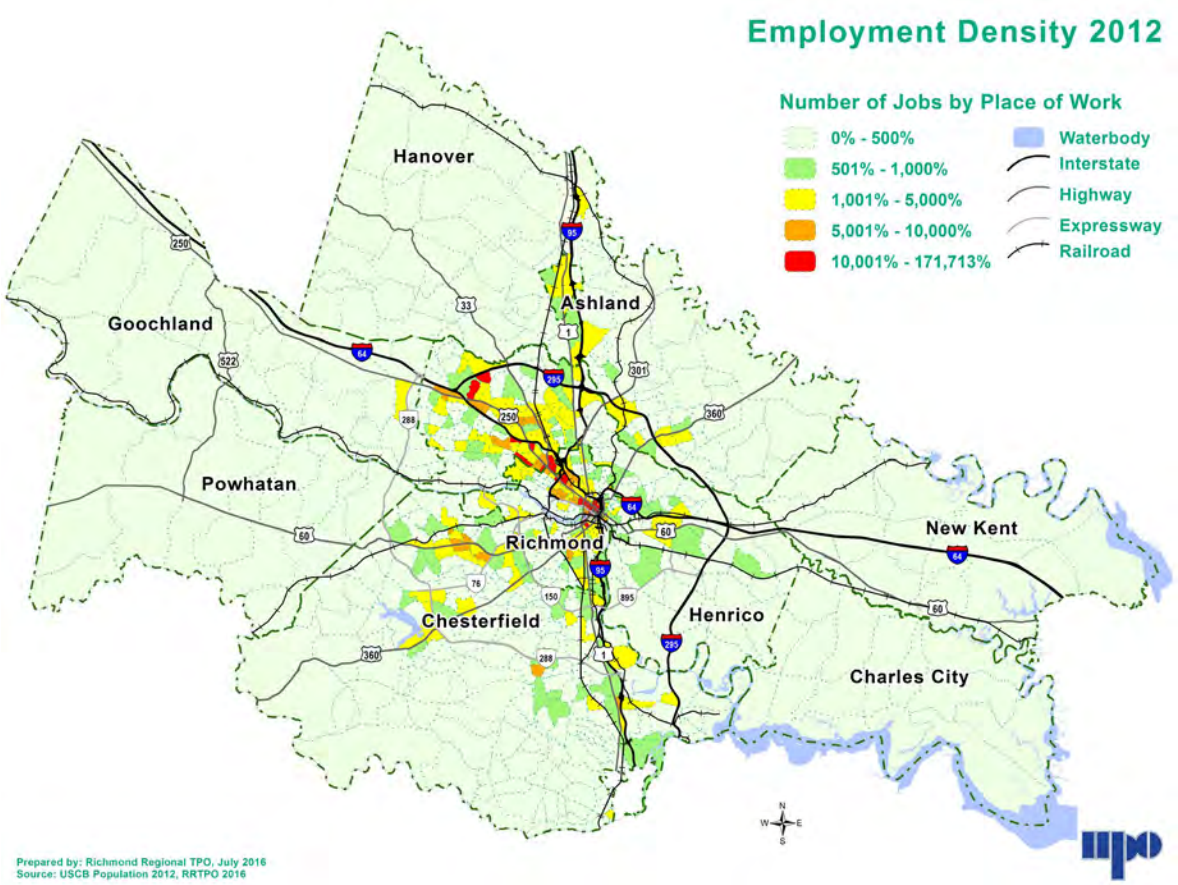
Special Populations for Title VI and Environmental Justice Planning

Title VI of the Civil Rights Act of 1964 and Executive Order 12898 on Environmental Justice (discussed in detail in the Environmental Justice section of the plan2040 Vision document) direct every recipient agency to identify and address the effects of all programs, policies, and activities on populations protected from discrimination and those traditionally disadvantaged groups, defined as Minority and Low-Income Populations. Tracts are designated concentration areas if its percentage of the sensitive population exceeds the average percentage of the target population in all tracts in the region. Special populations meeting the requirements of Title VI and Environmental Justice analysis standards include minorities, households in poverty, the elderly, individuals with a disability, and individuals with Limited English Proficiency. The data provided was based on ACS 2009 to 2013 data.

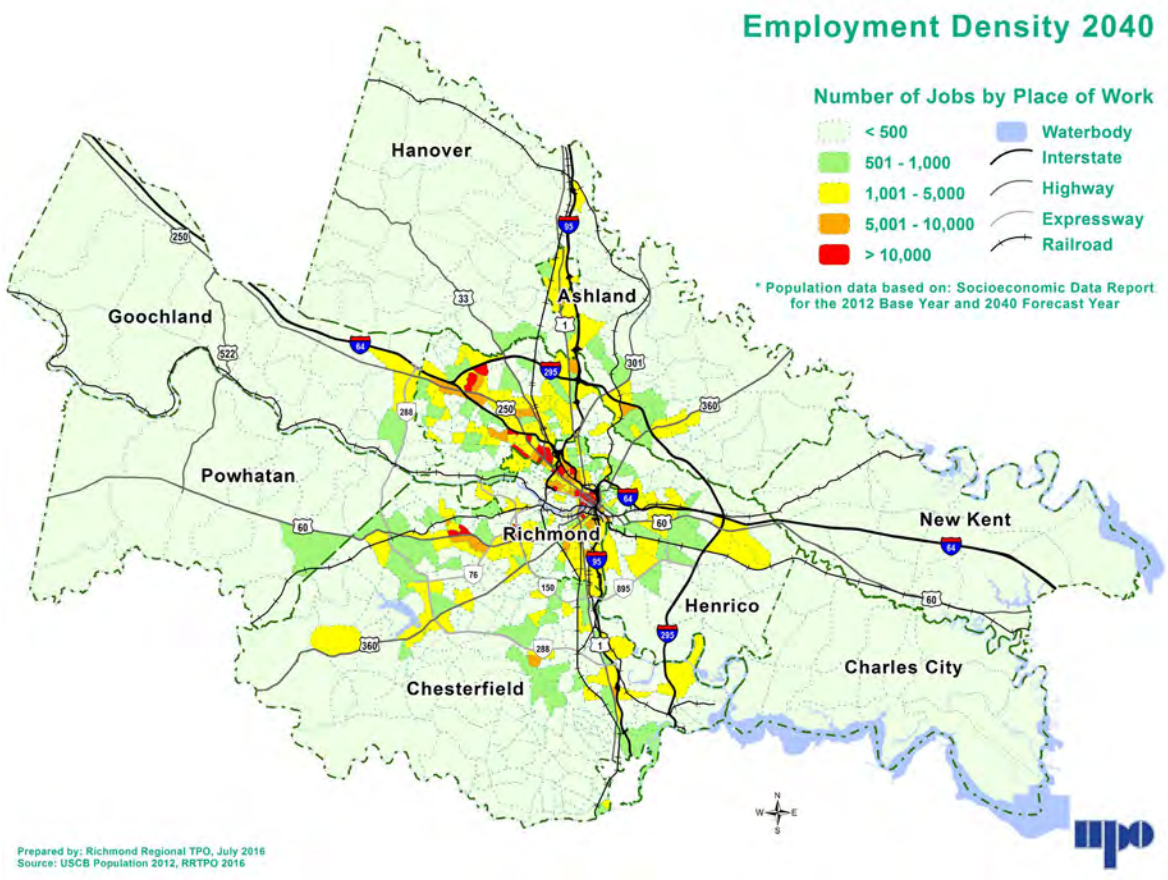
Minority Population

Minority populations are often underrepresented in the transportation planning process, and exclusion has resulted in negative impacts on this group historically. Minority members form a growing portion of the population, particularly in urban areas, but have experienced high barriers to participation in decision-making. Members of the Minority Population are persons who identify themselves as American Indian and Alaska Native, Black or African American, Asian, Hispanic or Latino and Native Hawaiian and Other Pacific Islanders. It includes all people who have not identified themselves as Non-Hispanic White in US Census race and ethnicity question.

As shown in Ffig. 1.10 the population of different races as well as the calculated minority population for each jurisdiction in the Richmond region. The percentage of the total population in the Richmond region identifying as a racial or ethnic minority is 40 percent. Twenty-eight percent of



MAP 1.3. 2012 EMPLOYMENT DENSITY IN THE RICHMOND REGION



MAP 1.4. 2040 EMPLOYMENT DENSITY IN THE RICHMOND REGION

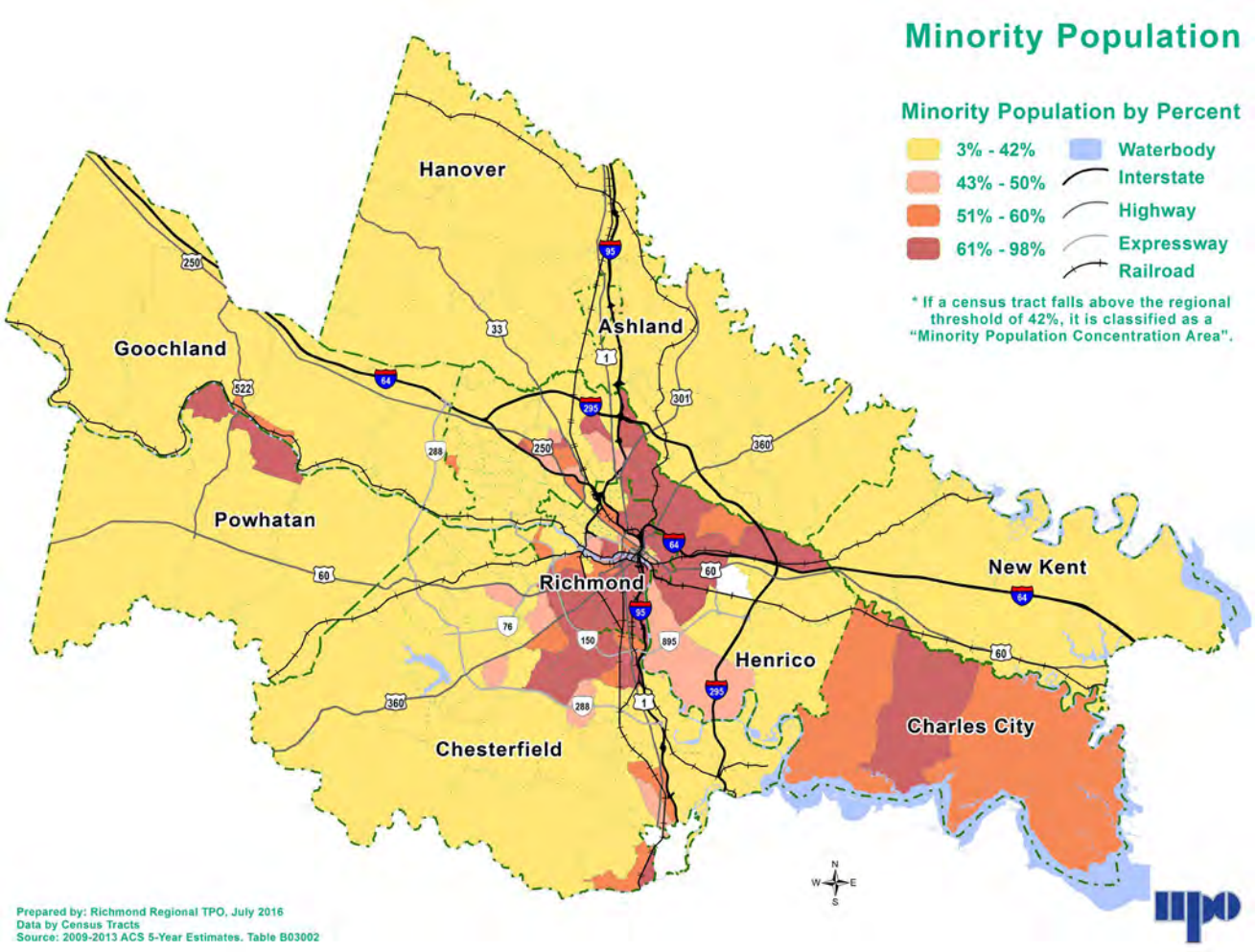
Jurisdiction	Total Population	Non-Hispanic White	Hispanic or Latino	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander alone	Some Other Race	Two or More Races	Minority Total	Minority Percentage
Charles City	7,205	2,941	109	3,485	497	14	9	3	147	4,264	59.2%
Chesterfield	320,430	207,449	23,612	70,505	779	10,975	133	652	6,325	112,981	35.3%
Goochland	21,565	16,591	456	4,395	20	8	0	2	93	4,974	23.1%
Hanover	100,328	85,264	2,284	9,117	280	1,396	18	267	1,702	15,064	15.0%
Henrico	311,314	175,825	15,622	90,324	939	20,969	59	583	6,993	135,489	43.5%
New Kent	18,791	15,038	423	2,794	129	103	0	67	237	3,753	20.0%
Powhatan	28,108	23,308	524	3,555	60	162	0	28	471	4,800	17.1%
Richmond	207,878	81,985	12,970	101,673	271	4,615	54	259	6,051	125,893	60.6%
Region Total	1,015,619	608,401	56,000	285,848	2,975	38,242	273	1,861	22,019	407,218	40.1%

FIG. 1.9. MINORITY POPULATIONS IN THE RICHMOND REGION

the regional population identifies as Black or African American, six percent identifies as Hispanic or Latino, four percent identifies as Asian, and two percent identifies as two or more races.

Illustrated in Mmap 1.5, the percentage concentration of minority populations in the Richmond region by census tract. The regional average concentration of minority populations for census tracts is 42 percent.

The highest concentrations of minority populations occur in the City of Richmond, eastern Henrico County, northern Chesterfield County adjoining Richmond, and Charles City County. The majority of census



MAP 1.5. MINORITY POPULATION CONCENTRATION IN THE RICHMOND REGION, 2013

tracts with a percentage minority population greater than the regional average of 42 percent are located in the City and its adjacent tracts, especially to the northeast.

Low Income Population

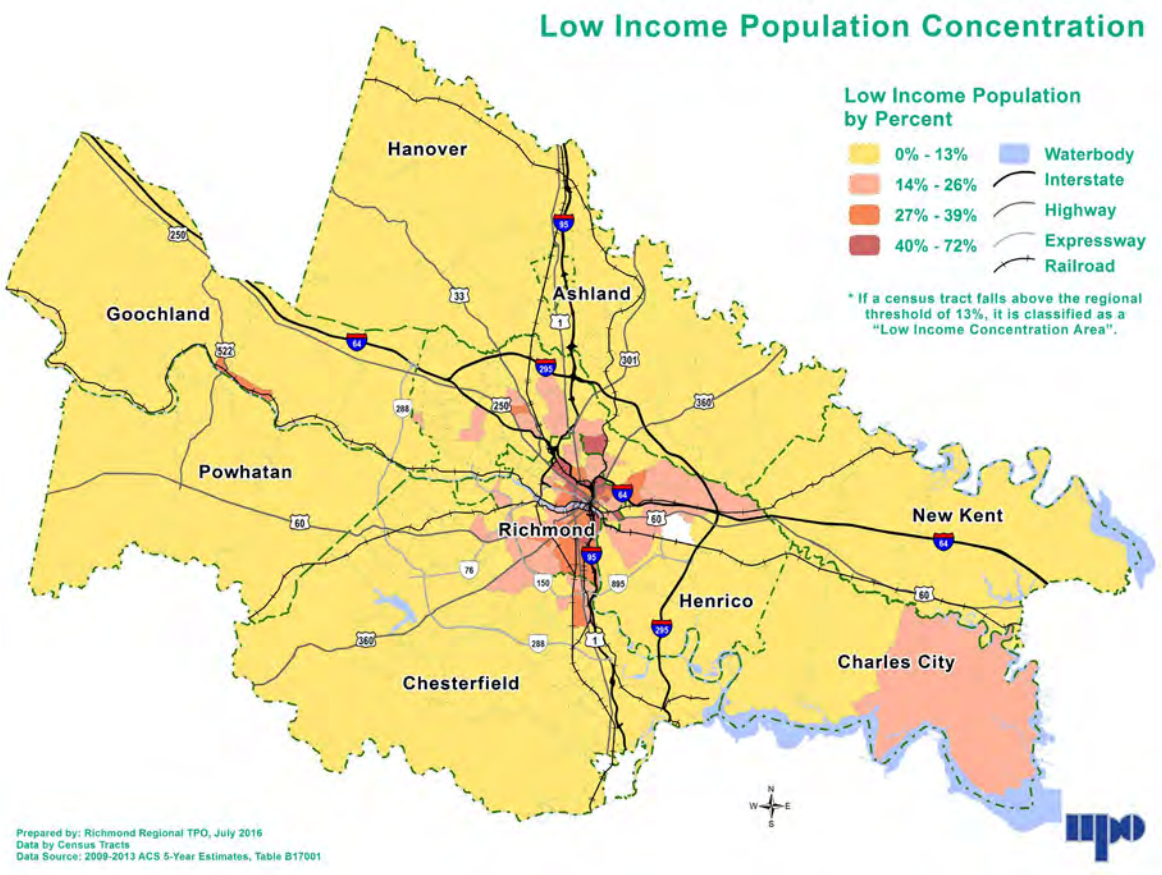
Though the largest concentrations of individuals below the poverty line reside in the City of Richmond, there are significant pockets of concentrated poverty in inner-ring suburbs. The total number of individuals in poverty in Henrico and Chesterfield exceeds the total living in the City of Richmond. The Low Income Population is defined as persons or families whose household is at or below the poverty threshold, which is determined by the Census Bureau using three factors: householder's age, size of the family, and number of related children below 18 years old. Illustrated in Ffig. 1.11, the total number and percentage of low income residents in each jurisdiction in the Richmond region. The regional average of low income population in the region is almost 12 percent.

The distribution of low income population in the Richmond

Jurisdiction	Total Population	Income in Past 12 months below poverty level	Percentage
Charles City	7,190	850	11.8%
Chesterfield	315,276	21,240	6.7%
Goochland	19,335	1,081	5.6%
Hanover	98,006	5,019	5.1%
Henrico	307,669	32,877	10.7%
New Kent	18,238	1,074	5.9%
Powhatan	24,841	1,347	5.4%
Richmond	197,932	50,681	25.6%
Region Total	988,487	114,169	11.5%

Source: 2009-2013 ACS 5-Year Estimates Table B17001

FIG. 1.10. LOW INCOME POPULATION IN THE RICHMOND REGION IN 2013



MAP 1.6. LOW-INCOME POPULATION CONCENTRATION IN THE RICHMOND REGION, 2013

region in 2013 is shown in Mmap 1.6. As with the minority population, the majority of the low-income population is located within the City of Richmond. With the exception of the area west of downtown, most census tracts within the City show a concentration of low-income population that is double the regional average. Several census tracts in downtown Richmond and areas immediately north are shown to have more than thirty-five percent of the population classified as low income. Portions of eastern and western Henrico and areas immediately around I-95 and US Route 1/301 in south Richmond and Chesterfield are also low-income population concentration areas.

Elderly Population

The fastest growing segment of the U.S. population is older adults. The number of elderly individuals in the region is increasing as Baby Boomers (born between 1946 and 1964) continue to age, which will significantly impact demands on the transportation system. Driving will become difficult or impossible for many as they grow older, creating a growing need for public and paratransit services. Improvements in roadway signage, lighting, or other highway system elements will be required to accommodate a higher number of drivers with visual or other physical challenges due to aging.

Jurisdiction	Total Population	Elderly Population	Percentage of Elderly Population
Charles City	7,205	1,316	18.3%
Chesterfield	320,430	35,501	11.1%
Goochland	21,565	3,546	16.4%
Hanover	100,328	13,772	13.7%
Henrico	311,314	39,577	12.7%
New Kent	18,791	2,398	12.8%
Powhatan	28,108	3,714	13.2%
Richmond	207,878	23,274	11.2%
Region Total	1,015,619	123,098	12.1%

Source: 2009-2013 ACS 3-Year Estimates Table B01001

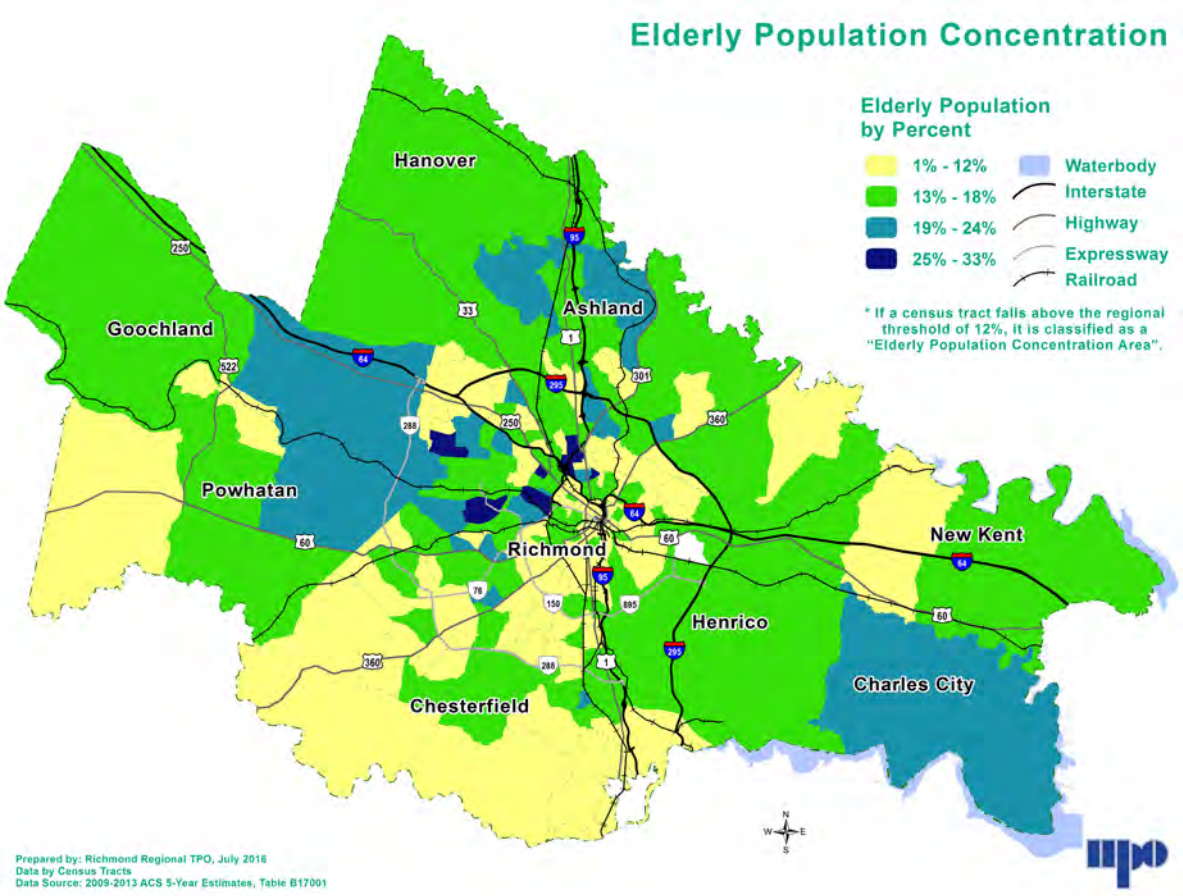
FIG. 1.11. ELDERLY POPULATION IN THE RICHMOND REGION IN 2013

According to American Community Survey 2009 to 2013 estimates, the Richmond region had 123,098 citizens age 65 or older, slightly over 12 percent of the planning district population (Ffig. 1.12). Charles City County has the highest percentage of elderly individuals (18%), followed closely by Goochland (16%).

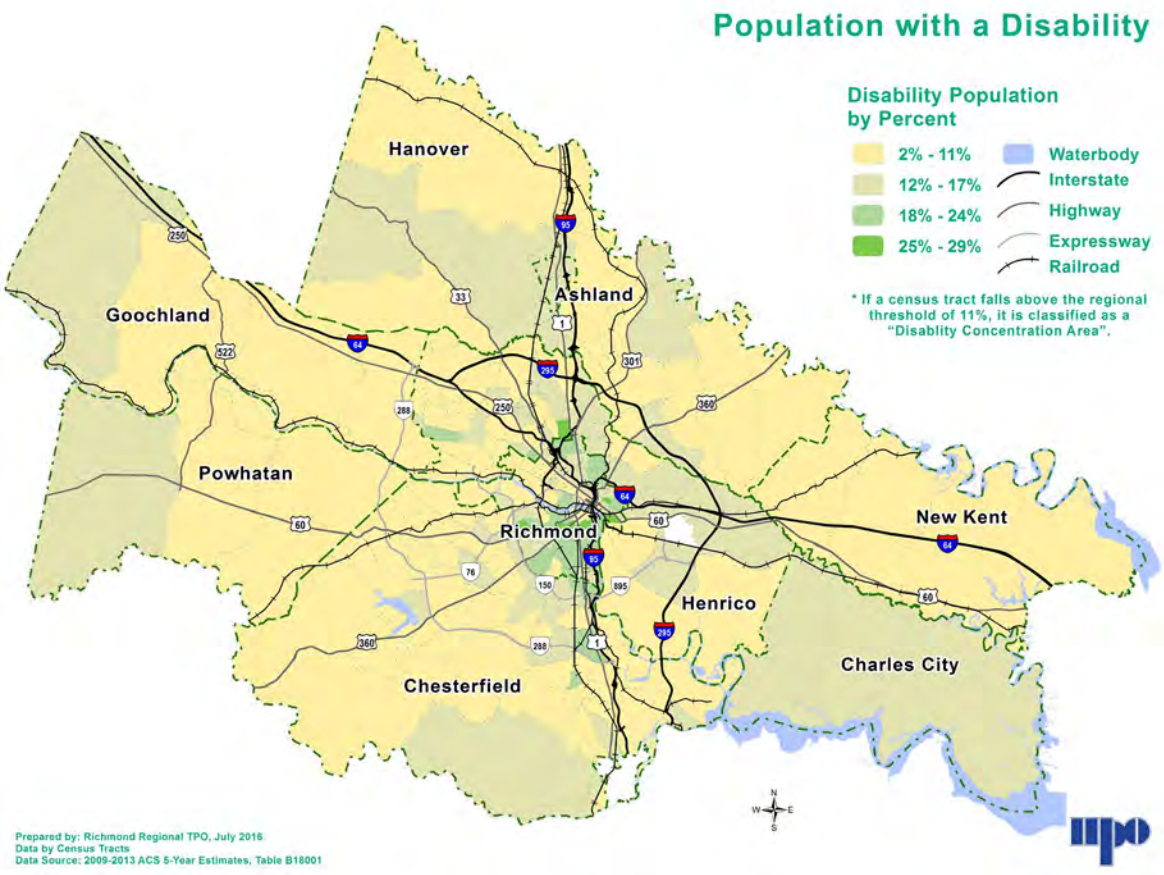
Similarly, Mmap 1.7 shows the concentration of the elderly population by Census Tract in 2013. The average percentage of elderly residents for all tracts in the region is 12.3 percent. A census tract with a concentrated elderly population is defined as having more than 12.3 percent of its residents over 65. The whole of Charles City and Goochland, parts of Powhatan and New Kent, as well as areas around Ashland have census tracts with concentrated elderly populations. Similarly, pockets in the west end of the City and western Henrico County show concentration of elderly population as well.

Individuals with Disabilities (Disability Status)

Transit service providers in the region are required to offer reasonable accommodations for individuals with disabilities, and this group must be represented in the transit planning process. This group includes people affected by blindness, deafness, or a severe hearing or vision impairment and people who have a condition that substantially limits one or more basic physical activities, such as walking or climbing stairs. About 85 percent of individuals with disabilities live in suburban and rural counties that rely on paratransit services to supplement the fixed-route bus system. According to American Community Survey 5-year estimates, in 2013, around ten percent of the region's population had a disability. Disability status by



MAP 1.7. CONCENTRATION OF ELDERLY POPULATION IN THE RICHMOND REGION IN 2013



MAP 1.8. CONCENTRATION OF INDIVIDUALS WITH DISABILITIES IN THE RICHMOND REGION IN 2013

jurisdiction in the region for the year 2013 is shown in Ffig. 1.13. Chesterfield and Charles City counties have the largest population with a disability (12.7% and 13.8% of the total jurisdictions' population, respectively).

The concentration of populations with a disability in the Richmond region in the year 2010 is shown in Mmap 1.8 The average percentage of residents with a disability for all tracts in the region is 11.4 percent. A census tract with a concentrated population is defined as having more than 11.4 percent of its residents who are affected by a disability. The map illustrates that the City of Richmond has the greatest number of tracts with extreme concentrations of individuals with a disability. Henrico and Charles City counties have large areas of moderate concentrations of individuals with a disability.

Jurisdiction	Total Population	Population with a Disability	Percent With a Disability
Charles City	7,202	914	12.7%
Chesterfield	317,538	26,554	8.4%
Goochland	19,352	1,575	8.1%
Hanover	99,307	8,914	9.0%
Henrico	308,636	25,417	8.2%
New Kent	18,208	1,564	8.6%
Powhatan	24,899	2,059	8.3%
Richmond	205,220	28,259	13.8%
Region Total	1,000,362	95,256	9.5%

Source: 2009-2013 ACS 3-Year Estimates Table B18101

FIG. 1.12. DISABILITYSTATUS IN 2013

Limited English Proficiency Population

Limited English Proficiency (LEP) Population are persons for whom English is not their primary language and who have a limited ability to speak, understand, read or write English. It includes people who reported to the US Census that they do not speak English well or do not speak English at all. The transit planning process is modified using dual-language survey materials and public engagement efforts where a large LEP population must be accommodated.

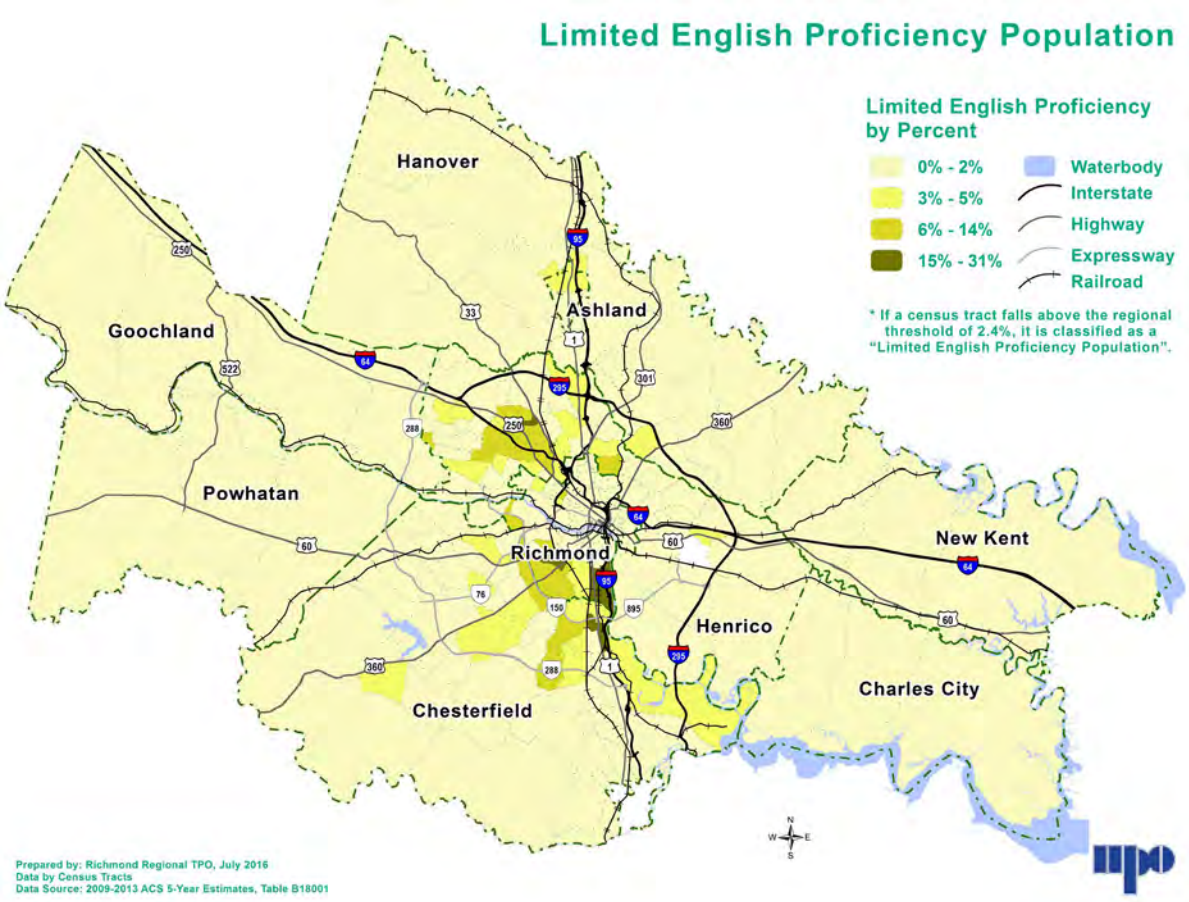
Jurisdiction	Total Population	LEP Population	% LEP Population
Charles City	6,918	10	0.14%
Chesterfield	300,744	6,747	2.24%
Goochland	20,621	87	0.42%
Hanover	95,188	604	0.63%
Henrico	291,042	8,150	2.80%
New Kent	17,831	129	0.72%
Powhatan	26,918	110	0.41%
Richmond	194,637	5,358	2.75%
Region Total	953,899	21,195	2.22%

Source: 2009-2013 ACS 5-Year Estimates Table B16005

FIG. 1.13. LEP POPULATION IN THE RICHMOND REGION, 2013

Fig. 1.13 shows the LEP population for each jurisdiction in the Richmond region. Slightly over two percent of the region's population reports that they do not speak English well or do not speak English at all.

The distribution of areas of LEP population concentration in the Richmond region is shown in Mmap 1.9. The average percentage of LEP residents for all tracts in the region is 2.7 percent, with any concentration area (please clarify this) falling above that threshold. The majority of the LEP population is located in South Richmond and adjoining Chesterfield County along the Route 1, Route 60 and Route 360 corridors. Some tracts with concentrations of LEP populations are located in western Henrico.



MAP 1.9. LIMITED ENGLISH PROFICIENCY POPULATION IN THE RICHMOND REGION, 2013

plan2040

Land Use & Environmental Mitigation

The Clean Air Act Amendments

The Clean Air Act Amendments (CAAA) were signed into law on November 15, 1990. The 1990 CAAA provided for a comprehensive revision of the 1977 CAAA. 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.

NAAQS History:

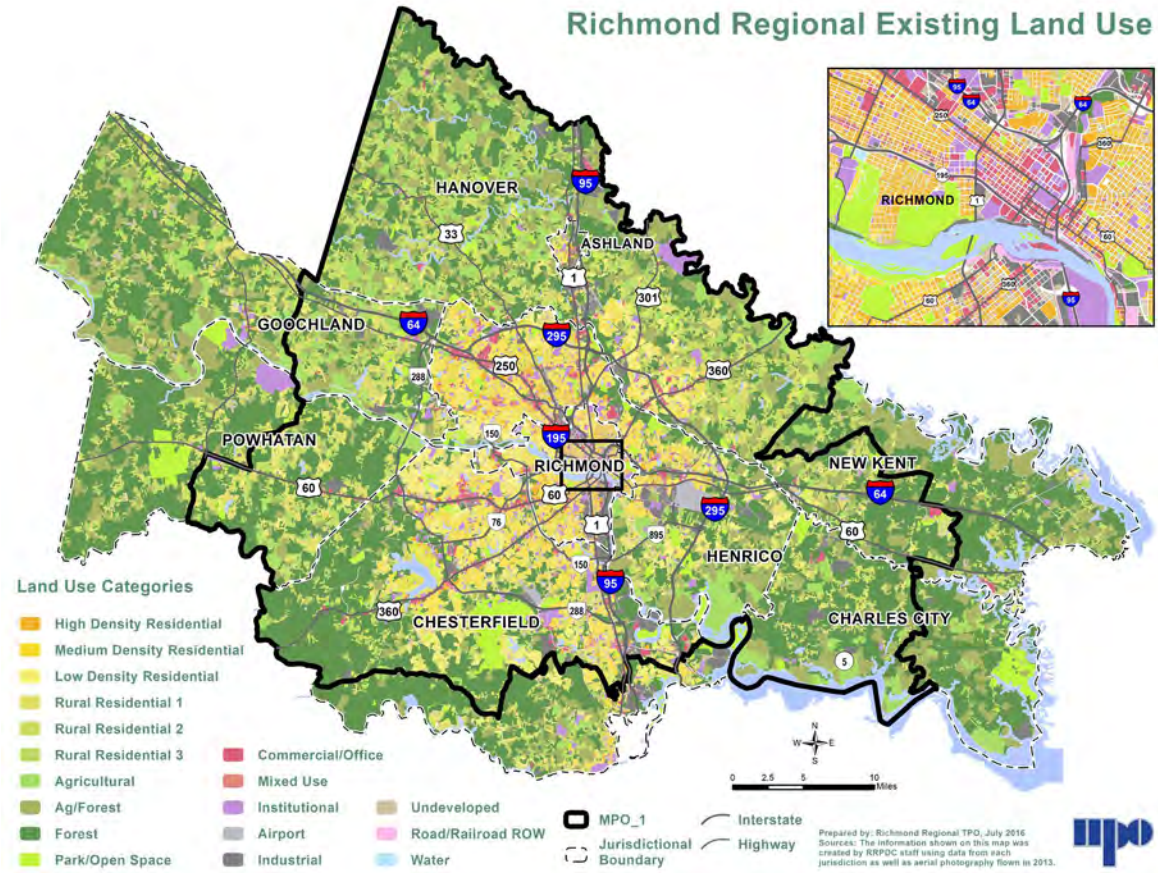
- On November 6, 1991, the Richmond Region was classified by EPA as a moderate ozone non-attainment area for the one-hour ozone standard (56 FR 56694).
- On November 17, 1997, EPA approved Virginia's request for redesignation of the Richmond moderate 1-hour ozone nonattainment area from nonattainment to attainment and approved the area's maintenance plan.
- As a result of the EPA promulgating a new 8-hour ozone standard, the EPA redesignated the Richmond Region as a moderate ozone nonattainment area, effective June 15, 2004
- In October 2006, Virginia Department of Environmental Quality (VDEQ) submitted a redesignation request to EPA based on various measures to improve air quality and an improvement in 8-hour ozone monitoring data. EPA approved the redesignation request, and the Richmond area was redesignated into attainment with the 8-hour ozone standard, effective June 18, 2007 (72 FR 30485). EPA also approved the associated maintenance plan, including new motor vehicle emission budgets for transportation conformity since these requirements must continue under the maintenance designation.
- In March 2008, EPA advised that it would proceed to lower the 8-hour ozone standard to 0.075 parts per million (it was previously set at 0.08 ppm). As a result of this change and based on the three previous years of data exceeding these new standards, the Richmond and Tri-Cities Maintenance Area jurisdictions (i.e., Richmond, Henrico, Hanover, Charles City, Petersburg, Colonial Heights, Hopewell, and Prince George) would be redesignated to nonattainment status. These designations were expected to occur in March 2010. However, on January 6, 2010, EPA proposed to strengthen the national ambient air quality standards (NAAQS) for ground-level ozone, the main compound of smog. EPA proposed that the 8-hour primary ozone standard be changed to a level within the range of 0.060 to 0.070 ppm (the current primary 8-hour average ozone standard is 0.075 ppm). Following an initial delay in setting the final standard, EPA set and announced finalization of the standard by July 31, 2011.
- On September 2, 2011, President Obama announced that the new proposed standards were withdrawn and EPA would now move forward with the implementation of the 2008 standard of 0.075 ppm (which had been on hold since the announcement of the standard reconsideration in 2009). In addition, the Richmond area experienced three years (2009-2011) of relatively good air quality readings and DEQ submitted a revised area recommendation request to EPA on November 21, 2011 asking for the Richmond area to be designated as an attainment area.

EPA Region III responded on December 9, 2011 that it intended to designate the Richmond area as "unclassifiable/attainment" and EPA published final designations in the summer of 2012. The current design value for the three-year period from 2013-2015 in the Richmond area, according to DEQ, is 0.063, which is below the 0.07 standard established by EPA in October 2015.

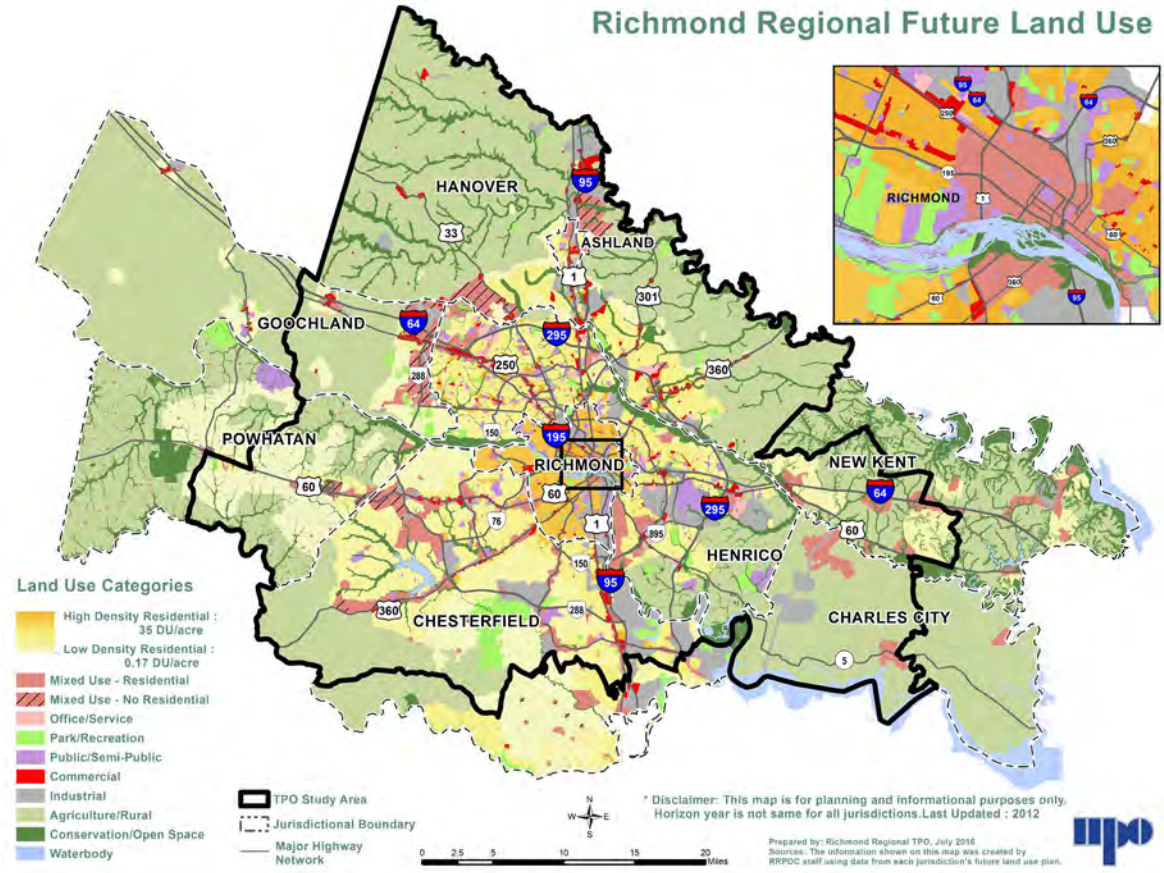
Richmond Regional Existing and Future Land Use Maps

Each locality in the Richmond region has an adopted Comprehensive Plan that provides policy guidance on existing and future land uses across the jurisdiction. Each of these Comprehensive Plans, and accompanying land use plan maps, is maintained as an isolated document, with no relationship to the adopted documents or maps in surrounding localities.

The Richmond Regional Existing Land Use Map (Mmap 1.10) depicts existing land use in the region in 2013. The dataset is the second iteration, updated from the 2009 dataset completed in 2012. The initial dataset was created using an amalgamation of locality GIS data and aerial photography. This iteration was updated using only aerial photography, to find changes in land use over time. In it, each parcel in the region has been assigned one of 19 land uses, from Agricultural



MAP 1.10. RICHMOND REGIONAL EXISTING LAND USE



MAP 1.11. RICHMOND REGIONAL FUTURE LAND USE

to Commercial to Residential, separated by density.

Similarly, for a future regional overview of planned land uses in the localities in the Richmond region, RRPDC staff used local comprehensive plans and future land use maps to create a map depicting future land use across the region. To accomplish this, RRPDC staff consulted with locality staff to aggregate/group local future land use designations into broad regional categories. For residential land use categories, a notation was maintained in the dataset that indicates the planned density thresholds or averages, for example, 4 dwelling units per acre. It is this density notation that enables the residential density grading depicted in the map. In this analysis, comprehensive land use plans from each jurisdiction in the Richmond region were used to map out the future land use snapshot for the entire region. It should be noted that these plans have different horizon years and are not coordinated between jurisdictions at this time (Mmap 1.11).

Common trends are evident when studying the resulting land use and transportation structure of the Richmond region. Development of the region as a whole is spreading southwest at a more rapid pace than any other area in the region. Many new transportation facilities are planned in the western area of the region. For example, the extension of the Powhite Parkway in Chesterfield County from its current terminus to Route 360 will help mitigate the additional traffic expected with growth in this area.

Another observation from this analysis is the difference in future development styles between the urban and rural jurisdictions. The traditional development that has occurred in the urban jurisdictions follows a linear pattern along major arterials (note: Broad Street, Midlothian Turnpike, and Hull Street). Rural counties are aware that development can make or break the quality of life and rural atmosphere of their jurisdictions, and have developed plans that reflect that concern.

The designation of development centers, or specific areas where development will be directed, is apparent in the future land use plans of each of the four rural jurisdictions in the region. Development in this pattern will not only push to conserve the rural landscape, but also deter sprawling growth and reduce traffic congestion caused by frequent stops and turns. One of the most discussed topics of new development is the issue of density. It is proven in many cities that higher population densities tend to foster use of mass transit and pedestrian modes of transportation. Higher densities in turn lessen the rate of land consumption by concentrating new development in more urban areas, most likely as infill development. The Chesapeake 2000 Agreement (C2K) has incorporated a dedication to lessen the rate of consumption of natural lands by the three states involved – Virginia, Maryland, and Pennsylvania.

Another topic of discussion regarding new development is the jobs-housing balance. The idea of people living closer to where they work is something that is not new to anyone, but it is an important detail in planning for new development. If developers, businesses, and local government take into account the housing needs of commercial and industrial businesses, long commutes and traffic congestion might be cut in the future.

There are many aspects of growth that can be addressed by looking at the impacts of land use and transportation on our region. This analysis only scratches the surface of the potential for improvement that may be looked at in the near future. We can continue to study these trends and incorporate land use/transportation factors into many different planning exercises.

Some types of new land use patterns that may need further consideration in the 20 year horizon of this plan are:

- Neo-traditional development – These developments aspire to return suburban communities to the "traditional" form of neighborhood. Developments such as Kentlands in Maryland have successfully used this form of land use to achieve a community whose resale and property values are slightly higher than neighboring suburban developments. Neo-traditional developments typically have a well-defined center that includes commercial, office, and residential uses at high densities. Some neighborhoods include multiple residential types from apartments and condominiums to single family homes on smaller lots with maximum rather than minimum setbacks, and have front porches and sidewalks with minimal space for driveways and back yards. Although residential lot yield and density are similar to neighboring communities, the smaller lots allow for more open space and civic areas. Combined with Grid Street patterns, walking and biking can be an effective and efficient alternative to the automobile in these communities.
- Transit Oriented Development These developments have a well-defined central place around a transit stop. The central place provides much of the retail needs of the average commuter, other retail establishments, and some office space. High-density housing is located within a quarter-mile of the stop to encourage necessary densities to make them viable. Lower density housing is further out. Transit oriented design places a high priority on walkability, so urban design, sidewalks, pedestrian paths, and human scale are important attributes of such developments.
- Other Techniques – Other residential techniques that could be explored by the RRTPO or local governments include rural design districts, cluster development where total density remains the same as conventional suburban design but lots are smaller so the remaining land is left as open space, and mixed residential development densities with an affordable housing component. Commercial applications include commercial centers as opposed to strip malls, shopping villages that create several smaller buildings instead of one strip mall, and commercial/office mixtures. Localities can also place a premium on growth management by focusing incentives on revitalization and infill development and creating disincentives for growth where provisions of public services would be more costly.

POTENTIAL MITIGATION STRATEGIES	
Resource	**Strategy**
Neighborhoods and communities, homes and businesses	• Minimize noise impact with sound barriers • Prevent the spread of hazardous materials with soil testing and treatment
Wetlands and Water Resources	• Realign roadway corridors to avoid aquatic resources. • Replace or restore wetlands • Submerge or utilize bottomless culverts. • Bridge sensitive areas instead of laying pavement directly onto the ground. • Improve storm water management. • Reduce fill footprints using steeper slopes. • Reduce roadway medians. • Make perpendicular crossings of streams and riparian buffers rather than lateral encroachments. • Restore streams and/or stream buffers.
Forested and other natural areas	• Minimize removal and/or selective cutting in forested areas except for what is needed to establish roadways and associated rights-of-way. • Preserve and/or re-establish vegetation whenever possible within other open areas not slated for road construction. • Use selective cutting and clearing • Replace or restore forested areas, preferably at a 2 to 1 ratio for replacement.
Endangered and threatened species	• Use selective cutting and clearing • Replace or restore forested areas, preferably at a 2 to 1 ratio for replacement. • Bridge sensitive areas instead of laying pavement directly onto the ground • Use guidance in the "Virginia Wildlife Action Plan" to protect species and habitat.
Air quality	• Control loose exposed soils with watering or canvas sheets • Minimize idling of heavy construction vehicles

FIG. 1.1. POTENTIAL MITIGATION STRATEGIES

Discussion of Potential Environmental Mitigation Activities

Background

This discussion of "potential environmental mitigation activities" is being included in the **plan2040** update in response to the requirements of the FAST Act federal legislation carrying forward MAP-21 federal legislation Sec 450.322 (f) (7) Development and Content of the Metropolitan Transportation Plan.

"A discussion of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the metropolitan transportation plan. The discussion shall be developed in consultation with Federal, State, and Tribal land management, wildlife, and regulatory agencies."

The federal legislation requires that the MPO (RRTPO) consult with natural resource and environmental agencies on the metropolitan transportation plan. During the public review period, RRTPO staff contacted a selected list of federal, state and local environmental/natural resource agencies to request their review and comment on the draft **plan2040** update. The RRTPO received a few comments which have been addressed in the Appendix section of this document.

(Placeholder for after public comment period)

plan2040 and Project Level Environmental Analysis

plan2040 includes projects expected to be built by 2040; however, detailed environmental analysis conducted through the National Environmental Policy Act (NEPA) does not apply to the MTP. With exceptions for regional ambient air quality, offsetting environmental impacts during the metropolitan transportation planning are not required. While detailed environmental analysis is not required, it is important to consult with environmental resource agencies during the development of the metropolitan transportation plan.

Detailed environmental analysis of individual transportation projects occurs later in the project development process as the improvement approaches the preliminary engineering stage. At this stage, project features may be narrowed and refined, and the environmental impacts and environmental mitigation strategies can be appropriately ascertained.

Impact Types and Mitigation Strategies

Some common environmental impact types that are considered in an environmental analysis for a specific project include:

- Neighborhoods and communities, homes, and businesses
- Cultural resources (i.e., historic properties or archaeological sites)
- Parks and recreation areas
- Wetlands and water resources
- Forested and other natural areas
- Agricultural areas
- Endangered and threatened species
- Air quality

Environmental mitigation is the process of addressing damage to the environment caused by transportation or other public works projects. Commonly, actions taken to avoid or minimize environmental damage are also considered mitigation as well.

Potential environmental mitigation activities may include

- Avoiding impacts altogether
- Minimizing a proposed activity/ project size or its involvement
- Rectifying impacts (restoring temporary impacts)
- Precautionary and/or abatement measures to reduce construction impacts
- Employing special features or operational management measures to reduce
- impacts
- Compensating for environmental impacts by providing suitable replacement or substitute environmental resources of equivalent or greater value, on or off-site

Potential Mitigation Activities Identified in Environmental Studies

A review of environmental studies conducted in association with proposed transportation projects showed a wide range of potential environmental mitigation activities. A summary of these potential mitigation activities is provided here. Many studies include both planned strategies to prevent environmental impact (minimization) and strategies to atone for it (mitigation). Some of these potential mitigation strategies are outlined in the figure below.

Role of the RRTPO in Potential Environmental Discussions

Large transportation projects are underway in the Richmond region that has regional significance as well as potential regional environmental impacts. Maps of the most common environmental features have been developed by the RRTPO showing the location of parklands and conservation lands, wetlands, threatened and endangered species, superfund sites and scenic rivers. The responsibility for project planning and funding for environmental mitigation, however, comes from the state and local levels. The RRTPO is evaluating its role in mitigation activities and, based on this evaluation, may expand its efforts to facilitate information sharing about potential mitigation locations, techniques, best practices, etc.

Maps of Common Environmental Features in the Richmond Region

Superfund Sites

The CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) federal law of 1980 authorized the United States Environmental Protection Agency (EPA) to create a list of polluted locations requiring a long-term response to clean up hazardous material contaminations. These locations are known as Superfund sites, and are placed on the National Priorities List (NPL). The NPL guides the EPA in "determining which sites warrant further investigation" for environmental remediation. There are currently four Superfund sites on the National Priorities List in the Richmond region.

Threatened & Endangered Species

Plant and animal species judged as threatened or endangered are listed by state, federal, and international agencies as well as by some private organizations. The Virginia Department of Conservation and Recreation (VDCR) works in conjunction with US Fish & Wildlife Service's Endangered Species Program to identify threatened and endangered species. The main aim is to protect endangered and threatened species, and then encourage their recovery. In the Richmond region, the major conservation sites are located in northern New Kent County along the Pamunkey River, in Charles City County along the Chickahominy River, areas adjacent to the James River along the eastern Henrico/Chesterfield border, areas adjacent to the James River in Goochland County, along the James River in Richmond City, and Pocahontas Park in Chesterfield.

Wetlands

Wetlands are land areas that are saturated with water and take on characteristics that distinguish them as a distinct ecosystem: they provide habitat for fish, wildlife and a variety of plants. Wetlands are important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, act as filters to cleanse water of impurities and recycle nutrients. To have a consistent regional wetland layer, data from the US Fish & Wildlife Service's National Wetland Inventory (NWI) has been used in the map. Wetlands occur throughout the Richmond region as evident from the map.

Parklands & Conservation Lands

These lands have been identified using a variety of local, regional, state, and federal sources, including information available from the Virginia Department of Conservation and Recreation conservation lands database, the Virginia Department of Game and Inland Fisheries Wildlife Management Areas, Virginia Department of Forestry State

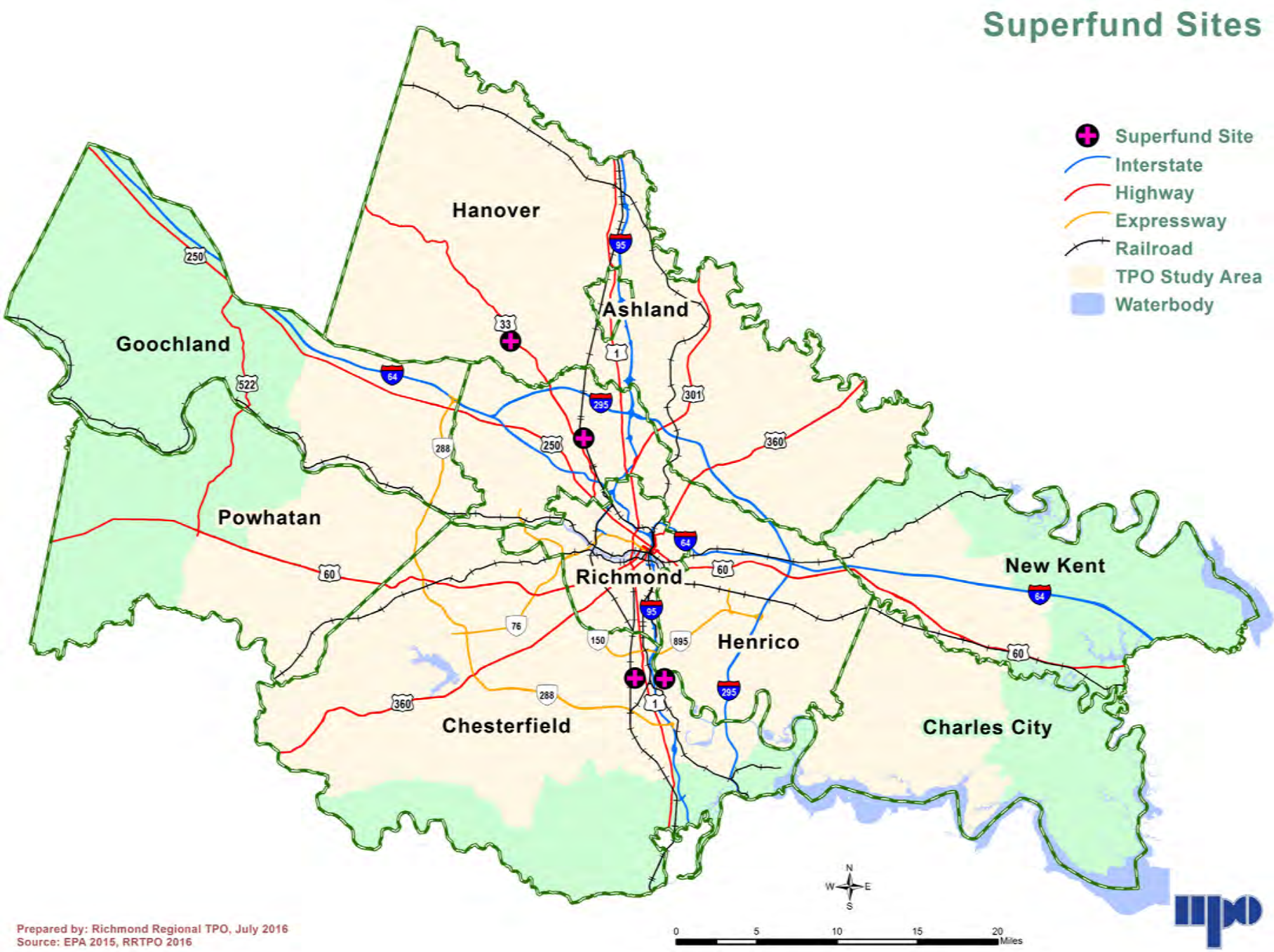
Forests Natural Areas, National Park Service Lands, as well as conservation easements held by the Nature Conservancy, the Virginia Outdoors Foundation and other organizations and privately owned conservation lands. All of these lands are unlikely to undergo future development or conversion to residential or economic development uses. Limitations such as public ownership, conservation easements, and programmatic uses result in this diminished land development likelihood.

Some of these sites, such as local and state parks, act as transportation attractors given their uses for recreation and social gathering events. However, other sites such as conservation easements and wildlife management areas are typically not large drivers of traffic, and can act as obstacles to future roadway and transportation route development. The Parklands and Conservation lands are distributed throughout the region with Pocahontas State Park in Chesterfield County, Powhatan Wildlife Management Area in Powhatan County and Chickahominy Wildlife Management Area in Charles City County being some of the larger ones in the region.

Scenic Rivers

Virginia's Scenic Rivers Program's intent is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. The Virginia Department of Conservation and Recreation (VDCR) identifies portions of the James, Pamunkey, Chickahominy, Appomattox and South Anna Rivers as Scenic Rivers.

MAP 1.12. SUPERFUND SITES IN THE RICHMOND REGION



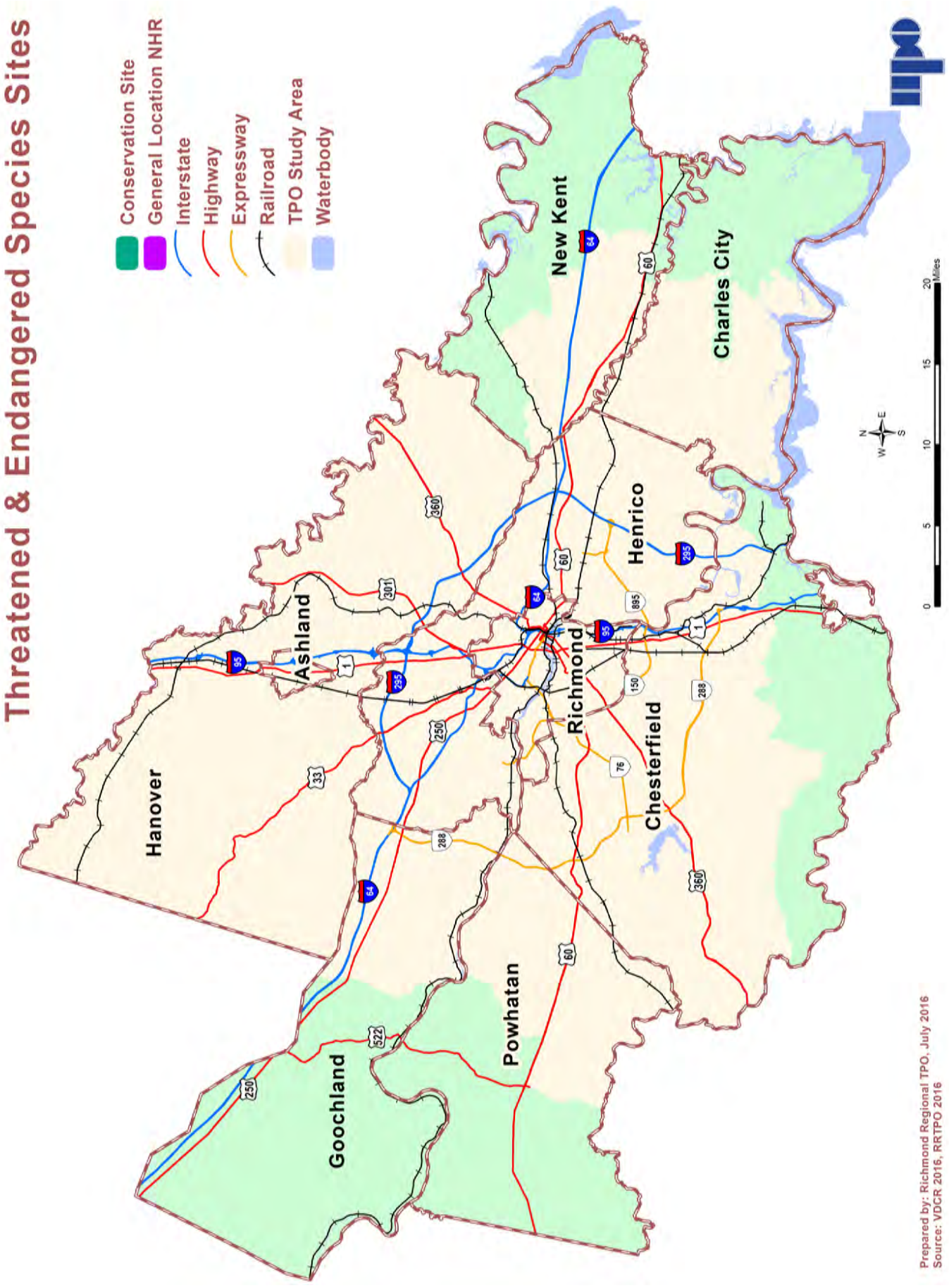
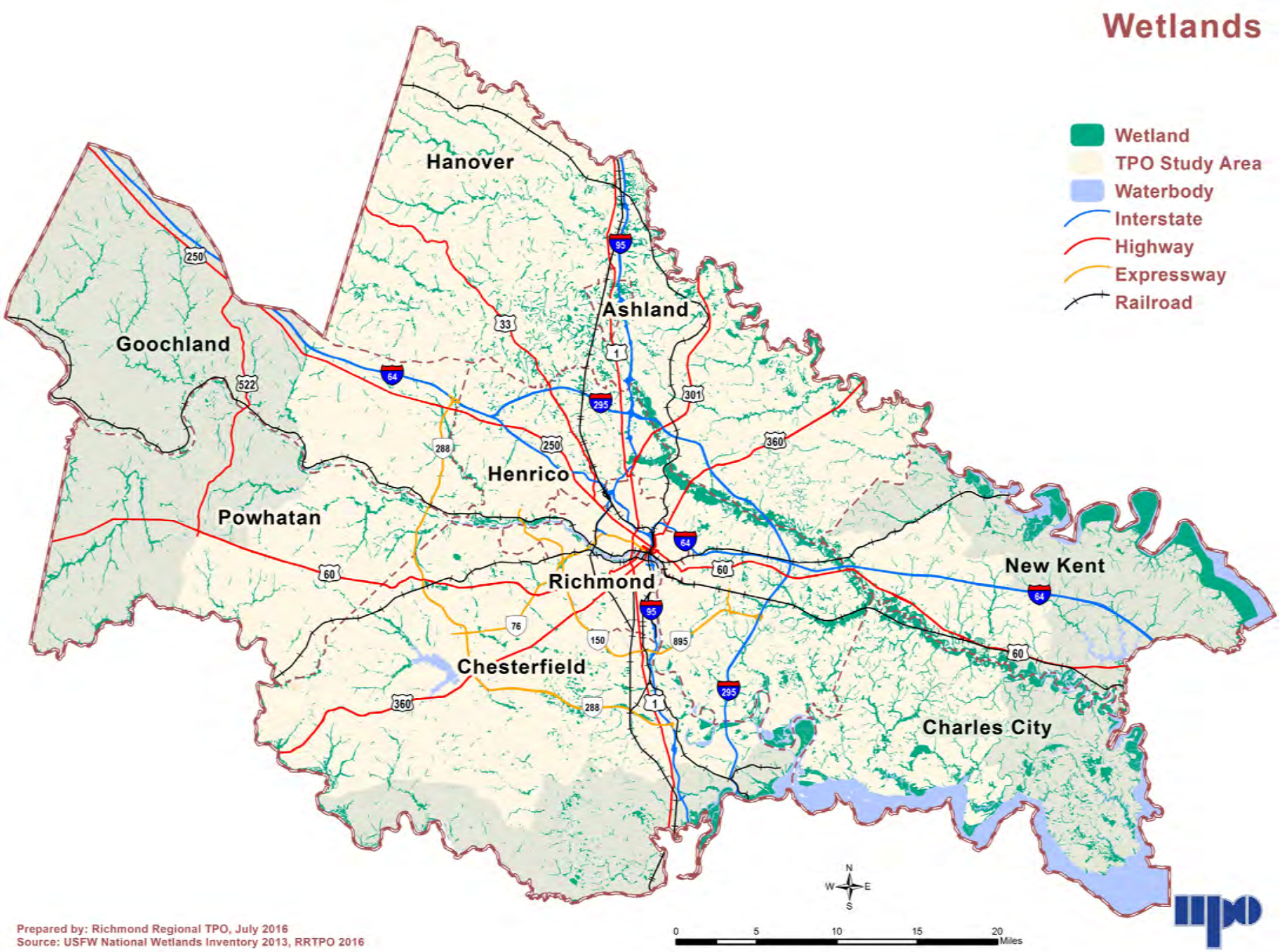


FIG. 1.2. THREATENED & ENDANGERED SPECIES IN THE RICHMOND REGION

FIG. 1.3. WETLANDS IN THE RICHMOND REGION



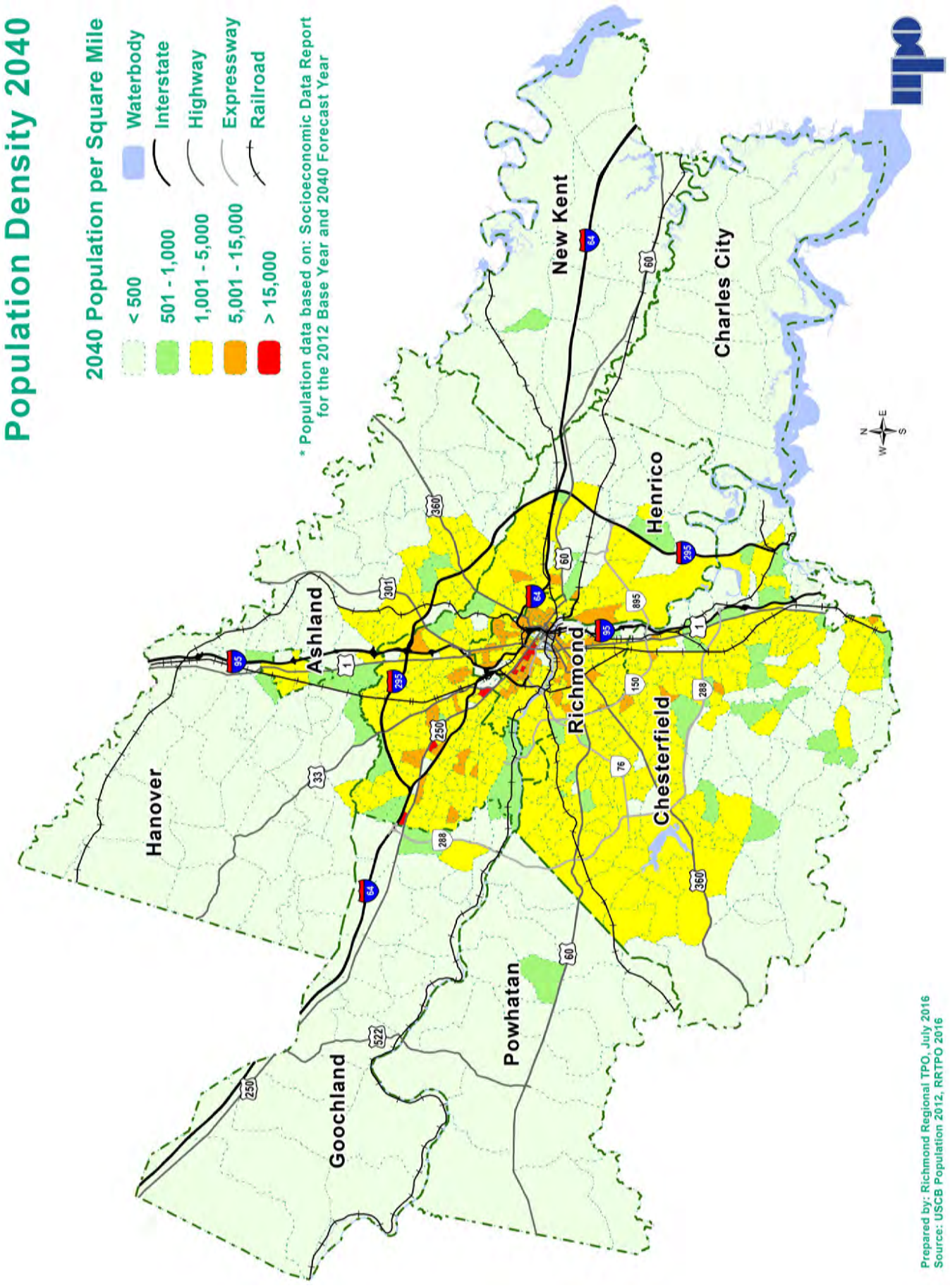


FIG. 1.4. PARKLANDS AND CONSERVATION LANDS IN THE RICHMOND REGION

FIG. 1.5. SCENIC RIVERS IN THE RICHMOND REGION

plan2040

Regional Road Network

The dominant mode of transportation in the Richmond region is the highway system which is available for use by many transportation modes. For example, roads provide transportation access for buses, carpools, bicycle and pedestrian travel, and freight movement.

Although there may be a need to reduce vehicle emissions to improve air quality, roadways are the primary component in the plan2040 Fiscally Constrained Plan. Included in plan2040 are a variety of improvements planned for the roadways in the Richmond region. Some of these improvements are meant to reduce vehicle-miles of travel and improve traffic operations, which would then improve air quality and reduce energy consumption.

This section will review some of the essential elements of the highway system, and together with the Congestion Management section, provide an overview of the trends affecting the region's roadway system.

FIG. 3.1. I-95 AT HERMITAGE. RRPDC

Federal Roadway Functional Classification

The Concept of Functional Classification

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. Basic to this process is the recognition that individual roads and streets do not serve travel independently in any major way. Rather, most travel involves movement through a network of roads. It becomes necessary then to determine how this travel can be channelized within the network in a logical and efficient manner. Functional classification defines the nature of this channelization process by defining the part that any particular road or street should play in serving the flow of trips through a highway network.

An illustration of a functionally classified rural network is shown in Ffig. 3.2. Since the cities and larger towns generate and attract a large proportion of the relatively longer trips, the arterial highways generally provide direct service for such travel. The intermediate functional category, the collectors, serve small towns directly, connect them to the arterial network, and collect traffic from the bottom-level system of local roads, which serves individual farms and other rural land uses.

Although the above example has a rural setting, the same basic concepts apply in urban areas

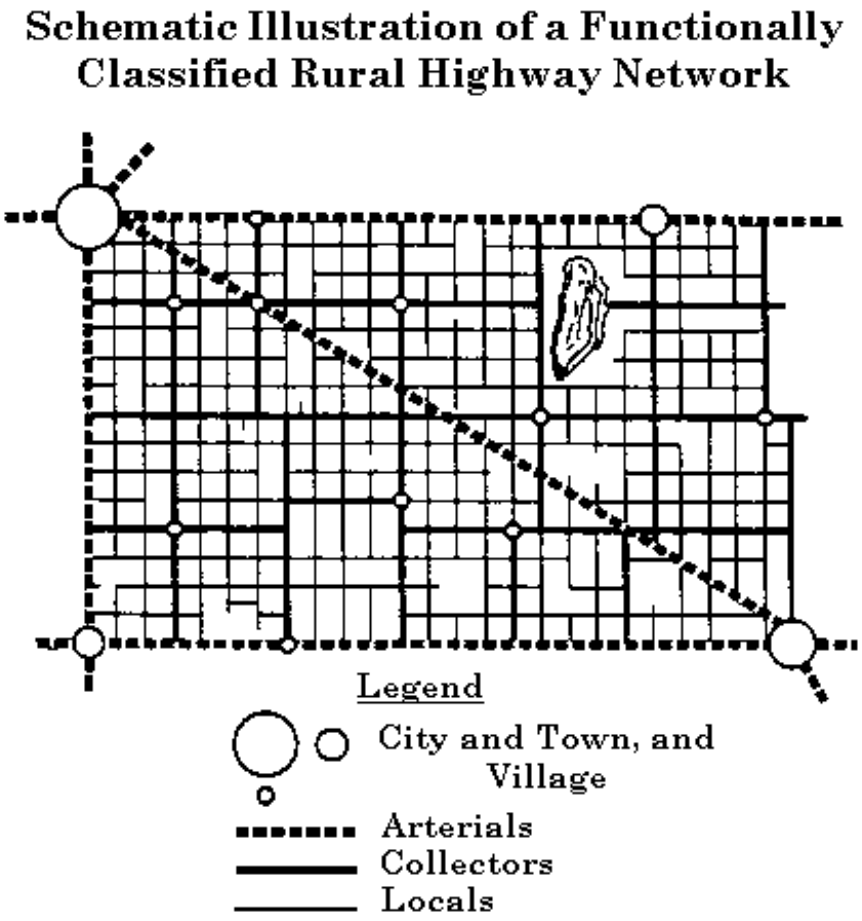


FIG. 3.2. FUNCTIONALLY CLASSIFIED RURAL HIGHWAY NETWORK

as well. A similar hierarchy of systems can be defined; however, because of the high intensity of land use and travel throughout an urban area, specific travel generation centers are more difficult to identify. In urban areas additional considerations, such as spacing, become more important in defining a logical and efficient network. A schematic illustration of a functionally classified urban street network is shown in Ffig. 3.3.

Allied to the idea of traffic channelization is the dual role the highway network plays in providing (1) access to property, and (2) travel mobility. Access is a fixed requirement, necessary at both ends of any trip. Mobility along the path of such trips can be provided at varying levels, usually referred to as "level of service." It can incorporate a wide range of elements (e.g., riding comfort and freedom from speed changes) but the most basic is operating speed or trip travel time.

It was pointed out in the discussion of Ffig. 3.3 that the concept of traffic channelization leads logically not only to a functional hierarchy of systems, but also to a parallel hierarchy of relative travel distances served by those systems. This hierarchy of travel

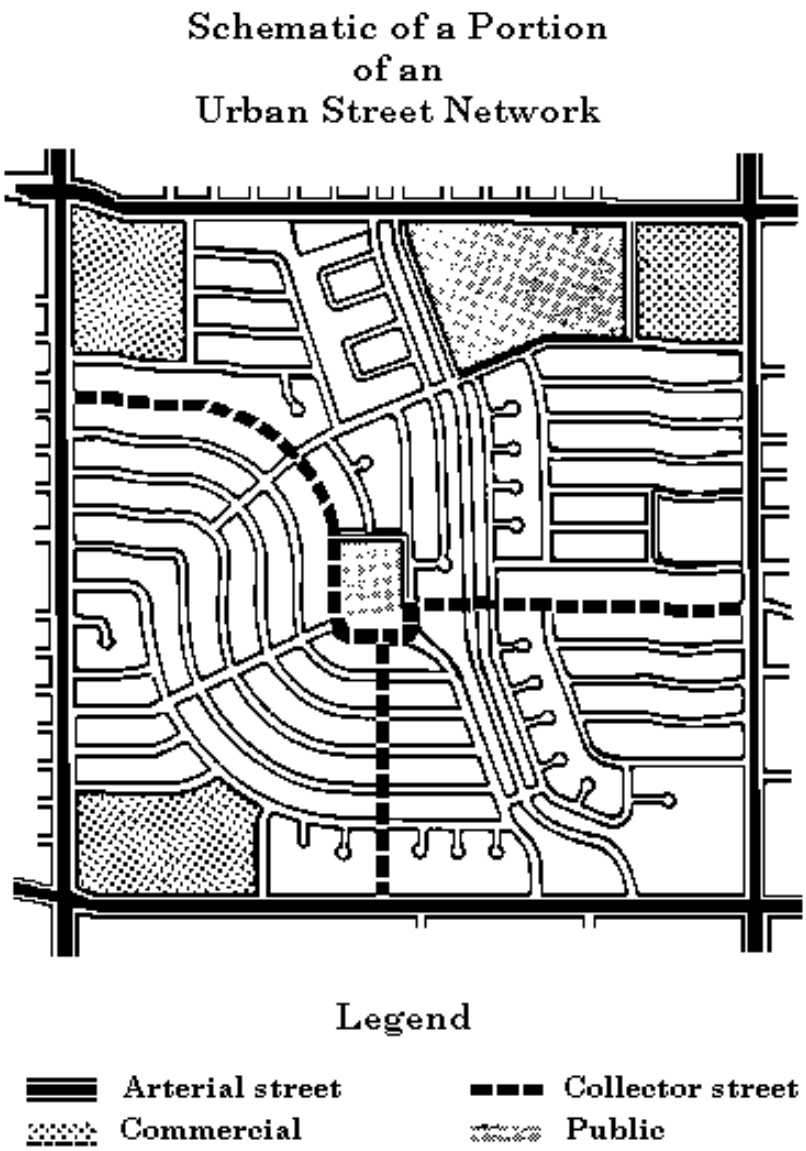


FIG. 3.3. URBAN STREET NETWORK

distances can be related logically to a desirable functional specialization in meeting access and mobility requirements. Local facilities emphasize the land access function. Arterials emphasize a high level of mobility for through movement. Collectors offer a compromise between both functions. This is illustrated conceptually in Ffig. 3.4.

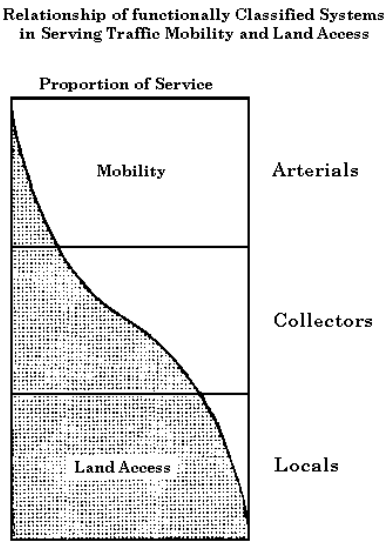


FIG. 3.4. FUNCTIONAL CLASSIFICATION RELATIONSHIP TO MOBILITY AND ACCESS

Functional classification can be applied in planning highway system development, determining the jurisdictional responsibility for particular systems, and in fiscal planning.

Area Definitions

Urban and rural areas have fundamentally different characteristics as to density and types of land use, density of street and highway networks, nature of travel patterns, and the way in which all these elements are related in the definitions of highway function. Consequently, there is a separate classification of urban and rural functional systems.

Experience has shown that extensions of rural arterial and collector routes provide an adequate arterial street network in places of less than 5,000 persons. Hence urban classifications are considered in the context of places of 5,000 persons or more.

Urban areas are defined in Federal-aid highway law (Section 101 of Title 23, U.S. Code) as follows:

The term 'urban area' means an urbanized area or, in the case of an urbanized area encompassing more than one State, that part of the urbanized area in each such State, or an urban place as designated by the Bureau of the Census having a population of five thousand or more and not within any urbanized area, within boundaries to be fixed

by responsible State and local officials in cooperation with each other, subject to approval by the Secretary. Such boundaries shall, as a minimum, encompass the entire urban place designated by the Bureau of the Census.

The remainder of this discussion of functional classification will focus on urbanized areas as this applies to the Richmond urbanized area.

Functional System Characteristics

Functional Systems in Urbanized Areas

The four functional systems for urbanized areas are urban principal arterials, minor arterial streets, collector streets, and local streets. The differences in the nature and intensity of development between rural and urban areas cause these systems to have characteristics that are somewhat different from the correspondingly named rural systems.

The Hierarchy of Urbanized Area Functional System:

- Principal arterials
- Minor arterial streets
- Collector streets
- Local streets

Since there is a wide variation in the characteristics and magnitude of service provided by this basic functional system, further stratification of routes is prescribed to ensure greater adaptability for subsequent use. In urbanized areas, the routes on the principal arterial system are sub-classified as Interstate, other freeways and expressways, and other principal arterials.

Urban principal arterial system: In every urban environment there exists a system of streets and highways which can be identified as unusually significant to the area in which it lies in terms of the nature and composition of travel it serves. In smaller urban areas (under 50,000 population) these facilities may be very limited in number and extent, and their importance may be primarily derived from the service provided to travel passing through the area. In larger urban areas their importance also derives from service to rural oriented traffic, but equally or even more important, from service for major movements within these urbanized areas.

This system of streets and highways is the urban principal arterial system and should serve the major centers of activity of a metropolitan area, the highest traffic volume corridors, and the longest trip desires; and should carry a high proportion of the total urban area travel on a minimum of mileage. The system should be integrated, both internally and between major rural connections.

The principal arterial system should carry the major portion of trips entering and leaving the urban area, as well as the majority of through movements desiring to bypass the central city. In addition, significant intra-area travel, such as between central business districts and outlying residential areas, between major inner city communities, or between major suburban centers should be served by this system. Frequently the principal arterial system will carry important intraurban as well as intercity bus routes. Finally, this system in small urban and urbanized areas should provide continuity for all rural arterials which intercept the urban boundary.

Because of the nature of the travel served by the principal arterial system, almost all fully and partially controlled access facilities will be part of this functional system. This system is not, however, restricted to controlled access routes. To preserve the identification of controlled access facilities, the principal arterial system is stratified as follows:

1.Interstate

2.Other freeways and expressways

3.Other principal arterials (with no control of access)

The spacing of urban principal arterials will be closely related to the trip-end density characteristics of particular portions of the urban areas. While no firm spacing rule can be established which will apply in all, or even most circumstances, the spacing of principal arterials (in larger urban areas) may vary from less than one mile in the highly developed central business areas

to five miles or more in the sparsely developed urban fringes.

For principal arterials, the concept of service to abutting land should be subordinate to the provision of travel service to major traffic movements. It should be noted that only facilities within the "other principal arterial" system are capable of providing any direct access to adjacent land, and such service should be purely incidental to the primary functional responsibility of this system.

Urban minor arterial street system: The minor arterial street system should interconnect with and augment the urban principal arterial system and provide service to trips of moderate length at a somewhat lower level of travel mobility than principal arterials. This system also distributes travel to geographic areas smaller than those identified with the higher system.

The minor arterial street system includes all arterials not classified as a principal and contains facilities that place more emphasis on land access than the higher system, and offer a lower level of traffic mobility. Such facilities may carry local bus routes and provide intra-community continuity, but ideally should not penetrate identifiable neighborhoods. This system should include urban connections to rural collector roads where such connections have not been classified as urban principal arterials.

The spacing of minor arterial streets may vary from one-eighth to one-half mile in the central business district to two to three miles in the suburban fringes, but should normally be not more than one mile in fully developed areas.

Urban collector street system: The collector street system provides both land access service and traffic circulation within residential neighborhoods, and commercial and industrial areas. Major and minor collectors are also under the urban collector street system. It differs from the arterial system in that facilities on the collector system may penetrate residential neighborhoods, distributing trips from the arterials through the area to the ultimate destination. Conversely, the collector street also collects traffic from local streets in residential neighborhoods and channels it into the arterial system. In the central business district, and in other areas of like development and traffic density, the collector system may include the street grid which forms a logical entity for traffic circulation.

Urban local street system: The local street system comprises all facilities not on one of the higher systems. It serves primarily to provide direct access to abutting land and access to the higher order systems. It offers the lowest level of mobility and usually contains no bus routes. Service for through traffic movement usually is deliberately discouraged. To assist in enhancing pedestrian safety and reduce vehicular accidents, these streets may be appropriate for implementing "traffic calming" measures such as narrow lane widths, special signage, speed humps, four-way stops and other treatments.

Extent of Mileage and Travel on Urban Systems: Guideline ranges of travel volume (VMT) and mileage of each of the four functional systems for urbanized areas can be found in fig. 3.5. Systems developed for each area using the criteria herein will usually fall within the percentage ranges shown.

The adopted functional classification system for the Richmond area is shown on the Map 3.1 and available in further detail on VDOT's webpage.

GUIDELINES ON EXTENT OF URBAN FUNCTIONAL SYSTEMS		
System	**Range**	
	VMT (percent)	**Miles**
Principal arterial system	40 – 65	5 – 10
Principal arterial plus minor arterial street systems	65 – 80	15 – 25
Collector street system	5 – 10	5 – 10
Local street system	10 - 30	65 - 80

FIG. 3.5. GUIDELINES ON EXTENT OF URBAN FUNCTIONAL SYSTEMS

Administrative Functional Classification

Although the maps shown above reflect the adopted Federal Functional Classifications for streets and highways in the Richmond region, in many cases, individual jurisdictions in the area may adopt their own variation of a roadway functional classification system for planning purposes. These local systems are referred to as "administrative" functional classification systems to distinguish them from the federal classifications. For example, at least one Richmond area jurisdiction classifies collector roads into two types: major and minor collectors. This refinement assists in planning for appropriate roadway connectivity, posted speed limits and other design considerations. Therefore, locally adopted transportation plans may include modifications or deviations from the official federal classifications of Richmond area roads and highways.

National Highway System

The National Highway System (NHS) consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the following subsystems of roadways (note that a specific highway route may be on more than one subsystem):

- Interstate: The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- Other Principal Arterials: These are highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- Strategic Highway Network (STRAHNET): This is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes.
- Major Strategic Highway Network Connectors: These are highways which provide access between major military installations and highways which are part of the Strategic Highway Network.
- Intermodal Connectors: These highways provide access between major intermodal facilities and the other four subsystems making up the National Highway System.

The NHS includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs).

A map of the NHS in Richmond, VA Urbanized Area, which includes parts of RRTPO and Tri-Cities MPO as of November 2015 is shown as Mmap 3.20.

Regional Road Network Operations

An analysis of the trends in roadway utilization, such as vehicle miles of travel, safety and congestion, is included in Congestion Management section. Presented here is a review of several critical elements that reflect the current state of the system in the Richmond metropolitan area. This includes indexes maintained by VDOT that track maintenance of the roadway surface conditions and bridge conditions.

Roadway Surface Conditions

The table in Ffig. 3.6 from VDOT's "State of the Pavement 2015" report, shows that the Richmond Construction District includes more lane mileage to be maintained than any other district in Virginia.

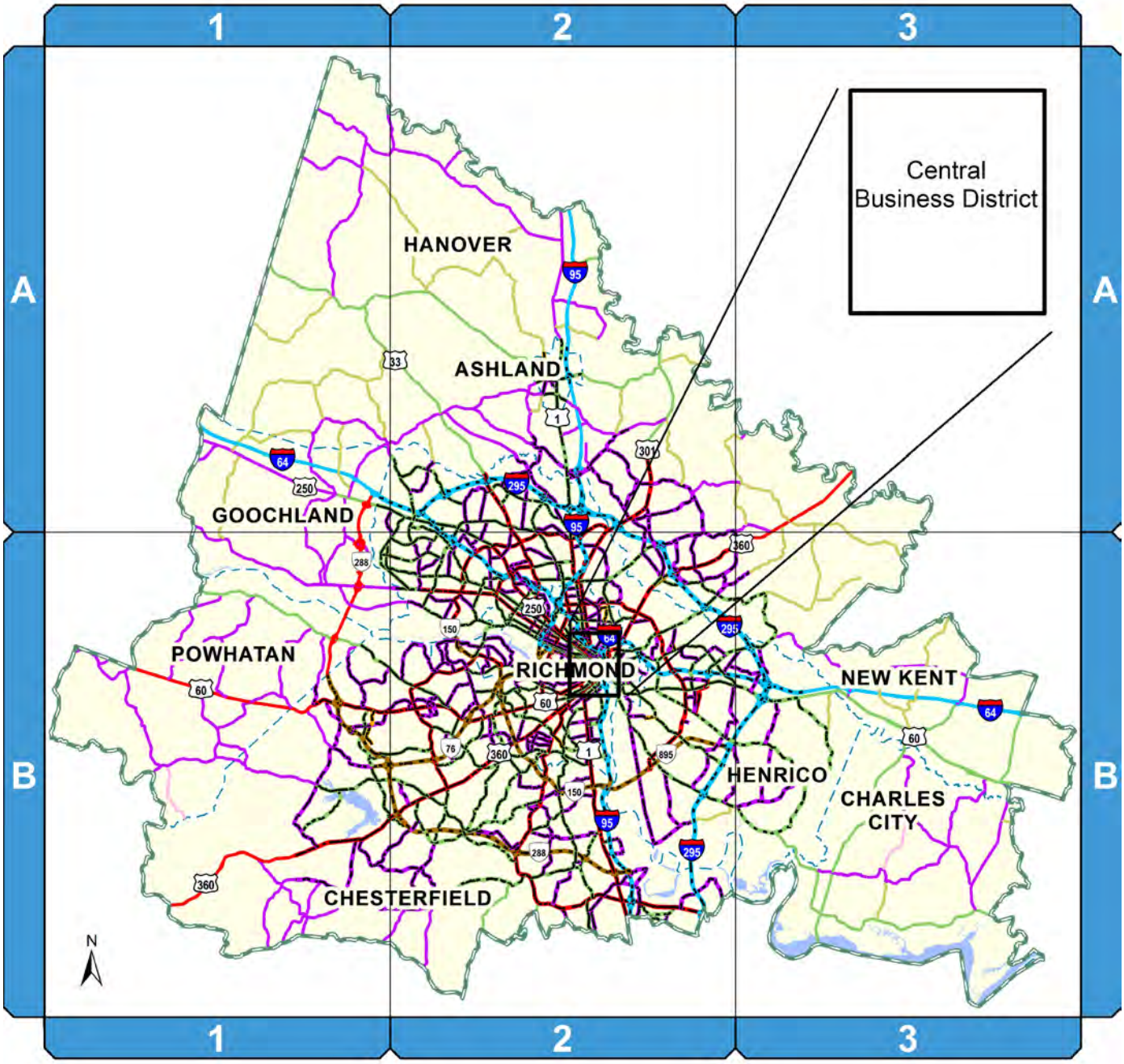
In general, wear and tear on roadway surfaces is due to two

LANE MILEAGE BY DISTRICT AND SYSTEM					
District	Interstate	Primary	Secondary	Frontage	Total
Bristol	528	2,809	12,306	112	15,755
Salem	493	2,668	14,731	105	17,967
Lynchburg	0	2,805	12,379	43	15,245
Richmond	1,323	3,439	13,932	75	18,769
Hampton Roads	874	1,770	7,112	92	9,858
Fredericksburg	281	2,190	9,279	24	11,774
Culpeper	279	1,852	8,282	52	10,465
Staunton	940	2,482	10,473	75	13,970
Nova	725	1,732	10,878	78	13,413
Statewide	5,443	21,747	99,400	656	127,246

FIG. 3.6. LANE MILEAGE BY DISTRICT AND SYSTEM

plan2040: Long-Range Transportation Plan

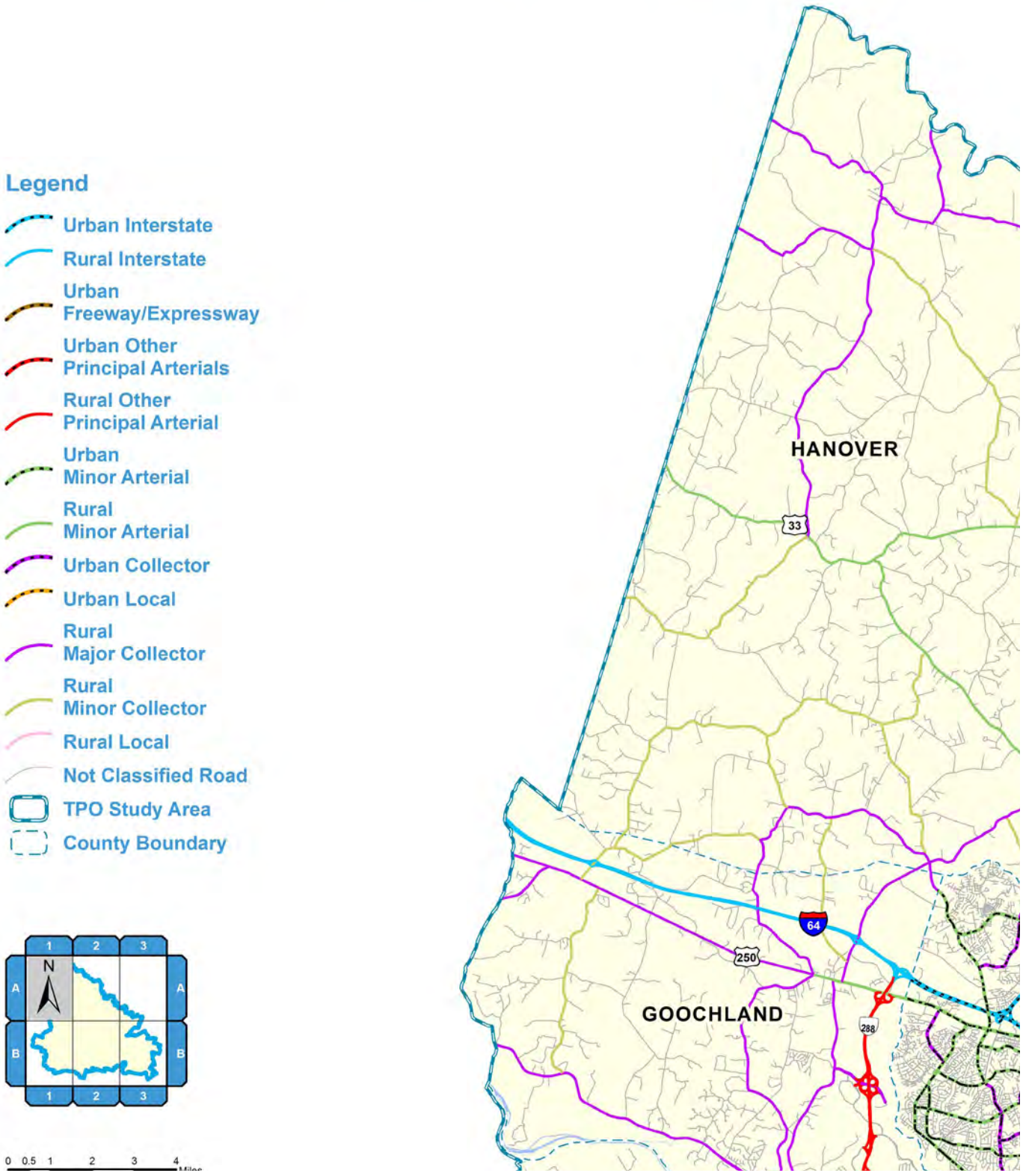
Regional Road Network by Federal Functional Classification



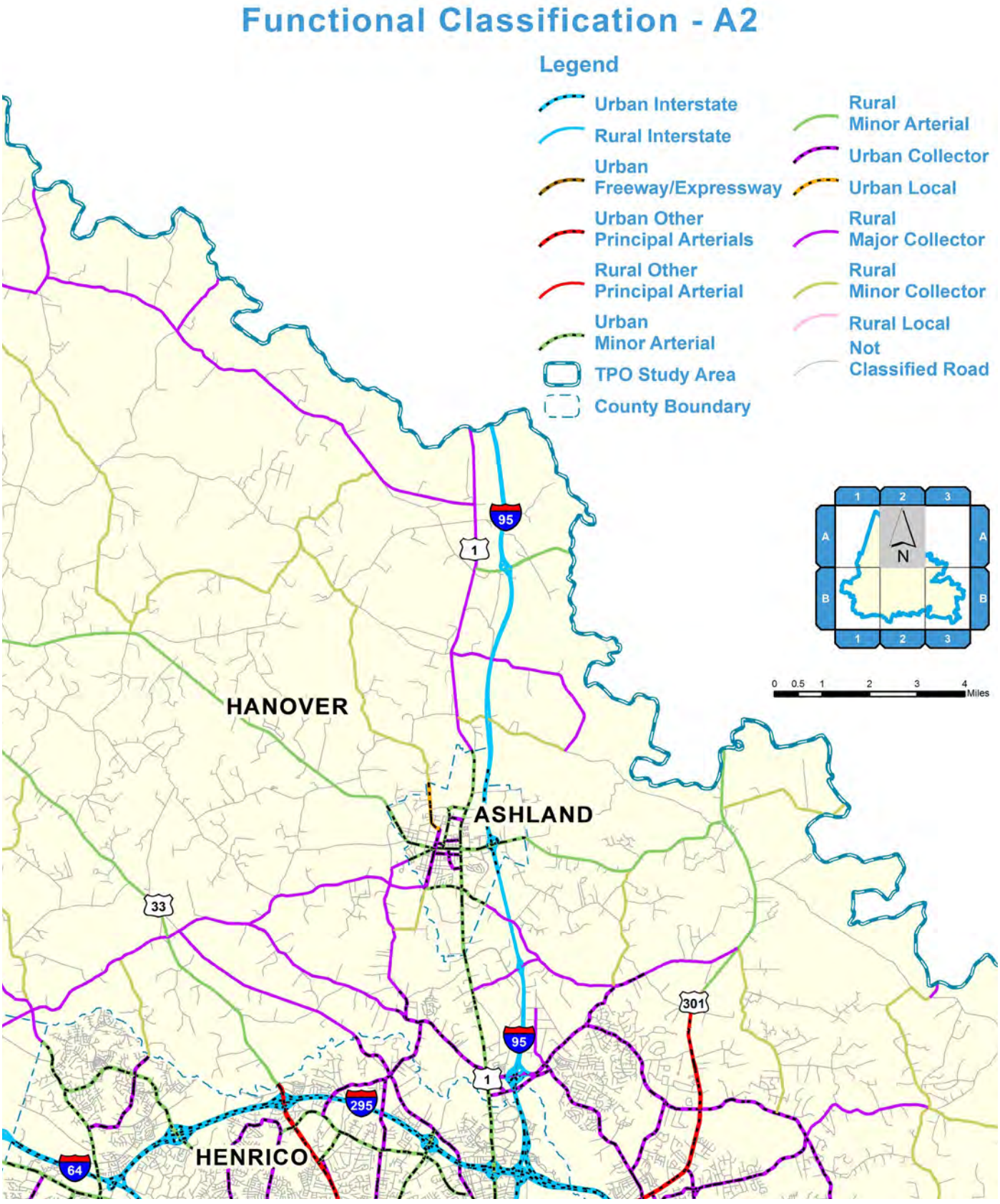
Source : Local Jurisdictions, VDOT, RRPDC

MAP 3.13. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICA-

Functional Classification - A1

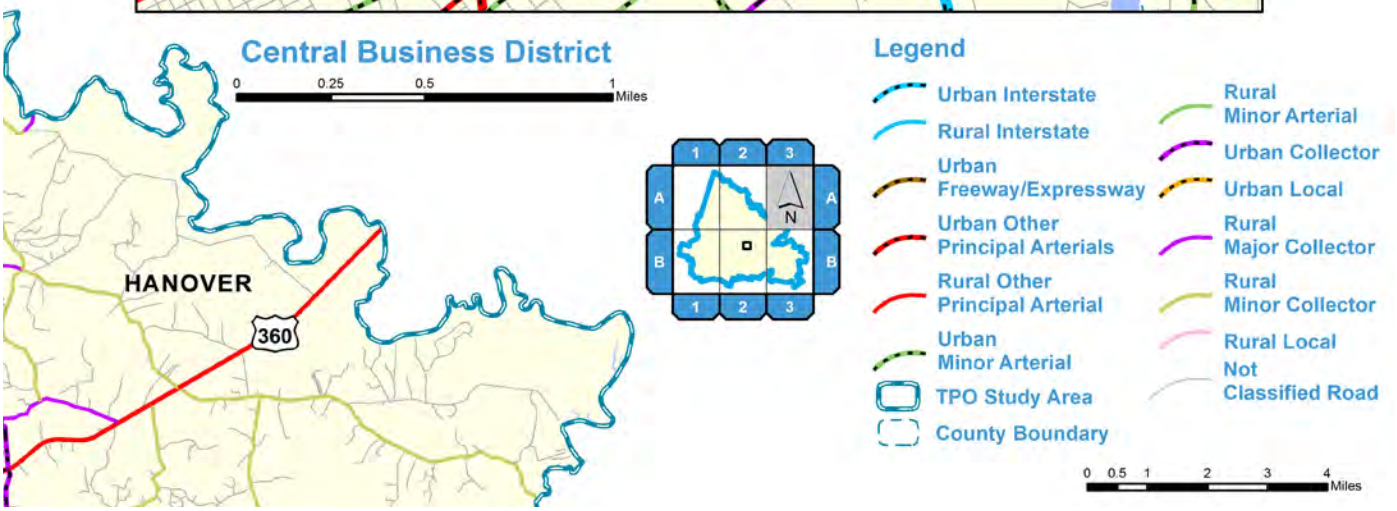


MAP 3.14. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - A1

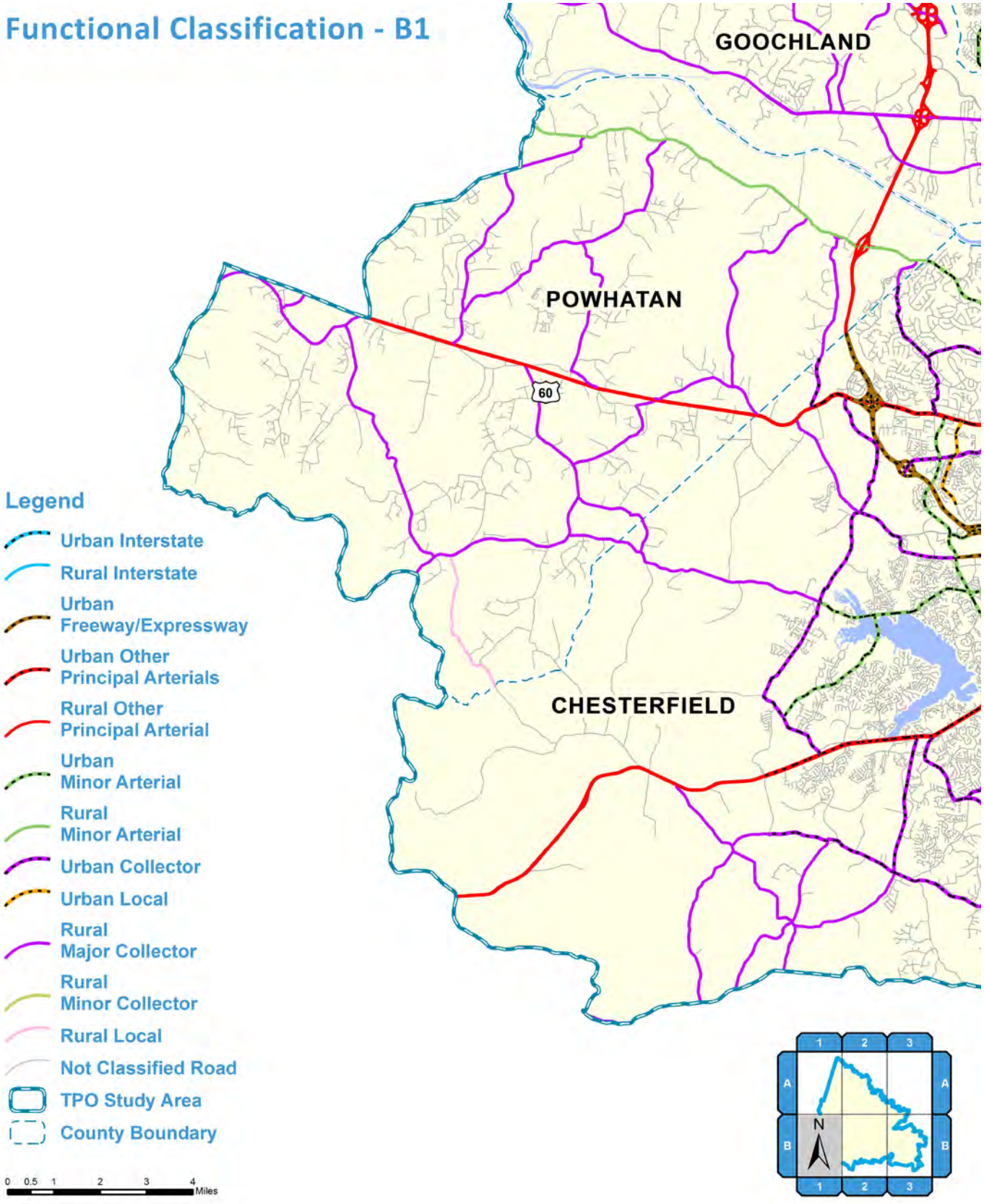


MAP 3.15. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - A2

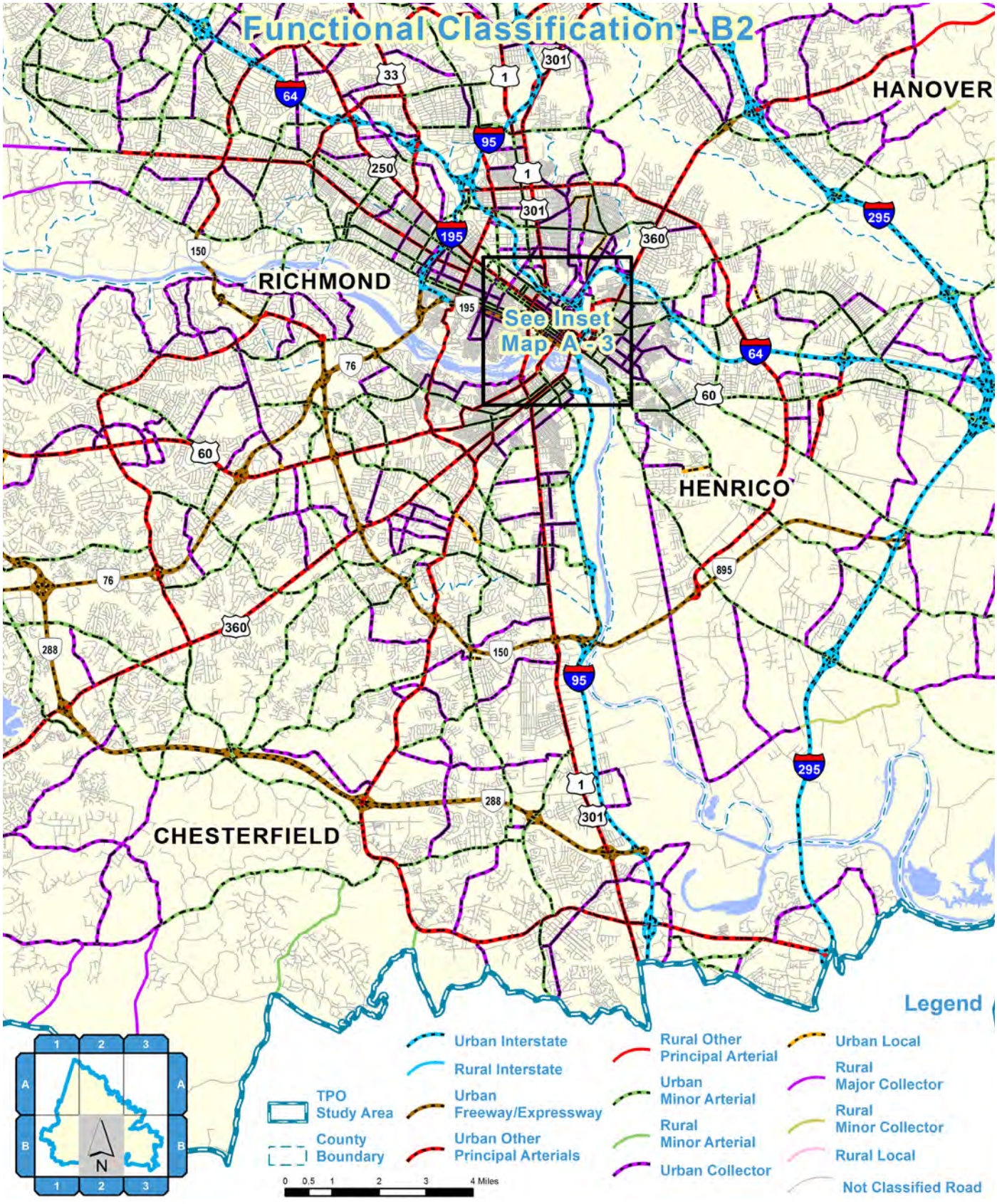
Functional Classification - A3



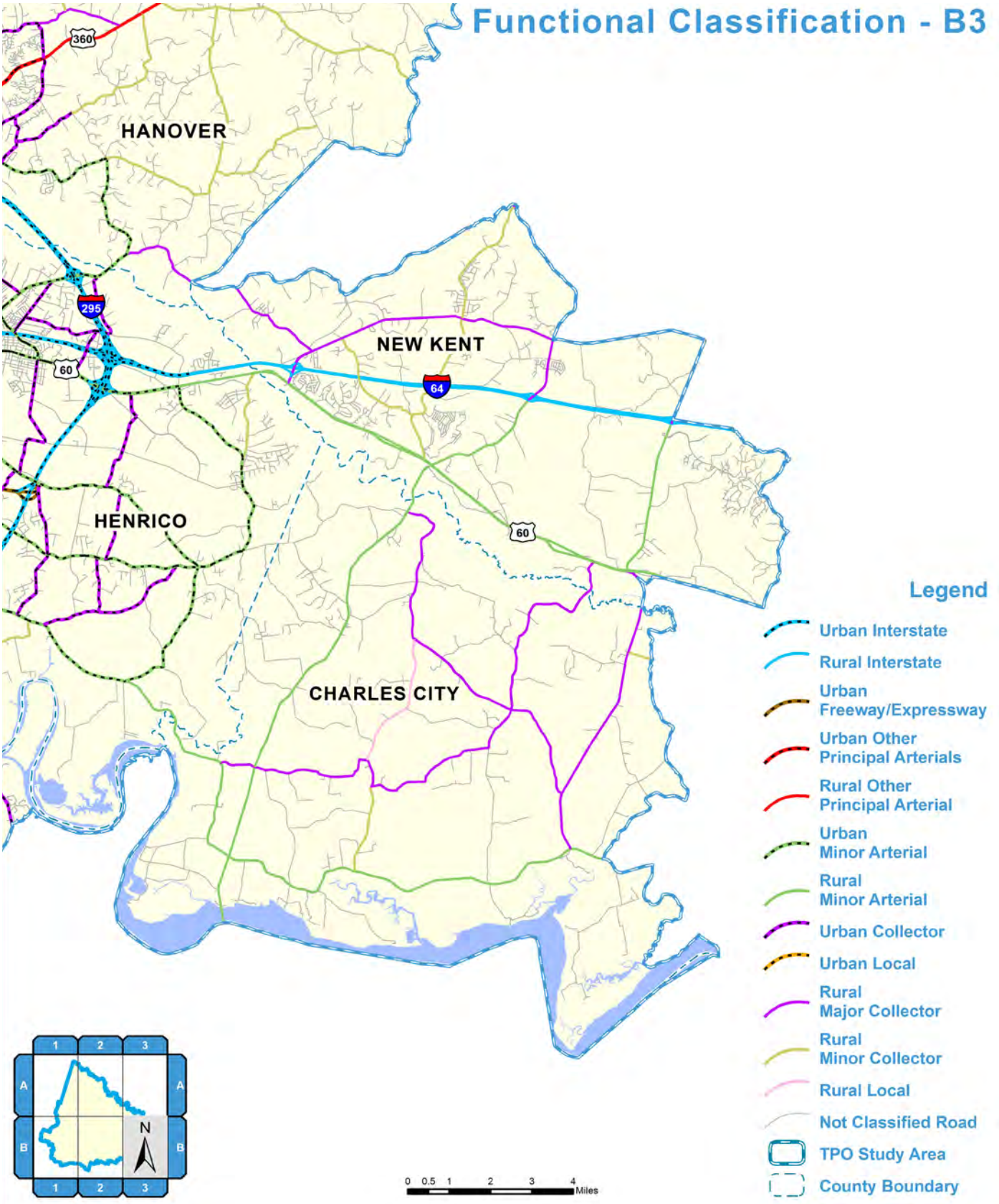
MAP 3.16. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - A3



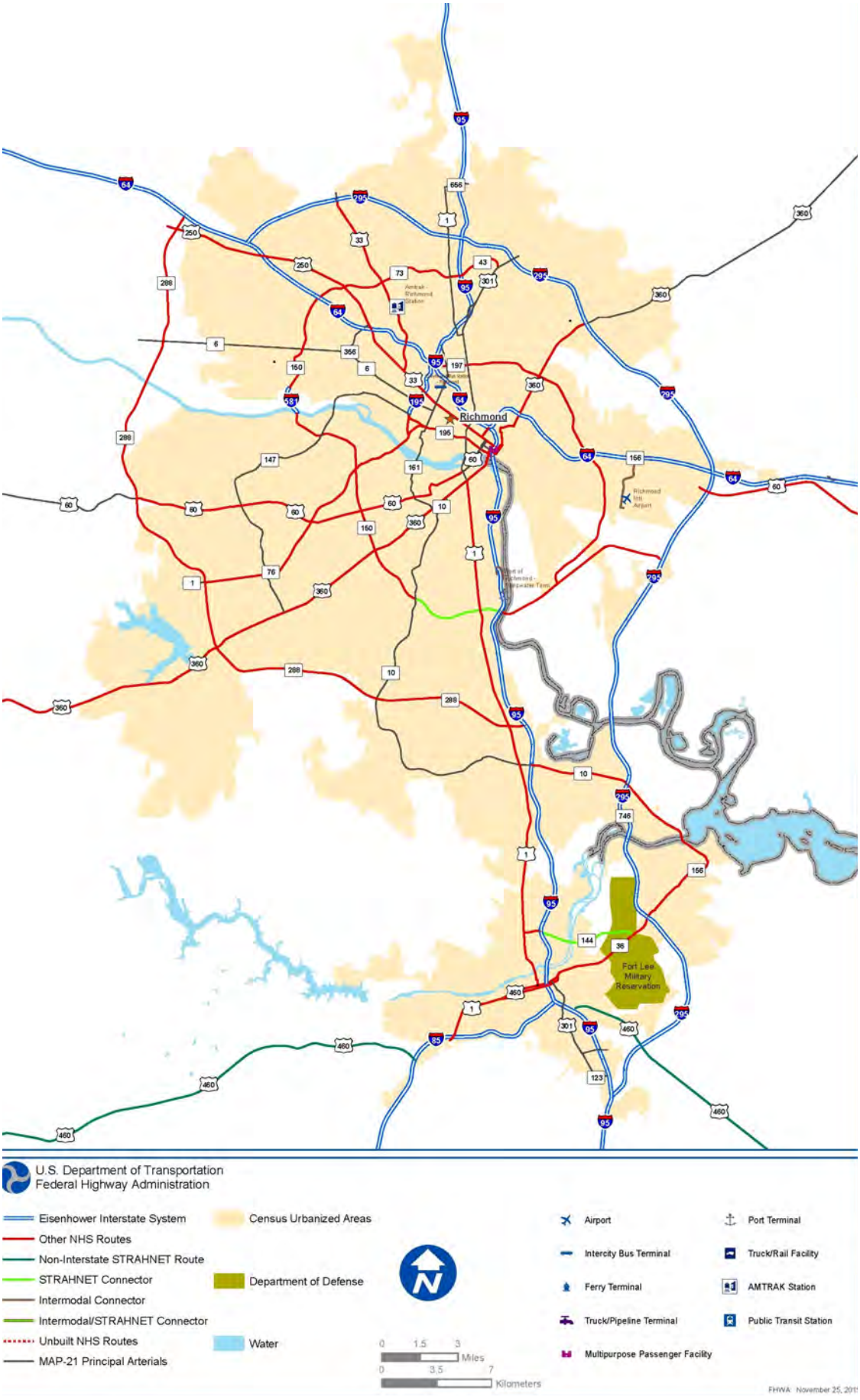
MAP 3.17. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - B1



MAP 3.18. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - B2



MAP 3.19. VDOT 2014 APPROVED FUNCTIONAL CLASSIFICATION - B3



MAP 3.20. NATIONAL HIGHWAY SYSTEM - RICHMOND, VIRGINIA

principal factors: 1) vehicle load related damages (e.g., fatigue cracking, patching, rutting, etc.); and 2) non-load-related comprised of distresses (e.g., transverse and longitudinal cracking, longitudinal joint separation, bleeding, etc.) considered to be primarily non-load related, i.e., caused by weathering of pavement surface or materials and/or construction deficiency.

Pavement condition of counties in the Richmond region for 2015 Interstate System is illustrated in Ffig. 3.7.

"Pavement ride quality" of counties in the Richmond region for the 2015 Interstate System is illustrated in Ffig. 3.8.

PAVEMENT CONDITION FOR 2015 INTERSTATE SYSTEM			
County Name	Lane Miles Rated	Deficient Lane Miles	% Deficient
Chesterfield	136.8	7.23	5.29%
Goochland	111.66	9.62	8.62%
Hanover	168.22	14.25	8.47%
Henrico	394.17	80.27	20.37%
New Kent	80.43	4.37	5.43%

Source: VDOT State of the Pavement 2015. October 2015

FIG. 3.7. PAVEMENT CONDITION FOR 2015 INTERSTATE SYSTEM

PAVEMENT RIDE QUALITY FOR 2015 INTERSTATE SYSTEM			
County Name	Lane Miles Rated	Deficient Lane Miles	% Deficient
Chesterfield	134.18	6.7	4.99%
Goochland	113.04	3.1	2.74%
Hanover	168.19	9.04	5.37%
Henrico	363.22	53.07	14.61%
New Kent	98.06	4.85	4.94%

Source: VDOT State of the Pavement 2015. October 2015

FIG. 3.8. PAVEMENT RIDE QUALITY FOR 2015 INTERSTATE SYSTEM

Bridge and Culvert Conditions

Bridges and culverts are an important part of any regional transportation system. Due to the presence of many rivers including the James River, Pamunkey River, Chickahominy River, Appomattox River and South Anna River and numerous creeks and streams, there are many bridges (and culverts) in the Richmond region. Similarly, due to the presence of an integrated network of highways including Interstates 64, 95, 195 and 295, freeway Routes 76, 150, 288 and 895 and many other state and US highways there are many elevated (grade-separated) interchanges. The condition of these structures is the key to the smooth flow of transportation in the Richmond region.

The Richmond Regional Bridge and Culvert Inventory and Structural Assessment Report 2015 Update

This RRTPO produced document provides an inventory of all the structures in the region, and identifies structures with poor conditions (structurally deficient, functionally obsolete, weight posted, etc.). This document is based on the snapshot of the data captured from VDOT's online dashboard as of January 15, 2015. (The Richmond Regional Bridge and Culvert Inventory and Structural Assessment document can be assessed from the RRTPO's website).

Bridges and culverts in the Richmond region are owned and maintained by VDOT, various jurisdictions and other public and private agencies. VDOT owns and maintains around 85 percent of all bridges and culverts in the region. The City of Richmond and Henrico County own and maintain almost 10 percent of all bridges and culverts. Chesterfield County and the Town of Ashland both maintain 1 culvert each. Local Tolling agency Richmond Metropolitan Transportation Authority (RMTA) owns and maintains about 33 bridges and culverts (2.3% of all structures). A few bridges are owned and maintained by the private sector. Transurban owns and maintains 34 bridges and culverts on Route 895 (including ramps). Private railroad agencies CSX Corporation and Norfolk Southern Railways own and maintain 4 bridges in total (3 by CSX and 1 by Norfolk Southern).

The median year a structure (bridge or culvert) was constructed (or underwent major reconstruction) in the Richmond region is 1985, making the median age of the structures in the region 30 years as of January 2015. Out of 1,412 structures in

the Richmond region, 64 structures (4.5%) built before 1950 have not undergone any major reconstruction work. The bulk of the bridges in the region were built from 1960 to 1990 (52%).

Structures are considered structurally deficient if they have been restricted to light vehicles, closed to traffic or require rehabilitation. Structurally deficient means there are elements of the bridge that need to be monitored and/or repaired. The fact that a bridge is "structurally deficient" does not imply that it is likely to collapse or that it is unsafe. In 2014, 109 structures were classified as structurally deficient and in 2015, 110 structures (Map 3.3).

A functionally obsolete structure (bridge or culvert) is one which was built to standards that are not used today. These structures are not automatically rated as structurally deficient, nor are they inherently unsafe. Functionally obsolete bridges do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded. In 2014, 183 structures were classified as functionally obsolete and in 2015, 185 structures.

According to the Federal Highway Administration (FHWA) a structure is deemed "deficient" if the structure is rated either 'structurally deficient' or 'functionally obsolete'.

Sufficiency ratings were developed by the Federal Highway Administration to serve as a prioritization tool to allocate funds. The rating varies from 0 percent (poor) to 100 percent (very good). The formula considers structural adequacy, whether the structure is functionally obsolete and level of service provided to the public.

Deficient bridges with sufficiency ratings of less than 50 qualify for federal bridge replacement funds. In the Richmond region, the number of structures eligible for federal bridge replacement funds has increased from 70 to 77 from 2014 to 2015 (Map 3.4).

Similarly deficient bridges with sufficiency ratings greater than 50 and less than or equal to 80 qualify for federal bridge rehabilitation funds. In 2015, in the Richmond region 171 structures have been identified as deficient structures with sufficiency rating greater than 50 and less than 80.

The following summaries the findings of 2015 update of the Richmond Regional Bridge and Culvert Inventory and Structural Report:

- Total number Structures in the Richmond Region : 1,412
- Total number of Bridges : 815
- Total number of Culverts: 597
- Total number of Structurally Deficient Bridges: 110
- Total Number of Functionally Obsolete bridges: 185
- Total number of Deficient bridges: 295
- Median Age of Structures : 30 years
- Number of Structures eligible for Federal Bridge Replacement Funds: 77
- Number of Structures eligible for Federal Bridges Rehabilitation Funds: 171

Toll Roads

There are several toll facilities in the Richmond area including:

The Downtown Expressway and Powhite Parkway along with VDOT's Powhite Parkway Extension (Route 76):

These roads form a 16-mile highway network that extends from Interstates 95 and 195 in Richmond into central Chesterfield County. Tolls range from 15 cents to $1.50, depending on vehicle size and toll collection location.

The Downtown Expressway and Powhite Parkway are operated by the Richmond Metropolitan Transportation Authority (RMTA).

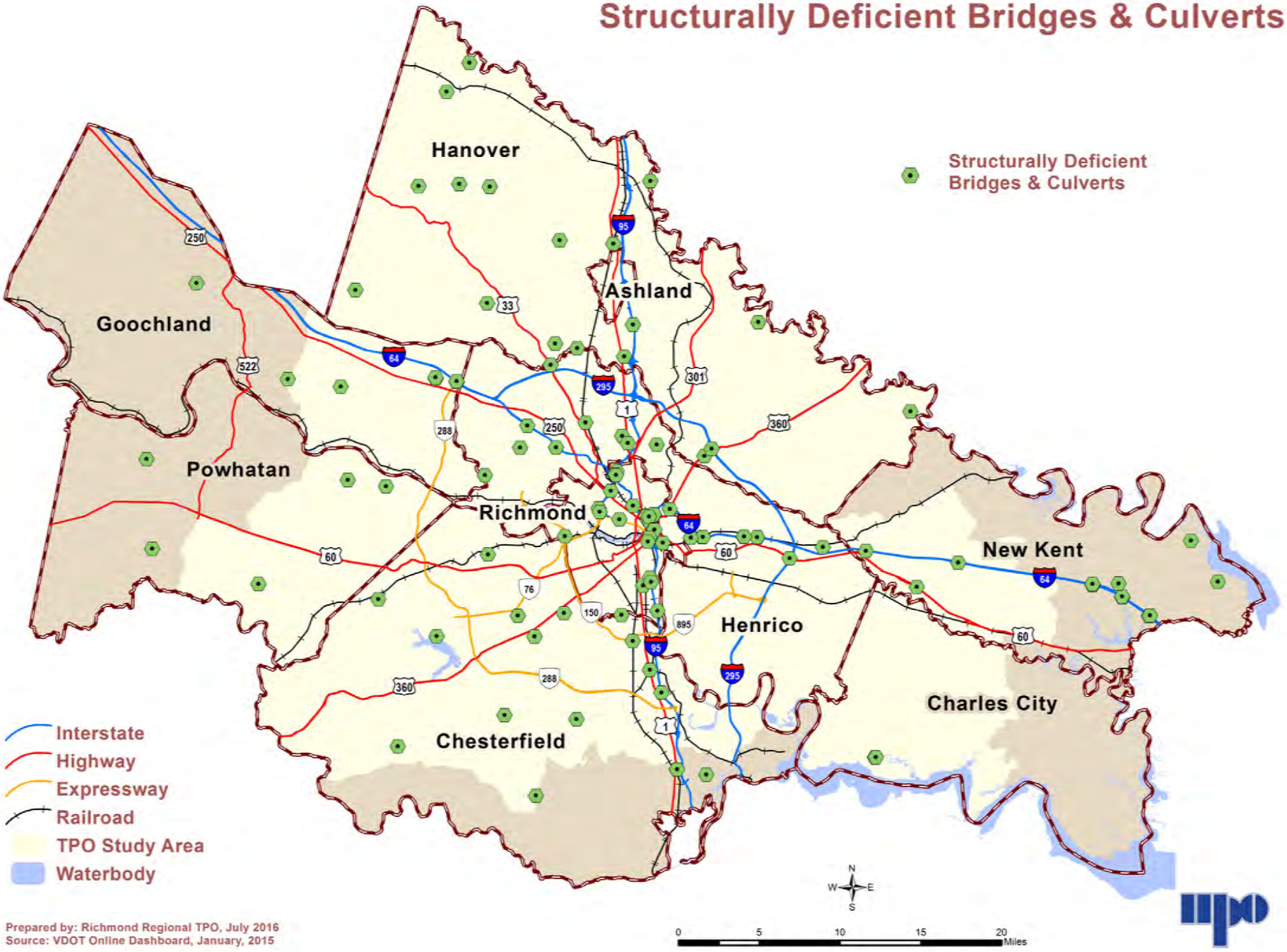
For general information about the RMA's Downtown Expressway or Powhite Parkway toll facilities, call 804-523-3300.

For general information about VDOT's Powhite Parkway Extension toll facilities, call 804-378-3403.

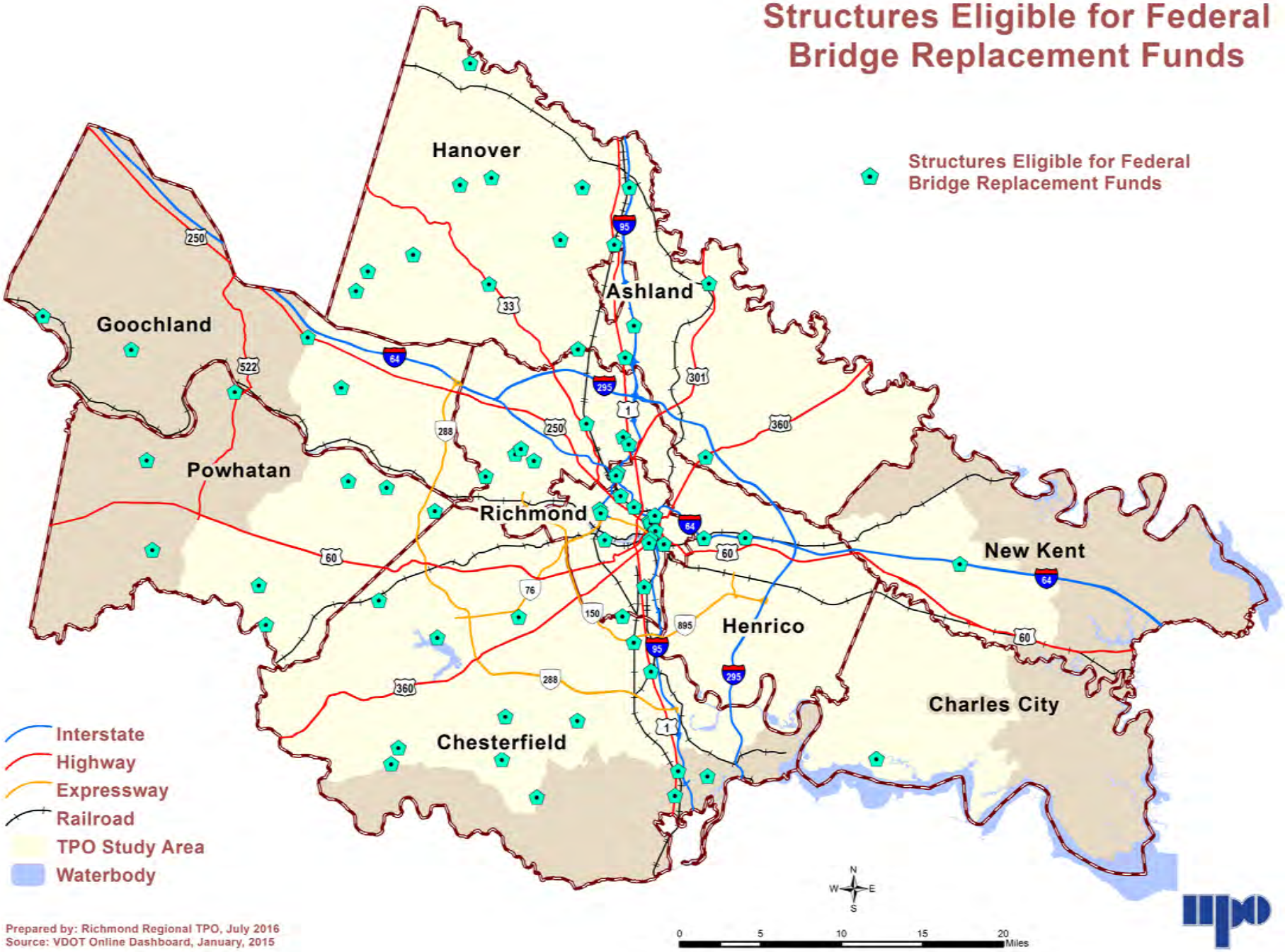
The Boulevard Bridge

The bridge is owned by RMTA. It spans the James River and

MAP 3.21. STRUCTURALLY DEFICIENT BRIDGES AND CULVERTS IN THE RICHMOND REGION



MAP 3.22. STRUCTURES ELIGIBLE FOR FEDERAL BRIDGE REPLACEMENT FUNDS IN THE RICHMOND REGION



connects the Westover Hills community to Maymont Park in the city on Route 161.

Many Richmonders still call the Boulevard Bridge "The Nickel Bridge" because of its initial five-cent toll.

Tolls are 35 cents for two-axle vehicles and 50 cents for three-axles. Vehicles with more than three axles aren't permitted.

The Pocahontas Parkway

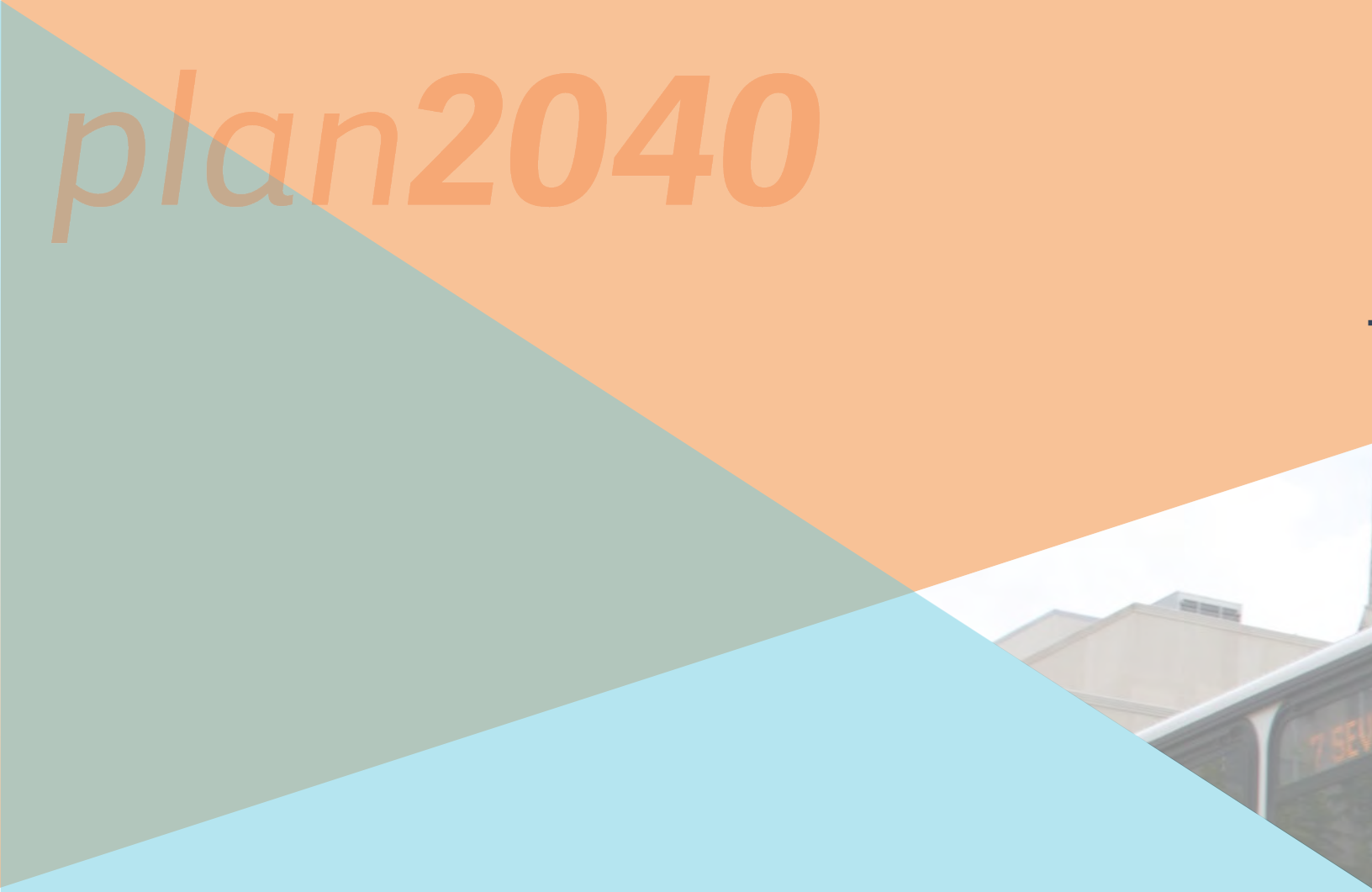
The parkway is a direct drive connecting Chesterfield County (Chippenham Parkway - Route 150) to eastern Henrico County (Interstate 295) and the Richmond International Airport.

The Richmond Airport Connector Road, a direct link between Pocahontas 895 and the airport, opened in January 2011.

The toll is $2.75 ($3 during the morning and afternoon commutes). E-ZPass riders can use the high-speed open lanes, allowing them to travel through the toll facility at highway speeds.

For more information, call 804-822-3420 or visit the following website: http://www.pocahontas895.com/using_pocahontas_895/toll_prices.html

plan2040



Regional Transit

Greater RVA Transit Vision Plan

The expansion of the Pulse, the bus rapid transit service along the Broad Street corridor from Willow Lawn in Henrico County to Rocketts Land in the City of Richmond, countered with reductions in funding to existing transit services has generated a focus on what the Richmond region needs in terms of regional transit.

DRPT, in cooperation with the RRTPO and GRTC, is currently developing the Greater RVA Transit Vision Plan, an effort to look at regional transit needs and the vision for transit in the greater Richmond area. This long-term vision document for transit is using current transit and demographic data, land use data and plans, transit and population forecasts, public opinion surveys, and stakeholder input to create a guide for transit development in the region through 2040. The Vision Statement reads:

"By 2040, transit will connect the Richmond region through an efficient, reliable, seamless and sustainably-funded system that benefits everyone by enabling economic growth, promoting livable and walkable transit-oriented development, expanding access to jobs and services, and strengthening multi-modal access within and beyond our region"

Initial work started with GRTC and the Southern Institute of Research to understand attitudes and opinions about transit in the Richmond region. Two series of public meetings were held in November 2015 and June 2016 to kick off the visioning process for the plan and present alternatives to address transit needs and opportunities throughout the region. The Greater RVA Transit Vision Plan is scheduled for completion in early fall 2016 and the recommendations from the plan will be used to inform plan2045, the next RRTPO long-range transportation plan.

GRTC Pulse

GRTC Transit is developing plans for the institution of a 7.6 mile bus rapid transit (BRT) line along Broad and Main Streets from Willow Lawn to Rockett's Landing. The project, titled the Pulse, is supported in part by a federal transportation investment generating economic recovery (TIGER) grant, and will operate in dedicated and general traffic lanes. Partners include the U.S. Department of Transportation (USDOT), Virginia DRPT, VDOT, City of Richmond, and Henrico County.

Among the features of the Pulse are low floor buses, off-board ticketing, travel times that are almost 50% shorter than local buses, and unique, high-quality stations. Detailed preliminary engineering began in May 2015, as VDOT continues the Design-Build Process for the final design and scope validation for the project. Final design should be completed in August 2016 with service still scheduled to begin in October 2017.

BRT has various elements that distinguish itself from regular transit service currently provided by GRTC Transit. These elements include:

- Running ways: Dedicated transit or mixed use lanes with transit signal priority or queue jumps to reduce delays for transit vehicles
- Faster service: Higher station spacing results in consolidated boarding and alighting and reductions in delays
- Safe and accessible stations: Sheltered stations with raised platforms for level boarding
- Environmentally friendly vehicles
- Off-board fare collection system
- Frequent service with longer hours of operation
- Intelligent Transportation Systems (ITS): Real-time passenger information, transit signal priority, closed circuit TV, emergency phones
- Distinctive branding of vehicles and stations with unique design elements

Benefits of the GRTC Pulse include improving local and regional mobility, promoting livable, transit-oriented development and planning, providing a cost-effective transit solution for users. From an economic perspective, the graphics below identify savings in time, transportation costs, and increases in job creation for the Richmond area due to the project.

Richmond Transit Network Plan

The Richmond Transit Network Plan is a yearlong planning study to analyze the current GRTC Transit System bus network in the City and reconsider the design of the bus routes in the context of a changing city and the new GRTC Pulse BRT. The plan will consider how to connect local routes to the BRT to ensure Richmond has a

connected transit network. The plan will seek public and stakeholder input on key choices and trade-offs to understand how the City should best meet the needs an dpreferences of the community to develop a blueprint for the City's transit system.

The Transit Network Plan will serve as a blueprint to update the City's transit system and redesign the bus routes over the next few years. With the upcoming opening of the GRTC Pulse in 2017, the City has an opportunity to rethink its transit system with the new BRT service on Broad and Main Streets. The planning process will engage the public in a thorough conversation about the benefits, goals and trade-offs involved in deciding how to serve the City, its residents, workers, students and visitors with transit. The resulting plan will recommend changes to the bus routes in the City starting in 2017.

Part of the scope for the plan includes examining a spectrum of choices for the transit network that can be implemented within the existing budget for GRTC Transit System. Under the Familiar Concept, riders would have shorter walks to bus service along more streets. Fifty percent of the transit funding would be spent on spreading service along more miles of road with less frequency to reach lower density areas. The remaining fifty percent of funding would be spent on service along major corridors with higher frequencies to capture riders.

The high Coverage Concept would have funding allocation priorities similar to the Familiar Concept, but buses would run about 20 percent faster by thinning out bus stops from every block to every third block. Service would be spread out to reach nearly all people.

The High Ridership Concept, the third concept proposed in the Transit Network Plan, would allocate 80 percent of transit funding to service on more frequent routes that will attract high ridership, and the remaining 20 percent of funding would be spent on spreading service along more miles of road with less frequency. Frequent bus service would be concentrated along major corridors, and buses would run an estimated 20 percent faster by thinning bus stop locations. The Transit Network Plan should be completed in early 2017 after the completion of the stakeholder and public meetings through December 2016.

Existing Transit in the Richmond Region

Town of Ashland

The Town of Ashland 2011-2012 Comprehensive Plan notes that a common theme of previous transportation studies conducted by the TPO, VDRPT, GRTC and the Town is the general lack of public transportation options in outlying areas of the metropolitan region, including Ashland. "This includes transport needs of dependent population of senior citizens, persons with disabilities and low-income workers…." As a policy recommendation the Town's Comprehensive plan notes that "the town shall continue to attempt to obtain sufficient funding through grants and other sources to implement a local transit circulator…."

Charles City and New Kent Counties

On-demand bus service for destinations in Charles City and New Kent Counties is provided by Bay Transit and available to the general public Monday to Friday from 6:00 a.m. to 6:00 p.m. The New Kent Comprehensive Plan notes the County desires to establish express transit service to/from downtown Richmond to a park and ride lot located in the median of Rt. 60 a short distance from the US 60/VA 249/33 intersection.

Chesterfield County

At present the following GRTC routes extend into Chesterfield with coordination from Access Chesterfield:

- 64-Stony Point Express
- 82 Express
- 66 Express
- 62 Midlothian
- 73 Ampthill

The following excerpt from the Chesterfield County website addresses paratransit in Chesterfield:

"Access Chesterfield… provides transportation services for any Chesterfield County resident who is disabled, aged 60, or who meets federal income guidelines." Curb-to-curb service is provided and trips outside Chesterfield County must be for medical purposes with two exceptions:

1. For passengers living in Southeastern Chesterfield County, limited transportation is available along a designated route in Colonial Heights

2. Disabled passengers who work in the designated service area will continue to be transported to and from work

Although Access Chesterfield cannot transport persons to Richmond for reasons other than medical appointments, or disabled passengers to work, connecting service is available to GRTC Routes.

Goochland and Powhatan Counties

There are no transit services available to the general public. The Goochland 2035 Comprehensive Plan notes that as a Policy Implementation Strategy, the County should "Explore the expansion of GRTC service to West Creek Business Park and Centerville Village." Powhatan's Long-Range Comprehensive Plan also has an objective to "Identify opportunities for future regional transit service into the county. Work with regional partners to enhance Travel Demand Management (TDM) programs targeted at commuters to reduce single occupant vehicle trips during peak travel times."

Hanover County

Although public transportation services in Hanover County are limited to seasonal bus service between Richmond and King's Dominion, the County's comprehensive plan notes that an objective of the plan is to "Provide options for multimodal transportation networks through land development design that reduces dependency on motorized vehicles."

Henrico County

GRTC operates nine local routes that provide access to the City of Richmond. Express buses serve four park and ride facilities and provide peak hour service for commuters to and from downtown Richmond. The County's Comprehensive plan notes that with regard to bus service, the following policy should guide the provision of bus service in the county: "Continue to monitor citizen satisfaction with GRTC service and ensure a bus system that provides adequate service to the residents of the county."

City of Richmond

Public transportation is also addressed in the Richmond Master Plan. Among the goals of the plan is "The City of Richmond will be served by a multi-modal regional transportation system connecting residents with areas of employment, commerce and education." The long-term transportation policies and strategies for the City of Richmond are designed to enable the City to "develop a regional multi-modal transportation system consisting of commuter and light rail, local and express buses, rapid busways, ridesharing, improved taxi service, and bikeways…." A second policy is to "encourage regional participation in achieving greater public transit ridership."

Among the public transportation issues noted in the plan are:

- Declining ridership attributed to limited funding, movement of large-scale retail establishments away from Downtown, lack of service to suburban employment and residential areas, fare increases, and widespread availability of parking
- Key residential and commercial sections of south, east and north Richmond are underserved by current routing patterns
- A lack of rider amenities and facilities such as shelters and benches and route information

The Master Plan policies and strategies include identifying a dedicated and reliable source of funding and identifying and protecting potential future transit corridors/rights of way. This would facilitate the development of light rail in the long term, and bus service on dedicated lanes in the short term. Other recommendations include implementing additional public transit service to Richmond

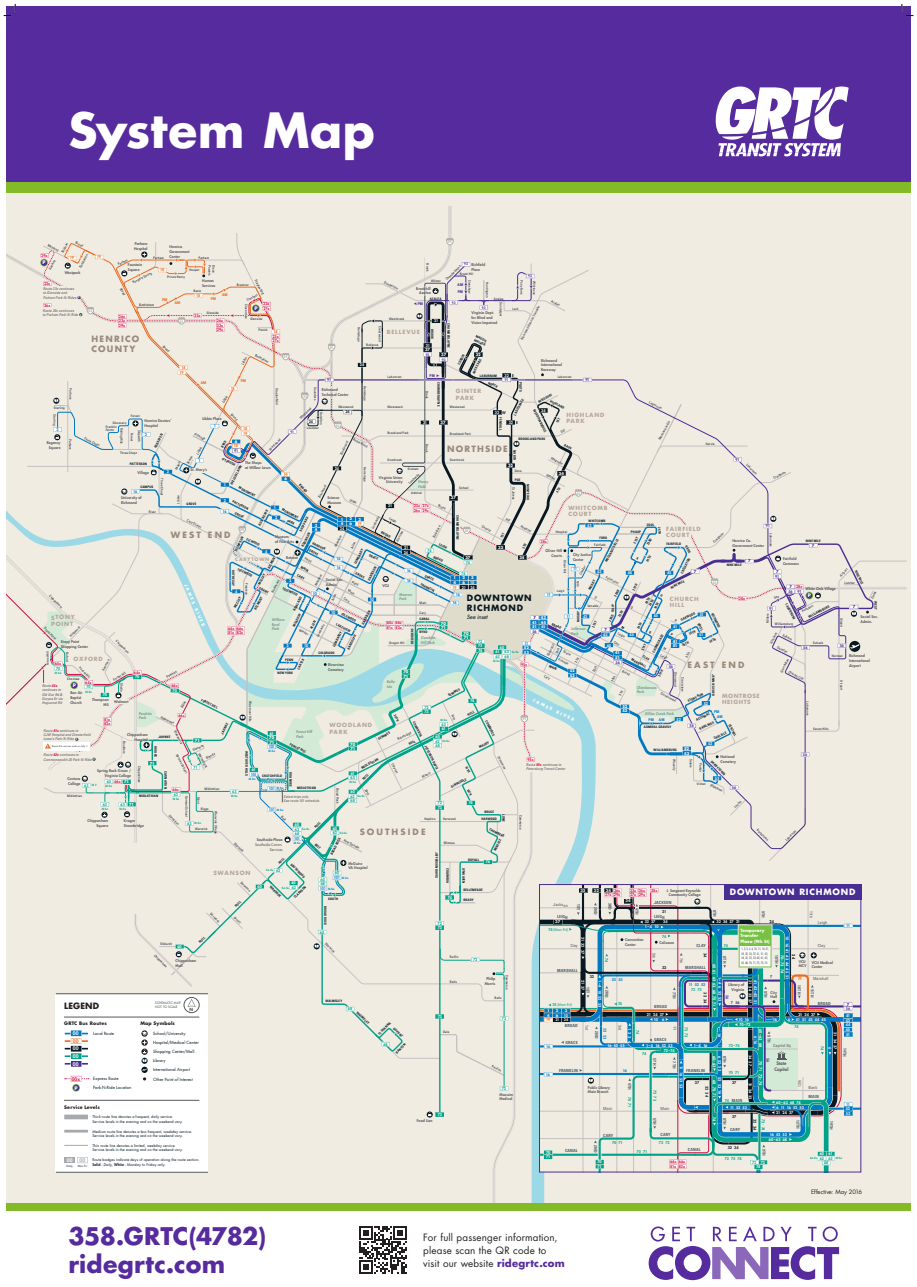
International Airport, enhancing bus stop signs and shelters, and providing express service operating on the interstate highways and expressways.

The General Transportation Guidelines in the Master Plan include:

- Explore transit options to meet community and commerce needs
- Explore expanding transit service to serve those with special needs
- Support bus and rail service, as needed, in mixed use areas identified on the Land Use Plan Map
- Support commuter and light rail service to selected areas

GRTC Transit System

For many long-time Richmond residents, fond memories include the electric streetcars that traveled along Broad Street and other corridors to provide public transportation in Richmond. Although ownership of the streetcar system changed hands on several occasions, the streetcars operated continuously until 1949 when buses replaced the last electric streetcars. When the old track system was removed and replaced with bus service, the end of an era occurred in Richmond. Since that time, more and more Richmond area residents have relied on private automobiles for the majority of their trips, and public transportation services shifted to filling the needs of the area's transportation dependent.



Today, the Richmond area has a public transit network that is limited by funding and jurisdictional support for such services.

Incorporated in 1973, the GRTC Transit System (GRTC) is the sole fixed route bus service provider in the Richmond area. Although AMTRAK offers intercity rail service to the public, with several routes boarding and alighting in the Richmond area, GRTC's fixed route bus service remains the principal mass transit option for travel within the Richmond metropolitan area.

GRTC is a non-profit public service corporation, owned equally by the City of Richmond and Chesterfield County and governed by a Board of Directors. There are 166 transit vehicles,

which include both buses and cutaway vans, which provide fixed route services to the Cities of Richmond and Petersburg, and the Counties of Henrico and Chesterfield. Fixed route services are a combination of local and express bus service, with all local route buses equipped with low-floor entry, wheelchair ramps, and front-mounted bicycle racks.

For qualified disabled riders who are unable to use fixed-route service, GRTC offers paratransit service through the CARE program. CARE provides curb-to-curb service for eligible riders. Eligibility for the program is in accord with the Americans with Disabilities Act (ADA). More information on the CARE service is described in a following section.

GRTC oversees RideFinders, the region's transportation demand management agency, and C-VAN, a welfare-to-work transportation service provided in cooperation with local social service agencies.

GRTC's bus route structure can be described as a hub-and-spoke system, where service converges on a central downtown area – near Richmond City Hall and the VCU medical campus -- and then fans out into the surrounding neighborhoods. The express routes provide direct service from the surrounding residential areas in the outlying counties to downtown Richmond with few stops in between.

GRTC operates a highly efficient bus system, but one which does not provide extensive service coverage in the suburban areas surrounding the downtown core of the region.

Existing GRTC bus routes are are shown graphically on the GRTC Routes System Map from May 2016 to the right.

GRTC has undertaken a number of projects to enhance customer service and convenience. These include the installation of new bus stop signs, and institution of a mobile app which features a trip planner, a bus stop search capability, real time bus tracking, and service updates. Additionally, GRTC has undertaken the system-wide replacement of fare boxes with electronic devices that enable riders to use a greater variety of fare payment options. GRTC has also introduced a series of one, seven and thirty day unlimited ride passes that may be purchased at the farebox, selected vendors, at RideFinders or online.

In April 2014, GRTC opened a temporary downtown transfer center along North Ninth and East Leigh Streets. The plaza, which was created to improve on-time performance and provide a central location to transfer, also provides enhanced amenities to aid in way-finding customers. The plaza is intended to minimize the disturbance of bus traffic during events that occur along Broad Street, and features 13 curbside bus bays shared by one to three routes. Signs and kiosks identify each bay and provide bus schedule information, maps and arrival times.

In 2011, with funding support from RRTPO and the DRPT, GRTC produced a "Transit Development Plan" (TDP) -- a comprehensive evaluation of GRTC's service and cost characteristics. The next update to the TDP is currently underway as of the **plan2040** update. Key elements of the TDP include:

- Development of goals, objectives and performance standards;
- A peer agency review;
- Evaluation of service characteristics and identification of strengths and weaknesses;
- Results of a transit on-board survey;
- Listing of potential service and facility improvements;
- Recommended service changes and capital improvements;
- Funding requirements and potential funding sources.

Specific recommendations included in the TDP are separated into near-term (six year time period) and long term considerations. Generally, the types of specific recommended improvements include:

- Routing changes
- Scheduling improvements
- Service span extensions

- Improvements to public information

A 2013 update to the TDP assessed GRTC's progress in attaining the goals of the TDP. The Update also presented key service and financial projections through FY2020.

In addition to the TDP, in July 2013, the Richmond Strategic Multimodal Plan was completed. The plan identifies the following guiding principles that will guide transit-related decisions:

- Safety
- Multimodal linkages
- Regional coordination
- Sustainability
- Alternative mode support
- Innovation

GRTC CARE

GRTC's CARE service is a curb-to-curb service available to eligible customers in the system's fixed-route service area. Operated on a contract basis at this time by MV Transit, the service area includes the City of Richmond and Henrico County. In addition to the ADA-mandated service for customers residing within ¾ of a fixed transit route, GRTC also offers CARE PLUS service in areas of Henrico and Richmond not serviced by local transit routes. To be eligible for CARE and CARE PLUS service, an application must be submitted to ADA Ride (www.adaride.com). Customers are approved based on eligibility requirements established by the Americans with Disabilities Act (ADA) and receive an identification card and program information.

The overall level of service in the City of Richmond and Henrico County is adequate in both coverage and availability; however, demand is expected to increase dramatically as the senior population increases faster on a percentage basis than total population. In addition, the general regional population is also expected to grow rapidly which also may result in increased demand for CARE service.

Travel Training

In late 2015 GRTC initiated a travel training program for current CARE customers 18 and older. The program provides riders with the skills need to utilize fixed route transit service and includes instruction in essential travel skills, making judgments about safety and danger, and using appropriate social and communication skills. One-on-one and group training are provided and the program includes bus familiarization sessions as well as a 'travel buddy" component. In addition to providing riders with the freedom and confidence to travel independently throughout the community, the program is intended to divert at least 10% of the CARE trips to fixed route at an estimated savings of over $400,000.

Other Transportation Services

In addition to Bay Transit, there are other transportation services available to commuters in rural areas. For example, RideFinders, a division of GRTC, assists commuters, including those living in the region's rural areas, to find carpools and vanpools. Commuters traveling to jobs in Hampton Roads may use a similar service called Traffix.

There also are services not available to the general public, but are provided to persons who qualify for paratransit services based on age, income, or disability. Transportation for elderly, disabled and low-income individuals is available from a wide variety of providers, including those providers who are reimbursed through Medicaid.

In 2007 a statewide process to improve coordination of transportation for special populations began under the leadership of the Virginia Department of Rail and Public Transportation (VDRPT). The elements of the Coordinated Human Services Mobility Plan included an assessment of available services; an assessment of transportation needs for individuals with disabilities, older adults, and people with low incomes; identification of strategies, activities and/or projects to address the identified needs and gaps; and the prioritization of the strategies, activities, and/or projects based on resources, time and

feasibility for implementation. The plan was updated in May, 2014 to "identify examples of projects and programs initiated since the issuance of the 2008 plans which demonstrate human service transportation enhancements and coordination efforts…" and to develop "…a plan that meets coordinated transportation requirements and facilitates access to critical FTA monies."

Needs and Gaps Assessment for the Transportation Disadvantaged

In 2015, the RRTPO undertook the development of a report Needs and Gaps Assessment for the Transportation Disadvantaged. Available on the RRTPO website, elements of this study included the identification of the transportation disadvantaged groups, an evaluation of the demand for specialized services, a review and analysis of existing services and the gaps between existing services and estimated demand, the identification of specialized transportation issues, and forecasts of the future demand for specialized services. Using the findings from the report, the following recommendations for the enhancement of human service transportation were developed:

Short Term (0-2 years)

1. Establish a specialized transportation services coordination entity

2. Through the coordination entity, develop and maintain a directory of transportation services

3. Utilize the coordination entity as a means to develop more consistent policies and guidelines for the provision and use of specialized transportation services

4. Through the coordination entity, initiate a dialogue between dialysis treatment centers and other medical centers and transportation providers to identify opportunities for coordination and increased consideration of specialized transportation operational issues in scheduling medical appointments

Mid-Range (3-5 years)

5. Provide incentives for the use of public transit, including training related to how to access and use existing services

6. Explore opportunities to use transportation network companies

7. Utilize the site plan review and approval process as an opportunity to ensure that proposed new development can be readily accessed by larger vehicles

Long Term (6-10 years)

8. Provide curb cuts, sidewalks, benches, bus shelters, pedestrian facilities and lighting at public transit stops

9. Establish partnerships with employers for the purpose of securing financial support for work-related transportation services

10. Institute expanded services to under-served areas

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Bicycle & Pedestrian

The long-term investment in cycling and pedestrian transportation infrastructure is often challenging to grasp. These modes typically provide, small-scale or neighborhood-level access opportunities, while long-term planning efforts are focused on a regional scale. Additionally, it is only recently that bike and pedestrian planning and infrastructure investment has reemerged as a core element of a functional and multi-faceted transportation system. Previous transportation policy and investment efforts have been predominantly focused on vehicular travel. As attitudes toward development of a multimodal transportation infrastructure continue to evolve, the Richmond Regional Transportation Planning Organization will continue to work with its partners to create a regional infrastructure base that reflects the desires and needs of the localities and agencies the RRTPO serves.

This chapter includes information on the value and benefit of cycling and walking, as well as regional recommendations for ensuring the integrating of these infrastructure modes into the existing and future transportation fabric. This chapter will also provide a brief overview into federal and state bicycle and pedestrian programs and funding strategies, and will conclude with an existing conditions assessment for both the region and the nine localities that partner with the RRPDC.

Making Cycling and Walking Viable

When considered, cycling and walking are of the healthiest modes of transportation. Utilizing these modes on a regular basis reduces the risk of heart disease, high blood pressure, obesity, and diabetes. Furthermore, cycling and walking can help improve air quality and decrease noise pollution. Given all the known benefits of these modes, why do only 3.4% of 142 million working Americans bike or walk to work?

There are numerous answers to this question. Some argue that typical commute distances are too far to make either of these modes a feasible option. Others claim that biking and walking are not safe in urban/suburban areas. And still others believe that bicycling and walking have not been championed in public policy as a viable option, particularly in the United States. All of these perspectives are reasonable and it's likely that all of them, plus numerous others, have contributed to marginalizing cycling and walking as everyday transportation modes. That being said, about a third of all trips in the US are within 2 miles, while over half of all trips are within 5 miles. These trip distances are well within biking and walking shed distances; however, safety concerns and lack of dedicated facilities keep these modes from being viable options. If work is five miles away, but the only roads leading to the office are major highways, cycling and walking are negated as options.

Regional Recommendations for Encouraging Biking and Walking

In stimulating higher rates of cycling and walking, the region can develop an overall transportation management strategy. This strategy is cost effective from a public investment point of view, especially considering the favorable impacts upon air quality and community health. The following are technical and policy actions which can be taken to maximize the benefits of these modes:

- Include bicycle/pedestrian links when planning for transportation projects: Bicycling and walking linkages are viable modes for connections between residential areas and activity center. When these modes are carefully considered in relation to regional transit systems and in the design of activity centers, they can support access and circulation other than just by private vehicles.

- Target scarce resources for settings with the greatest payoff: These include settings where travel distances between residential areas and key trip attractors are relatively short; settings where there are high concentrations of people under 40 (such as university communities); and areas where there already exists compatible infrastructure which can be modified into appropriate facilities.

- Place emphasis on conventional facilities: For utilitarian travel like commuting, bike/walk patrons are more likely to be interested in an efficient, direct path with acceptable safety levels, rather than a path which is scenic but indirect.

- Promote linkages for continuity: Even where systems of bike trails, paths, or walkways exist, they may fall short if there are significant gaps or barriers in the network to connect activity centers. Continuity can be improved through careful planning and identification of obstacles.

- Consider the linkage with transit: While cycling or walking as a primary mode to work can offer significant benefits, improving congestion and air quality may be even greater if bicycling and walking are given greater attention as supporting modes by connecting with transit for longer trips.

- Seek private sector involvement and support: Developers play an important role in the potential for bike/pedestrian use in the design of buildings and subdivisions, in terms of the location of buildings relative to streets, other buildings, services, and transit. Similarly, employers can be encouraged to increase attention to bike/walk use through provision of bike facilities and showers and changing facilities.

- Provide marketing and education: Assuming strategies can be implemented which materially enhance the environment for cycling or walking, it will be important to notify the public of the changes and their potential benefits.

In the long-term, realizing the ultimate potential of cycling and walking depends on altering numerous factors including but not limited to current development trends, planning procedures, funding programs, and preferences which are conditioned on current experience. Towards this end, the measures listed above should significantly increase the use and associated benefits of these oft-neglected, yet time-honored transportation modes.

Bicycle and Pedestrian Planning at the Federal Level

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 enacted significant changes to Federal transportation policy and programs that expanded consideration of and eligibility for cycling and walking. These expanded policies and programs were reinforced with the Transportation Equity Act for the 21st Century (TEA-21) in 1998, the Safe Accountable, Flexible, Efficient Transportation Equity Act: a Legacy for Users (SAFETEA-LU) in 2005 and the Moving Ahead for Progress in the 21st Century Act (MAP-21).

On December 4th 2015, the FAST Act, or Fixing America's Surface Transportation Act, was signed into law by President Obama. This Act was the first long-term transportation bill approved since SAFETEA-LU in 2005. Like the transportation acts before it, the FAST Act largely maintains the current program structures and allocations. Regarding bike and pedestrian programming, Congress has approved allocations of approximately 800 million per year over the life of the bill. However, the once independent Transportation Alternatives Program has now been rolled into the Surface Transportation Program (STP). This program consolidation provides more opportunity for these once bike and pedestrian-specific funds to be flexed or diverted to non-bike/ped transportation improvements.

Bicycle and Pedestrian Planning at the State Level

VDOT's state bicycle and pedestrian program, which has been promoting bicycling and walking within the state since the late 1970s, provides planning assistance to state and local transportation planners, activity coordination for various bicycle committees, and bicycle and pedestrian education and safety promotions.

In 2003, the Virginia Secretary of Transportation set forth policy goals relating to the integration of bicycle and pedestrian travel into the Virginia multimodal transportation system. As a result, VDOT conducted a comprehensive review of policies and procedures relating to bicycle and pedestrian accommodations. The result of this review was the Commonwealth Transportation Board's 'Policy for Integrating Bicycle and Pedestrian Accommodations' (called simply Policy) adopted in March 2004, which established cycling and walking as "fundamental travel modes" and guided VDOT's consideration of bicycling and walking in the planning, funding, design, construction, maintenance, and operation of Virginia's transportation network.

Statewide Bicycle and Pedestrian Policy Plans

In 2011, VDOT released State Bicycle Policy Plan. The purpose of this Plan is to establish a vision for the future of bicycling in the Commonwealth and to advance the bicycle element of the Policy (2004) "consistently, appropriately, and cost effectively."

The 2011 VDOT State Bicycle Policy Plan has two major goals as listed below:

- Goal 1: To increase the use of bicycling in Virginia to include a full and diverse range of the population for all trip purposes.
- Goal 2: To improve safety and comfort of bicyclists throughout Virginia and to reduce bicycle crashes.

In 2014, VDOT released State Pedestrian Policy Plan, a companion plan to the 2011 Bicycle Policy Plan. Like the 2011 bicycle plan, the purpose of the Pedestrian Policy Plan is to establish a vision for the future of walking in the

Commonwealth and to advance the walking element of the Policy "consistently, appropriately, and cost-effectively."

The 2014 VDOT State Pedestrian Policy Plan has five major goals as listed below:

- Goal 1: Improve the safety and comfort of pedestrians throughout Virginia and reduce pedestrian related crashes.
- Goal 2: Enhance mobility and accessibility for pedestrians.
- Goal 3: Achieve a more connected pedestrian network in Virginia.
- Goal 4: Better promote and educate planners, designers, advocates, and stakeholders on the requirements of the CTB Policy for Integrating Bicycle and Pedestrian Accommodations.
- Goal 5: Improve available guidance on pedestrian accommodations.

Both Plans maintain the same four core elements that outline each plans' more specific recommendations. The core elements are listed below:

Element 1 : Clarify Policies with regard to bicycle/pedestrian accommodations. VDOT should provide additional guidance on the planning, design, operation, and maintenance of bicycle/pedestrian facilities. In some cases, this will involve clarifying or revising existing policies and procedures. In other cases, it will involve developing new resources to guide the implementation of the Policy across all disciplines of the department.

Element 2: Provide staff training and guidance to integrate the Policy requirements in projects and programs. VDOT staff should receive training and guidance on their job responsibilities in order to ensure they are able to design, construct, operate, and maintain roadways that safely and appropriately accommodate bicycling/walking as a multimodal option.

Element 3: Improve outreach and coordination. In addition to VDOT, there are many other agencies and organizations in the Commonwealth responsible for implementing bicycle/pedestrian projects and programs. A high-level of coordination among these entities will benefit stakeholders and the general public.

Element 4: Measure and evaluate progress. Regular monitoring and evaluation of bicycle/pedestrian performance measures will help ensure that the bicycle mode is included in the everyday operations of VDOT, so Virginia can continue moving toward a truly multimodal transportation network.

The Virginia Outdoors Plan

Released in 2013 by the Virginia Department of Conservation and Recreation (DRC) the Virginia Outdoors Plan is the state's official conservation, outdoor recreation and open-space plan. It is a guide to meet the land conservation and outdoor recreation needs of Virginia. The Trails and Greenways portion of the plan best addresses pedestrian and bicycle networks and facilities on a statewide level. In particular the plan promotes active communities and open spaces linked by trails and greenways that connect individuals, children and their families to nature and to each other

Bicycle and pedestrian facilities are listed under "Trails and Greenways" which identify the following as goals for Virginia:

- Goal 1: Enhance access to the outdoors through the development of a trails network that promotes healthy recreation and connects citizens, including children and families, to Virginia's diverse open space and natural landscapes.
- Goal 2: Improve linkages between communities and key tourist destinations in both rural and urban areas to promote regional outdoor recreation and heritage tourism initiatives, support local economies, and provide economic stimuli for small business startups and entrepreneurial expansion.
- Goal 3: Create the foundation of a statewide system of interconnected open-space corridors through which trails traverse, in order to support long-term protection of Virginia's green infrastructure and the ecological services it provides.

- Goal 4: Integrate trails as a critical component in Virginia's transportation infrastructure, in order to provide efficient and convenient nonmotorized connections to neighborhoods, schools, community facilities and employment centers.
- Goal 5: Educate citizens about the trail network's social, ecological, transportation and wellness benefits, and foster educational pursuits through environmental research, multicultural programs and outdoor classrooms.

Existing/Proposed National/Regional Bike-Ped Corridors in the Richmond Region

US Bike Routes 1 and 76

U.S. Bike Routes 1 and 76 are signed national bicycle touring routes that cross the Richmond Region. The routes intersect in Ashland and Hanover County. US Bicycle Route 1 (USBR 1) and US Bicycle Route 76 (USBR 76) were both designated by the American Association of State Highway and Transportation Officials (AASHTO) in 1982. While originally established in 1982, both routes were relocated in 2005. Furthermore both routes draw bicycle tourists from around the world as well as from within the Region.

USBR 1 runs from Maine to Florida (north-south) with approximately 274 miles in Virginia and 108 miles within the Richmond region. USBR 1 passes through six of the region's nine jurisdictions; from north to south: Hanover, Ashland, back to Hanover, Henrico, Richmond, Chesterfield, and Powhatan.

USBR 76 runs from Yorktown, Virginia to the eastern border of Kansas (east-west) with approximately 560 miles in Virginia and 102 within the Richmond region. USBR 76 passes through six of the region's nine jurisdictions; from east to west: Charles City, Henrico, Richmond, back to Henrico, Hanover, Ashland, back to Hanover and Goochland.

Virginia Capital Trail

Virginia Capital Trail is a 51 mile paved bicycle and pedestrian trail linking Richmond to Williamsburg along the historic Route 5 corridor. The project is divided into nine sections, and six are located within the Richmond Region. While each section was completed on its own scheduled, all sections are complete at this time and the entire 51 mile corridor is now open for use. The trail officially opened on October 2 2015.

East Coast Greenway

The East Coast Greenway (ECG) is a developing trail system, spanning 2,900 miles as it winds its way between Canada and Key West, linking 25 major cities along the eastern seaboard. About 400 miles of the ECG is located in Virginia. From Washington, D.C., the ECG enters Virginia along the Mount Vernon Trail. From Mt. Vernon, the ECG continues on road to Fredericksburg along the route of the future Potomac Heritage Trail. From Fredericksburg, the ECG continues south to Richmond, where the Greenway divides into two routes: the spine route, which continues south to North Carolina's Piedmont region, and the alternate Historic Coastal Route, which heads southeast through Jamestown and Williamsburg before aiming south toward Wilmington, N.C.

James River Heritage Trail

The James River Heritage Trail is a proposed braided trail network in the heart of Virginia that follows the James River from the foothills of the Allegheny Mountains to the Chesapeake Bay. Department of Conservation and Recreation (DCR) completed a draft plan of the 540 mile trial in August 2011. Almost one-third of the proposed network is located in the Richmond Region.

Richmond Region's Bike-Ped Matrix

Richmond Region's Bike-Ped Matrix identifies the following components for all the nine member jurisdictions of the Richmond region:

- Existing policies and existing/planned facilities in current comprehensive plans (or other related plans) relating to bicycle and pedestrian facilities.
- Existing regulations in site plan and subdivision ordinances (or equivalent) relating to the bicycle and pedestrian facilities.

- The mechanisms for programming maintenance of these facilities.

- Other related components like Safe Routes to School and Park and Ride Lots.

MAP 4.23. MAP 4.1: EXISTING AND PROPOSED REGIONAL BIKE-TRAIL CORRIDORS

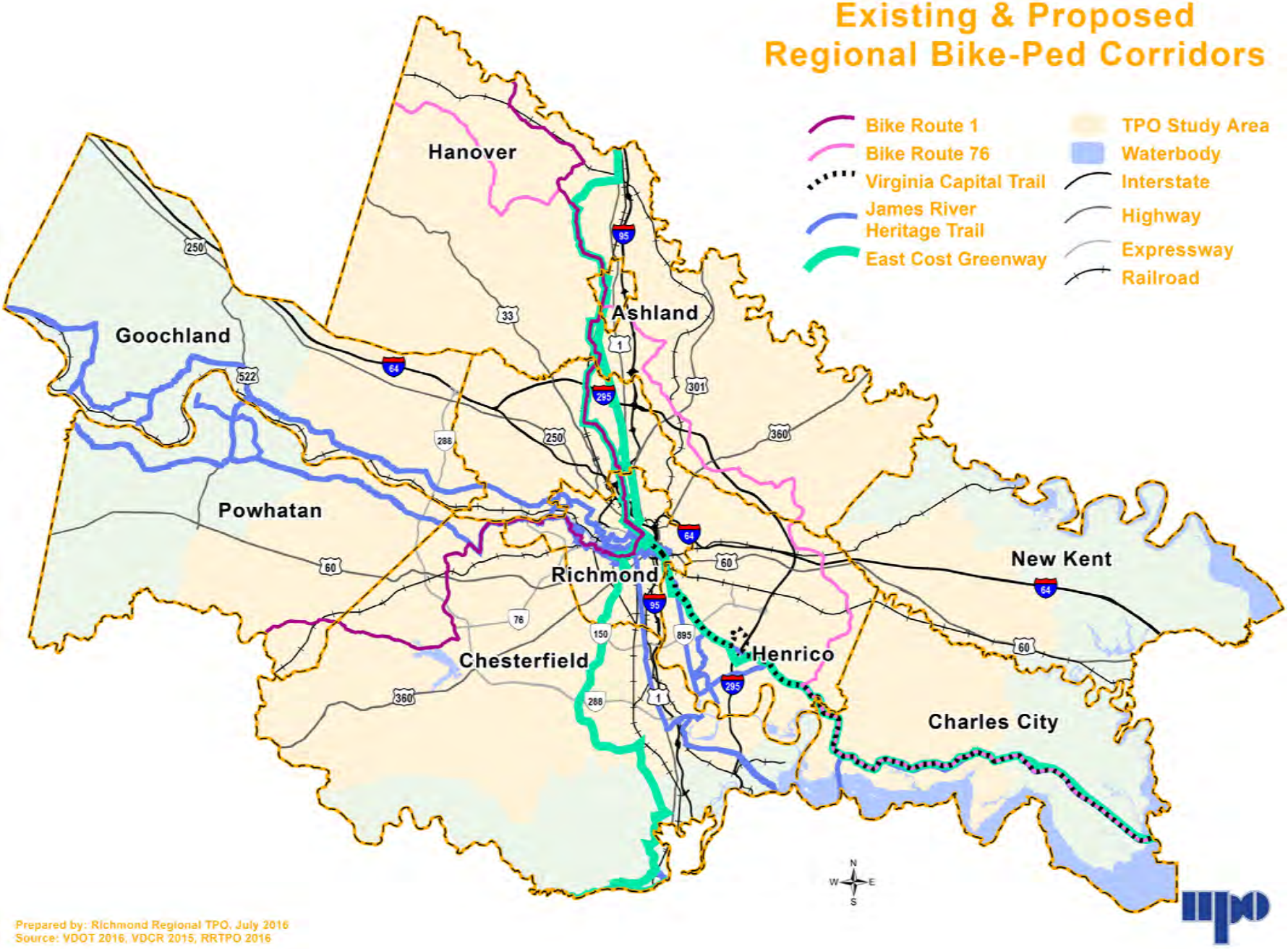


FIG. 4.1. FIG. 4.1: RRTPO BIKE-PED MATRIX

Jurisdiction	Bike- Ped In Comprehensive / Other Plans	Plan Adoption Date	Zoning / Subdivision Ordinances	Bike-Ped Corridors		Maintenance Programming	Other Bike and Ped Improvements	Park and Ride
				Existing	Proposed			
Ashland	# States updating of 1998 Bicycle and Pedestrian Plan. # Sidewalk Replacement Plan to be updated as current projects are completed. # Continued work with Hanover County and other regional partners, including the East Coast Greenway Organization to develop a connected trail system. # When road improvements are made, a bike lane should be added, and facilities for bicyclists should be made available along the route. The appropriateness of shared lane marking or sharrows should be investigated within the Town and if useful the application of these road markings is recommended. # States updating the Parks and Recreation Master Plan. # Future Transportation Map in Comprehensive Plan denotes bike trail extension. # Transportation 2020 Plan inventories and details new bike-pedestrian infrastructure. # Design Guidelines Handbook details trail construction standards.	Dec 6, 2011 (Reviewing Comp Plan this year - 2016)	n/a	# Trans-American Route / US Bike Route 76 Interstate # Bike Route 1 # Ashland Trolley Line - 1mile # N. James Street Trail to Vaughan Road and Carters Hill Subdivision # Lance and Bridle segment of connection from Trolley Line to YMCA # Downtown streetscape	# East Coast Greenway # Railside Trail # Stony Run Trail to De Jarnette Park # Mechumps Creek Trail # Extension of Trail along Hill Carter Parkway # Sidewalk gaps on Ashcake Road # Pedestrian/Bike Bridge over I-95 # Priddy park - wetlands boardwalk # Green Acres and W. Vaughan Road extended	n/a	2015 - Henry Clay Elementary School -- Infrastructure projects 2010 - Henry Clay Elementary school and John Gandy Elementary School enforcement crossing guard and safety patrol training 2010 - Henry Clay Elementary School sidewalks and crossing Improvements.	None officially designated. One in VDOT plan.
Charles City	Area Plans: Roxbury Development Center, Courthouse Development & Hideaway Development Center to be developed with sidewalks/ crosswalks. Decorative street lighting and public transportation services to be used.	Sept. 22, 2009	n/a	# Trans- American Route / US Bike Route 76 # Virginia Capital Trail (sections)	# Virginia Capital Trail (sections) # Virginia Capital Trail Extensions (Courthouse Road & Wilcox Neck Road)	n/a	n/a	n/a

FIG. 4.2. FIG. 4.1: RRTPO BIKE-PED MATRIX

Jurisdiction	Bike- Ped In Comprehensive Plan/ Other Plans	Plan Adoption Date	Zoning/Subdivision Ordinances	Bike-Ped Corridors		Maintenance Programming	Other Bike and Ped improvements	Park And Ride
				Existing	Proposed			
Chesterfield	Bikeways and Trails Plan (Chapter 14 of Chesterfield Comprehensive Plan) # States to establish a comprehensive bikeway system by: accommodating the needs of both recreational and commuter cyclists; developing a primary bikeway network focused on Pocahontas State Park and the Route 10 and Courthouse Road corridors; and building the network to link population concentrations and nodes of activity. # States to create a bikeway system that is cost-effective by: pursuing expansion through existing rights-of-way and easements; and working with the biking community to disseminate information and receive feedback about the condition and usability of the system. # States to ensure that the bikeway system grows along with development of the County by: encouraging developers to provide interlinking bike routes; reserving natural and open areas for bikeways; strengthening the site plans review process to assure the integration of bikeways into new developments; and incorporating bikeways into the development of new public facilities. Area Plans: Pedestrian Accessibility # Chesterfield Area Plans fall into three categories regarding polices addressing pedestrian movement: plans that do not address pedestrian accessibility, plans that vaguely address improving pedestrian accessibility; and plans with detailed goals and objectives regarding pedestrian accessibility and mobility. # Examples of the latter include the: Bon Air Community Plan; Eastern Midlothian Plan; Chester Plan; Midlothian Area Community Plan; Northern Area Plan; Powhite Route 288 Development Area Plan; Route 360 Corridor Plan. # Policies include: incorporating pedestrian facilities into new developments and roads; developing a comprehensive pedestrian network where appropriate; linking pedestrian and bike routes to public facilities (e.g., schools, parks, libraries, recreation sites); and encouraging land use that accommodates pedestrian movement.	Nov. 18, 2015 Adopted Various Dates	# Subdividers are required to construct sidewalks as defined by the Publicly Maintained Sidewalk Criteria. # Generally, sidewalks are required as a condition of approval for development. # County can request a pedestrian plan submitted in conjunction with site plan or tentative subdivision plan submission. # For newly constructed streets to be accepted by VDOT pedestrian accomodations are required based on the following factors (per VDOT's Secondary Street Acceptance Requirements): - Median lot sizes - Average daily traffic - Proximity to schools - Functional classifcation	Bike Lanes/Paved Shoulders # Route 10, Beach to 150 # Courthouse Road, 60 to 360 # Courthouse Road, 360 to 288 # Bailey Bridge, 360 to Glen Tara # Smoketree Drive, Yarrow Lane to Gordon School Road # Ironbridge Parkway, Arbor Landing Drive to Stephens Point (or Route 10) # Coalfield Road, Genito to Charter Colony # Coalfield Road, Genito to Charter Colony # Charter Colony Parkway, Coalfield to Woolridge Road # Woolridge Road, 60 to Charter Colony # Genito Road, 360 to Courthouse # Genito Road, 360 to South Ridge # Genito Road, South Ridge to Fox Chase Lane # Lucks Lane, Courthouse to Spirea (connects to bike path constructed with Rt 288) # Robious Road, Old Bon Air to Woodmont # Robious Road, Polo Parkway to Salisbury # Robious (Twin Team – Robious Forest) # Bailey Bridge (Claypoint – Manchester HS) # Various roadway projects including bike lanes/paved shoulders Sidewalk # Matoaca # Village of Chester # Village of Midlothian (Coalfield Road/Route 60/Woolridge Road) # Meadowdale(Hopkins/Meadowbrook/Cogbill) # Bon Air (Forest Hill/Buford) # Ettrick (Chesterfield Ave and side streets) # Harrowgate (Old Hundred – School Street) # Osborne (Cliff Lawn – shopping center) # Route 10, Village of Chester, Pedestrian Improvements # Smoketree (community center – Courthouse Road) # Genito Road, South of 360 # Providence (Route 60 – Woodward) # Old Hundred (East Boundary – Genito) # Kelly Green Drive (Old Hundred – school) # Spirea (Mountain Laurel – Sunflower) # Salem Church (Sara Kay – schools) # Cogbill (Chesterwood – Howell) # Deer Run (US 360 – Chital) # Coalfield (Route 60 – Watkins ES) # Robious Crossing (Polo Pkwy – schools) # Various roadway projects including pedestrian accomodations	Bike Lanes/Paved Shoulders - Active Projects # Huguenot Road from Polo Pkwy to Forest Hill Avenue # Bailey Bridge, under construction, Claypoint to Manchester HS # Clover Hill Athletic Complex/Horner Park Trail, from Genito Road to south of Otterdale Branch # Dundas Road, bridge improvements # Ettrick/Virginia State University Riverside Trail, along Appomattox River at VSU Randolph Farm # Falling Creek Historic Trail, along Falling Creek at Marina Drive # Genito Road, bridge east of Woolridge Road # Lake Chesdin Park Trail, from Ivey Mill Road to park boundary # Lucks Lane, from Spirea Road to Route 288 (2 phase project) # Old Bermuda at Old Stage Road # Providence Middle School Revitalization Project, from South Providence Road to Starlight Lane # Robious Road, from Robious Forest Way to the county line # Horner Park Trail # Lake Chesdin Trail # Bayhill Point Trail From Bikeways and Trails Plan - (0 to 10 Years) # Courthouse Road, from Belmont Road/Route 288 to Southlake Boulevard # Government Center Connector Trail, from Salem Church Road through Pocahontas State Park to Newbys Bridge Road/Route 288 # Jefferson Davis Highway (Route 1/301), from the county line to Osborne Road # Johnston Willis Drive, from Trade Road to Midlothian Turnpike (Route 60) # Manchester Middle School Revitalization Project, trail(s) connecting campus to community # Southlake Boulevard, from Courthouse Road to Trade Road # Stratton Park Trail, along Falling Creek from Chippenham Parkway to Jessup Road # Swift Creek Trail, from Pocahontas State Park to Hull Street Road (Route 360) # Trade Road, from Southlake Boulevard to Johnston Willis Drive Sidewalk - Active Projects # Harrowgate (Curtis - Hyde Park) # Old Centralia (Castlebury to Glen Oaks) # Route 1 at Ruffin Mill Road # Belmont (Belrun to Lamplighter) # LeGordon (Charter Colony to Midlothian Wood) # Providence (Route 60 to Woodward Drive) # Bailey Bridge (Battlecreek to Manchester High School) # Spring Run (Brocket to Spring Run Elementary School) # Ecoff (Ivywood to Ken Drive) # Elkhardt at Providence Middle School	# Bike lanes are maintained by VDOT # Sidewalk is maintained by VDOT unless on private property # Trails to be maintained by VDOT or Chesterfield Department of Parks and Recreation	# 2008 - Chesterfield County elementary Schools (38) walkability audits and curriculum. # 2010 - Robious elementary school / Middle School Sidewalks. # 2010 Robious Middle School, Robious, Bettie weaver, Clover Hill elementary schools Enforcement crossing guard and safety patrol training # On-going efforts to connect pedestrian paths to trails and schools	# East Coast - Route 10 Target - Colonial Heights # DSCR (Defense Supply Center Richmond) # Chesterfield Baptist # Lowe's on US 360 at Winterpock Road # Swift Creek Baptist Church on Spring Run Road # John Tyler Community College on Route 1 # Midlothian P&R (Lowe's, Chesterfield Town Center) # Wawa Rivers Bend & 295 across from McDonald's # Kroger Marketplace at Stonebridge, Walmart (Brook & Parham) # K-Mart (The Breckenridge Center), Route 1 & Route 10 # 12810 Jefferson Davis Hwy # Food Lion (Route 1) # Walmart (Route 10)

Bicycle & Pedestrian

FIG. 4.3. FIG. 4.1: RRTPO BIKE-PED MATRIX

Jurisdiction	Bike- Ped In Comprehensive Plan/ Other Plans	Plan Adoption Date	Zoning/Subdivision Ordinances	Bike-Ped Corridors		Maintenance Programming	Other Bike and Ped improvements	Park And Ride
				Existing	Proposed			
Goochland	#Area Plans: Centerville Village/Goochland Courthouse Village/West Creek # Build small segments of pedestrian pathways or bikeways on project-by-project basis to form an interconnected network of pedestrian pathways in the long term as segments are connected. # Safe, well-designed pedestrian pathways to be provided when recommended by village design standards. Design standards address landscaping, lighting, placement of buildings, and parking to improve walkability. # Investment in the County's transportation network should promote: #Safety (including pedestrian safety) #Accessibility and interconnectivity of different travel modes # West Creek Multi-use Trail - Connect Rte. 250 and Rte. 6 with a public multi-use trail. # Identify suitable location for Park-and-Ride lot in Centerville Area	June 4, 2015	Zoning Ordinance, Appendix A, Route 250 and Goochland Village Courthouse Overlay Districts, sidewalks and interconnectivity required	# Bike Route 76	#Goochland Courthouse Village, #River Road Community West Creek Multi-use Trail	# Bike lanes and sidewalks maintained by VDOT unless on private property	n/a	# I-64 at Ashland Rd # I-64 at Oilville Rd #Centerville/West Creek Area (future)
Hanover	The Comprehensive Plan, Transportation Plan, recommends roads be designed in accordance with illustrated cross sections, some of which include sidewalks/ bike ways; objectives include providing options for multimodal transportation networks through land development design that reduces dependency on motorized vehicles. Comprehensive Plan, Land Use Plan, includes strategies for suburban development that includes promoting the interconnection of communities to enhance vehicular, bicycle, and pedestrian circulation and reduce demand along existing and proposed thoroughfares.	Sept. 11, 2013	#Rural Conservation Districts - Permitted Use §26-54 #Single-family Residential District - Street Buffer Requirements §26-66 #Multi-Family Residential District - Street Buffer Requirements §26-77 #Mixed-Use District - Street Buffer Requirements §26-96	#Cold Harbor Battlefield Park #Hanover Wayside Park #Montpelier Park #North Anna Battlefield Park #Pole Green Park #Poor Farm Park #Courthouse Park #Washington Lacy Park	#Trolley Line Trail #Mattaponi Trail #Pamunkey Trail #East Coast Greenway	n/a	Laurel Meadow Elementary School, completed in 2011	# US 360 and Rte. 640

FIG. 4.4. FIG. 4.1: RRTPO BIKE-PED MATRIX

Jurisdiction	Bike- Ped In Comprehensive Plan/ Other Plans	Plan Adoption Date	Zoning/Subdivision Ordinances	Bike-Ped Corridors		Maintenance Programming	Other Bike and Ped improvements	Park And Ride
				Existing	Proposed			
Henrico	Bicycle Facility Policies : # States to facilitate bicycle travel along all planned and existing designated, long distance bicycle routes in the county (Rtes 1, 76 and VA Capital Trail) through use of signage, shared lanes, bike lanes and shared use paths. # Sates to consider the accommodation of bicycles in the planning and design of all major road projects where feasible. # States to encourage bicycle accommodations in conjunction with new development. # States to consider the development of a county-wide bicycle plan in order to identify and evaluate potential locations for bicycle facilities. Pedestrians Policies: # States to encourage new developments to install sidewalks and other pedestrian facilities. Connections to other neighborhoods and key destinations such as schools, libraries, parks, etc., are encouraged. # Sidewalks and other pedestrian pathways along all new and reconstructed major thoroughfares excluding interstate highways and other controlled-access roads are required. # The Draft Comprehensive plan identifies roads suggested for bike lanes or paved shoulders. # Potential off-road corridors and areas that need attention to pedestrian accommodations (especially within designated Village areas) have been identified.	Aug. 11, 2009	n/a	# Trans-American Route / US Bike Route 76 # Interstate Bike Route 1 # VA Capital Trail # Sidewalks on all new and reconstructed thoroughfares.	• East Coast Greenway • Additional connections and spurs to the VA Capital Trail • Construction of mixed-used trails where feasible in conjunction with road improvement projects #Sidewalk retrofit projects countywide where feasible #Pedestrian accommodations along GRTC transit routes	# No maintenance policies regarding bicycle lanes. # Sidewalks within the ROW are maintained by Henrico County unless there is a maintenance agreement that indicates otherwise.	n/a	# Gaskins Road at I 64 # Parham Road at Fordson Road # Glenside Drive and Staples Mill Road, #White Oak Village Shopping Center
New Kent	#There are several places in the Comprehensive Plan (both in the text and maps) that refer to increases in bicycle and pedestrian accommodations, especially in designated Village areas. #New Kent has 6 designated bicycle routes, but are designed for Class A (expert) riders due to insufficient shoulders. #Major Thoroughfare Plan and Rural LRTP call for remedy of insufficient shoulders on major corridors, to improve safety.	Oct. 12, 2012	Includes requirements for lighting and landscaping, including pedestrian accommodations in residential subdivisions and within areas designated as Village	# There are 6 designated bicycle routes throughout the County #Pedestrian accommodations in New Kent Courthouse and Bottoms Bridge Village areas	Continued progress on the Courthouse to Courthouse connector (between Charles City and New Kent along Route 155)	Funding in place to repair broken or missing bicycle route signage or poles	n/a	Designated Park and Rides at Route 60 in Bottoms Bridge and just off Exit 214 on Poindexter Road.

FIG. 4.5. FIG. 4.1: RRTPO BIKE-PED MATRIX

Jurisdiction	Bike- Ped In Comprehensive Plan/ Other Plans	Plan Adoption Date	Zoning/Subdivision Ordinances	Bike-Ped Corridors		Maintenance Programming	Other Bike and Ped improvements	Park And Ride
				Existing	Proposed			
Powhatan	# States to promote "complete street" designs that promotes pedestrian and bicycle friendly facilities with design that is compatible with land use quality objectives, including distinctions between rural characters and strategically located mixed-use districts. # States to address the above mentioned objective by promoting pedestrian and bike improvements, especially in new developments, to enhance walkability. New Streets should connect to new and existing sidewalks and off-street pedestrian or multi-use paths in a way that promotes safe crossing for pedestrians and improves opportunities for using multiple modes of travel.	July 12 2010	n/a	#Interstate Bike Route 1 (along Genito Road) #3 "Share the Road" #Courthouse to Library #Fighting Creek Park Trails	# James River Heritage Trail # Population Centers to Parks	n/a	n/a	None.
Richmond	Richmond Strategic Multimodal Transportation Plan *"Richmond Connects" completed January 2013 *Included recommendations for bike lanes and cycletracks in downtown and throughout much of the city (pending more in-depth analysis) *Recommends a Complete Streets approach to planning and design Bike Master Plan *completed in March 2015 as an Appendix to Richmond Connects *Proposes more than 100 lane miles of bike lanes, buffered bike lanes, and cycletracks (barrier-separated bike lanes), including in downtown *Proposes ~35 lane miles of bike/walk streets (traffic calmed streets, aka bike boulevards) *Proposes more than 30 linear miles of shared-use paths/greenways *Emphasis on improved bridge crossings	SMTP completed January 2013 but will be adopted as part of Comp Plan revisions BMP will be adopted as an appendix to the SMTP with the Comp Plan revisions	Revisions to the City's subdivision ordinance are in draft form currently. The draft includes provisions for sidewalks and connectivity to existing city right of way and pedestrian infrastructure.	*80+ lane miles of signed bike routes with sharrows *24 lane miles of bike lanes including more than 8 lane miles of buffered bike lanes *4 lane miles of bike/walk streets *3 linear miles of paved, shared-use paths *Potterfield bike/ped bridge over James and associated paths under construction	*22 lane miles of bike lanes (buffered and contraflow) in FY17 *Avg of 2+ lane miles of bike boulevards each year *~80 additional lane miles of bike lanes by 2025 *Shared-use paths and greenways as funding becomes available. Existing goal of 1 linear mile per year.	n/a	n/a	*K- Mart - Midlothian Tpke & Greshamwood Pl *Southside Plaza

plan2040

Rail in the Richmond Region

The movement of people and goods by rail provides an efficient, cost effective and environmentally beneficial transportation mode choice for residents and businesses. The Richmond region is traversed by several key rail corridors and is positioned as a vital lynchpin connecting the Southeast High Speed Rail (SEHSR) corridor with the Northeast Corridor (NEC), an electrified railway line that runs from Washington, D.C through Baltimore, Philadelphia, New York City to Boston. Additionally, the region is served by both of Virginia's Class I railroads, CSX and Norfolk Southern.

The metropolitan transportation planning process can support policies that advocate investments in the rail system and to a lesser degree, also identify projects to be funded with TPO-directed financial resources. While the regional financial resources are not sufficient to support improvements for an entire corridor, the region is capable of supporting spot-improvements with independent utility such as siding extensions, crossovers, signal upgrades or grade-separation of crossings which can improve the performance of the rail system to the benefit of both passenger and freight movements.

This section will summarize statewide rail planning efforts and funding, an introduction to key CSX and Norfolk Southern corridors passing through the region, and higher speed passenger and freight rail capacity improvements contemplated along the East Coast.

Virginia Statewide Rail Plan

In 2013, the Virginia Department of Rail and Public Transportation (DRPT) completed the Virginia Statewide Rail Plan. The purpose of this plan was to provide a vision for rail transportation in the Commonwealth of Virginia through 2040. The plan outlines the current condition of Virginia's rail system, challenges facing the system, and identifies projects necessary for improvement of the network. A companion document, the Resource Allocation plan, details project selection and prioritization, funding and implementation schedules. The figure lists the $6.9 Billion in projects contemplated in the statewide plan recommendations for rail resource allocation.

According to DRPT's Statewide Rail Plan, in 2013 Virginia's rail system consisted of nearly 3,400 route miles, most of which are operated by two Class I railroads—the Norfolk Southern (2,020 miles) and CSX (850 miles) and nine shortline railroads. The Surface Transportation Board defines Class I national railroads as line-haul freight railroads exceeding $433.2 million in 2011 annual operating revenue, and Class III shortline railroads are line-haul carriers with annual revenues less than $34.7 million in 2011 revenues. Two of Virginia's nine shortlines are primarily switching railroads serving marine terminals and industrial

Rail Resource Allocation Plan Recommendations (VSRP, 2013)

Projects by Corridor	Total Cost ($2012)
I-95/I-64 Transportation Corridor	**$5,538,326,476**
I-95 Passenger Service Capital	$287,055,518
Phase I	$194,141,752
Phase II	$92,913,766
I-95 Passenger Service Operating	$108,063,559
Phase I	$17,279,871
Phase II	$78,253,593
Phase III	$12,530,095
Southeast High Speed Rail	$3,776,971,620
Phase I—Tier II EIS DC2RVA	$130,225,119
Phase II—DC2RVA Improvements	$1,656,554,650
Phase III—Hampton Roads	$576,994,923
Phase IV—Richmond to Raleigh	$1,413,196,928
National Gateway	$205,789,400
Phase I	$53,076,686
Phase II	$152,712,714
I-64 Passenger Service Capital	$46,637,139
Phase I	$11,637,139
Phase II	$35,000,000
I-64 Passenger Service Operating	$71,509,240
Phase I	$12,131,823
Phase II	$59,377,417
VRE	$1,042,300,000
Phase I	$32,500,000
Phase II	$1,009,800,000
I-81 Transportation Corridor	**$1,142,271,768**
Crescent Corridor	$628,485,743
Phase I	$186,571,700
Phase II	$61,800,000
Phase III	$380,114,043
US 29, 460 & I-81 Passenger Service Capital	$505,320,063
Phase I—Lynchburg Service	$103,658,630
Phase II—Extension to Roanoke	$128,364,197
Phase III—Extension to Bristol	$47,694,234
Phase IV—Two Roundtrips to Lynchburg	$91,338,957
Phase V—Two Roundtrips to Roanoke	$109,786,726
Phase VI—Extension to Richmond	$24,477,319
US 29, 460 & I-81 Passenger Service Operating	$8,465,962
Phase I	$2,049,849
Phase II	$6,416,113
Route 460 Heartland Transportation Corridor	**$60,375,000**
Phase I	$36,375,000
Phase II	$24,000,000
Port of Virginia	**$64,618,177**
Phase I	$9,611,806
Phase II	$55,006,371
Shortline Program	**$119,057,269**
Phase I	$82,312,519
Phase II	$36,744,750
Total	***$6,924,648,690***

FIG. 6.1. LONG-RANGE RAIL RESOURCE ALLOCATION PLAN RECOMMENDATIONS (VSRP, 2013)

facilities. There are no Class II Railroads in Virginia. Two passenger systems—Amtrak and VRE—provide service over this private freight railroad system. Major lines run north-south and east-west, and important rail lines converge at key nodes: Norfolk, Richmond, Lynchburg, Roanoke, and Alexandria.

Statewide Rail Funds

DRPT's Rail Division manages grant programs to implement freight and passenger rail initiatives. These funds have evolved over time and at present help to maintain a competitive rail network serving the Port of Virginia and to divert truck traffic from the state's highways.

Rail Industrial Access Fund

The Rail Industrial Access Program promotes truck diversion by providing grant assistance to connect new or expanding businesses to the freight railroad network. The program supports localities, businesses, or industries seeking access to a common carrier railroad. Applications are accepted throughout the year.

Rail Preservation Fund

The Rail Preservation Fund benefits the shortline railroads, which provide the "local" network and the "last mile" of rail freight service. It promotes the continuation of rail service by achieving Federal Railroad Administration Class 2 track safety standards. It also promotes development of rail transportation support facilities, encouraging industrial growth and promoting truck diversion from Virginia's highways.

Rail Enhancement Fund

The Rail Enhancement Fund is a dedicated source of funding for capital improvements benefiting passenger and freight initiatives. Applications must achieve a Benefit-Cost Ratio of 1.0 or greater, meaning the value of public benefits must be greater than the public funds invested within an established time period. This fund is typically utilized by Class I railroads, the Port of Virginia, and Virginia Railway Express for major capital investments.

Intercity Passenger Rail Operating and Capital Fund

The Intercity Passenger Rail Operating and Capital (IPROC) Fund provides operational funding for four state-supported Amtrak Routes, consisting of six state-supported Amtrak trains. The Passenger Rail Investment and Improvement Act of 2008 required states with Amtrak

FIG. 6.2. LOCATION OF RECOMMENDED VIRGINIA STATEWIDE RAIL PLAN PROJECTS BY CORRIDOR (VSRP, 2013)

services less of than 750 miles to pay for the routes or cease operation. This fund enables the Commonwealth to continue those services. It is also the source of funds for passenger rail equipment upgrades and capital improvements.

Virginia's Class I Railroads

Two of the Nation's Class I railroads, CSX and Norfolk Southern, operate in Virginia. These railroads own the majority of freight rail track infrastructure in the State. Norfolk Southern operates roughly 60% of Virginia's freight rail track, while CSX operates about 30%. Both CSX and Norfolk Southern have been working on system-wide corridor investments to improve the intermodal connectivity to U.S. mid-west markets.

Both railroads provide major east-west and north-south connections. Typically, tonnage that is Virginia-based (moving inbound, outbound, or within the State) moves east-west and is focused on the Port of Virginia. By tonnage, coal accounts for over two thirds of Virginia-based rail traffic. Rail tonnage that has both an origin and destination outside Virginia (pass-through traffic) primarily moves north-south.

Norfolk Southern

Norfolk Southern operates approximately 20,000 route-miles in 22 eastern states and the District of Columbia, and serves every major container port in the U.S. This network includes 2,079 miles in Virginia along three corridors; the Crescent Corridor, the Heartland Corridor, and the Coal Corridor.

The Crescent Corridor consists of two north-south lines. The Piedmont line runs from Alexandria to Danville, and the Shenandoah line runs from Front Royal to Bristol and serves the Virginia Inland Port. Principal train types on these lines are intermodal, general merchandise, and auto. The Heartland Corridor runs through the southern portion of the State from the Hampton Roads to West Virginia. The Heartland Corridor is Norfolk Southern's primary intermodal train system connecting the Port of Virginia to Midwest markets. The Coal Corridor is the line with the heaviest use, carrying unit trains from the Appalachian coalfields to the Norfolk Southern Coal Marine Terminal at Lambert's Point, Norfolk.

CSX

CSX operates a 21,000 route-mile network serving 23 states, Washington, DC, the Canadian provinces of Ontario and Quebec, and 70 ports. The Virginia portion of this network is 1,054 miles. CSX trains in the Commonwealth move along the National Gateway and Coal Corridors. The National Gateway Corridor generally follows I-95 with an extension to Hampton Roads. It is CSX's principal intermodal train system connecting the Port of Virginia to external markets. Like the Norfolk Southern Coal Corridor, the CSX Coal Corridor is the company's line of heaviest use, transporting coal from Appalachia through Richmond to Peninsula coal marine terminals.

Corridor Profiles

The following corridors, and improvements described, are of utmost significance to rail operations and economic competitiveness in the Commonwealth of Virginia. Improvements to this network result in significant gains, both public and private. Benefits accrue to:

- Import and export customers: increased capacity and decreased transit time.
- The Port of Virginia: making the port more attractive to ocean carriers by improving intermodal connectivity to the U.S. Midwest markets.
- The public: removing trucks from highways improves safety, lowers maintenance costs, alleviates congestion, and reduces fuel consumption and greenhouse gas emissions.

Most importantly, network improvements cannot be considered in either geographic or proprietary isolation. A network, by its nature, spreads the benefits of improvement throughout the system to many users. Therefore, enhancements can be leveraged into proportionally outsized gains. For the same reason,

investment must be considered with great care and foresight. When opportunities exist, the region must be deliberative, but also ready to act.

The Heartland Corridor

The Heartland Corridor is a public-private partnership between Norfolk Southern and Virginia, West Virginia, Ohio, and the federal government to create the shortest, fastest route for double-stacked container trains moving between the Port of Virginia and the Midwest. The new routing improves transit time between Norfolk and Chicago from four days to three, and is nearly 250 miles shorter than previous routings.

The 2010 opening of the corridor to double-stacked intermodal traffic was the result of one of the most extensive railroad engineering projects of the last century. It is also a model of the type of public-private partnerships that can strengthen Virginia's and the Nation's transportation infrastructure.

National Gateway

The National Gateway is an innovative public-private partnership that will create a double-stack freight rail corridor between Mid Atlantic sea ports and the Midwest. The improvement projects are designed to increase the vertical clearances at 61 locations on CSX rail lines in the region to accommodate intermodal trains carrying double-stack intermodal containers. Phase One of the National Gateway – providing double-stack clearance between CSX's existing intermodal terminal in Chambersburg, PA and a new intermodal hub facility in Northwest Ohio - was completed in 2013; Phase two of the project will provide for double-stack clearance of the CSX corridors between Chambersburg and the Port of Baltimore and Port of Virginia. The project is targeted for completion by 2017 and will coincide with the expansion of the Panama Canal, which is expected to bring more traffic through East Coast ports.

Regional Impacts of the Heartland and National Gateway Corridors

While the Heartland and National Gateway Corridors are major undertakings, opportunities for system improvements that enhance regional competitiveness are abundant. This region's rail network is the legacy of four separate railroads whose confluence was Richmond. The result of this fragmentary infrastructure today is a network that is heavily congested due to traffic volume, a mix of train types, and many conflicting routes.

Improvements to facilities such as CSX's Fulton rail yard and "S" line could bring benefits to Richmond like those that the Heartland Corridor and National Gateway will generate for the Port of Virginia and Hampton Roads. Improved rail access could have a positive impact on the Richmond Marine Terminal and its growing barge service.

Existing Intercity Passenger Rail

The Richmond region is located at the juncture of two of the nation's most important rail corridors. It is located at the southern end of Amtrak's Northeast Corridor (NEC) which runs from Boston to Newport News and Lynchburg via New York, Philadelphia, Baltimore, Washington D.C., and Richmond. Within Virginia, the NEC service comprises over 350 miles, and includes stops at Alexandria, Franconia/Springfield, Woodbridge, Quantico, Fredericksburg, Ashland, Richmond (Staples Mill Road/Greendale Station and Main Street Station), Williamsburg and Newport News, Charlottesville and Lynchburg. Investment in passenger rail benefits the surface transportation system by providing more reliable passenger service, increased highway capacity for goods movement, reduced fuel consumption per passenger mile, and a reduction in highway system impacts.

Main Street Station

The Main Street Station, located in downtown Richmond, has been undergoing restoration for multiple years and is a TPO Regional Transportation Priority Project. The project has been divided into three phases. The first phase was completed in December 2003, coinciding with the ending of a 28-year hiatus of having rail service into the City of Richmond's central business district. Phase two was completed in September 2007 and included the purchase of the remainder of the Main Street Station property and the rehabilitation of the head house.

The two phases, with a total investment of $39.3 million, were funded primarily by federal funds with other funding by the City and $2 million in RRTPO CMAQ allocations. The development schedule for Phase 3 is targeted for completion in 2017 and includes the restoration of the train shed, development of the seaboard buildings, and other improvements in support of the proposed Broad Street Bus Rapid Transit (BRT) project.

Richmond area residents are served by three primary north-south routes operated by Amtrak:

- Boston-New York-Washington-Richmond-Norfolk (Northeast Regional service) – this Amtrak route includes five northbound and five southbound trains operating each day along this route allowing for travel from Central Virginia to points along the Northeast Corridor.

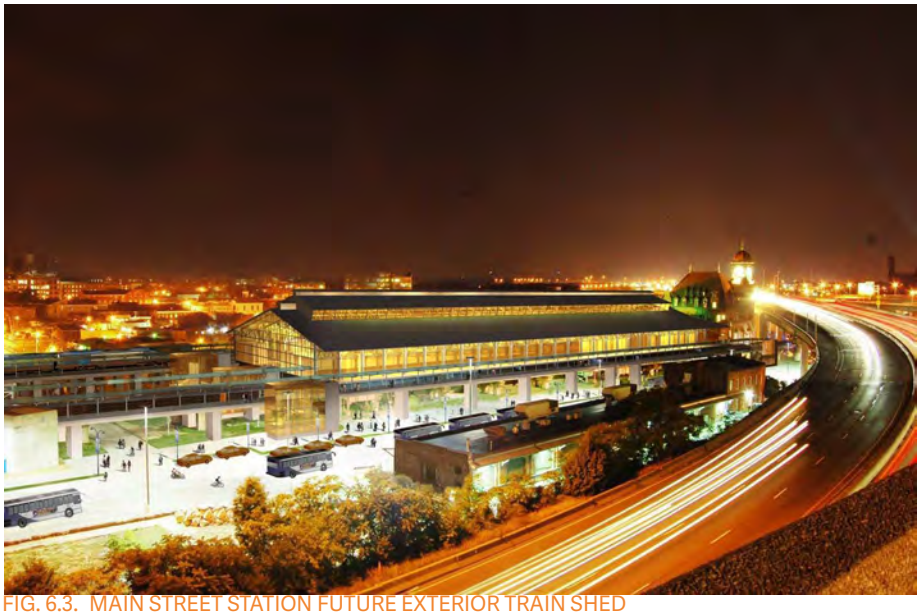


FIG. 6.3. MAIN STREET STATION FUTURE EXTERIOR TRAIN SHED

- New York-Washington-Raleigh-Jacksonville (Silver Meteor/ Silver Star/Palmetto service) – This Amtrak route includes 175 miles in Virginia, with stops at Alexandria, Quantico, Fredericksburg, Richmond, and Petersburg. Three southbound and three northbound trains operate each day along this route, resulting in 21 weekly northbound and 21 weekly southbound trips.

- New York-Washington-Raleigh-Charlotte (Carolinian service) – The Carolinian service traverses 175 miles in Virginia, with stops in Alexandria, Quantico, Fredericksburg, Richmond, and Petersburg. One train trip is made daily in the northbound and southbound directions.

The Richmond region is also located at the northern end of the Southeast High Speed Rail (SEHSR) Corridor; one of the five original national corridors designated under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) which authorized a program of high-speed rail corridors nationwide. The SEHSR corridor was first designated by the U.S. Department of Transportation in 1992, and ran from Washington D.C. to Charlotte, N.C. via Richmond and Raleigh, N.C. Its original designation was extended to include South Carolina, Georgia and Florida. The SEHSR corridor has also been extended to include a link between Richmond and Hampton Roads. The status of SEHSR corridor improvements and higher speed rail studies is described in the next section.

Southeast High Speed Rail

The Southeast High Speed Rail Corridor (SEHSR) is a passenger rail project to extend high-speed passenger rail services from Washington, D.C. south through Richmond to Petersburg with a spur to Norfolk (Hampton Roads region) and to Raleigh, Durham, Greensboro and Charlotte in North Carolina, through Greenville, South Carolina,

terminating in Atlanta. Virginia DRPT has been working with North Carolina, South Carolina, and Georgia to advance this project.

In October 2010, Virginia received $44.3 million in federal high speed rail funds to complete the Tier I EIS for the portion of SEHSR between Richmond and Washington, D.C. With these funds, the DC2RVA Tier II Environmental Impact Statement (EIS) was initiated in the fall of 2014 by DRPT. The study will analyze specific rail infrastructure improvement alternatives and service upgrades intended to improve the travel time, service frequency, and on-time performance of passenger trains operating between Washington, D.C. and Richmond, VA. The DC2RVA corridor is one component of a broader east coast rail system, extending from Atlanta to Boston, undergoing rail improvement studies endorsed by the Federal Railroad Administration (FRA).

Required by the National Environmental Policy Act (NEPA), the EIS describes the potential impacts of proposed activities or projects on the natural and physical environment. The EIS is a tool for decision-making which evaluates multiple project alternatives, and is generally phased into two or more rounds – or "tiers" – of environmental review. In Tier I, the EIS analyzes a project on a broad scale, considering general environmental conditions and levels of impact with little to no site-specific detail. In Tier II, the EIS examines project alternatives in greater detail, and impacts are addressed with potential mitigation measures. Upon approval of Tier II documentation, the decision on a preferred alternative leads to an official Record of Decision (ROD) which ultimately allows for permitting, final design, right-of-way acquisition and construction to move forward.

The DC2RVA segment of the SEHSR corridor is a vital lynchpin between the Northeast Corridor (NEC), an electrified railway line that runs from Boston through New York City, Philadelphia, and Baltimore to Washington, D.C., and the greater SEHSR corridor. Each segment comprising the overall NEC and SEHSR system is at various stages in the NEPA/EIS process as visualized in the following map (Conceptual Location of NEC and SEHSR Corridors under Study) and described below:

- NEC – The Northeast Corridor, the most heavily traveled rail corridor in the U.S., is under study as part of the NEC FUTURE Tier I EIS. The FRA launched NEC FUTURE in February 2012 to determine a long-term vision and investment program for the NEC, in addition to meeting NEPA requirements. The Tier I EIS and Vision are expected for completion in 2016.

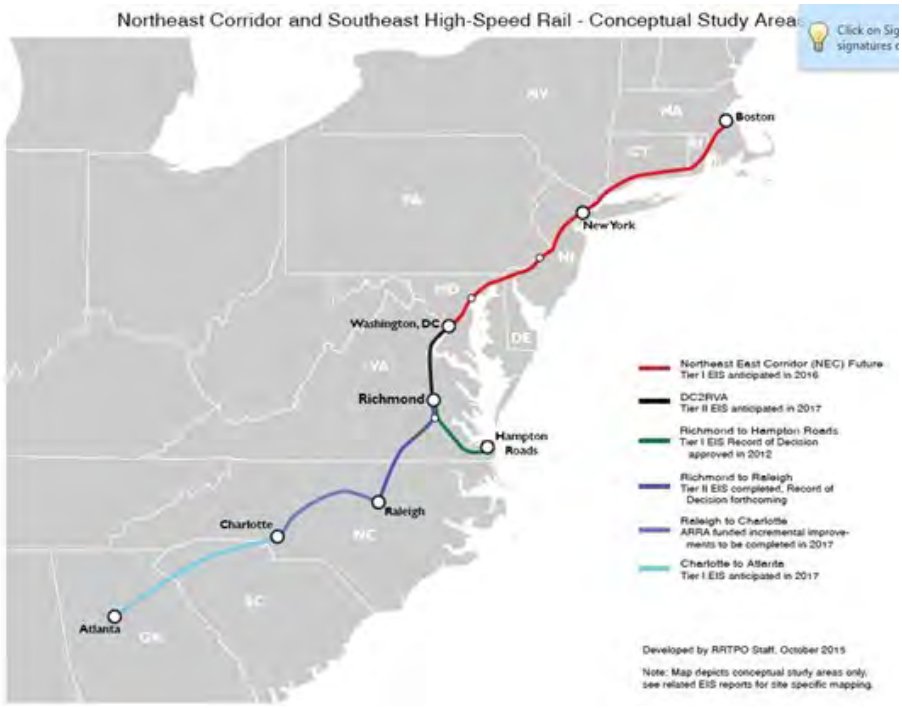


FIG. 6.4. NORTHEAST CORRIDOR AND SOUTHEAST HIGH-SPEED RAIL

- DC2RVA – The Washington, D.C. to Richmond segment was initially studied and proceeded through the Tier I EIS process as part of the October 2002 Record of Decision (ROD) for the entire Washington, D.C. to Charlotte SEHSR corridor. DRPT has begun work on the Tier II EIS focused on the DC2RVA segment, with a final document anticipated in 2017.

- Richmond to Raleigh – The Richmond to Raleigh segment also proceeded through Tier I as part of the October 2002 ROD for the Washington, D.C. to Charlotte corridor. The Draft Tier II EIS for Richmond to Raleigh was completed in 2010, at which point FRA, NCDOT and Virginia DRPT undertook an extensive public engagement and review process. The Final Tier II EIS was recently completed and signed by FRA in September 2015, with a Record of Decision expected in 2016.

- Richmond to Hampton Roads – The Richmond to Hampton Roads spur of SEHSR was studied in a separate Tier I EIS process from the Washington, D.C. to Charlotte corridor. In 2010, the Commonwealth Transportation Board (CTB) selected a preferred alternative for enhanced passenger rail service between the two regions. The preferred alternative addressed both Peninsula service between Richmond and Newport News as well as Southside service between Richmond and Norfolk. The Final Tier I EIS was approved by FRA in August 2012, and approval of the Record of Decision followed in December 2012.

- Raleigh to Charlotte – The Raleigh to Charlotte segment of SEHSR has advanced through Tier II and is now under construction. The rail improvements along this segment were largely funded through federal stimulus money from the American Recovery and Reinvestment Act (ARRA).

- Charlotte to Atlanta – The Charlotte to Atlanta segment is an extension of SEHSR, building on the prior study of the Washington, D.C. to Charlotte corridor. The Tier I EIS for Charlotte to Atlanta is currently underway and is anticipated for completion in 2017.

Next Steps

As of publication of plan2040, the Tier II EIS document and Record of Decision for the DC2RVA segment of SEHSR had yet to be finalized. Upon adoption by FRA, the RRTPO will be in position to consider possible investments in projects of independent utility to advance implementation of this project.

Status Check on National Rail Plan and Policies

In 2008, Congress passed the Passenger Rail Investment and Improvement Act (PRIIA) which was subsequently signed into law. 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." As of 2016, the FRA has yet to formally adopt a National Rail Plan, however, a number of building block documents have been released in subsequent years; most notably the National Rail Plan: Progress Report released in September 2010.

FRA's vision for a national rail program as outlined in the progress report, is to develop tiered passenger rail corridors that take into account different markets and geographic contexts:

Core Express Corridors: These routes would connect large urban areas up to 500 miles apart with 2-3 hour travel times and train speeds between 125 and 250 mph. Service will be frequent and will operate on electrified, dedicated track that is publicly owned. Based on their operation in and between large, dense metropolitan regions, the Core Express corridors will form the "backbone" of the national passenger rail system.

Regional Corridors: This network would connect mid-sized urban areas, and smaller communities in between, with convenient, frequent 90-125 mph service on a mix of dedicated and shared track. In some areas, these corridors could connect to Core Express corridors, with many potential passenger services operating over both the Core Express and Regional routes.

Emerging/Feeder Routes: Emerging routes would connect regional urban areas at speeds up to 90 mph on shared track. In some areas, the Emerging/Feeder routes could connect to the Core Express or Regional corridors, allowing residents of these smaller or more distant areas to have efficient access to the national system.

Since the delivery of the Preliminary Plan, the FRA has begun official work on the NRP. The process commenced with FRA led public outreach events and meetings with expert stakeholders to gain a comprehensive understanding of the issues, and develop strategies to leverage strengths of the current system. The next steps include identifying regions of the country where Core Express, Regional, and Emerging/Feeder corridors could be feasible; estimating investments to develop the passenger rail network and improve freight rail intermodal corridors; and evaluating the return on investment, including public benefits, from system investments. Finally, there will be a comprehensive strategy to implement the Plan with legislative, policy, and administrative recommendations.

Already, however, the Richmond region has been included in the federally designated Southeast High-Speed Rail (SEHSR) Corridor. The SEHSR Corridor consists of a number of rail segments located in South Atlantic states with through service to and from the Northeast Corridor. The majority of HSR development thus far has been focused on the portion of the Corridor from Washington, D.C. to Charlotte, N.C. The SEHSR Corridor will include operations at top speeds of 110 mph, meaning that it will likely be defined as a Regional Corridor in the NRP. Recently, Draft Environmental Impact Statements (DEIS), critical components to project development, were issued for the Richmond to Hampton Roads and Richmond to Raleigh sections of the corridor.

plan2040

Freight & Intermodal Systems

The Richmond region's freight transportation system is an interconnected, complex network of highways, local roads, navigable waterways, and rail lines linked to each other through hubs at the Richmond Marine Terminal, Richmond International Airport, major railyards, and distribution and warehousing facilities spread throughout the region. This system accommodates the movement of raw materials and finished products from the entire spectrum of agricultural, industrial, retail, and service sectors of the regional economy. More than 85,000 people in the Richmond region are employed in freight intensive industries, including over 20,000 people employed directly in the transportation and warehousing sector. Collectively, the state's multimodal freight network and freight intensive industries support jobs throughout the Commonwealth.

The effective incorporation of freight transportation considerations into the metropolitan transportation planning process is extremely important because the freight system is a crucial contributor to the regional economy and quality of life. In the past, regional engagement in directing policy or projects to benefit the movement of freight was left primarily to the private sector; this is not the case today. Recognizing the need to reassess our competitive market position and develop strategies to improve intermodal connections, the RRTPO undertook a regional planning effort in conjunction with Tri-Cities MPO. The study, "Richmond/Tri-Cities Regional Intermodal Strategies" (study), was accepted by the RRTPO on May 10, 2010. Since 2010, the RRTPO has continued to engage in work efforts advancing the consideration of freight in the metropolitan transportation planning process, including engagement through stakeholder members of the Richmond's Future Logistics Roundtable.

The freight transportation system is important to consider in long-range planning because of both its positive and negative contributions to communities. The metropolitan planning process must not only consider the benefits, but also the negative externalities of freight movements, including consideration of the health impacts of air pollution, noise and vibration impacts of heavy trucks and trains, and the potential for disproportionate impacts on low-income and/or minority communities.

Graphic source: Beyond Traffic 2045, USDOT

An efficient transportation system is a necessary condition for economic competitiveness and for realizing the full economic potential of the region. On the other hand, freight – along with the rest of transportation sector – produces many negative externalities, which, in turn, can generate community opposition to freight activities . The metropolitan transportation planning process must seek to balance freight benefits and drawbacks.

Freight is ubiquitous, it is all around us, but often unseen. The freight system is a multimodal engine that drives our economy. Access for goods moved by trucks, trains, and barges from and to our coastal ports in Hampton Roads provides a critical gateway to the global economy. Imports arrive in Virginia's deepwater ports on large container ships and are transferred to trucks, trains, and barges which take the cargo to intermodal transfer centers and, from there, to warehouses and stores across the Commonwealth and around the nation. The Commonwealth's ability to compete in global markets, and to meet the needs and expectations of consumers and industry, depends on a robust multimodal freight transportation system.

The Richmond area has a long history of providing intermodal services to the region and to points further west in Central Virginia. In its early history, the James River was used as a major shipping route to bring products and raw materials to markets along the Eastern Seaboard and to world markets across the Atlantic. As time progressed, rail movement became a primary means of moving freight and helped shape the country's urban centers. Remnants of the large scale rail facilities can still be seen around the area, as well as in the major rail lines which are in active use. With the invention and commercial application of the internal combustion engine, trucks became an important mode for moving freight around the United States. Early US Routes like Route 1 and 301 as well as Route 60 and 360 were forbearers of the interstate system that were important truck lines. The advent of the Interstate system did not leave the Richmond area behind, as Interstates 95, 64 and 85 converge in the Richmond region.

Given the Richmond region's natural locational advantages for goods movement, it will be imperative that the transportation system be maintained and adequately adjust to meet future needs. With the rise of online shopping and next-day delivery, the planning and investment in infrastructure and vehicles (trains, trucks and vessels) that make the freight transportation system work can be easily taken for granted.. But, today, the freight system is strained. The roads, and railways along the eastern seaboard are becoming

Chmurra JobsEQ Industry Snapshot for Richmond PDC as of Q4 2015, includes employment by two-digit NAICS codes 11-Agriculture, 21-Mining, 31-Manufacturing, 42-Wholesale Trade, and 48-Transportation/Warehousing
National Cooperative Highway Research Program (NCHRP) Report 739, Freight Trip Generation and Land Use (2012)

increasingly congested, and the continued performance of ports and inland waterways will depend on routine dredging and updates to aging facilities and equipment. Despite these challenges, there are opportunities through the metropolitan transportation planning process to identify, prioritize and fund projects to improve the performance of the freight system.

This section will examine various aspects of transporting freight within and through the region: firstly, a look at the existing network and hub facilities for rail, truck, waterborne, and air freight to and from the Richmond region; secondly, an analysis of commodity flows data; and finally the chapter will conclude with the trends and policies that will shape the future of freight transportation planning in the Richmond region.

Intermodal Freight Explained

Intermodal freight is defined as the movement of containerized cargo over air, land or water through the use of different modes of transportation (aircraft, truck, rail, barges, ships, etc.) capable of handling containers.

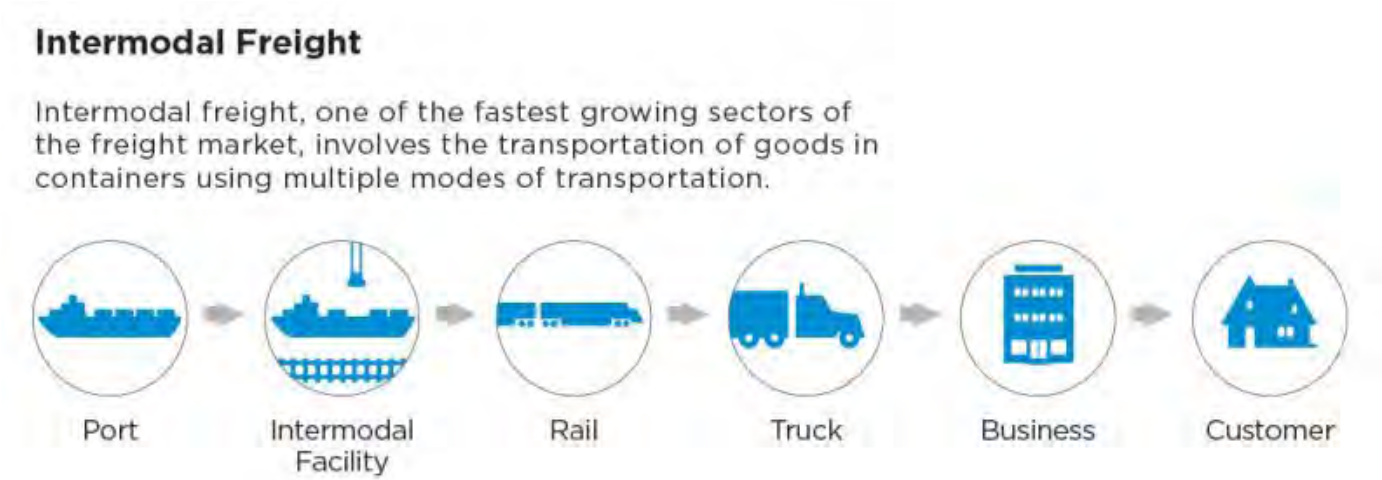
In general, goods that are high value or perishable (i.e. time sensitive) are more likely to move by faster modes, while goods that are lower value or cost sensitive are more likely to move by slower modes. For example, electronic equipment for manufacturing operations would likely be shipped by air, whereas bulk commodity grains commonly travel by rail. This plays a major role why in many cases mode shift is not likely to occur, because for high value/time sensitive goods the speed, reliability, and total travel time of transportation are highly important to manufacturers who are shipping and/or retailers who are receiving the goods.

Richmond Region Freight Infrastructure Assets - Network and Hubs

Rail

Network

Two major railroad companies have operations and tracks in the Richmond area: CSX Corporation and Norfolk Southern Corporation. They account for the majority of the freight movement in the region; complimenting CSX and Norfolk Southern is the Old Buckingham Branch rail line which primarily carries coal. Generally, CSX operations are intended to serve north-south corridors while Norfolk-Southern services east-west corridors within our region. CSX also maintains important rail sidings and spurs at Richmond International Airport and the Richmond Marine Terminal on Deepwater Terminal Railroad.



Graphic Source: National Freight Strategic Plan, USDOT

Hubs

CSX maintains Acca Yard as their primary facility with approximately 20 tracks and provides such freight services as classification, staging, bulk transfer, rail car maintenance and industrial switching. Acca Yard is physically constrained for expansion purposes. The costs to obtain the necessary land for expansion are prohibitively expensive. In addition, the yard is one of the most congested facilities on the east coast and serves CSX Railroad and Amtrak. Another drawback to the site is that the other major rail company in the region, Norfolk-Southern, does not operate at this facility. Approximately 20 tracks are available within the Acca Yard. The yard must also accommodate Amtrak passenger trains, which pass through the yard every day, complicating yard activity in order to meet scheduled train service. Acca Yard is on the federally designated Southeast High Speed Rail Corridor which will also require accommodating additional passenger rail traffic.

CSX also maintains Fulton Yard with 13 tracks with staging being its primary function, and Collier Yard with 13 tracks and limited classification and storage services as well as bulk transfer, industrial switching, and staging. Fulton Yard is smaller than Acca Yard and is limited to support facilities, staging, and limited industrial switching. The yard is used by CSX for train switching and as a staging area before trains are sent to Acca Yard for coordination into the freight movement queues. Fulton Yard is not served by Norfolk Southern. Finally, the proximity to a historic district in the City of Richmond may have additional negative impacts. There are 13 available tracks in Fulton Yard.

Note: For additional information on rail investment within the region, see the Rail in the Richmond Region section of the Technical Document.

Trucking

Network

Although freight is a multimodal system – trucking is the lifeblood of goods movement in the Richmond region and throughout the United States. It is legal for heavy duty and lightweight delivery trucks to travel on nearly every roadway in the region, however, the most critical corridors for freight movement have been designated regional multimodal freight network. The regional multimodal freight network takes into account USDOT and VDOT designated networks of national and statewide significance, in addition to regionally designated corridors from the 2010 "Richmond/ Tri-Cities Regional Intermodal Strategies".

The combined network of the "Richmond MSA Regional Multimodal Freight Network" is shown on Map 5.1; freight movement within the region is dependent upon the functionality of this network of corridors.

What types of trucks travel on the Richmond Region's roadways?

Combination Truck Carrying Intermodal Shipping Containers

Typical Truck Trip Generators: Intermodal facilities such as ocean ports, rail terminals, and inland ports

Typical Truck Trip Attractors: Intermodal facilities such as ocean ports, rail terminals, and inland ports; Manufacturing facilities; Warehousing and Distribution facilities

Combination Truck with Semi-Trailer

Typical Truck Trip Generators: Manufacturing facilities; Warehousing and Distribution facilities

Typical Truck Trip Attractors: Warehousing and Distribution facilities; Retail businesses such as grocery stores

Combination Truck with Dry Bulk or Liquid Bulk Trailer

Typical Truck Trip Generators: Grain elevators and other agricultural facilities; Raw material extraction sites; large-scale construction or demolition sites

Typical Truck Trip Attractors: Grain elevators and other agricultural facilities; Intermodal facilities such as ocean ports, rail terminals, and inland ports; large-scale construction or demolition sites; Manufacturing facilities; Landfills

Combination Truck with Auto-Rack or Flatbed Cargo

Typical Truck Trip Generators: Intermodal and roll-on/roll-off (ro-ro) facilities such as ocean ports, rail terminals, and inland ports; Manufacturing facilities; Retail businesses such as automotive dealers

Typical Truck Trip Attractors: Intermodal and roll-on/roll-off (ro-ro) facilities such as ocean ports, rail terminals, and inland ports; Retail businesses such as automotive dealers

Dump and Cement Trucks

Typical Truck Trip Generators: Raw material extraction sites; Construction or demolition sites

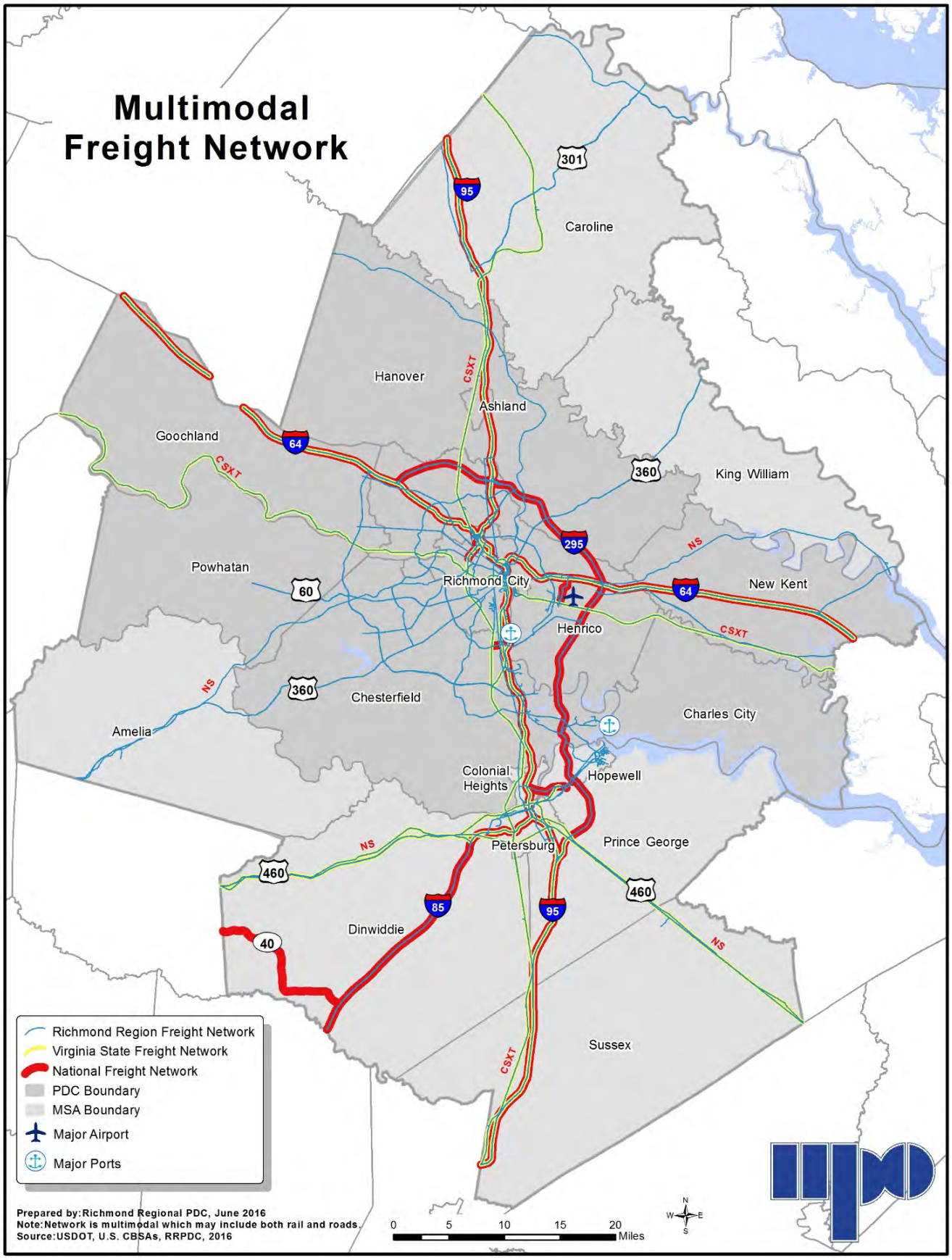
Typical Truck Trip Attractors: Construction or demolition sites; Landfills

Delivery Vans

Typical Truck Trip Generators: Mail sorting and transfer facilities; Commercial and residential areas

Typical Truck Trip Attractors: Mail sorting and transfer facilities; Commercial and residential areas

Photo credits: Virginia Office of Intermodal Planning and Investment, Virginia Multimodal Freight Plan, Appendix C, Figs. 5-1 to 5.6



MAP 5.24. MULTIMODAL FREIGHT NETWORK

Hubs

The hubs of trucking activity are dispersed throughout the region in areas of freight intensive land uses. The RRTPO has begun an effort to map and analyze freight intensive land use areas which will be used to inform the plan2045 document and to validate and improve the quality of outputs from the truck component of the regional travel demand model. Hubs of freight activity include but are not limited to industrial facilities, mining operations, agricultural processing facilities, warehousing and distribution centers, intermodal facilities, and retail centers.

Shipping and Barge

Network

The vast global maritime network consists of key shipping lanes traversing oceans, seas and inland waterways. Maritime transportation is the most effective mode to move large quantities of cargo over long distances, facilitating international trade. The Richmond region is linked to global markets through shipments to and from the Port of Virginia terminals in Hampton Roads. Shipments to and from the Port of Virginia to/from Asian markets come via the Panama and Suez Canals and from European markets via the Atlantic Ocean. Inland waterways, such as the James River serving Richmond, are critical components of the maritime network, especially in Western Europe where they are used extensively for goods movement.

Hubs

Richmond Marine Terminal

The Richmond Marine Terminal is strategically located to play a major role in the future economic development for central Virginia by virtue of its location and capability to provide a link to domestic and international markets and the global economy. The Richmond Marine Terminal, under operations by the Port of Virginia, currently has through bills of lading with 9 international carriers; providing the advantage for goods bound for Richmond to forgo customs screening in POV's terminals in Hampton Roads.

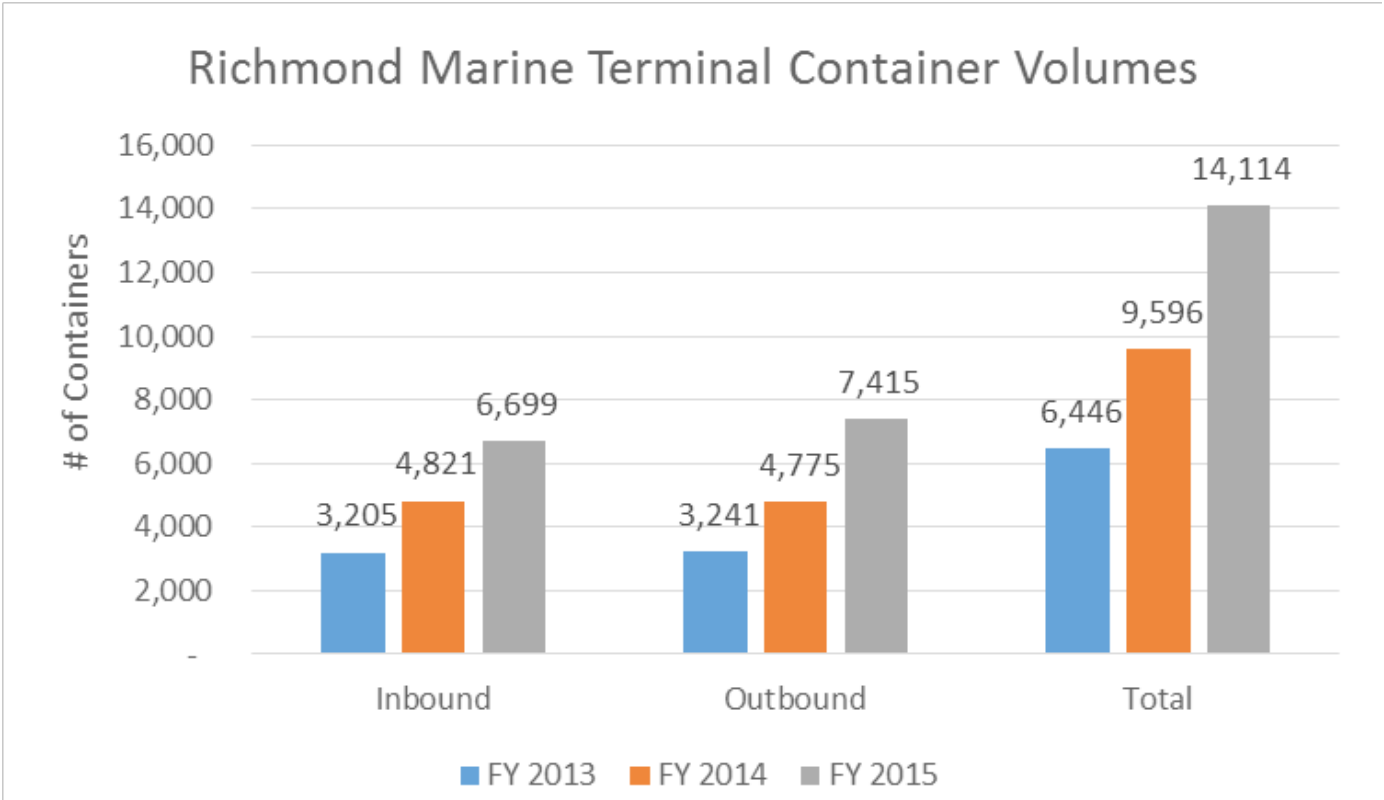


FIG. 5.1. RICHMOND MARINE TERMINAL CONTAINER VOLUMES

The 121-acre facility is a domestic and international multimodal freight and distribution center located on the James River, approximately 100 miles from Cape Henry serving waterborne, rail and truck shippers throughout the Mid-Atlantic States. The facility has the capacity to absorb significantly more cargo and the area outside of the gate is uniquely situated to be redeveloped with manufacturing, distribution and warehouse facilities that will benefit from the proximity to the port and rail. The Port of Richmond offers significant logistical advantages with the relatively low congestion on the highway transportation system and with its excellent location along I-95 with easy access to I-64, I-85, I-295 and US 460 and Foreign Trade Zone #207. Rail unloading and distribution capabilities for shippers are provided by CSX over Deepwater Terminal Rail and by Norfolk Southern via local switch.

Beginning in late-2008, a container-on-barge service began operating between the Richmond Marine Terminal and the Port of Virginia terminals in Hampton Roads. This service provides an alternative to trucking imports bound for regional distribution or exports from the region to international markets. The service mitigates highway system impacts associated with goods movement by shifting individual containers from truck to barge. As seen in Fig. 5.1, the Richmond Marine Terminal has experienced year over year growth in container volumes since the Port of Virginia's 2013 fiscal reporting year.

Other Terminals

While the Richmond Marine Terminal is the largest public port in the region and handles the vast majority of waterborne freight, there are several other marine oil and bulk terminals in the region. These include:

- Shirley Plantation - Weanack Land Limited Partners
  501 Shirley Plantation Road, Charles City, VA
- Kinder Morgan Energy Partners
  3302 Deepwater Terminal Road, Richmond, VA
- Vulcan Materials
  1300 Willis Road, Richmond, VA
- IMTT Richmond
  5500 Old Osborne Turnpike, Richmond, VA
- Flint Hills Resources
  4110 Deepwater Terminal Road, Richmond, VA
- Simsmetal America
  3220 Deepwater Terminal Road, Richmond, VA
- E.I. DuPont Drewry's Bluff
  1201 Bellwood Road, Richmond, VA

Air

Network

Air routes are practically unlimited and provide long distance mobility and flexibility for the movement of people and goods. Air transportation accommodates high value freight or just-in-time deliveries, and is generally considered a niche segment of global goods movement.

Hubs

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

Richmond International Airport

The Richmond International Airport (RIC) serves a 41-county area throughout eastern and central Virginia and has experienced significant growth in demand for both commercial passenger service and air cargo activity. RIC is located on 2,600 acres in eastern Henrico County, seven miles east of downtown Richmond. It is owned and operated by the Capital Region Airport Commission (CRAC) a political subdivision of the Commonwealth of Virginia. CRAC member jurisdictions are the City of Richmond, and Chesterfield, Hanover, and Henrico Counties. The Commission's enabling legislation allows membership to the counties of Charles City, Goochland, New Kent,

Powhatan, and the Town of Ashland.

In the last decade, RIC completed major elements of an historic capital improvement program. A new terminal, dedicated in 2007 and featuring separate arrival and departure levels, has a design capacity of more than six million enplaned passengers per year. Additional projects completed include the addition of 10 new airline gates, the construction of a two-level terminal curbside roadway, the renovation of existing terminal facilities, the construction of a new FAA air traffic control tower nearly three times taller than its predecessor, a new central utility plant, expanded security facilities, and additional parking facilities, including garages for public and rental car use. Construction was completed in 2010 for the Airport Drive creating a four-lane divided roadway from Clarkson Road to Charles City Road; in 2011 a connector between Charles City Road and the Pocahontas Parkway was open providing direct access to RIC from State Route 895.

Air cargo activity has been relatively stable, reporting total cargo in the range 90 million pounds per year. RIC has 100,000 square feet of warehouse/office area and utilizes 1 million square feet of ramp area. Due to its mid-Atlantic location along major north-south flyways and non-congested airspace, RIC has also seen its role as a diversion airport grow substantially in recent years. There is opportunity and capacity for increased air cargo movements at RIC. Also, the recent construction of a new access road has opened up new development sites with access to runways and cargo areas.

Chesterfield County Airport

Chesterfield County Airport is a general aviation airport that provides facilities for privately-owned aircraft used for personal and business activities. It is also designated as a reliever airport to Richmond International Airport and is designated as a C-II facility, one which can handle airplane approach speeds of 121 to 140 knots and plane wingspans of 49 to 78 feet.

The airport is owned by Chesterfield County and operates as a department within the county. The airport encompasses 586 acres with an additional 28.5 acres of aviation easements. The airport has a 5,500-foot x 100-foot runway with a full-length parallel taxiway. Apron space is approximately 41,500 square yards with a total of 97 paved tie-downs. There are hangars for aircraft storage and a sophisticated lighting system for nighttime flights. The airport has facilities for both major and minor aircraft repair, fuel services and has an airplane base of 105 aircraft.

Hanover County Municipal Airport

The Hanover County Municipal Airport opened in 1971 and is strategically located on over 200 acres of land east of I-95, just north of the I-295 interchange between the Atlee and Lewistown Road I-95 exits. It is adjacent to the Hanover Industrial Airpark with over 550 businesses. As part of the National Transportation System, the airport provides general aviation services to both corporate businesses, small package operators and the recreational pilot. The airport serves small single engine and multi-engine aircraft, as well as light business jets, and is designed to accommodate up to Category II Aircraft. It has a full service fixed base operator that provides air taxi/ charter service as well as flight instruction and aircraft maintenance.

The airport has been identified by the Federal Aviation Administration National Plan of Integrated Airport Systems (NPIAS) as a vital link to air service in the Richmond Metropolitan area. As such, the airport has been designated as an air carrier reliever airport to Richmond International Airport (RIC) in both the National System and the Virginia Air Transportation System. The airport has a 5,400-foot x 100-foot asphalt runway, lighting facilities, and corporate hangars as well as over 50 individual hangers with an additional 50

plus aircraft tie-down spaces. Full service fueling is available with both JET A and Avgas. There are approximately 125 aircraft based at the airport.

New Kent County Airport

Constructed in 1955, the New Kent County Airport is owned and operated by the county. The airport sits on 130 acres with an additional 63 acres of easements. The airport is included in both the National Plan of Integrated Airport Systems (NPIAS) and the Virginia Air Transportation System (VATS).

The airport has one recently rehabilitated 3,600-foot x 75-foot runway with adjacent parallel taxi way serving both recreational and corporate operations. There are 44 tie-downs, 46 T-hangar units and one maintenance hangar for minor repairs. Under the Airport Reference Codes, New Kent County Airport is considered a general aviation B-1 small aircraft airport. It is appropriate for airplanes with approach speeds of 91 to 120 knots with wing spans less than 48 feet.

Analysis of Commodity Flows in Richmond Region

In 2012, 51 million tons of freight was transported into, within and from the Richmond region. The amount of growth of freight volumes in the Richmond region to the year 2040 will be tied to overall population and employment growth, changes in national and global logistics patterns, and the evolution of the region's industry structure.

In 2012, $55 billion of freight was transported into, within and from the Richmond region. The growth in freight values in the Richmond region to the year 2040 will be tied to consumption patterns, changes in national and global logistics and the evolution of the region's industry structure.

Freight Stakeholder Engagement

With the goal of growing the Richmond region as a frieght and logistics hub, the think tank Richmond's Future assembled a group of experts in goods movement and freight intensive industry. This group of government and private sector representatives from both the Richmond and Crater PDC regions convened as the Richmond Future's Logistics Roundtable. The following "Recommended Steps to Capitalize on the Logistics Assets of the Richmond and Crater Regions" were adopted in a white paper by the Richmond's Future Logisticis Roundtable.

- Develop an inventory of logistics assets in the Richmond/Crater Regions
- Establish a long-term arrangement between the Port of Richmond (now known as Richmond Marine Terminal) and the Virginia Port Authority
- Develop a Master Plan for the area around the Port of Richmond
- Explore approaches to assemble and prepare land for economic development
- Market the region's logistics assets and promote the opportunities they present to our region's economic development efforts
- Identify best practices from other logistics communities

Next Steps: Freight Planning into the Future

Trends

The USDOT recently adopted a 30-year framework for transportation planning into the future known as Beyond Traffic 2045. This report analyzed the latest data and trends shaping transportation to frame policy choices for the future – including trends and choices for freight: How will we move things? How to reduce freight chokepoints that drive up the cost of doing business?

Beyond Traffic 2045 highlighted the following freight trends:

- By 2045, freight volume will increase 45 percent
- Online shopping is driving up demand for small package home delivery, which could soon substitute for many household shopping trips
- International trade balances, due in part to low US energy costs, could shift from imports toward exports, but overall globalization will increase both, straining ports and border crossings

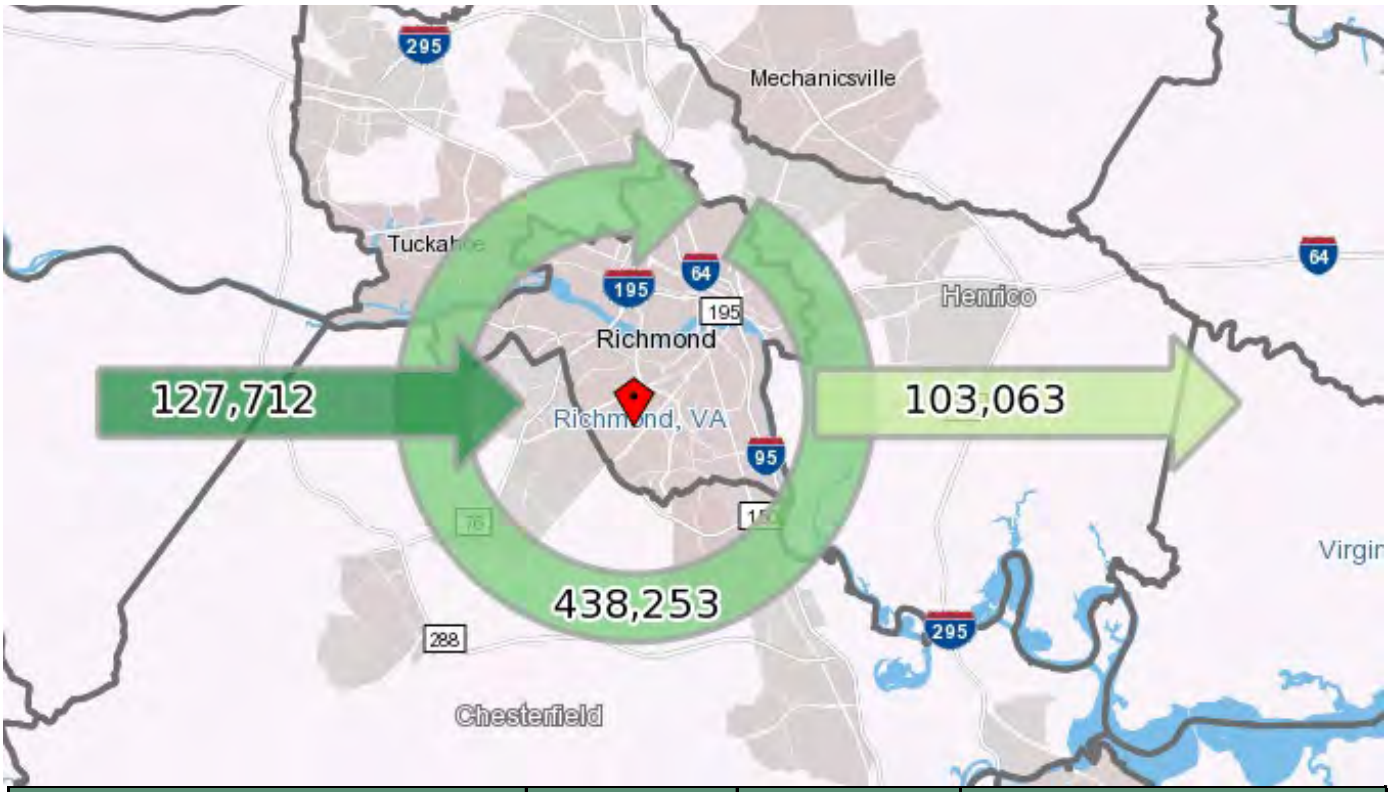
Beyond Traffic 2045 notes that our increasingly urbanized

population in the United States will pose challenges for "first mile" and "last mile" freight movements. It is anticipated that freight demand will be concentrated in the large metropolitan areas where America's population is growing the fastest. The report notes that increasing freight demand in densely populated areas will complicate "first mile" movement of goods out of ports and "last mile" movement of goods from freight hubs to their final destinations, which is often the least efficient portion of the supply chain for most goods.

Innovations

Beyond Traffic 2045 also highlights the key innovations in technology as information and communications technology are increasingly applied to optimize global supply chains. New technologies and business practices are decreasing logistics and transportation costs, and increasing reliability in spite of limited improvements to transportation infrastructure. For example, new technologies allow companies to more accurately determine freight routes, travel times and infrastructure capacity in real-time.

As discussed in Transportation Innovations, the emergence of automated vehicles will likely first impact freight - as fully and partially self-driving trucks, ships, and planes begin to disrupt the industry. For tractor-trailer semis,



	2012	2040	Tons of Freight (by Percentage)
Into Region - Richmond as Destination	26,265,120	68,127,972	61%
From Region - Richmond as Origin	19,767,922	72,651,659	73%
Within Region	5,266,009	17,301,200	70%
Total Freight	51,299,051	158,080,831	68%

	2012	2040	Value of Freight (by Percentage)
Into Region - Richmond as Destination	$ 27,753,700,717	$ 66,178,700,562	58%
From Region - Richmond as Origin	$ 24,040,591,399	$ 87,362,084,321	72%
Within Region	$ 3,632,165,075	$ 11,952,904,653	70%
Total Freight	$ 55,426,457,190	$ 165,493,689,536	67%

FIG. 5.2. TRANSSEARCH FREIGHT COMMODITY FLOWS BY TONS AND VALUE FOR RICHMOND PDC REGION IN 2012

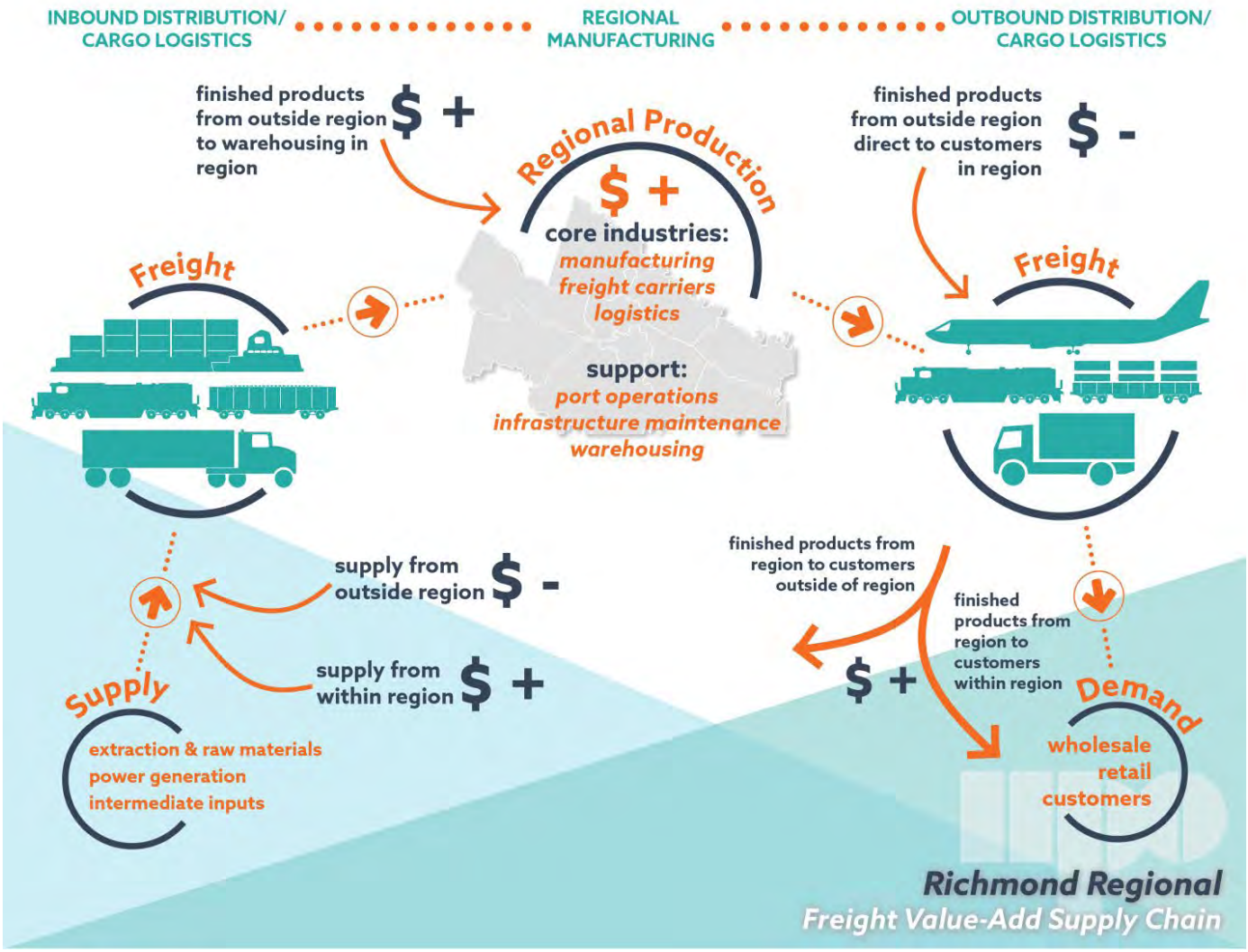


FIG. 5.3. RICHMOND REGIONAL FREIGHT VALUE-ADD SUPPLY CHAIN

sensor technologies that allow for vehicle-to-vehicle communications between trucks could allow for trucks to travel more closely together. Improved fuel efficiency and lane mile capacity could result from adoption of 'truck platooning' or 'truck train' practices. Automation technology is already being adopted by ports. At major container ports, including Virginia International Gateway (VIG) in Portsmouth, VA, the process of transferring containers from ships to docks, trucks, and trains is becoming highly automated, reducing reliance on human operators.

Policy

With passage of a new five-year surface transportation bill, Fixing America's Surface Transportation (FAST) Act – Congress has brokered a long-term agreement to continue addressing the nation's infrastructure challenges. The bill continues funding for a range of highway, rail and transit programs, however, a major achievement of the bill centers on new planning provisions and funding opportunities for freight infrastructure.

With the FAST Act, Congress has recognized that investments in freight infrastructure are crucial to stitching together global supply chain networks with local industries and regional economies. Whether by improving connections to ports or relieving congestion at highway bottlenecks, transportation investments play a key role in facilitating interstate commerce and goods movement.

Beyond Traffic 2045, USDOT, https://www.transportation.gov/sites/dot.gov/files/docs/Draft_Beyond_Traffic_Framework.pdf

Prior to the FAST Act, federal transportation spending advanced on projects without a coordinated national freight strategy or investment program. The FAST Act addresses this shortcoming by initiating the following freight provisions of importance to the RRTPO metropolitan transportation planning process:

1. The FAST Act establishes the 'Nationally Significant Freight and Highway Projects' (NSFHP) program, which will direct $4.5 billion (over 5 years) in competitive grants to nationally and regionally significant freight and highway projects. Eligible applicants include localities, metropolitan planning organizations (MPOs), port authorities, and state agencies. Eligible projects include freight corridors of national significance, roadways or railways connections to major intermodal centers, and port-related capital expenditures.

Future RRTPO planning efforts should identify unfunded projects in the Richmond region that may be eligible to compete for NSFHP funding, provide technical assistance to potential locality project applicants, and evaluate opportunities for the RRTPO to serve as applicant for projects of regional significance.

2. The FAST Act launches a new $6.3 billion (over 5 years) freight formula program, aiming to target investments on a newly-designated 'National Highway Freight Network' and other critical urban and rural freight corridors. Specific program guidance is forthcoming, however, a key provision encourages that MPOs work with state DOTs to designate 'Critical Urban Freight

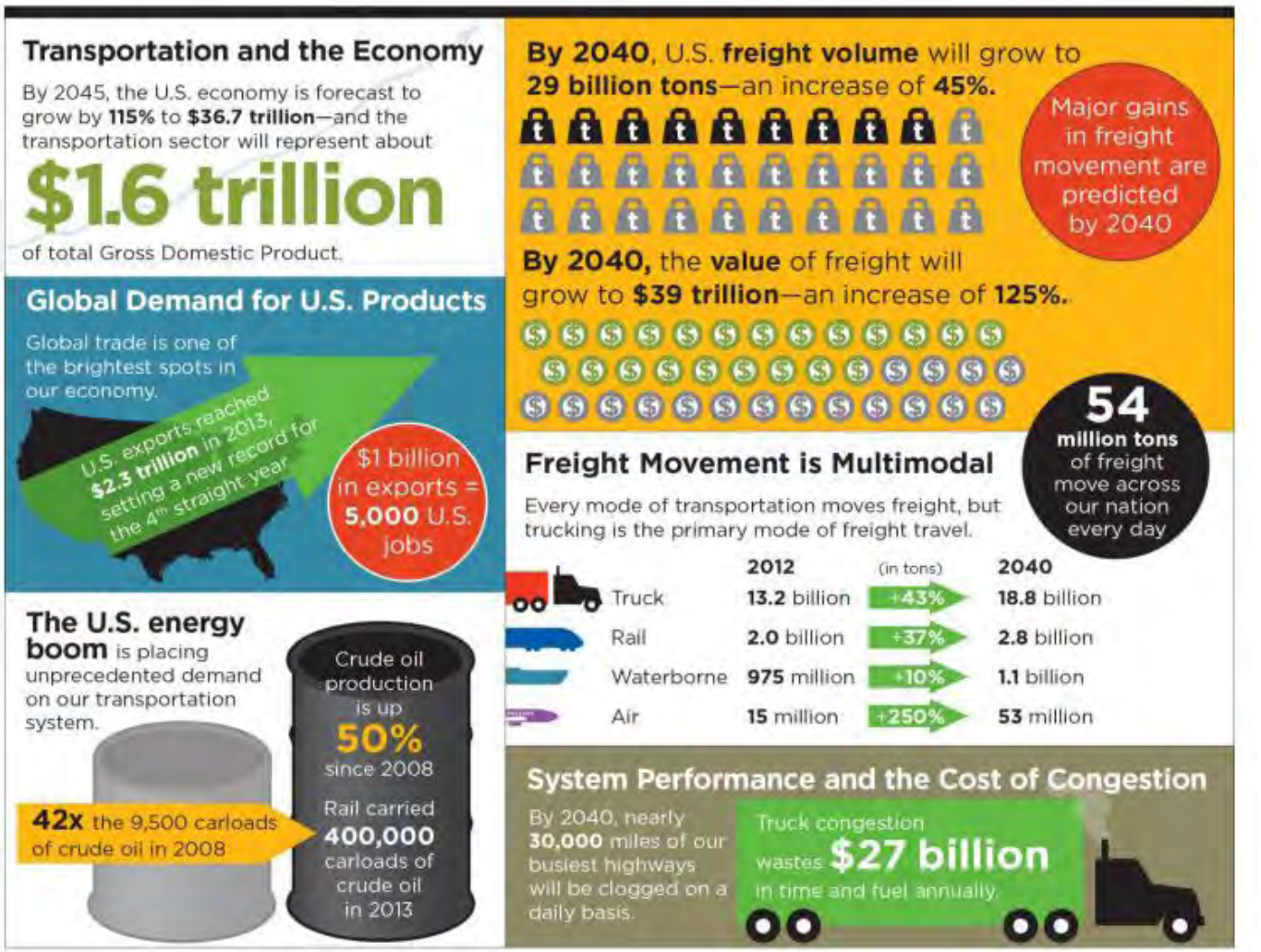


FIG. 5.4. TRANSPORTATTION AND THE ECONOMY (BEYOND TRAFFIC 2045, USDOT)

Corridors'. Upon MPO designation, 'Critical Urban Freight Corridors' meeting all program requirements would become eligible for program funding.

Future RRTPO planning tasks should aim to systematically identify and designate 'Critical Urban Freight Corridors' based on guidance received from VDOT and FHWA. The designation of additional 'Critical Urban Freight Corridors' is a required step for projects not on the 'National Highway Freight Network' to become eligible for funding under this program.

3. The FAST Act requires that US DOT and state DOTs adopt and continually update freight strategic plan documents. Additionally, the bill encourages state DOTs to establish and engage with standing Freight Advisory Committees.

The RRTPO will continue coordinating with US DOT and VDOT on freight strategic planning efforts, provide input/comments on national and state freight plan documents, and evaluate opportunities to participate in the state Freight Advisory Committee.

Overall, the new freight provisions of the FAST Act take steps toward establishing a more comprehensive national freight policy, strategic plan, and network. These directives, along with associated sources of funding for projects, set the stage for continued efforts by the RRTPO to engage in strategic regional freight planning and project programming.

With freight growth, it will be important for the region to balance regional economic benefits with potential negative externalities by applying mitigation strategies. Without effective planning and policies, growing freight volumes could impact air quality, health and quality of life in neighborhoods along freight corridors. Compared to passenger vehicles, heavy trucks are known to emit large amounts of air pollutants – including hydrocarbons and nitrous oxides. While trucks have made great strides in reducing emissions, the average diesel-fueled heavy truck emits more than twice as many hydrocarbons per mile and more than 15 times as many nitrous oxides as the average passenger car . These emissions can impact human health, particularly in neighborhoods adjacent to heavily trafficked freight corridors.

The metropolitan transportation planning process provides significant opportunity to improve the efficiency, safety and environmental impact of freight movement in the Richmond region. For the first time, Congress has provided dedicated funding for freight infrastructure. The FAST Act will provide the region new opportunities to compete for funding to enhance the region's freight transportation system. These goals can only be accomplished, however, if stakeholders in the region champion meaningful projects that meet the criteria specified in the FAST Act.

Beyond Traffic 2045, USDOT, https://www.transportation.gov/sites/dot.gov/files/docs/Draft_Beyond_Traffic_Framework.pdf

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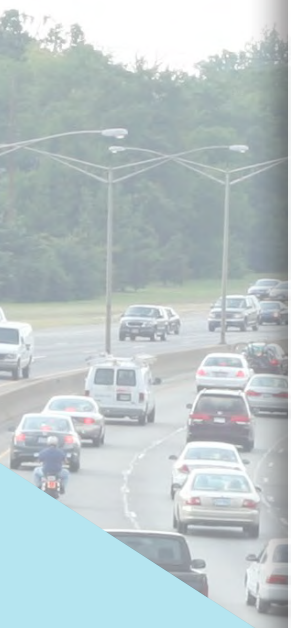
plan2040

Congestion Management



Background and Methodology

The Richmond Regional Transportation Planning Organization (RRTPO) is the federally designated Metropolitan Planning Organization (MPO) for the Richmond region and required to maintain a Congestion Management Process (CMP) as an integral part of the planning process. A CMP provides performance measures and congestion mitigation strategies that align with the goals and objectives of the MTP and are programmed in the TIP. The CMP, as an ongoing systematic process, provides for the collection of up-to-date information concerning the transportation system's performance and provides alternative strategies for congestion management which meet state and local needs. The CMP applies these strategies to capacity increasing projects and improvements and transitions them into the funding and implementation stages for major corridors identified in the CMP roadway network.

Federal regulations require that a CMP be in place in all Transportation Management Areas (TMAs), which are urban areas over 200,000 in population. The CMP is to be implemented as a continuous part of the metropolitan planning process, which includes the Metropolitan Transportation Plan (MTP), the Transportation Improvement Program (TIP), and the Unified Planning Work Program (UPWP). Utilizing various sources of data and the analysis of trends and conditions, the CMP addresses regional congestion issues by monitoring the region's roadway network, identifying congested corridors, and developing strategies and recommendations to alleviate congestion on the roadway network.

The process for incorporating congestion issues into the planning process is defined by the following steps:

1. Develop regional objectives

2. Define the CMP network

3.Develop multimodal performance measures

4. Collect data/monitor system performance

5. Analyze congestion problems and needs

6. Identify and assess strategies

7.Program and implement strategies

8. Evaluate strategy effectiveness

This update to the CMP coincides with plan2040 as a section of the plan and as a separate technical report. The 2011 CMP Update incorporated two new sources of data; INRIX 2010 historic speed data and comprehensive 2009 accident data from the Virginia Department of Transportation. Since then the I-95 Corridor Coalition has worked with the University of Maryland in developing the Vehicle Probe Project (VPP) suite of analytics and visualization tools to use with vehicle probe data sources such as INRIX, Here, and the National Performance Management Research Data Set (NPMRDS). The VPP tools allow for the analysis of historic probe data for most of the RRTPO CMP network. The VPP suite of tools will be used in the analysis of network specific performance measures. The Urban Mobility Scorecard produced by the Texas Transportation Institute (TTI) will be used in the analysis of performance measures at a regional level and will be used as a comparison to peer regions across the country. A Potential for Safety (PSI) score is the number of serious or fatal crashes minus the predicted rate for that type/volume roadway, and PSI scores developed by the HSIP staff of the Traffic Engineering Division of VDOT will be used to highlight safety issues on the CMP network.

Federal Regulations and Policy

The CMP has been a part of the nation's surface transportation funding program and authorization bills since 1991 when it was introduced under the Intermodal Surface Transportation Efficiency Act (ISTEA). Under ISTEA, it was known as the Congestion Management System (CMS) and continued as such under the Transportation Equity Act for the 21st Century (TEA-21). The CMS was created to support effective decision making as part of the metropolitan transportation planning processes. In 2005, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was enacted and refers to a "congestion management process" instead of a congestion management system, recognizing that the CMS was often treated as a stand-alone data analysis exercise or a report on congestion. The CMP is intended as an on-going and evolving process, fully integrated into the metropolitan transportation planning process and which continually addresses the results of performance measures, concerns of the region and/or community, new objectives and goals of the TPO, and up-to-date information on congestion issues.

The name change is also intended to encourage regions to incorporate congestion management into the planning process rather than have it as a stand-alone program or system. In 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21) was enacted. MAP-21 incorporated a performance-based multimodal focus into the transportation planning process of MPOs. The Fixing America's Surface Transportation Act (FAST Act), signed into law on December 4, 2015, carries the same performance-based approach from MAP-21.

Citing the Code of Federal Regulations Title 23 Chapter 1, Section 450.320, a congestion management process in transportation management areas is defined as a "process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of

new and existing transportation facilities eligible for funding… through the use of travel demand reduction and operational management strategies".

The development of the CMP is flexible, allowing each metropolitan area to address how they will analyze and identify congestion and safety conditions within their transportation network. The CMP is an ongoing process which continually evolves and grows with new congestion issues, new data sources, new strategies, and even changes in goals and objectives over time. The results of the CMP are multimodal system performance measures; and strategies that manage demand and reduce SOV travel.

RRTPO Congestion Management Goals

In developing the CMP Technical Report, the goals of plan2040 were taken into consideration. The goals focus on access to employment, congestion mitigation, freight mobility, multimodal connectivity, system reliability, safety, and transportation/land use integration. To achieve these goals the CMP puts forth strategies to maintain and optimize the current transportation network and to promote alternatives to SOV travel and thereby increase mode choice. The implementation of these strategies is not mutually exclusive and they often overlap, with new construction to add capacity being the last option to be considered.

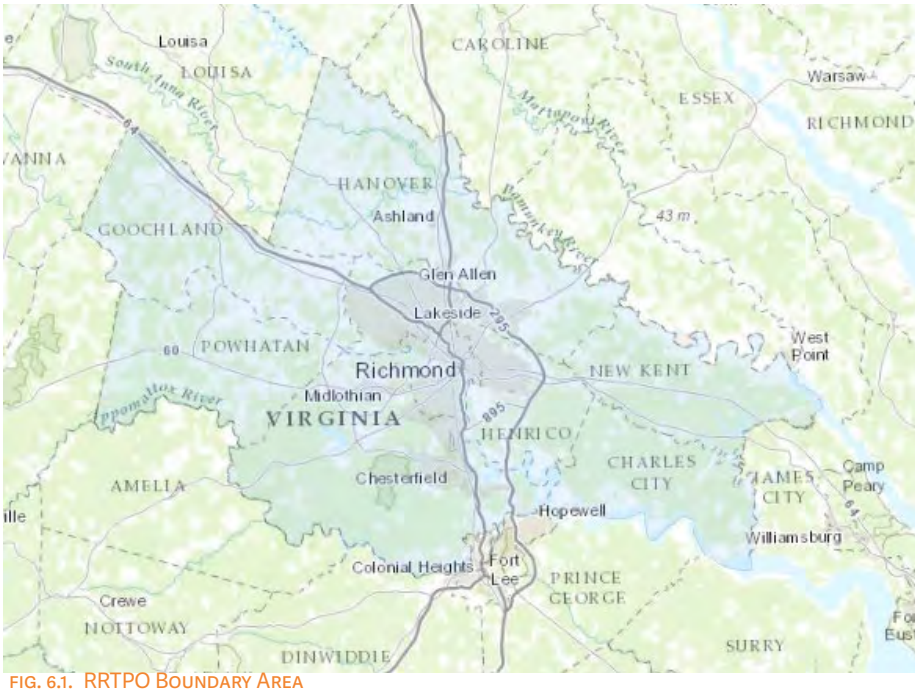


FIG. 6.1. RRTPO Boundary Area

These strategies can be grouped as:

- Traffic Operations Strategies which focus on increasing the efficiencies of the roadway network through the use of intelligent transportation systems (ITS)
- Public Transportation Strategies which focus on improving transit service and coverage and rely on transportation demand management (TDM) and ITS
- Demand Management Strategies which focus on providing more transportation options by promoting the use of alternative modes, managing and pricing assets, altering work patterns, and influencing land use
- Road Capacity Strategies which focus on adding capacity to the roadway network through redesign and new construction

Commuting Patterns

Based on the 2009-2013 5-Year Estimates from the American Community Survey (ACS) data, commuting data for the Richmond region, by jurisdiction, was analyzed to determine the length of time commuters traveled to work and the means of transportation which was taken. The Longitudinal Employer Household Dynamics program (LEHD) was used to obtain the distance traveled to jobs. A map of the Richmond region below shows the jurisdictions included in the ACS data and the commuting footprint for the data collection and analysis in the CMP Technical Report.

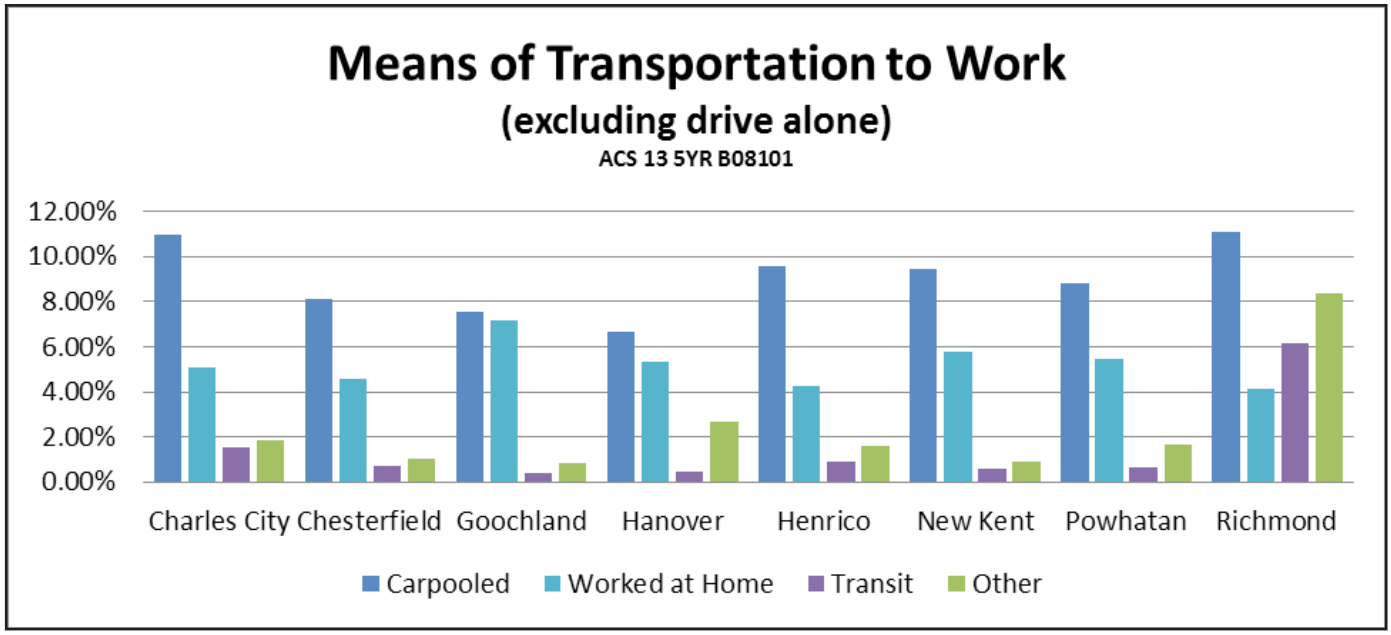


FIG. 6.2. MEANS OF TRANSPORTATION TO WORK BY JURISDICTION

Means of Transportation to Work

The majority of commuters in the Richmond region drive to work alone. Carpooling comes in a distant second at only 9.05% of commuters carpooling and the category of worked at home makes up 4.57%. Transit and other make up the remaining 4.67% with transit accounting for 1.82% of commuters region wide.

In most jurisdictions, the percentage of commuters driving alone is above 80%. The percentage of commuters driving alone in each jurisdiction is:

- Charles City 81%
- Chesterfield 86%
- Goochland 84%
- Hanover 85%
- Henrico 84%
- New Kent 83%
- Powhatan 83%
- Richmond 70%

The only jurisdiction with less than 80% of its commuters driving alone is the City of Richmond, which has 70% of its commuters driving alone. Richmond also has the largest share of commuters who use public transit at 6%. Concerning alternatives to driving alone, carpooling makes up the largest share of commuters.. Working at home has the next highest share in each jurisdiction, except for the City of Richmond. Goochland has nearly the same share for carpooling and working at home at 8% and 7%, respectively. Other, motorcycle, bicycle, walking, taxicab and other, make up a significant share, 8%, of the mode to work for commuters in the City of Richmond.

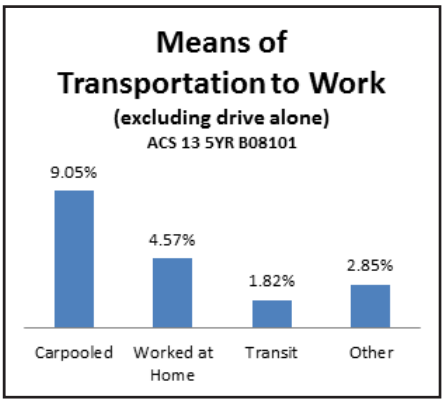


FIG. 6.3. MEANS OF TRANSPORTATION TO WORK BY MODE

Travel Time to Work

The largest percent of commuters in the Richmond region, 45%, spend 15 to 29 minutes commuting. Of the rest, 23% of commuters have a commute of less than 15 minutes and 27 % have a trip of between 30 to 59 minutes. Commuters with a commute of 1 hour or more make up only 4% of the region's commuters.

The breakdown among the jurisdictions shows differences between the smaller jurisdictions and the larger ones. The larger jurisdictions have a higher proportion of commuters commuting

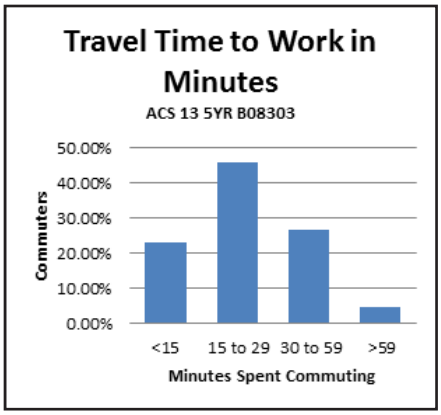


FIG. 6.4. TRAVEL TIME TO WORK IN MINUTES

under 30 minutes compared to commuting 30 to 60 minutes. The proportions for Chesterfield are 63% to 33%; Hanover 66% to 29%; Henrico 77 % to 20%; and Richmond 77% to 18%. The smaller jurisdictions have either larger percentages of commuters with the longer commutes or the proportion of commutes less than 30 minutes and commutes of 30 to 60 minutes are similar. Charles City has 36% of commuters commuting less than 30 minutes and 52% commuting 30 to 60 minutes. Corresponding figures for Goochland are 49% to 44%, New Kent 43% to 51%, and Powhatan 41% to 50%. Charles City has the highest percentage of commuters commuting 1 hour or longer at 11% of commuters making a commute this long.

Distance to Jobs

Just over 50% of the commuters in the Richmond region have commutes of less than 10 miles. Commuters traveling 11 to 24 miles make up the next largest percentage at 31%, and more commuters travel over 50 miles, 14%, than those who travel 25 to 50 miles, 4%.

The smaller jurisdictions have between 62% and 70% of commuters with commutes of 50 miles or less while the larger jurisdictions have 82% to 85% of commuters with commutes of this length. The largest percentage of commuters in the smaller jurisdictions travel 11 to 24 miles, whereas the largest percentage of commuters in the larger jurisdictions travel under 10 miles. Powhatan commuters don't follow this pattern, having the highest percentage of commuters traveling less than 10 miles to jobs. Commutes for residents of Chesterfield are evenly split between less than 10 miles and 11 to 24 miles, with 41% of commuters having trips of each category. Hanover's commuters are also almost evenly split between commutes of less than 10 minutes and 11 to 24 minutes at 43% and 41%, respectively. Even though only 4% of all commuters region wide travel 25 to 50 miles to jobs, the percentage of commuters from Goochland and New Kent are notable at 29% and 24%, respectively. Charles City also has a large percentage of commuters traveling this far at 20%. The only jurisdiction which has a large percentage of commuters traveling over 50 miles is Powhatan. Commuters

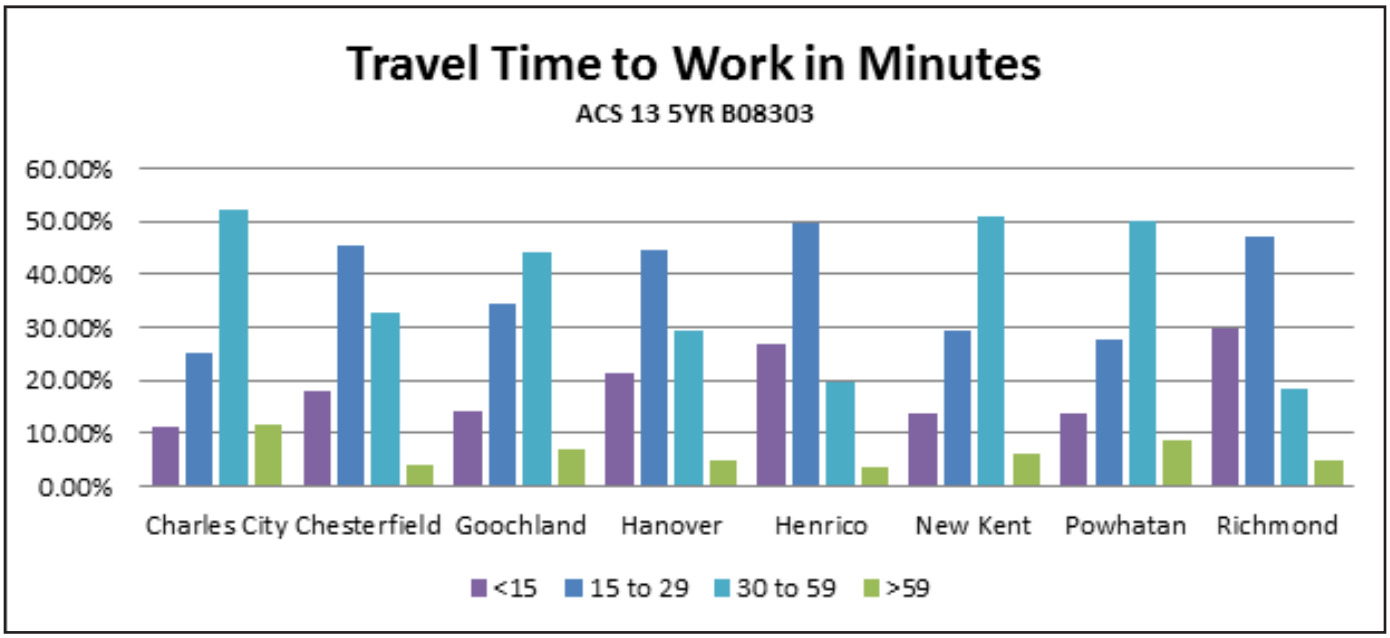


FIG. 6.5. TRAVEL TIME TO WORK IN MINUTES BY JURISDICTION

in the City of Richmond have the shortest commutes, with 68% less than 10 miles.

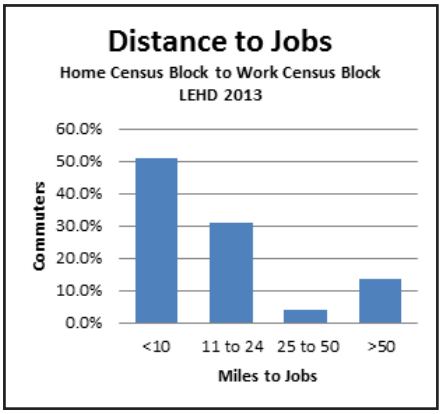


FIG. 6.6. DISTANCE TO JOBS BY MILES

Regional Performance Measures

The Texas Transportation Institute (TTI) at Texas A&M University publishes an annual Urban Mobility Scorecard, formerly called the Urban Mobility Report. The Urban Mobility Scorecard uses highway performance data from the Federal Highway Administration and, beginning with the 2015 scorecard, traffic speed data collected by INRIX. The scorecard provides information on several factors related to congestion and mobility for urban areas in the United States. Richmond is included in the study under the classification of a large urban area (1 million to 3 million people). This is the first year Richmond has been classified as a large urban area. Since 1982 Richmond has been a medium urban area (500,000 to 1 million people). Richmond, being the smallest in the large urban category, will be compared to the 7 smallest large urban areas and the 6 largest medium urban areas instead of to the large urban areas as a whole. The summary data for Richmond and its peer large urban areas are provided in Fig. 6.8.

The data from the Urban Mobility Scorecard allows for the tracking of trends related to the performance of the roadway network. The data is useful in detecting directional changes in performance or regional characteristics, and in comparing the Richmond region with other similar regions. It should be noted that the data in the Urban Mobility Scorecard is for the entire Richmond urbanized area from its 2010 designation, not the TPO study area, which is a different geographic area as shown in Map 6.2.

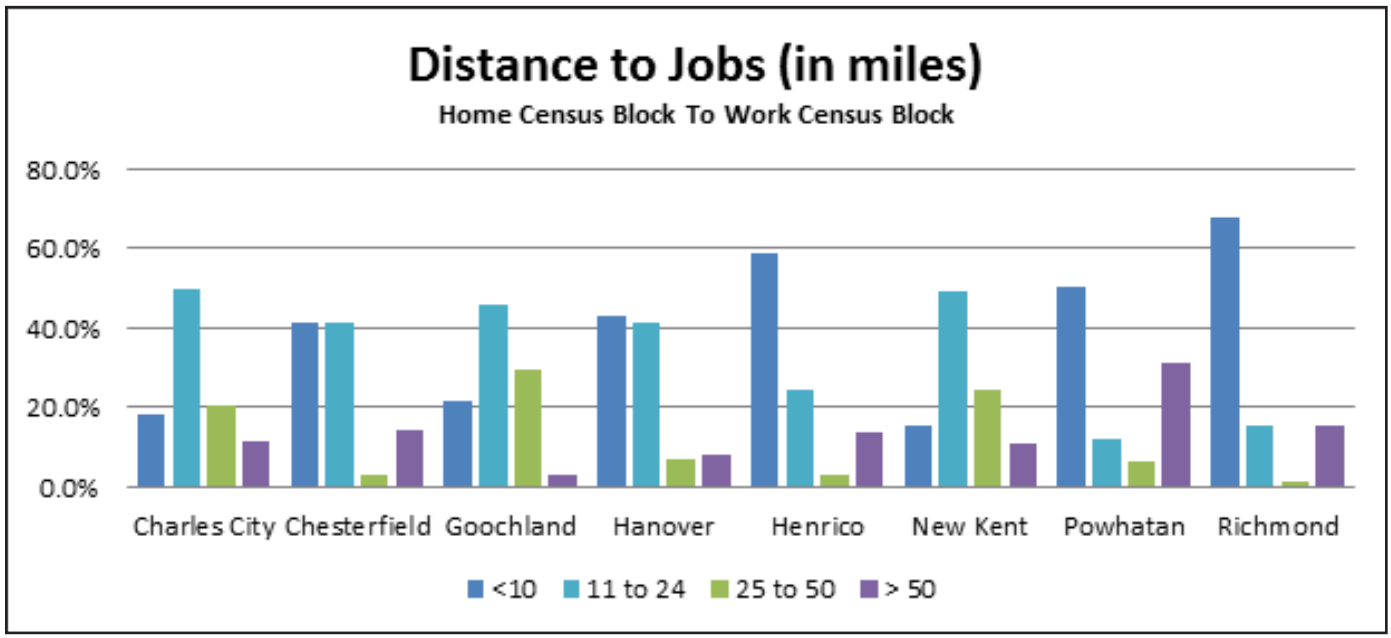


FIG. 6.7. DISTANCE TO JOBS BY MILES BY JURISDICTION

Urban Area	Population Group	Population (000)	Rank	Total Daily Vehicle-Miles of Travel (000)	Congested Travel (% of peak VMT)	Congested System (% of lane-miles)	Number of Rush Hours (time when system may be congested)	Annual Hours of Delay		Travel Time Index		Freeway Planning Time Index 95th Percentile	
								Total Delay (000)	Rank	Value	Rank	Value	Rank
Providence RHI A	Lrg	1,180	40	21,588	27	20	3.6	37,809	41	1.20	37	2.25	42
Louisville-Jefferson County KY-IN	Lrg	1,110	41	21,198	30	26	3.6	38,622	46	1.20	37	2.42	32
Salt Lake City-West Valley City UT	Lrg	1,100	42	17,098	27	25	3.0	25,925	51	1.18	46	2.13	49
Memphis TN-MS-AR	Lrg	1,085	43	22,461	23	20	2.0	37,824	40	1.19	42	2.08	55
Jacksonville FL	Lrg	1,085	43	20,990	24	21	2.9	29,680	48	1.18	46	2.27	39
Oklahoma City OK	Lrg	1,000	45	24,375	25	23	2.8	46,652	33	1.19	42	2.08	55
Richmond VA	Lrg	1,000	46	21,211	18	18	1.6	26,104	63	1.13	88	1.78	80
New Orleans LA	Med	975	47	13,661	40	29	5.0	39,159	38	1.32	13	3.46	3
Raleigh NC	Med	965	48	18,726	24	20	2.6	23,128	55	1.17	54	2.11	53
Bridgeport-Stamford CT-NY	Med	955	49	15,679	48	39	6.2	37,119	43	1.36	6	3.32	5
Buffalo NY	Med	945	50	15,873	25	21	2.9	25,851	52	1.17	54	2.13	49
Hartford CT	Med	910	51	18,095	30	26	3.8	28,296	49	1.20	37	2.30	38
Tucson AZ	Med	865	52	15,586	28	26	2.4	35,993	44	1.22	32	2.11	53
Average for 13 Urbanized Areas		1,013		18,866	28	24	3.3	33,089	48	1.21	41	2.34	43

FIG. 6.8. SUMMARY DATA FOR TTI URBAN MOBILITY REPORT FOR RICHMOND URBANIZED AREA

MAP 6.25. RICHMOND URBANIZED AREA

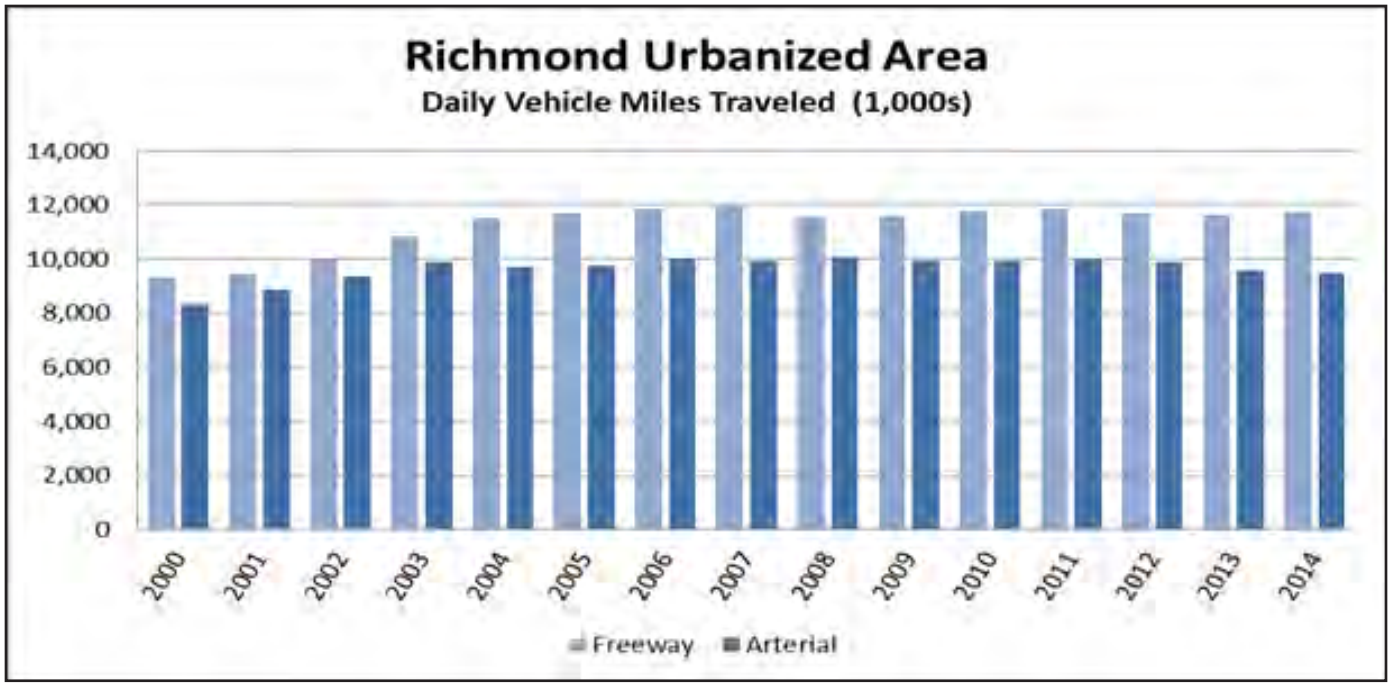


FIG. 6.9. DAILY VEHICLE MILES TRAVELED FROM 2000-2014 FOR RICHMOND URBANIZED AREA

Daily Vehicle-Miles of Travel

Vehicle-Miles Traveled (VMT) is the total number of miles traveled by vehicles in a specified region for a specified time period and is used as an indicator of roadway use. Daily VMT is a measure commonly used to gauge the daily demand placed on a region's transportation network, and is used to determine federal-funding. The Federal Highway Administration (FHWA) along with each state department of transportation determine the state's annual average daily traffic (AADT) and convert it to VMT by multiplying the AADT by the length of the road segment.

Richmond's DMVT for 2014 was 21,211,000 miles, 11,719 freeway miles and 9,492 arterial miles. Richmond's DVMT of 21,211 is above the average of 18,965 for the 13 comparison Urbanized Areas from the Urban Mobility Scorecard. DVMT in the Richmond Urbanized Area had been growing until 2007 at which point it began a slight decline for 6 of the past 8 years.

Congested Hours, Congested Lane-Miles, and Congested VMT

When comparing Congested Hours, Congested Lane-Miles, and Congested VMT (See the Scorecard methodology at the end of the section) for the 13 large urban areas, Richmond's level of congestion is the lowest for all three measures. The percent of Richmond's VMT which is congested is 16%, whereas the next lowest percentage is for Memphis at 23%. Richmond's percentage of lane miles which are congested is 16%. Providence, Memphis, and Raleigh all tie for second lowest with 20 percent of their lane-miles being congested. Richmond also has the lowest number of congested hours at 1.5 hours. Memphis has 2 congested hours and Tucson has 2.4. Looking at these measures of congestion, Richmond has very little congestion compared to its peers.

Annual Hours of delay

Annual hours of delay is computed by TTI as the total travel time above that needed to complete a trip at free-flow speeds. The Richmond urbanized area ranks 53rd out of 101. Rankings for the other 12 comparison regions range from 33rd to 55th, making the Richmond urbanized area second in lowest hours of delay behind Raleigh, NC. Annual hours of delay have increased steadily, correcting slightly around 2008 and then continuing to increase. This trend is similar in the other regions; although some declined further and some

have had a flatter increase since their declines.

Travel Time Index

The travel time index (TTI) is a ratio of travel time in peak period traffic to travel time in free-flow. It measures the amount of additional time needed to make a trip during a typical peak travel period in comparison to traveling at unimpeded speeds.

The TTI is computed by dividing the average of all peak period trip times for a region by the average of all free flow (non-peak) travel times for the region. If an average trip in a region took 26 minutes during the peak travel period, but only 20 minutes under free-flow conditions, the travel time index would be 26/20 = 1.30. This can also be expressed by stating that the delay penalty for driving during the peak period is approximately 6 minutes.

The TTI for the Richmond region was 1.13 in both 2014 and 2013. In 2005, the TTI average was 1.11, and Richmond ranked 92nd lowest out of 101 urban areas. In 2006, it increased to 1.12, and in 2008 to 1.13. The following year the TTI returned to 1.12, where it remained until it reached its current level of 1.13. With a TTI of 1.13, it would take a driver in the Richmond region 13% longer to make a trip during peak travel periods as opposed to the same trip at times of the day when travel occurs at free-flow speeds. For the past decade, the Richmond urbanized area has ranked in the high 80's to the low 90's and is currently ranked 88th out of the 101 other urban areas.

Richmond has the lowest TTI of the 13 peer urban areas. Raleigh and Buffalo tie in rank at 54th with TTIs of 1.17, and Bridgeport-Stamford has the highest TTI at 1.36 and ranks 6th. Similar to the others, Richmond's TTI increased until 2008 and then declined due to the Great Recession. By 2014 Richmond's TTI was again at 2008 levels. Only Charlotte and Nashville have TTIs lower than they did in 2008. The TTI declines in Austin, Nashville, and Hartford began before 2008.

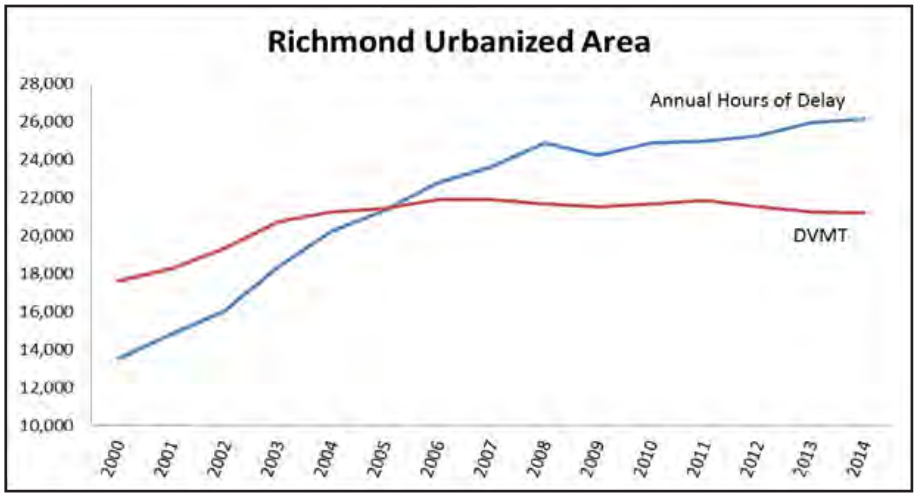


FIG. 6.10. DAILY VMT AND ANNUAL HOURS OF DELAY TRENDS FROM 2000-2014 FOR RICHMOND URBANIZED AREA

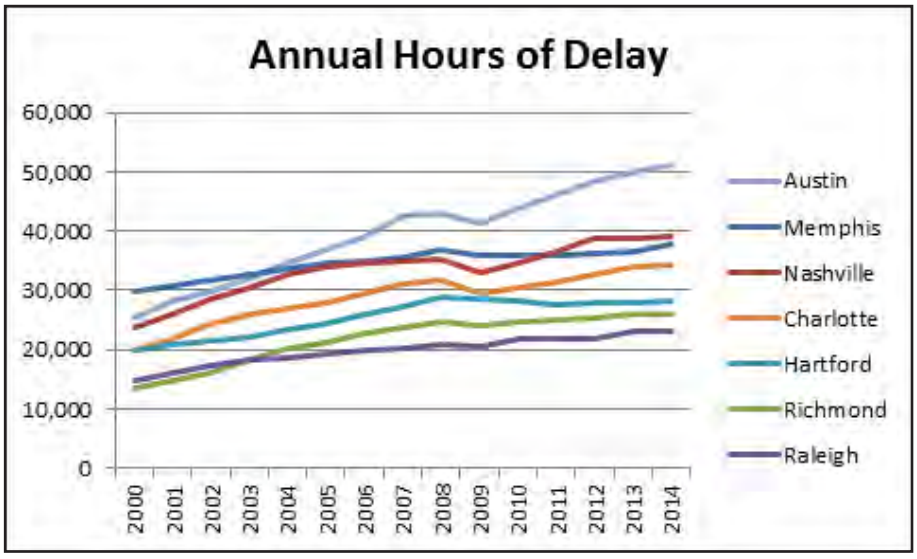


FIG. 6.11. ANNUAL HOURS OF DELAY COMPARISON TO OTHER URBANIZED AREAS FROM 2000-2014 FOR RICHMOND URBANIZED AREA

Year	2005		2006		2007		2008		2009		2010		2011		2012		2013		2014	
	value	rank	value	rank	value	rank	value	rank	value	rank	value	rank	value	rank	value	rank	value	rank	value	rank
Population	920	47	903	46	938	46	948	46	955	46	970	46	975	46	988	45	995	45	1,000	46
Travel Time Index	1.11	92	1.12	88	1.12	90	1.13	84	1.12	88	1.12	89	1.12	89	1.12	89	1.13	84	1.13	88
Annual Hours of Delay	21,310	53	22,764	53	23,808	52	24,854	52	24,197	52	24,860	52	24,944	52	25,239	53	25,934	52	26,104	53
DVMT	21,440		21,880		21,885		21,840		21,538		21,668		21,825		21,535		21,216		21,211	

FIG. 6.12. POPULATION, TRAVEL TIME INDEX, ANNUAL HOURS OF DELAY, AND DVMT FOR 2005-2014 FOR RICHMOND URBANIZED AREA

Planning Time Index

The Planning Time Index (PTI) is a measure of reliability. A 95th percentile PTI represents the amount of time you must plan for a trip in order to be late only one time in a month. Richmond's PTI of 1.76 means that to ensure that you will not be late when making a trip which could take 20 minutes if there is no traffic, you should plan on just over 35 minutes for the trip. In other words you should increase your expected trip time by 76% or approximately 15 minutes. Richmond ranks 80th out of the 101 urbanized areas in the Urban Mobility Scorecard. That is the best ranking for the peer group, with the next best rank being 55th, which is held by Memphis and Oklahoma City. The peer group ranks fall within the range of 32nd to 55th with New Orleans and Bridgeport-Stamford having the worst ranks of 3rd and 5th respectively.

The RRTPO Regional Performance Measures 2015 Annual Progress Report indicates that at a regional scale, the highway network in Richmond allows for easier, more reliable movement of workers as compared to most other metros. This scale of analysis is interesting in drawing broad conclusions about the state of congestion in the Richmond region, but such a scale may overlook the well-known spot areas of daily congestion where opportunities for applying mitigation strategies still exist.

Congestion Management Process Network Analysis

The RRTPO CMP process consists of four activities that seek to define, identify, mitigate, and monitor congestion on the CMP network.

- System Definition and Data Collection - Identify the roads to be included in the CMP study network. Determine the time frame and frequency of data which will be used to quantify congestion.
- Congestion Definition and Identification - Develop indicators of congestion that can be quantified through the use of performance measures (e.g. travel time and speed for roadway segments) (TTI, PTI, BI, Speed). Then apply the congestion indicators to the CMP network to determine congested corridors. The result will be the identification of locations where recurring congestion exists along the CMP network.
- Congestion Management Strategies - Compile a list of congestion mitigation strategies which could be used to mitigate congestion.
- System Monitoring - Develop corridor fact pages with performance data and trends, mitigation strategies, and projects in the TIP and MTP which will impact the corridor.

System Definition and Data Collection

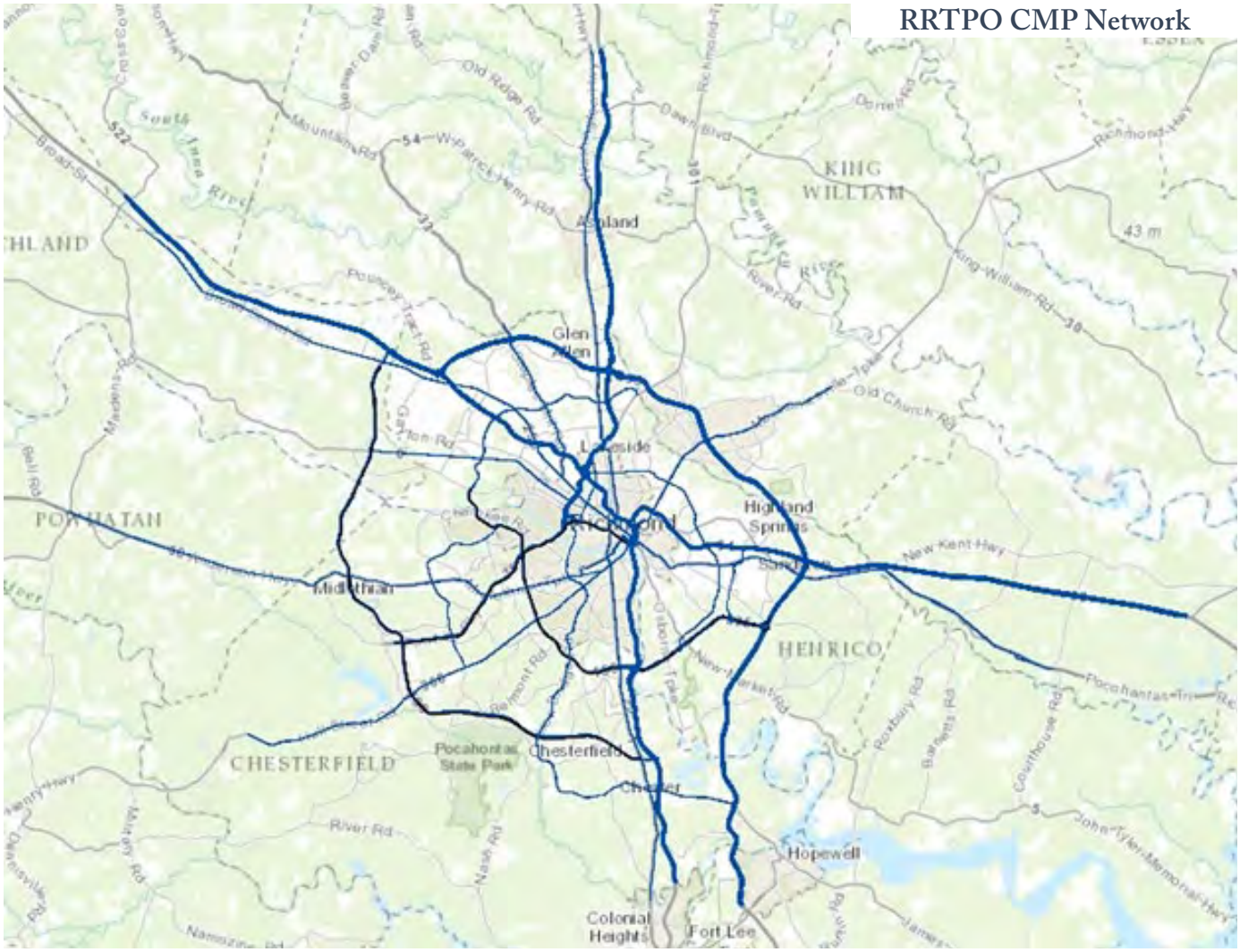
The CMP monitors the transportation system located in the RRTPO study area. The study area is within the boundary of the Richmond Regional Planning District Commission (RRPDC), which is made up of the Town of Ashland, the Counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent and Powhatan, and the City of Richmond. Hanover and Henrico Counties are fully within the study area as is the City of Richmond. A majority of Chesterfield County is also within the study area except for the southern portion which is within the Tri-Cities Area MPO. The eastern portions of Goochland and Powhatan Counties and the western portions of Charles City and New Kent Counties complete the study area.

Congestion Management Process Network

Data for the CMP will consist of 2014, on Tuesdays, Wednesdays, Thursdays, INRIX traffic data obtained through the I-95 Corridor Coalition VPP, and PSI safety designation score. The CMP network has not changed from the one used for the 2011 CMP Update (see Fig. 6.12). The CMP roadway network consists of interstates, other freeways and expressways, and other principal arterials in the RRTPO study area. There are four interstates, I-95, I-195, I-295 and I-64 in the Richmond region, along with 5 roadways classified as other freeways and expressways, VA-76 (toll), VA-150, VA-195 (toll), VA-288, and VA-895 (toll).

Road Name	Description
I 95	From the northern MPO boundary in Hanover County to the southern MPO boundary in Chesterfield County
I 64	From SR 617 (exit 167) in Goochland County to SR 155 (exit 214) in New Kent County
I 195	From the Bryan Park Interchange to I 95 (exit 74) in the City of Richmond
I 295	From I 64 (exit 177) in Henrico County to the southern MPO boundary in Chesterfield County
SR 6	From SR 288 in Henrico County to SR 161 (Boulevard) in the City of Richmond
SR 10*	From US 360 in the City of Richmond to I 295 in Chesterfield County
SR 76	From 288 in Chesterfield County to I 195 in the City of Richmond
SR 147	From US 60 in Chesterfield County to SR 150 in the City of Richmond
SR 150**	From I 95 in Chesterfield County to route 7518 (Parham Road) in Henrico County
SR 161	From I 95 (exit 80) in the City of Richmond to SR 10 in the City of Richmond
SR 288	From I 64 in Henrico County to I 95 in Chesterfield County
SR 895**	From I 95 in Chesterfield County to I 295 in Henrico County
US 1	From the northern MPO boundary in Hanover County to the southern MPO boundary in Chesterfield County
US 33	From Route 632 (Ashland Road) in Hanover County to US 250 in the City of Richmond
US 60	From US 522 (Maidens Road) in Powhatan County to US 360 downtown in the City of Richmond and from Laburnum Avenue to SR 155 in New Kent County
US 250	Broad Street from western MPO boundary to 18th Street
US 360	From western MPO boundary in Chesterfield County to Route 606 (Studley Road) in Hanover County
Courthouse Rd*	From US 60 in Chesterfield County to US 360 in Chesterfield County
Parham Rd	From SR 150 in Henrico to US 301 in Henrico County
Laburnum Ave	From the Bryan Park Interchange to SR 895 in Henrico County
Airport Rd**	From I 64 (exit 197) in Henrico County to SR 895 Henrico County

FIG. 6.13. 2016 CMP NETWORK



MAP 6.26. RRTPO CMP NETWORK

With roads marked with an (*), INRIX data is not available on these roadways and with

(**) indicate roads with small portions of the roadway not covered by INRIX data. Congestion Definition and Identification

The CMP relies heavily on vehicle probe data purchased by VDOT and analyzed using analytical tools provided through the I-95 Corridor Coalition. In 2010 the Richmond Area Transportation Planning Organization joined the I-95 Corridor Coalition, an interagency group established in 1993 to enhance regional transportation mobility, safety, and efficiency along I-95 in the Mid-Atlantic States. The coalition has grown from its original focus on vehicle travel along I-95 to an organization which encompasses all modes of transportation and a geographic area far greater than the I-95 corridor. The I-95 Corridor Coalition partnered with the CATT Labs at the University of Maryland in the development of the Vehicle Probe Project (VPP), a set of analytics and visualization tools for use with real-time traffic information data provided by INRIX. VDOT has purchased INRIX data for the entire state of Virginia for use in the VPP. These analytics form the basis of the analysis which was performed in this CMP. The tools in the VPP are used to determine the location and intensity of congestion and the times at which congestion occurs.

Potential for Safety Improvement (PSI) scores developed by the HSIP staff of the Traffic Engineering Division of VDOT will be used to highlight safety issues on the CMP network. A PSI score is the number of

serious or fatal crashes minus the predicted rate for that type/volume roadway.

There are two types of congestion: recurring and non-recurring. Recurring congestion is caused by the physical state of a roadway and is usually predictable. This congestion can occur due to an increase in demand, a change in roadway capacity from one section to another, multiple access points or unsafe conditions. As people use the roadway they become accustomed to this congestion. Morning and afternoon peak hours are typically when this type of congestion generally occurs, but it may occur at other times in areas with a high concentration of shopping area or at an event venue.

Non-recurring congestion is caused by some activity on a roadway, and is usually not expected. Traffic incidents, vehicle crashes and breakdowns, pot holes or other roadway failures, and events which spill over on to the roadway such as building fires, all have an impact on the ability of a roadway to handle the usual volume of traffic. Non-recurring congestion impacts the reliability of our region's transportation system.

The FHWA finds it acceptable for each MPO to approach the Congestion Management Process in a manner unique to their region and goals. The goals of the RRTPO CMP are to maintain and optimize the current transportation network and to promote alternatives to SOV travel, thereby increasing mode choice. Strategies in the CMP are designed to promote a reliable transportation network.

Congestion Management Strategies

There are many congestion management strategies, broadly categorized as Demand Management Strategies, Traffic Operations Strategies, Public Transportation Strategies, and Road Capacity Strategies. The use of any combination of strategies is permissible, however all strategies should be evaluated before considering adding single occupant vehicle (SOV) capacity.

The Congestion Management Process Guidebook describes the four categories of strategies as:

1. Demand Management Strategies which focus on providing more transportation options by promoting the use of alternative modes, managing and pricing assets, altering work patterns, and influencing land use.

2. Traffic Operations Strategies which focus on increasing the efficiencies of the roadway network through the use of intelligent transportation systems (ITS).

3. Public Transportation Strategies which focus on improving transit service and coverage and rely on transportation demand management (TDM) and ITS.

4. Road Capacity Strategies which focus on adding a capacity to the roadway network through redesign and new construction.

Example RRTPO CMP strategies include:

Demand Management

- Ridesharing
- Telecommuting
- Flexible work schedules
- Parking management
- Bicycle infrastructure and amenities
- Pedestrian infrastructure and amenities

Traffic Operations

- Operations centers
- Real-time traffic condition apps for drivers
- Timed signals
- Incident clearance - Safety Service Patrols
- Open road tolling
- Over height vehicle sensors
- Curve speed warning systems

Public Transportation

- Interface with other modes (Bicycle)
- Electronic fares
- GPS
- Apps for transit schedules

Road Capacity

- Restriping and lane modifications
- Intersection improvements
- Interchange improvements and collector distributor lanes
- Roundabouts
- Turn lanes
- Access management

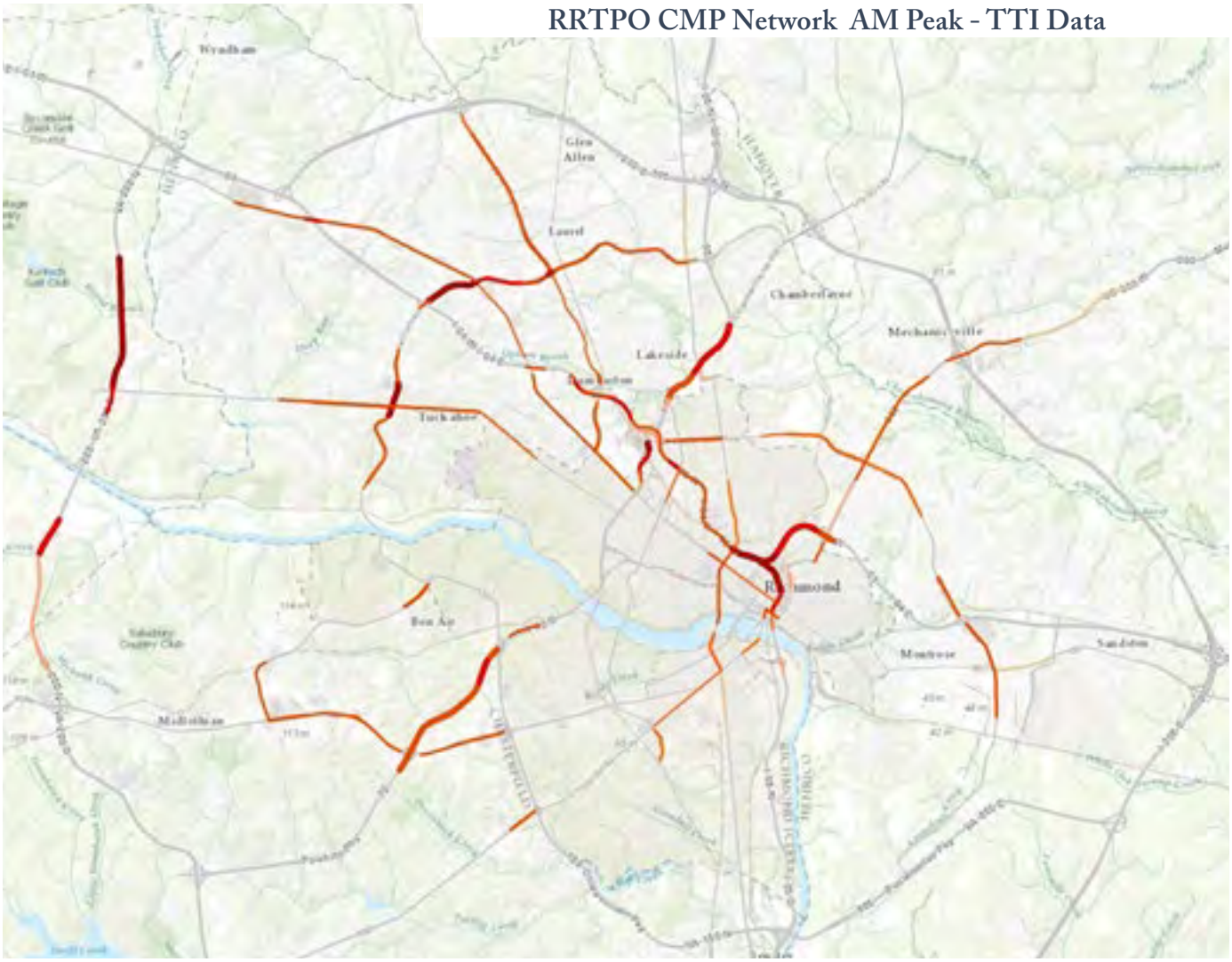
System Monitoring

Performance metrics from the VPP suite were analyzed for the CMP network. The TTI for the network during the morning peak period from 7 to 9 am is shown below. The darkest red and thickest lines indicate a TTI of over 2. Second darkest red with thick line indicates a TTI of 1.8 To 2. The red thin line indicates a TTI of 1.5 to 1.8. The thin orange line indicates a TTI of less than 1.5. For the PM TTI, the darkest red and thickest lines indicate a TTI of over 2. Second darkest red with thick line indicates a TTI of 1.8 to 2. The red thin line indicates a TTI of 1.5 to 1.8. The thin orange line indicates a TTI of less than 1.5.

Transportation Projects affecting the CMP Network

Many of the projects which have been programed in the Transportation Improvement Program (TIP) are located on the CMP network and advance the goals of the CMP. Since these projects are located on the network they increase the efficiency of the network through

RRTPO CMP Network AM Peak - TTI Data



MAP 6.27. RRTPO CMP NETWORK AM PEAK TTI DATA

MAP 6.28. RRTPO CMP NETWORK PM PEAK TTI DATA

the strategies of improving intersections and interchanges, redesigning roadways, adding turning lanes, and adding pedestrian amenities. There are other non-road specific projects in the region which affect the CMP network. These include improvements to traffic signal systems, park and ride lots, a bike share system, demand management programs provided through RideFinders, and transit system improvements implemented by GRTC.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) is an aspect of the transportation system which is undergoing rapid change. Not only are there new developments in ITS but these new developments give rise to new transportation opportunities and challenges. The Intelligent Transportation Society of America (ITSA) put forth the following description of ITS in their Strategic Plan. "Intelligent Transportation Systems (ITS) encompass a broad range of information communications and control technologies that improve the safety, efficiency, and performance of the surface transportation system. ITS technologies provide the traveling public with accurate, real-time information, allowing them to make more informed and efficient travel decisions. When integrated into the nation's roadways, vehicles, consumer electronics devices and public transportation networks, ITS can save lives, reduce congestion, improve mobility and optimize the existing infrastructure. ITS

investments provide a foundation for long-term benefits including government and industry cost savings, economy-wide productivity improvements, and an improved quality of life." Intelligent Transportation Society of America Strategic Plan

The USDOT ITS Strategic Plan 2015-2019 touches on another aspect of ITS. "Nearly every facet of our society is undergoing a shift of connecting the individual to the community. The "Internet of Things" movement is giving great power to the individual, by personalizing information that is time and location-aware. The "Internet of Things" also allows the broad transportation community (including public agencies and private organizations) to be more equipped to address how individuals experience transportation. The paradigm in which we can balance individual decision making and system-optimal transportation management is within grasp."

These two statements paint a picture of a future transportation system in which safety, efficiency, and mobility will be increased. These changes will not be implemented solely in the public sector, but they will impact the policy and planning decisions which will be made by public entities.

Many well-known forms of ITS are currently being used in the Richmond region, including electronic tolling, traffic cameras, variable message signs on highways, computerized traffic signal systems, emergency vehicle pre-emption devices on major roadways, and automatic vehicle location and electronic fare boxes on the transit system.

Change has also come as travelers use private-sector developed ITS enhancements. Smart phones are a prime force behind many of the latest innovations, and apps are available to get directions and travel conditions, call a ride, and plan a multimodal or transit based trip. Phones are even used to find parking and to pay for it. These changes help to increase the mobility of the region.

The implementation of crash avoidance systems in new vehicles and the research related to connected and self-driving cars will improve the safety of the transportation system.

The ITS architecture maintained by VDOT is an important planning tool. The architecture will ensure the connectivity and interoperability of the ITS infrastructure as additional components are integrated into the transportation system.

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Transportation Demand Management

Transportation Demand Management (TDM) is a set of planning processes, strategies, and policy decisions that are aimed at relieving congestion and improving efficiencies of the transportation infrastructure. TDM strategies result in more efficient use of transportation resources and provide a variety of economic, social, and environmental benefits. This section will focus on TDM strategies that are, or could be used in the Richmond region.

The RRTPO serves as the Richmond region's lead agency responsible for developing TDM processes, strategies, and policies and coordinating and partnering with provider entities that implement TDM strategies and activities. TDM policies, plans and programs supported by the TPO include:

- Intelligent Transportation Systems (ITS)
- Congestion Management Process (CMP) Planning
- Transit and Fare Incentives
- Carpool and Vanpooling
- Freight Diversion (I-64 Express)
- Flexible Work Hours and Teleworking
- Active Transportation: Bicycle and Pedestrian Connections
- Park and Ride Investments
- Parking Supply
- Other TDM Strategies for Alternative Transportation

RideFinders

RideFinders, a division of the GRTC Transit System, is the regional non-profit 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."

Beginning in 2009, the Virginia Department of Rail and Public Transportation (DRPT) requires all recipients of TDM grant funds to prepare a Long-Range TDM Plan. RideFinders completed its first Long-Range TDM Plan in the summer of 2011. Its current Work Program covers the period from July 1, 2014-June 30, 2018. This document provides an overview of the RideFinders TDM program; a summary of goals, objectives and performance measures; TDM program elements and service enhancements; description of RideFinders enhanced marketing program, and a funding overview.

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

- Transit Information and Transit Media
- Vanpool Formation Services
- Carpool Matching
- Telework Consulting
- Clean Air Program
- Downtown Commuter Guide
- Emergency Ride Home Program
- Transportation Planning
- Employer-Based Marketing
- Employer Relocation and Site Analysis Services
- Commuter Choice Program Development
- Bike and Pedestrian Commuter Service
- Park and Ride Lot Information

Carpooling is the sharing of rides in a private vehicle among two or more individuals and is the most common type of TDM alternative to driving alone. In addition to a matching service to help form carpools, RideFinders provides management for a fleet of approximately 140 vanpools serving Greater Richmond locations. Vanpools are an important alternative to driving alone, falling midway between transit and carpools in terms of carrying capacity and flexibility, economics, and convenience to the user. Vanpools usually involve groups of seven to fifteen people – mainly commuters – traveling together in a passenger van on a routine basis.

Not all carpools and vanpools in the Richmond area use the services of RideFinders, so it is not known precisely how many carpools and vanpools operate at any given time. Information gathered from surveys indicates that the use of alternative modes of travel such carpool/vanpool, bus, bike/walk and telework accounts for 12 percent of commuter travel in the Richmond area.

Employer Complementary Support Measures

Driving alone is such a long-standing habit for most commuters that few even think of trying an alternative without encouragement and assistance. Providing complementary programs and services that increase commuters' awareness of their alternatives, enhance the convenience of using an alternative, as well as reduce the need for a personal automobile during the workday, are important support measures that employers can offer.

Complementary programs and services fall into three categories: TDM program marketing, site amenities and design, and supporting activities.

TDM Marketing

As a complementary measure, program marketing features the dissemination of information on available TDM services and incentives to the public at large, the business community, or specific travel markets. Program marketing often also includes personalized trip planning assistance and special promotional activities such as transportation fairs or Commuter Information Days that can increase commuters' interest in ridesharing.

Marketing of TDM can be directed to commuters at several geographic levels: regional, local area, and individual employers. Regional marketing typically is sponsored by regional ridesharing or planning agencies, transit operators, and local governments. These agencies often promote the use of TDM generally, but some regional

programs promote specific regional strategies or services such as public transit. Regional commute groups increasingly focus on employer–based TDM marketing activities because of their greater effectiveness in promoting TDM to employees.

TDM marketing can also be targeted to a smaller audience in a defined local area, for example, an employment, shopping, or residential complex. Developers and property managers are often the sponsors of these programs generally as a condition placed on the development project by a local planning board. TDM marketing in a local area can also be sponsored by groups of employers and/or developers (e.g., transportation management associations). To these groups, joint marketing could result in cost savings over individual promotion. At employment sites, local area marketing is often targeted to new tenants by the leasing agent or building manager. Residential-based programs often target new residents through realtors and property managers.

The third geographic level of program marketing is at an individual employment site. Here, marketing is done by employers who promote use of TDM options to their employees. Employer marketing efforts sometimes include general promotion of TDM, but most often market the specific TDM services and incentives provided by the employer or options available only to employees at that site.

There are three components of TDM marketing that warrant attention: information dissemination, transportation coordinators, and special promotions.

Information dissemination methods might include mass mailings, websites, newspaper, radio and television advertising, and roadside signs. At individual employment sites, information dissemination typically relies on posters, bulletin boards, flyers distributed desk-to-desk, in-house newsletters, broadcast e-mails, new employee orientation packets, paycheck inserts, voicemail announcements and periodic promotional events such as transportation fairs. Methods of disseminating local area information may include posted notices, newsletters, website links, promotional events, mass mailings to new tenants or new homeowners, and distributions through realtors, building managers, and Chambers of Commerce. The most basic level of information dissemination is passive postings, such as carpool ridematch boards, "take one" information displays, kiosks, mass mailings, and roadside signs that inform commuters of assistance available from a remote source such as a regional ride-sharing agency. At this level, the commuter must make the effort to follow-up with an e-mail, call or mail-back card to receive more information.

The highest level of information assistance is provided by a commute information center, centrally located within an employment area, a transit station, or an individual employment site. At this level, the commuter still makes an effort to use the center's resources, but receives immediate, personalized assistance. These centers are staffed, generally full-time, and provide information on available services and personalized commute planning. RideFinders' Commuter Store, located in downtown Richmond, serves as an outlet for distribution of transit fare media, personalized ridematching assistance, and other commute-related products and services.

Employee Transportation Coordinators (ETCs), offer individual trip planning assistance at employment sites, and perform more general marketing and information functions. At employment sites, the ETC generally serves as the administrator of the company's commute program and manages the program's development, implementation, marketing, administration, and evaluation. At some job sites, the ETC position is a full or part-time position. In the Central Virginia region, most of the ETC job functions are incorporated as a part of an already established position. ETC's are at the heart of RideFinders' efforts to help Central Virginia maintain the region's air quality and reduce

traffic congestion. RideFinders offers free training, recognition opportunities and total support to these liaisons to the business community.

TDM marketing often includes special promotions such as periodic prize drawings, contests, awards for ridesharing, commuter or bicycle clubs, and other activities to attract the attention of commuters, generate excitement about the use of commute alternatives, and reward ridesharers. They are often sponsored in conjunction with area-wide commuter promotions such as annual Try Transit ridesharing week, Clean Commute Day, or Air Quality Action Days. Special promotions are widely used, especially at employment sites, in part due to their low cost and high publicity value. In addition, transportation or rideshare organizations may appeal to the general public through radio and television commercials, press releases, and public service announcements.

While RideFinders provides all of these services, there remains a role for local jurisdictions and the TPO to play in encouraging the use of these available resources by more businesses within the Central Virginia region.

Site Amenities and Design

Many employment sites, especially those in suburban areas, were designed with the expectation that employees would primarily arrive by private automobile. The goal of the second group of complementary programs, site amenities and design, is to change the work site to make it more "friendly" to commute alternatives.

"Rideshare Friendly" work site design refers to work sites that: accommodate the space and maneuvering needs of transit and vanpool vehicles; provide safe, attractive rideshare loading areas and preferential parking areas; and minimize the walking distance for high-occupancy-vehicle (HOV) commuters. Some sites also target the special needs of bicycle and pedestrian commuters by including bicycle parking protected from theft and from weather, showers and personal storage lockers, and bicycle maintenance facilities.

On-site services include cafeterias and restaurants, dry cleaners, ATMs, convenience shopping, video rental stores, printers and copy shops, and other personal or business-related service establishments commuters need to perform workday errands. Availability of service establishments on-site or within walking distance can minimize both the true and perceived need for a personal auto.

While site design issues are best left to local jurisdictions during the design review and negotiation phase, RideFinders has a strong and vested interest in working with developers regarding site design.

Supporting Services

Supporting services are program elements that address two concerns that commuters often have about use of commute alternatives: the fear of being stranded without transportation in the event of an emergency and the fear that use of ridesharing will hinder their advancement in the company.

Emergency Ride Home (ERH) programs, also known as guaranteed return trip, are "commuter insurance." ERH programs address concerns about being stranded without transportation, responding to personal emergencies, or working late unexpectedly by offering free or subsidized emergency transportation, generally by taxicab or rental car, to commuters who use alternative commute modes. RideFinders has an ERH program for registered carpool or vanpool commuters, cyclists and pedestrians, and bus riders. When registering, they must certify that they are committed to this alternative mode at least three days a week.

Corporate Commitment reflects a willingness of upper level corporate management to devote resources to the TDM program, provide tangible incentives, establish a corporate "culture" that supports employees' use of commute alternatives, and to participate in local and regional transportation-related programs. It is typically demonstrated by an extensive package of incentives

offered to commuters, but also includes supportive work environment policies. Strong corporate commitment is sometimes manifested by ridesharing among corporate executives.

Preferential High Occupancy Vehicle (HOV) Treatments

HOV facilities are designed and operated to give rideshare commuters priority treatment. Preferential HOV facilities are an effective way to encourage travelers to use higher-occupancy modes of travel by allowing rideshare commuters exclusive use of HOV lanes. The resulting reduction in travel time serves as an incentive to encourage use of HOVs.

HOV lanes are introduced by adding a lane (the HOV lane(s) are introduced as entirely new capacity), or by taking a lane, which involves the reallocation of current facilities, thereby taking capacity away from existing traffic. While adding a lane has been successful nationally, taking a lane has generally not been embraced by citizens.

Programming HOV facilities relies significantly on available resources and the ability to dedicate those resources toward an HOV project. Increasingly, federal and state funding programs and regulations (such as the federal Clean Air Act, Congestion Management System requirements, and local traffic mitigation ordinances) may place higher priority on the inclusion of HOV facilities in state and regional transportation system plans. Currently, the Richmond area has no HOV facilities nor does it have any planned.

Economic Incentives

Two key factors in the decision to use one mode over another are the relative time and costs. Financial incentives, termed user subsidies, offered directly to commuters by employers or public agencies, have been effective. Recent studies have concluded that subsidies are a component of effective employer trip reduction programs. Most commonly, subsidies are provided by employers who need to reduce parking demand or to alleviate access problems. Alternatively, public agencies may offer subsidies to commuters to achieve localized or area-wide trip reduction goals.

Some of the more common subsidy programs include:

Employer/Developer-Provided Incentives

- Transit Pass Subsidies: An agency purchases transit passes, tickets or tokens for employee use. The agency can either cover the full cost, share-the-fare with the employee, or pre-tax the fare cost. In other cases, the employer agrees to reimburse employees for their purchases
- Vanpool Operating Subsidies: Vanpool subsidies can take many forms. Employers that provide the vehicles, underwrite insurance and capital costs, or help employee groups arrange vanpool leases are providing an "in-kind" form of financial incentive. The federal Commuter Choice Program allows employers to subsidize the costs of employees' vanpool costs
- Rideshare Subsidies: Rideshare subsidies represent a means to more equitably implement a financial incentive by allowing employees to choose the alternative that best suits their travel needs, and then apply the rideshare subsidy to that mode.

Other Financial Incentives

Other financial incentives that provide a real, monetary incentive to using alternative travel modes do not involve direct subsidy payments to users. These include:

- use of fleet vehicles for ridesharing
- free or discounted fuel for pooling vehicles
- free or discounted maintenance and repair for pooling vehicles
- extra vacation for commute alternative users
- free or discounted equipment (shoes, bicycle helmets)

Public Agency-Provided Incentives

- Transit Fare Discounts: Fare discounts targeted to commuters are fairly rare, because commuters represent "choice" riders (i.e., having a choice of commute options). Service is generally the most costly to operate during the peak periods, and premium express-type commuter service most often commands a fare surcharge, not a discount. However, transit operators have experimented with free fares to increase ridership

- Transit Subsidies: While "user-side subsidies" are prevalent in transportation programs serving elderly persons and persons with disabilities, there are some examples of public sector agencies offering commuters direct subsidies for using transit. In some cases, cities or counties match employer transit subsidies. In other cases, transit operators sell passes to employers at a discounted rate if the employer provides a subsidy match. Finally, some public agencies have provided free transit tickets to commuters to use transit on a trial basis.

- Vanpool Start-up Subsidies: Some public agencies have subsidized the start-up costs of vanpools. This is accomplished by either providing a one-time start-up incentive to new vanpools or subsidizing all or part of an individual's vanpool fare for the first few months of operation. RideFinders' VanStart program, as well as the VanSave program, subsidizes the cost of empty seats. VanStart provides a temporary subsidy for a short, one-time period to allow the vanpool time to get the necessary number of riders to fill the vanpool. The owner-operator or van lessee must register the vanpool with RideFinders and request VanStart assistance within the first three (3) months, and the van must already have at least 50% of its passenger capacity filled. VanSave is a program that allows existing vanpools that have suffered a loss in riders to continue to operate until riders can be built up to a break-even level. The vanpool must have been operating for at least six months, be registered with RideFinders for at least 30 days, and must have lost at least 25% of its passengers for more than 30 days

Another effective method for providing user subsidies and transit discounts is to provide financial incentives to employers rather than directly to travelers, so as to reinforce in-house trip reduction programs and assist in compliance with requirements. Revenue for public subsidies can come from a variety of sources. User fees, such as parking revenue or taxes, can be utilized. Business taxes and developer fees can also be utilized. In addition, municipalities can secure federal grants for pilot programs. The City of Richmond Employee Trip Reduction Program is an excellent example: using a mix of federal, state and local funds, to date approximately 1,000 employees or 20 percent of the City's workforce have enrolled in the program, with about half of those enrolled using the program on a regular basis. The program provides transit swipecards for participants, as well as vanpool subsidies for certified vanpool riders.

Subsidies, when combined with parking charges, produce the most effective programs examined to date. This suggests that the inclusion of financial incentives in TDM programs is a critical consideration for developing an effective program.

As an example, the Commuter Choice Program, operated by RideFinders, refers to the Internal Revenue Code [(26 USC 132(f)] which permits employers to offer employees a tax-free benefit to commute to work by bus or vanpool. The Commuter Choice Program provides an attractive incentive for employees to choose public transit or vanpools. Employers select one of several program options to implement. Over fifty (50) Richmond area employers participate in the Commuter Choice Program, some of which include the following:

- Virginia Department of Small Business & Supplier Diversity
- Federal Bureau of Alcohol, Tobacco & Firearms
- Chippenham-Johnston Willis Hospital
- Federal Reserve Bank
- City of Richmond
- Federal Highway Administration
- 4th Circuit Court of Appeals
- LeClair Ryan
- University of Richmond
- Williams Mullen
- VCU Health System
- VCU School of Dentistry
- Virginia Department of General Services
- Virginia Department of Environmental Quality
- House of Delegates
- Office of the Attorney General
- Senate of Virginia
- State Corporation Commission
- U.S. Department of Housing & Urban Development
- Virginia Department of Taxation
- Virginia Board for People with Disabilities
- Virginia Department of Agriculture & Consumer Services
- Virginia Department of Criminal Justice Services
- Virginia Department of Education
- Virginia Department of Juvenile Justice
- Virginia Department of Medical Assistance Services
- Virginia Department of Transportation
- Virginia Employment Commission
- Virginia Department of Forensic Science
- Virginia Department of Conservation & Recreation
- Virginia Department of Housing & Community Development
- Virginia Department of Mental Health, Mental Retardation and Substance Abuse Services
- Virginia Worker's Compensation
- Virginia Department of Social Services
- Virginia Lottery
- Virginia State Bar
- Virginia Retirement System
- Virginia State Police
- Virginia State Board of Elections
- Library of Virginia
- Virginia Department of Rail and Public Transportation
- Virginia Department of Health
- Virginia Department of Business Assistance
- Hilton Garden Inn
- Davenport & Company LLC

Parking Supply and Pricing Management

The development and management of parking supply involves many public and private sector groups. The public sector plays several roles in parking supply, including:

- Localities set "parking requirements" in codes. Requirements in zoning codes usually vary with the type of land use
- Some localities build and manage off-street parking supply
- Localities control supply and regulation of on-street parking
- Localities influence rates charged by private providers of parking

The private sector also has an important role in parking. Where the market allows, commercial parking operators provide and price surface lots and garages available to commuters and shoppers.

Policies that influence parking supply, price, and location raise equity issues across affected parties. For example, supply or pricing changes at an activity center, whether downtown or suburban, may favor or disadvantage activity center growth and the economy relative to other centers in a region.

Parking and Demand Management

Parking is a vital element of any Transportation Demand Management program. Research has shown that parking pricing is, by itself, just as effective in reducing trips as a combination of several demand management strategies implemented without parking pricing. Therefore, the TPO and area local governments should examine parking policy as an integral part of any demand management program.

Localities can integrate parking into their demand management efforts through two broad approaches: pricing and supply management. Note, however, that several of these measures require approval at the state level before they can be considered.

Pricing

Parking pricing can serve the objective of trip reduction. Methods such as increased rates or surcharges at public and private facilities, removal of parking subsidies, implementation of regulations and agreements encouraging parking pricing as a demand management measure, changes in commercial parking rate schedules, parking taxes or other means, can reduce vehicle trips significantly.

Objectives will determine what strategies and policy instruments should apply. For lessening localized traffic problems, parking pricing or subsidy removal or changes in public parking rates at employment centers will be effective. However, to achieve regional objectives of improved air quality or trip reduction on routes traversing several jurisdictions, multi-jurisdictional pricing efforts are necessary.

It is important to appreciate that pricing can also bring results opposite to those desired. For example, pricing can divert some parkers to alternative parking facilities or shorten their parking stay. Planners need to anticipate these possible results along with mode shifts.

Governments may take several approaches to pricing parking. They may:

- Impose or increase fees and surcharges for solo drivers or long-term parkers in public parking facilities
- Give price preference to carpools and vanpools.
- Tax the providers of parking
- Impose parking pricing through regional regulations
- Tie funding allocations for road improvements to requirements for local trip reduction plans incorporating parking pricing

Employers also can play a role in pricing. They may:

- Remove, reduce or cash out employer-provided parking subsidies
- Reverse "early bird" or monthly discounts favoring long-term commuter parking
- Impose parking pricing and discount parking for carpoolers where free parking prevails, or where carpoolers enjoy no price breaks
- Develop parking regulations and pricing for commercial and retail mixed-use areas and manage and enforce parking

Supply Management

Parking supply measures support the objective of trip reduction. Revising minimum or maximum rates, allowing below minimum rates in proximity to transit or for demand management programs, and providing shared parking at mixed-use developments are important considerations in a trip reduction program.

As with pricing, program objectives will determine what strategies and policy instruments should apply. For new developments in proximity to transit, maximum rates and controls on street parking will provide incentive for transit use. Adding carpool stalls where supply is limited will provide an incentive for pooling, especially where stalls can be located near building entrances. Also worthwhile are flexible requirements allowing for reductions in normal on-site minimum parking requirements in return for support of ridesharing and transit encouragements, peripheral parking and transit facilities.

Localities influence the supply of parking at and around developments through:

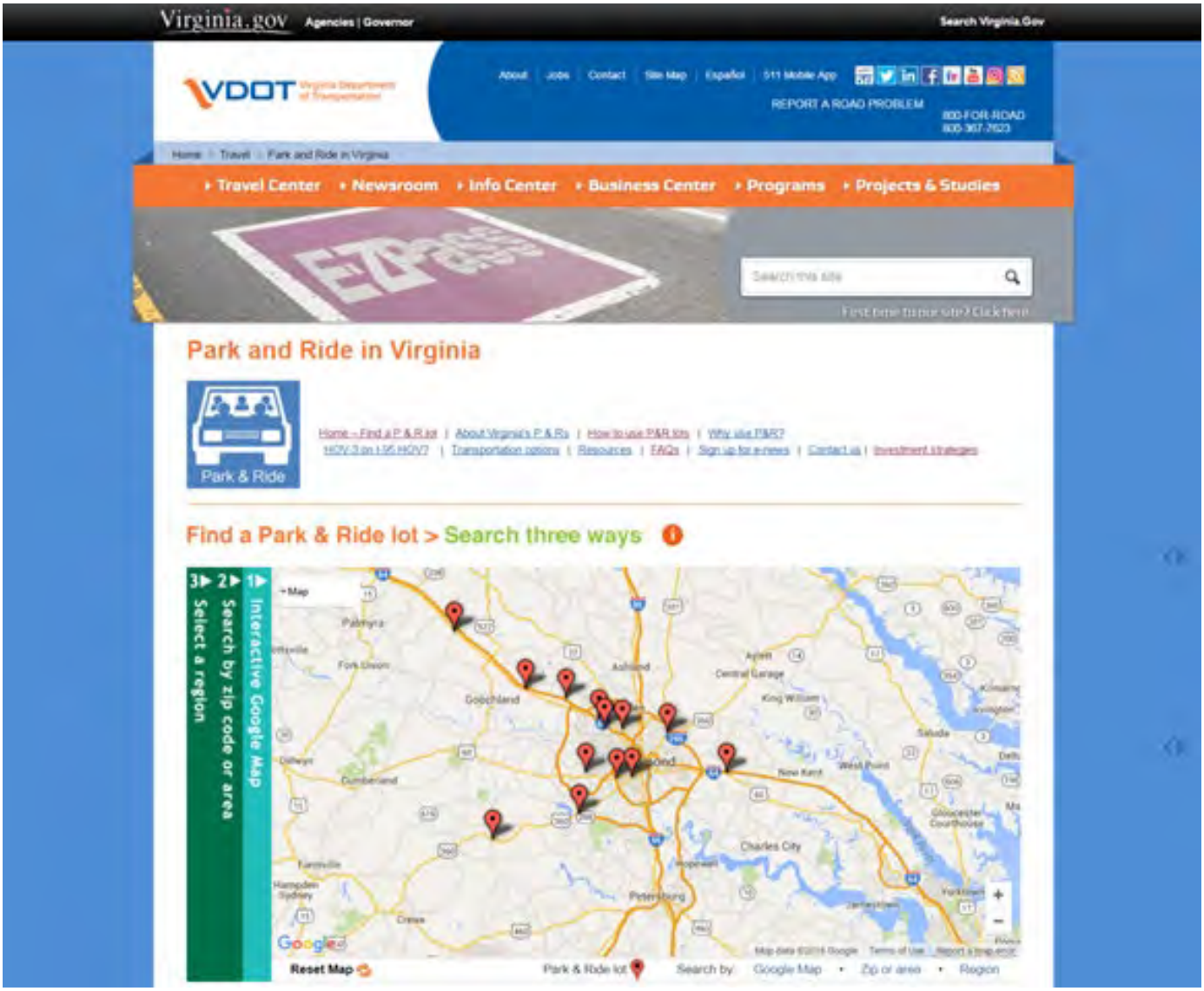

FIG. 7.1. VDOT PARK AND RIDE LOT WEBSITE

- Parking code measures
- On-street controls (meters, timed zones)
- Controls on the amount of parking built and operated by the public sector

Localities can exert the most direct control over parking supplies through the zoning code. Parking codes establishing the amount of parking developers must provide can be set with low minimums and/or maximums to insure overly ample supplies are not provided. Or, localities can allow reductions in minimum requirements in return for traffic mitigation.

Park and Ride Lots

A related strategy is the provision of park and ride lots. Park and ride lots are parking lots available for use when commuting to work or school, or when sightseeing, shopping, running errands, etc. The lots allow commuters, particularly those traveling longer distances, to park their vehicles at a convenient location and then finish their commute using alternative modes such as carpools, vanpools, bus, train, bike, or walk. The lots provide an essential service by serving as a place to meet other commuters to facilitate ridesharing.

In 2013, VDOT completed a statewide Park and Ride Lot Inventory and Usage Study which included a full-scale review of all of Virginia's park and ride lots, a website to assist users in finding Park and Ride lots (www.virginiadot.org/travel/parkride/home.asp), and a compiled list of recommendations for new,

expanded or enhanced Park and Ride Lots. During this study, it was determined that approximately 75 percent of Virginia's P&R lot spaces were being used, with some lots not having enough spaces to accommodate all of the demand. With a high percentage of the P&R spaces being at or near capacity, VDOT recognized a potential need for additional P&R lots across the state. In order to provide P&R lots that are conveniently located and feasible for commuters to use, VDOT conducted a data-driven study to determine where investments in P&R facilities are needed throughout Virginia. The goal of this effort was to develop a P&R investment strategy for each of VDOT's nine construction districts. The study recommends the development of eight additional park and ride lots within the Richmond urbanized area:

Chesterfield County

1. Hopkins Road near Chippenham Parkway - 150 spaces

2. I-95 at Woods Edge Road - 200 spaces

3. Courthouse Road near Powhite Parkway -2 00 spaces

4. Rt 10 near I-95 - 250 spaces

5. Rt 1/301 near Chippenham Parkway - 250 spaces

Henrico County

6. US 1 near I-95 - 200 spaces

7. Williamsburg Rd near Eastover Ave -100 spaces

New Kent County

8. Rt 609 at I-64 Exit 211-100 spaces

Currently, there are 12 designated park and ride lots in the Richmond region as well as a Park and Ride Strategy that received funding in FY2014:

- Chesterfield Commonwealth 20: Intersection of Rts 360 and 754 (Commonwealth Center Parkway) - 250 spaces, transit service available
- Big K-Mart: Intersection of Rt 60 and 150 -122 spaces,transit service available
- Southside Plaza:Intersection of Rt 30 and 161 -70 spaces,transit service available
- Bottoms Bridge:Intersection of Rts 33 and 249 - 37 spaces
- Mechanicsville: Intersection of Rts 360 and 640 - 97 spaces
- Parham Road: Intersection of Parham Rd and I-64 - 306 spaces, transit service available
- Glenside Drive: Intersection of Glenside Drive and Crockett Street - 423 spaces, transit service available
- Gaskins Road: Intersection of Gaskins Road and I-64 - 444 spaces, transit service available
- Hickory Haven: Intersection of Rts 250 & 623, Goochland County - 98 spaces
- Oilville: Intersection of I-64 & Rt 617, Goochland County - 20 spaces
- Hadensville: Intersection of Rts 250 & 629, Goochland County - 5 spaces

In addition the above noted sites, GRTC offers express bus service from park and ride lots located at Spring Rock Green/Virginia College, Bon Air Baptist Church, White Oak Village Shopping Center and the Petersburg Transit Center.

Variable Work Hours and Compressed Work Weeks

Work hour management is an important component of travel demand management because work hour policies contribute heavily to peak hour congestion. There are three types of variable work hours with potential application as demand management tools:

- Staggered work hours - Staggered hours are staged starting times set by employers
- Compressed work weeks - Compressed work weeks allow employees to work more hours in fewer days than the usual eight-hour per day schedule
- Flextime - Flextime allows employees to set their own arrival and departure time within a band of time

Employees and employers may find alternative work hours improve quality of life issues and employee performance and

lessen traffic congestion. Variable work hour programs in settings where workers need and want more flexibility in their schedules may reduce absenteeism, tardiness, and turnover.

RideFinders routinely introduces flexible work arrangements when promoting TDM strategies to local employers. Many organizations throughout the Richmond region have begun their own variable work hour programs.

Teleworking

Teleworking is a demand management strategy for reducing home-to-work trips by allowing employees to work at home or in a telework center. Teleworking employees usually work at home one to several days per week, but generally report to a central office location on the remaining days. To be able to work at home, employees are linked to the work place by computer and modem and other electronic communication devices.

The Telework! VA program provides incentives for Virginia businesses to establish or expand telework programs for employees. The Telework!VA program was launched by the Virginia Department of Rail and Public Transportation (VDRPT) to help reduce the number of commuters on Virginia roadways. Telework!VA provides guidance to companies on how to design a telework program, offering step-by-step instructions, case studies of successful implementation, and other resources including financial incentives.

Participating employers must be either a private for-profit business, or a non-profit organization classified as such under Section 501(c) of the Federal Internal Revenue Code, and must have a location with 20 or more employees in northern Virginia, the greater Richmond area, or the Hampton Roads area to be eligible for the Telework!VA financial incentives. RideFinders is the source for information and assistance in central Virginia for the Telework! VA incentive program.

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Transportation Innovations

How we choose to travel via our primary mode of transportation is in a constant state of development and change. In the Richmond region just a few generations ago, travel within the region was primarily accomplished on foot, by horse or horse-drawn carriage. Later the bicycle and electric streetcar began to appear, leading to growth and development in former edge areas. The preeminence of the private automobile from the post-war period to today has shaped the transportation network and the development pattern of the Richmond region. A key question is, what will new transportation innovations mean for the future of how we choose to get around in the Richmond region?

Technological advancements have long played a key role in transforming how people get around. In the future, new technology is expected to lower transportation costs, reduce emissions, improve safety, and make vehicles more efficient and reliable. For these goals to be realized, any transportation innovation will need to be economically viable, overcome potential liability and regulatory issues, and gain acceptance by society at large.

The pace of technological innovation is accelerating rapidly. Transportation technologies that do not exist today are likely to emerge in the next few years. As a result, it is difficult to predict exactly how and when the regional transportation system will be significantly impacted. Also, what we may expect the impact of technologies to be today, could have radically different implications on the use and performance of the transportation system than what has been predicted. In order to contemplate the future of transportation, it is important to catalog emerging transportation technologies and explore their possible implications. As new information comes to light future metropolitan transportation plans will account for innovations.

Alternative Fuels and Electric Vehicles

As the Richmond region enters the 21st century, alternative fuels and alternative fuel vehicles are once again gaining popularity as the future of petroleum-derived fuels becomes increasingly uncertain. Traditional internal combustion engines are being modified to burn alternative fuels such as compressed natural gas (CNG), biodiesel and ethanol/gasoline blends. Also consider electricity, liquefied natural gas, propane, biogas, compressed air, hydrogen fuel cells, or a hybrid approach. This allows current generation vehicles to burn fuels that are typically cleaner and help to lower dependence on petroleum-based sources. Some of these alternative fuel sources also use byproducts that have traditionally been disposed of or sources for which there are currently surpluses or unused manufacturing capacity.

In the last decade, electric vehicle technology has once again begun to gain popularity in the form of hybrid-electric vehicles (HEVs). HEVs contain both an electric motor and an internal combustion engine, both of which are capable of producing sufficient energy to power the vehicle. In contrast, electric vehicles (EVs) utilize an electric motor as their sole source of locomotive power.

An issue that comes up regularly when reviewing EV literature is the term "range anxiety", referring to the worry of EV owners and potential owners regarding the relatively short travel range (40-60 miles) of most current generation electric vehicles. A 2011 National Geographic online article, Range Anxiety: Fact or Fiction, reports that "a survey conducted last year by the Consumer Electronics Association found 71% of respondents feared running out of charge on the road—placing range anxiety among the most common perceived disadvantages of electric vehicles." Clearly, this can be a barrier to the acceptance of electric vehicles by a wider segment of the general driving public. Presumably, as EV infrastructure (charging stations specifically) becomes increasingly common, range anxiety will become less of an issue to potential buyers.

Potential Impact of Electric Vehicles on the Richmond Region's Transportation System

- Reduced emissions from non-point sources (i.e. vehicles)
- Net emissions unknown; electric vehicles require electrical generation and associated emissions
- Improved ground level air quality
- Requires new investment in dispersed charging stations and electric grid
- Electric vehicles can use existing roadway infrastructure without major adjustments
- Impact on Vehicle Miles Traveled is inconclusive

Autonomous and Connected Vehicles

Beginning in the 1980s, scientists and researchers have been investigating the potential of replacing the human element in transportation by exploring the potential for vehicle automation, popularly referred to as driverless cars. In the last decade the rate of technological change in vehicle automation has increased, and driverless cars are now being tested to varying degrees across the county, including on highways in Virginia. Predictions as to when driverless cars could take the road vary from five to fifty years; however, the impact of such technology on the transportation system could be vast. Nearly all major car manufacturers, along with Google, are developing driverless vehicles. These vehicles use cameras, radar, and laser sensors to maneuver along the roadway. Connected automation includes three variations of a vehicle:

- Autonomous Vehicle: Operates in isolation from other vehicles using internal sensors
- Connected Vehicle: Communicates with nearby vehicles and infrastructure
- Connected Automated Vehicle: Leverages autonomous and connected vehicle capabilities

The National Highway Transportation Safety Administration (NHTSA) defines vehicle automation as having five levels:

- No Automomation (Level 0): The driver is in complete and sole control of the primary vehicle controls – brake, steering, throttle, and motive power – at all times.

- Function-specific Automation (Level 1): Automation at this level involves one or more specific control functions. Examples include electronic stability control or pre-charged brakes, where the vehicle automatically assists with braking to enable the driver to regain control of the vehicle or stop faster than possible by acting alone.

- Combined Function Automation (Level 2): This level involves automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions. An example of combined functions enabling a Level 2 system is adaptive cruise control in combination with lane centering or traffic jam assist.

- Limited Self-Driving Automation (Level 3): Vehicles at this level of automation enable the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. The Google car is an example of limited self-driving automation. Examples of combined functions include traffic jam pilot, automated parking, and highway autopilot systems.

- Full Self-Driving Automation (Level 4): The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles such as closed campus driverless shuttles, valet parking in garages, and 'full automation' in certain conditions.

- Driverless Automation (Level 5): The vehicle is able to operate without any driver present. Functions may include automated taxi services and car-share reposition systems.

A related technology for 'Connected Cars', relies on WIFI for communication between vehicles (v2v) or between vehicles and infrastructure (v2i), and can warn drivers of upcoming traffic congestion, accidents, or other emergencies. Connected vehicles may help improve vehicle automation and have similar road safety and capacity impacts, but do not have the same potential to transform the transportation system by replacing drivers altogether.

The adoption of autonomous and connected vehicles technologies will have significant impacts on travel behavior, safety, car-ownership, infrastructure, land-use, and development patterns. In addition to a wide range of outcomes—from just a small improvement in safety of driving to a profound shift in travel behavior—the impacts remain uncertain. For example, autonomous vehicles could increase vehicle miles traveled (VMT) by lowering the time-costs of travel and parking and by giving increased mobility to children, the elderly, the blind, and others restricted from operating vehicles1. On the other hand, driverless cars could reduce VMT by enabling more car-sharing, better transit, and a shift from paying for vehicles and insurance in lump sums to paying for each trip or mile driven.

Potential Impact of Autonomous and Connected Vehicles on the Richmond Region's Transportation System

Guerra, Erick. (2015). "Planning for Cars That Drive Themselves: Metropolitan Planning Organizations, Regional Transportation Plans, and Autonomous Vehicles". Journal of Planning Education and Research, 1-15.

- Requires investments in pavement markings, signage, and signals for ease of recognition by vehicle sensors
- Improved safety and reduced collisions by removing human error
- Increased capacity of existing roadway network - as vehicles will be able to travel closer together
- Reduced car ownership, increase in car-sharing models
- Freight and transit industries as likely early adopters to offset labor costs
- Self-driving freight, transit, and personal vehicles may alter how people and goods move and where households and firms choose to locate
- Impact on Vehicle Miles Traveled unknown - potential to increase or decrease VMT

Transportation Network Companies

Transportation Network Companies (TNCs) such as Uber and Lyft are currently impacting traditional models of procuring transportation from third parties. TNCs are based on a software platform which creates an online marketplace in which a driver registered with the company may offer their own labor and car to people who request a ride. TNCs maintain the platform, vet drivers to ensure regulatory compliance, and process financial transactions. It is important to note that this model differs from traditional taxi services because the TNCs themselves are not directly providing transportation services, but are facilitating a marketplace of such transactions.

The services of transportation network companies are becoming increasingly popular because of the convenience of requesting a ride by a mobile app, and the competitive pricing of these services. Taxicabs can provide similar services, but while most cities require companies which provide taxicabs to meet certain requirements, transportation network companies may be exempt from such requirements due to their only providing a marketplace and not actually employing drivers or keeping automobiles.

Photo Source: Virginia Tech Transportation Institute

- In Virginia, TNCs did not have a regulatory framework or legal authority to operate in the state until February 2015. The regulations developed by lawmakers, the Virginia Department of Motor Vehicles, and TNCs require the following:
- Pay $100,000 for a license to operate in the state
- Drivers must be at least 21 years old and properly licensed to drive
- Drivers must undergo a background check including a comprehensive review of history of felonies and a search of the sex offender and crimes against minors registry
- The company or the driver must have insurance that covers up to $1 million in accident damage and they must abide by a zero-tolerance policy regarding use of drugs and alcohol

Potential Impact of TNCs on the Richmond Region's Transportation System

- Reduced car ownership, increase in car-sharing models
- Competition with existing taxi companies and impact on pricing
- Competition with public transit
- Integration of TNC-like applications by public transit agencies

Smart Road/Smart Highway

Nanotechnology used in sensor highway applications can enhance battery life, provide lightweight and high-strength materials, and reduce the size and increase the computing power of remote sensors. These remote sensors have numerous road uses, from adaptive traffic signals to monitoring bridge and road conditions and repair needs. Adaptive signal control technology (ASCT) uses remote sensors and computing power to respond to real time traffic. FHWA estimates that ASCT systems can increase traffic throughput by 10 to 50 percent, depending on the corridor and type of previous signal system. Less than one percent of the signals in the United States currently employ this technology (DVRPC LRTP).

Virginia Tech Transportation Institute manages the Virginia Smart Road, a full-scale, closed test-bed research facility owned and maintained by VDOT. This 2.2 mile, controlled access test track is built to FHWA standards with two paved lanes, three bridges including the Smart Road Bridge, and hosts a list of technological attributes to control various variables during testing and provide 24/7 monitoring through its computer-equipped control center. The Virginia Smart Road assists in observations of highway traffic and driver performance, lighting and weather impacts, and serves as QA/QC for the VDOT 511 Virginia system. As the Smart Road technologies advance results to assist in driving and infrastructure performance, the information exchange between vehicles or drivers and roadways will become more integral in improving safety and operations.

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Travel Demand Modeling

Since the adoption of plan2035, staff has been working with VDOT on updating the Richmond/Tri-Cities (RTC) regional travel demand model (RTDM) for use as a tool for scenario planning. The model utilizes Citilabs software and CUBE Catalog modeling platform to create regional travel demand estimates for the Richmond and Tri-Cities metropolitan areas. The model produces forecasts for the Richmond 8-hour ozone maintenance area, as well as parts of Goochland, Powhatan and Dinwiddie counties, and all of Charles City and New Kent counties. The RTDM is a four-step model that includes trip generation, trip distribution, mode split and traffic assignment. The model also includes feedback between highway assignment and trip distribution.

In 2015, the Richmond/Tri-Cities travel demand model was updated from a 2008 base year and 2035 horizon year to 2012 base year and 2040 horizon year using socioeconomic data and forecasts developed by the Socioeconomic Data Workgroup. Due to the timing of the delivery of the updated RTDM, scenario planning efforts could not be initiated for plan2040.

Improvements to the RTDM will provide additional opportunities for data analysis and public participation in the plan2045 update process. The following are some of the possible uses of the updated model for plan2045:

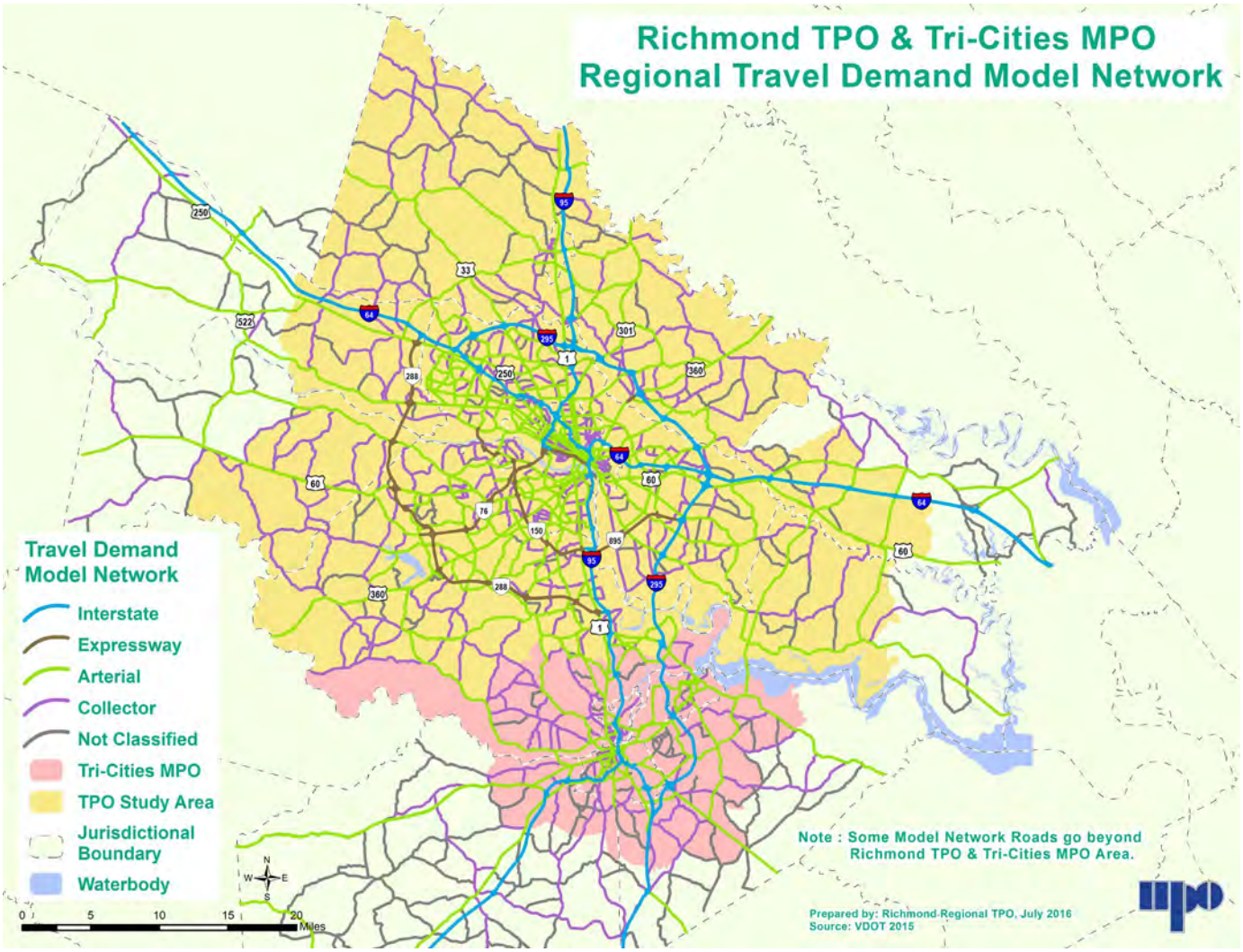
- Generate multiple regional transportation "scenarios" to aid in the plan visioning process
- Determine future transportation infrastructure needs
- Analyze the regional effects of different groups of transportation projects to aid in the project ranking and selection process
- Provide improved future traffic congestion forecasts for the CMP network analysis
- Validate other CMP data sources
- Analyze driver route choices and better inform the scope of the CMP network

The RTDM model can assist in answering common questions about the Richmond region's transportation system such as how many trips will people make, where will jobs and people locate and how will people travel.

Richmond TPO RTDM On-Call Consultant

As part of the development of resources to integrate scenario planning into the RRTPO Unified Planning Work Program, an on-call consultant was selected and hired in September 2015 to evaluate the RTDM provided by VDOT and to work with RRTPO staff on expanding the capabilities and uses of the model. The on-call consultant will provide technical assistance in travel demand forecasting and scenario planning to help inform staff and the RRTPO Board when making transportation planning decisions. The on-call consultant will also assist staff in the use of the RTDM for travel analysis supporting informed transportation planning decisions.

Work task orders include a review of the RTDM for deficiencies and potential outputs in its current version and the development of methodology for a deficiency analysis, updating the base year network to 2018 based on the RRTPO's current Transportation Improvement Program projects, updating the 2040 horizon year network with projects from the plan2040 Fiscally Constrained Plan, and developing a methodology for corridor and sub-area modeling and analysis. These initial work task orders will work to build a foundation for needs analysis and project identification in various elements of the RRTPO UPWP.



MAP 8.29. RICHMOND/TRI-CITIES REGIONAL TRAVEL DEMAND MODEL NETWORK

Scenario Planning

What is Scenario Planning?

FHWA defines scenario planning as "a process that can help transportation professionals to prepare for what lies ahead [and] provides a framework for developing a shared vision for the future by analyzing various forces that affect communities."1 Scenario planning is an approach that enhances traditional planning processes by helping citizens and stakeholders, both public and private, understand how demographic and land-use changes could impact state, regional, and local transportation networks. The most important distinction within scenario planning is identifying land-use patterns as variables rather than static inputs. Through the analysis of future scenarios based on demographic, economic, political, or environmental variables, citizens and stakeholders get a view of the possible future of their community. The ultimate goal of a scenario planning approach, then, is "a shared future vision that provides a framework for transportation priorities, goal, recommendations, and investments."

FHWA Peer Workshop

In November of 2014, the RRTPO participated in a scenario planning peer-workshop led by FHWA. With support from FHWA, the Hillsborough MPO for Transportation (Hillsborough MPO) and the Southwestern Pennsylvania Commission (SPC) contributed to discussions that allowed the RRTPO to gain insights into scenario planning practices. Through this collaboration, the RRTPO was able to identify opportunities for implementing a strategic scenario planning approach within the next Metropolitan Transportation Plan update. The next update, plan2045, will cover a time horizon through 2045 and is scheduled for adoption in 2021. While the current update will not explore an extensive use of scenario planning, the workshop identified possible opportunities for implementing such practices, with a more comprehensive approach to be used in the plan2045 update.

What are scenarios?

As described by FHWA, scenarios are narratives or sets of assumptions that explore the possible and plausible trajectories of change. More specific to

FIG. 8.1. COVER OF THE FHWA SCENARIO PLANNING PEER EXCHANGE WORKSHOP REPORT

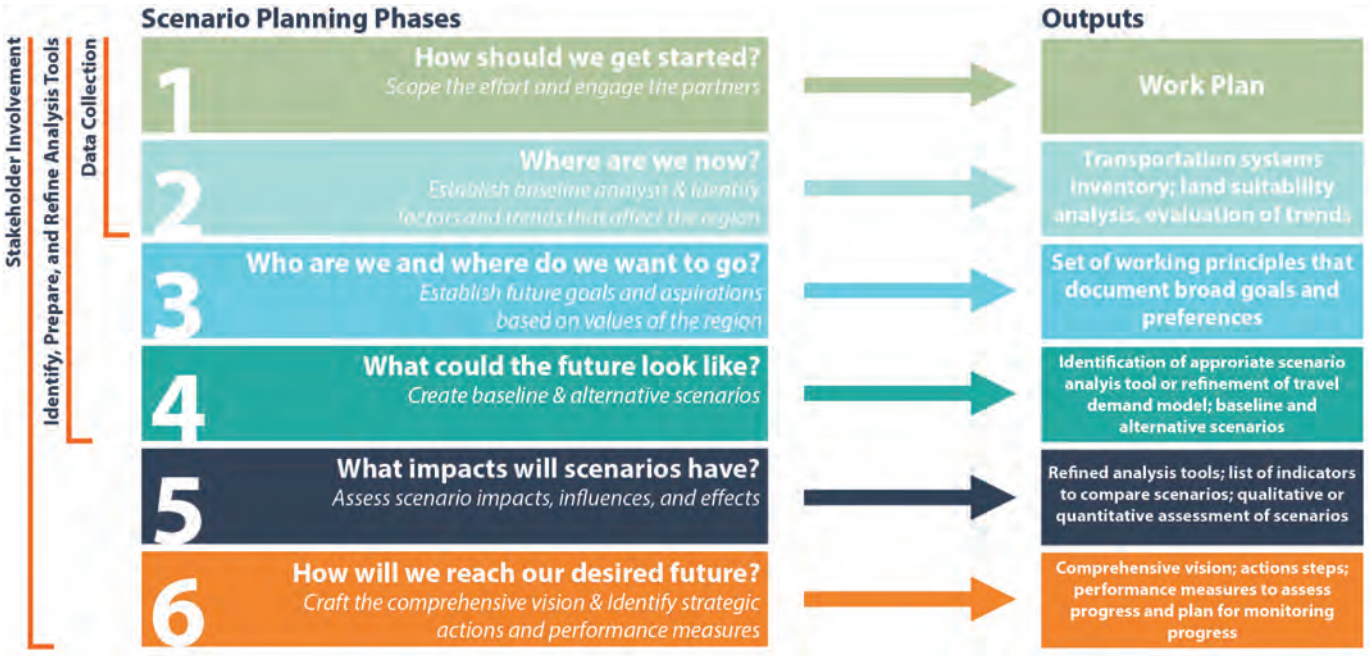


FIG. 8.2. FHWA SIX-PHASE SCENARIO PLANNING FRAMEWORK

scenario planning, they provide a means of visioning or imagining the possible future changes of a region, as well as the different policies and investment options that support those changes.

The Process

One of the most important advantages in taking a scenario approach to planning is the ability of the planning entity to customize or tailor the process to its unique conditions. Localities are able to use scenario planning to create well-thought out visions of their possible future, and compare those visions. Because of these comparisons, participants can discuss possible outcomes, identify and challenge current assumptions about the future, and agree on the necessary tradeoffs. The final product, then, is a process of consensus building that is more in-depth, locally relevant, and procedurally actionable. Through scenario planning, planners and stakeholders are able to make better decisions about the direction of planning efforts; decisions that are more comprehensive and sensitive to environmental and human variables.

Based on the FHWA Scenario Planning Guidebook, a scenario planning process will include six key phases. Formulated as questions for participants to ponder, these phases help guide planning efforts towards the ultimate goal: a shared vision and framework for transportation priorities, goals, recommendations, and investments.

Phase 1: How should we get started?

In this phase, RRTPO will develop the scope of the planning effort, and begin to identify and engage the necessary partners.

Phase 2: Where are we now?

After developing the scope and engaging the necessary partners, RRTPO will establish a baseline analysis, and identify important trends.

Phase 3: Who are we and where do we want to go?

Based on the geographic boundaries of the planning effort, in this case the Greater Richmond region, RRTPO will establish future goals and aspirations that speak to the values of the region.

Phase 4: What would the future look like?

In this phase, RRTPO will use baseline analysis from Phase 2 to create a snapshot scenario for the region. Secondly, future goals and aspirations from Phase 3 are used to create alternative development scenarios that create a view of the possible futures of the region.

Phase 5: What impacts will the scenarios have?

After creating the necessary scenarios, RRTPO will develop indicators that can be used for comparison. As scenarios are examines, analysis tools or models may be refined.

Phase 6: How will we reach out future?

In this phase, RRTPO will use the scenario comparisons to craft a comprehensive vision for the region. In addition, RRTPO will be able to identify proper action steps for achieving this vision, and develop performance measures to assess and monitor progress.

As the RRTPO moves through these phases of scenario planning, the following key elements must be kept in mind. First, scenarios must be used to compare and contrast interactions between multiple factors, e.g., land use, transportation, and economic development. Second, the comparison of scenarios will inform analysis of possible impacts on transportation networks. Third, comparison and analysis will lead to strategies that advance community or regional visions. And most important, the public shall be engaged throughout the entire process.

Precedent Efforts

The following reports and plans represent successful scenario planning efforts both within and outside our region. They each offer a unique example of how scenario planning can and should be used to better tailor a regional planning efforts; one that places a higher importance on public participation. This section aims to make connections between previous planning or visioning exercises in the region, the goals created from those exercises, and the subsequent plans meant to achieve those goals.

- Imagine Hillsborough 2040
- 2040 Transportation and Development Plan for Southwest Pennsylvania
- The George Washington Regional Scenario Planning Study
- Where Are We Growing? Land Use and Transportation in the Greater Richmond Region
- Richmond Regional Comprehensive Economic Development Strategy
- Building the Framework for Regional Collaboration
- Sustainable RVA Action Plan

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The Central Virginia Emergency Management Allicance

The Central Virginia Emergency Management Alliance (CVEMA) originated with the Central Virginia UASI, (Urban Areas Security Initiative) a Department of Homeland Security (DHS) program focused on enhancing regional preparedness in major metropolitan areas. Funded by DHS/FEMA, the UASI program is intended to assist participating jurisdictions in developing integrated regional systems for prevention, protection, response, and recovery.

When funding for the Central Virginia UASI was cut, the Central Virginia Urban Area Working Group committed to continuing to build on the partnerships and regional coordination established under the UASI program, establishing a voluntary coalition of emergency management and public safety professionals from the 25 localities surrounding the Richmond-Petersburg metropolitan area (VDEM Region 1, plus Caroline, Cumberland, and Louisa Counties.)

While the character of these communities varies significantly, from rural to suburban to urban, they all possess critical infrastructure and key resources that are vital to the region. Since 2012, State Homeland Security Grant funding has supported a staff position at the Richmond Regional Planning District Commission to manage the work of the CVEMA to support and sustain existing institutional capacity, foster regional collaboration in emergency preparedness, and enhance the resilience of the region.

The CVEMA region includes:

- The Counties of Amelia, Brunswick, Caroline, Charles City, Chesterfield, Cumberland, Dinwiddie, Essex, Goochland, Greensville, Hanover, Henrico, King and Queen, King William, Louisa, New Kent, Nottoway, Powhatan, Prince George, and Sussex
- The Cities of Colonial Heights, Emporia, Hopewell, Petersburg, and Richmond
- The military installations of Defense Supply Center Richmond, Fort A.P. Hill, Fort Lee, and Fort Pickett are also located within the CVEMA region

CVEMA includes local, state, federal, private sector and non-profit representatives with participants from multiple disciplines, including public safety, emergency management, fire/EMS, transportation, public works, social services, health districts, and others. State agencies that coordinate with the CVEMA

include the Virginia State Police, Virginia Department of Emergency Management, Virginia Department of Health, Virginia Department of Social Services, Virginia Department of Agriculture and Consumer Services, and the Virginia Department of Transportation. The CVEMA meets monthly to develop projects to enhance regional preparedness, share information, discuss regional issues and priorities, and track the progress of projects already underway.

The foundation of the work of the CVEMA is the understanding that emergencies, even seemingly small ones, have the potential to reach across jurisdictional boundaries and impact the region as a whole and that regional coordination allows for better and more cost-effective responses to events. The relationships that make regional coordination possible cannot be created in the chaos of a disaster but must be carefully and consistently built with time and effort and commitment. Because regional coordination requires staff to support and facilitate the mission of the group, the CVEMA seeks funding annually for planning staff, hosted at the RRPDC. This provides the dual benefit of giving every locality equal access to the planning staff and allowing the emergency planning staff to take advantage of an existing and proven framework for regional collaboration.

The Fixing America's Surface Transportation Act (FAST Act) released its final rulemaking on May 27, 2016 and included under 23 CFR 450.322 (h):

"The metropolitan transportation plan should include a safety element that incorporates or summarizes the priorities, goals, countermeasures, or projects for the MPA contained in the Strategic Highway Safety Plan required under 23 U.S.C. 148, as well as (as appropriate) emergency relief and disaster preparedness plans and strategies and policies that support homeland security (as appropriate) and safeguard the personal security of all motorized and non-motorized users"

The collaboration of the CVEMA with the RRTPO will be detailed further starting in plan2045 but some of the reports and planning efforts already underway inform plan2040 relating to evacuation route plans and traffic diversion plans.

Secure Commonwealth Initiative Strategic Plan

In the context of plan2040 for the Richmond region, Virginia's Secure Commonwealth Initiative Strategic Plan contains general and specific goals and strategies for improving the security of our transportation system. The guiding principles for the Secure Commonwealth Initiative Strategic Plan are the pillars of:

- Deterrence: Actions to reduce or eliminate threats against physical, economic and societal security
- Prevention: Actions to avoid an incident or to intervene to stop an incident from occurring that would harm lives and property

- Response: Actions addressing short-term, direct effects of a disaster, to include the execution of emergency operations plans and of activities to limit the loss of life, personal injury, property damage and other unfavorable outcomes

- Recovery: The development, coordination, and execution of service- and site-restoration plans for impacted communities and the reconstitution of government operations and services through individual, private-sector, nongovernmental and public assistance programs

These guiding principles are addressed across all levels of government and private industry and the citizenry. Emergency preparedness plans are based on needs assessments and are developed in collaboration with state and local emergency management officials and fire, law enforcement, emergency medical services, and public health services. Maximum coordination and utilization of resources requires integration of resources available at the local, state and federal levels. It should be noted that elected officials have the legal responsibility under the Virginia code for "local disaster mitigation, preparedness, response, and recovery" to protect the health and safety of all citizens.

One of the most critical areas of the region's infrastructure is the transportation system, a complex and dynamic network of highways, bridges, and tunnels. The Richmond region's transportation system is a fundamental resource, vital to the regional and national supply chain, which enables this region to prosper. Its protection is paramount.

The Richmond region's transportation system consists of a number of key modes: aviation, bicycle and pedestrian, maritime, rail, highways, trucking, busing, and public mass transit. Together the various transportation modes provide mobility for our population and the goods and services that are essential to our economy and communities. Interdependencies exist between transportation and nearly every other sector of the economy. Consequently, a threat to the transportation sector is also a threat to the many industries that rely on it. Information about threats affecting transportation modes must be adequately addressed through communication and coordination among the multiple entities that use or rely on these systems.

In the context of plan2040, efforts to improve security can be focused on specific elements of the statewide plan. As transportation improvements are proposed and evaluated for funding, the following security factors should carefully be considered:

- Ensure conformity of proposed transportation improvements with written policies and procedures pertaining to the protection of critical transportation infrastructure

- Ensure conformity of proposed transportation improvements with the current Continuity of Operations Plan that is in place in the Emergency Management Division of VDOT

- Evaluate proposed transportation improvements with reference to the VDOT's geospatial database documenting critical transportation infrastructure and key assets

- Evaluate proposed transportation improvements with reference to the Richmond Marine Terminal security plans

- Evaluate proposed transportation improvements with reference to the Airport Security Audits/Plans applicable to the Richmond International Airport and other general aviation facilities in the region

Commonwealth of Virginia Critical Infrastructure Protection and Resiliency Strategic Plan

According to the U.S. Department of Homeland Security (DHS) National Infrastructure Protection Plan (NIPP), critical infrastructure is defined as "assets, systems and networks, whether physical or virtual, so vital to the United States that the incapacity or destruction of such assets, systems or networks would have a debilitating impact on security, national economic security, public health or safety, or any combination of those matters."

Photo Source: CVEMA

In an effort to secure the nation's critical infrastructure, DHS has charged each state with developing a list of its Critical Infrastructure (CI). In Virginia, the responsible entity is the Critical Infrastructure Protection Program Manager within the Governor's Office of the Secretary of Public Safety and Homeland Security. As mandated by the General Assembly and the Code of Virginia, the Commonwealth, through the Secretary of Public Safety and Homeland Security, works with federal, state, and local officials, as well as private sector, and sector specific agencies to develop a seamless, coordinated, security and preparedness strategy with supporting implementation plans. This effort requires state agency participation and leadership, coupled with the development and sustainment of strong public-private partnerships.

The protection of the Commonwealth's CI is essential for making Virginia and the Nation safer, more secure, and more resilient to all hazards, including natural and manmade disasters. Protection includes actions to mitigate the overall risk to physical, cyber, and human CI assets, systems, networks, functions, or their interconnecting links resulting from: exposure, injury, destruction, incapacitation, or exploitation. This includes actions to deter threats, mitigate vulnerabilities, and minimize consequences associated with a terrorist attack or other incident.

Protection can include a wide range of activities such as improving business protocols, hardening facilities, building resiliency and redundancy, incorporating hazard resistance into initial facility design, initiating active or passive countermeasures, installing security systems, leveraging "self-healing" technologies, promoting workforce security programs, or implementing cyber security measures, among others. The National Infrastructure Protection Plan and its complementary Sector-Specific Plans provide a consistent, unifying structure for integrating both existing and future CI protection efforts. This information provides the Commonwealth with the core processes and mechanisms that enable all levels of government and private sector security partners to work together to implement CI protection in an effective and efficient manner.

Emergency Preparedness

The negative effects of natural disasters such as hurricanes, floods, tornadoes, earthquakes, winter storms and wildfires on Virginia's residents and economy are increasing due to increased urban development, industrial expansion, traffic congestion and widespread use and transport of hazardous materials. These factors also increase the risk and consequences of man-made emergencies such as, hazardous materials incidents, gas pipeline accidents, terrorist attacks, power failures, resource shortages and environmental contamination. Both international and domestic terrorist groups and like-minded individuals are a continuing threat to all critical infrastructure sectors.

In Virginia, counties and independent cities have primary responsibility for emergency operations and will commit all available resources to save lives and minimize property damage. Should local emergency response capabilities be overwhelmed,

Photo Source: Virginia Department of Emergency Management

outside assistance is available, either through mutual aid agreements with nearby jurisdictions, members of the Commonwealth's Statewide Mutual Aid Program, or from the state through the Virginia Emergency Operations Center (VEOC). When state resources are overwhelmed, the Governor may request federal assistance under a Presidential disaster or emergency declaration. A planned and coordinated response on the part of federal, state and local officials in support of responders in the field is critical to saving lives, protecting property, and restoring essential services.

Emergency Management Program for the Commonwealth

The strategies and objectives of the Emergency Management Program for the Commonwealth are established in several plans including:

- Secure Commonwealth Initiative Strategic Plan is a multi-year plan that sets the overall course and direction of Commonwealth Preparedness, including the emergency management program, by defining its vision, mission, goals, and objectives
- Commonwealth of Virginia Emergency Operations Plan (COVEOP), maintained by VDEM, including all annexes and appendices, is an all-discipline, all-hazards plan that establishes a single, comprehensive framework for the management of statewide incidents
- Hazard-specific operational plans, known as incident annexes, address hazards to which the Commonwealth is at high risk, either in frequency or impact. They include plans for emergencies related to nuclear power generation plant incidents, terrorism incidents, hurricanes, tropical storms, public health threats like pandemic influenza, large-scale hazardous-materials incidents, technological hazards, and earthquakes
- COV Standard Hazard Mitigation Plan identifies hazards and analyzes the potential impacts. The plan focuses on prevention and reduction of the impacts of hazards and establishes interim and long-term goals and objectives, strategies, programs and actions to avoid long-term vulnerability to the hazards
- Other hazard specific plans, developed by individual agencies to address specific incidents or pursuant to federal guidance, include a State Floodplain Management Plan, a Drought Assessment and Response Plan, and plans to address specific biological hazards such as pandemic flu and animal-borne diseases
- Agency strategic plans focus on prioritized actions, including the functions of each agency which are critical to the emergency response and recovery operations of the Commonwealth
- Agency continuity of operations (COOP) plans addresses an agency's ability to continue its essential functions in the event of a disruption. Plans include vital equipment, orders of succession and lines of authority. They also address the procedures for protecting, maintaining and restoring essential functions, including those that are critical to emergency response and recovery operations
- The Commonwealth of Virginia Critical Infrastructure Protection and Resiliency Strategic Plan support the National Infrastructure Protection Plan (NIPP) by establishing a coordinated approach to national priorities, goals, and requirements for CI protection. The strategic plan requires the development of Sector Specific Plans to provide the means by which the NIPP is implemented across all critical infrastructure and key resources sectors

Additional information is available and accessible to the general public on the state emergency management website.

www.vaemergency.com

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Richmond Regional Transportation Planning Organization