RICHMOND REGIONAL MASS TRANSIT STUDY

FINAL TECHNICAL REPORT

May 8, 2008

Richmond Area Metropolitan Planning Organization
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Acknowledgment

Prepared in cooperation with the U.S. Department of Transportation and the Virginia Department of Transportation.

Disclaimer

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

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The Richmond Regional Planning District Commission recognizes the work of the Regional Mass Transit Study Advisory Committee who worked tirelessly to develop and review this study. The members were appointed by the Metropolitan Planning Organization and include representatives from the Technical Advisory Committee (TAC) the Citizens Transportation Advisory Committee (CTAC) and the Elderly and Disabled Advisory Committee (EDAC):

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Richmond Area

Metropolitan Planning Organization

The Richmond Area Metropolitan Planning Organization (MPO) is the federal and state designated regional transportation planning organization that serves as the forum for cooperative transportation decision-making in the Richmond area. The Richmond Regional Planning District Commission is the contracting agent and staff for the Richmond Area MPO.

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1.1 INTRODUCTION

The Richmond area Metropolitan Planning Organization is undertaking a Regional Mass Transit Study (RMTS) that is being conducted in coordination with the GRTC Transit System Comprehensive Operations Analysis. The Regional Mass Transit Study is a comprehensive study providing for the development and implementation of a regional mass transit system based on the following study objectives:

- Produce a plan of action for the development and implementation of regional mass transit programs and services over mid-range (3 to 10 years) and long range (10 to 25 years) time horizons with consideration given to corridor prioritization.
- Cover the entire Planning District 15 area and linkages to adjacent areas including metropolitan areas as appropriate for consideration of all public transportation modes.
- Address all surface public transportation modes (i.e. local and express bus, car and vanpool programs, ADA/specialized public transportation services, bus rapid transit, street car/trolley, light rail, and commuter rail).
- Provide recommendations for dedicated, on-going funding programs to meet capital and operating needs.
- Provide recommendations for supportive land uses appropriate to enhancing public transportation services.

This Chapter provides an overview of existing conditions in the Richmond region from demographic, land use, and transportation perspectives. Section 1.2 provides an initial identification of areas in the Richmond region that may be appropriate for public transportation, based on demographic and employment forecasts and indicators of appropriate transit services. Section 1.3 summarizes the most recent transportation and land use components of comprehensive plans for each of the jurisdictions in the region. Section 1.4 identifies preliminarily the potential transit trip generators and attractors within the study area. Section 1.5 reviews a Rail Transit Feasibility Study. Section 1.6 summarizes transportation needs for the elderly, mobility impaired and low-income populations.

Information gathered and presented here will be used to help identify potential transit corridors and modes throughout the Richmond region. Subsequent technical memoranda will further delve into influencing factors for implementing transit, comparing the Richmond region with other regions in the eastern United States from a transit service provision perspective, and the alternative transit modes that could be considered for the Richmond region.

1.2 AREA DEVELOPMENT AND SERVICE DEMAND

Demographic analysis is a first step in identifying the portions of the Richmond region for which public transportation may be effective. This analysis is based on forecasts of population, households, and employment for the Richmond Metropolitan Organization (MPO) urban study area at the Traffic Analysis Zone (TAZ) level for two future years (2016 and 2031) as developed by the Richmond Regional Planning District Commission (RRPDC) and approved for use in all regional planning activities. Estimated values have been prepared by the study team, for an interim year (2016) using simple linear interpolation. These forecasts have been provided to and reviewed by each of the jurisdictions. Some jurisdictions have noted that recent development trends suggest that growth in specific TAZs may occur sooner or later than implied by the official forecasts.

1.2.A DEMOGRAPHIC AND EMPLOYMENT FORECASTS

Demographic indicators are useful in the identification of the current and anticipated spatial concentrations of people, households, employment, and automobile ownership throughout the region. These help to define the transportation needs and the likely effectiveness of various forms of public transit in addressing these needs. This study utilized current population (2007) and employment (2006) estimates developed by the Virginia Employment Commission. These population and employment estimates only include the MPO urban study area. This data has been supplemented by the MPO through its Socioeconomic Data Work Group to produce the "Socioeconomic Data Report 2000-2031" which was approved by the MPO on November 8, 2007 and used as the basis for this study. The absolute change in these four indicators is analyzed at the TAZ level between two time periods: 2006 to 2016 and 2016 to 2031.

Between 2006 and 2016, the population of the Richmond MPO urban study area is forecast to grow by approximately 116,000 people, from 876,000 people to 992,000 people (Table 1-1). The counties with the greatest population growth are Chesterfield County (43,000 people) and Henrico County (38,000 people), which account for over 70 percent of population growth. Little growth is expected to occur in Richmond City, Charles City County, Goochland County, New Kent County, and Powhatan County. Spatially, this growth is largely concentrated around the border of Richmond and in Chesterfield County, though many TAZs in Richmond are projected to experience a decrease in population (Figure 1-1). The TAZs with the greatest increase in population (over 1,000 residents) tend to be located along major transportation corridors: I-95, I-64, and I-295. One exception is Chesterfield County, which is forecast to experience significant growth in its western region.

Table 1-1: Change in Population in the Richmond Region

County	2006 to 2016	2016 to 2031
Charles City*	829	1,549
Chesterfield*	43,221	120,674
Goochland*	4,344	12,046
Hanover	20,193	43,635
Henrico	38,297	92,791
New Kent*	3,167	11,769
Powhatan*	4,169	8,588
Richmond City	1,486	4,768
Total	115,706	295,820

**Reflects MPO Study Area and forecasts; does not cover entire jurisdiction*

Between 2016 and 2031, the population in the Richmond MPO urban study area is forecast to grow by approximately 296,000 people, from 992,000 people to 1,288,000 people (Table 1-1). Growth will likely spread outward from the City of Richmond. Over 72 of the population growth during this time period is forecast to occur in Chesterfield County[1] (121,000 people) and Henrico County (93,000 people). The greatest growth continues to be located along the major interstates and western Chesterfield County (Figure 1-2). While Hanover County is forecast to add nearly 44,000 residents, most of this growth is concentrated on the southern border of the county, near I-295. In addition, Goochland County and Powhatan County are forecast to experience growth of over 10,000 persons. Little growth is expected to occur in Charles City County.

Between 2006 and 2016, the number of households in the Richmond MPO urban study area is expected to grow by over 49,000, from 347,000 households to 397,000 households (Table 1-2). Household growth patterns mirror that of population growth. Over 72 percent of household growth is forecast to occur in Chesterfield County (19,000 households) and Henrico County (17,000 households), with an additional 14 percent occurring in Hanover County (7,000 households). While most TAZs experience an increase of between 0 and 500 households, several TAZs are forecast to lose households, especially in Richmond (Figure 1-3). Those TAZs with the greatest growth (501 to 1,000 households) are in western Chesterfield County and Henrico County.

[1] Not all of Chesterfield County is included in the Richmond area MPO

Figure 1-1: Absolute Population Change – 2006 to 2016

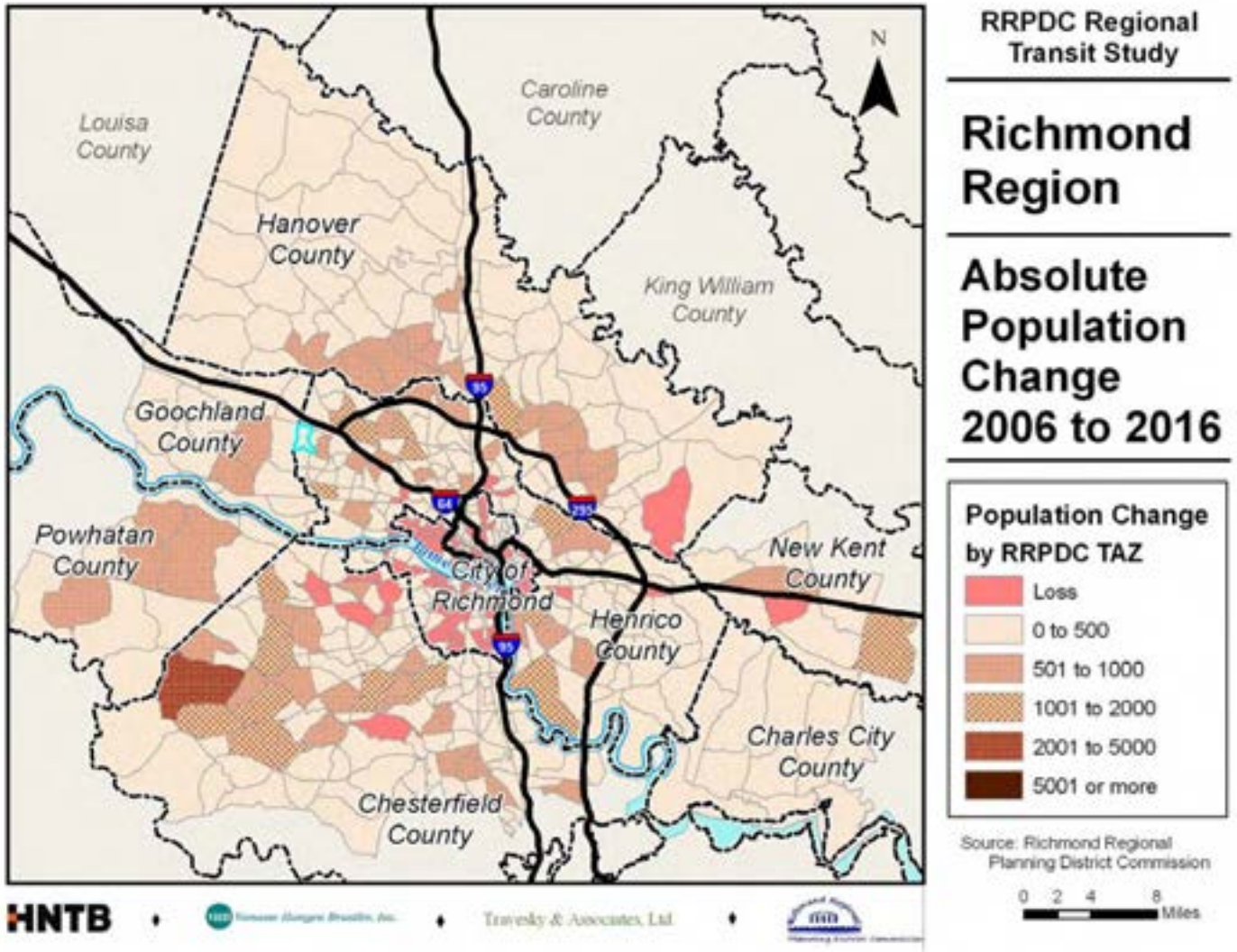


Figure 1-2: Absolute Population Change – 2016 to 2031

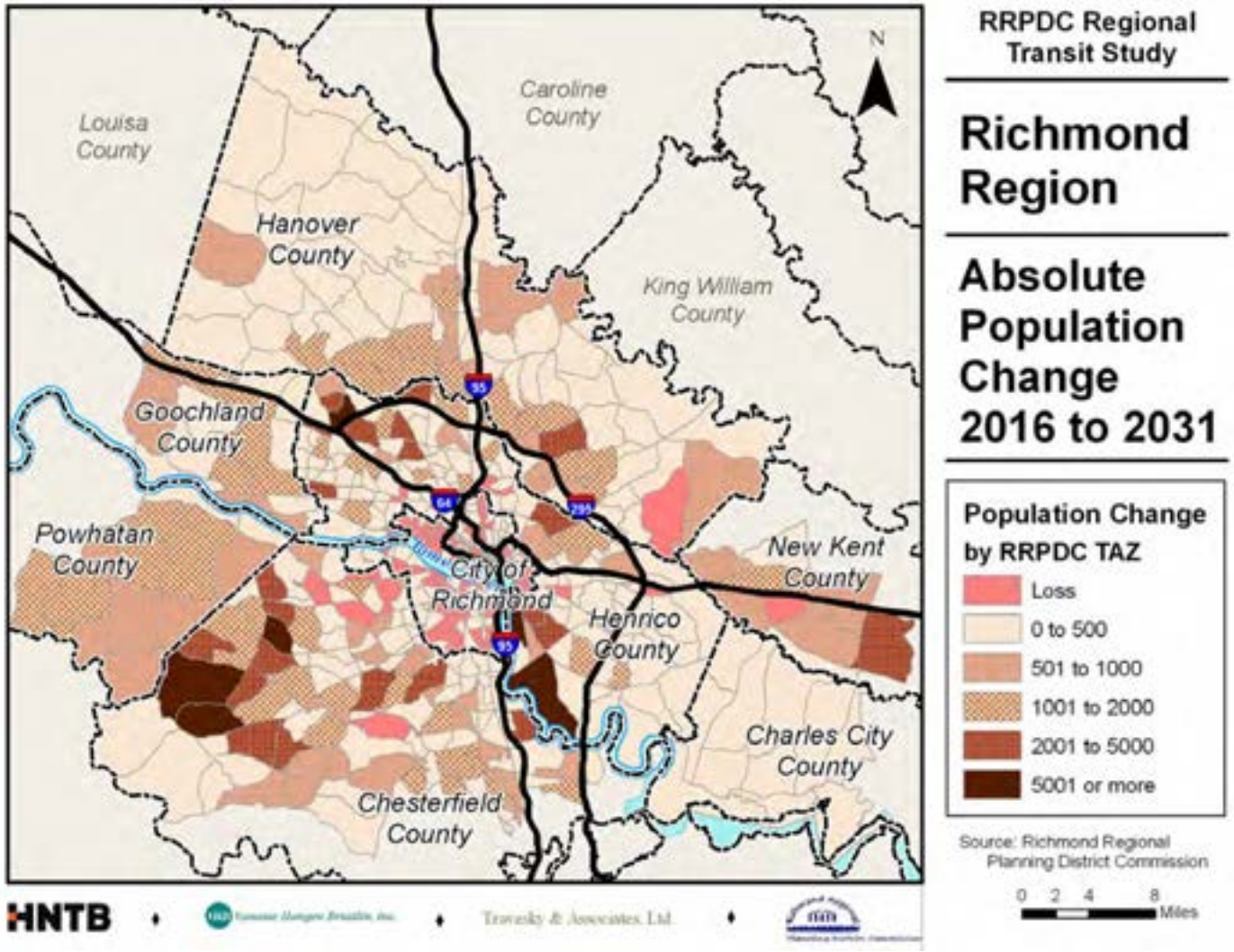


Figure 1-3: Absolute Household Change – 2006 to 2016

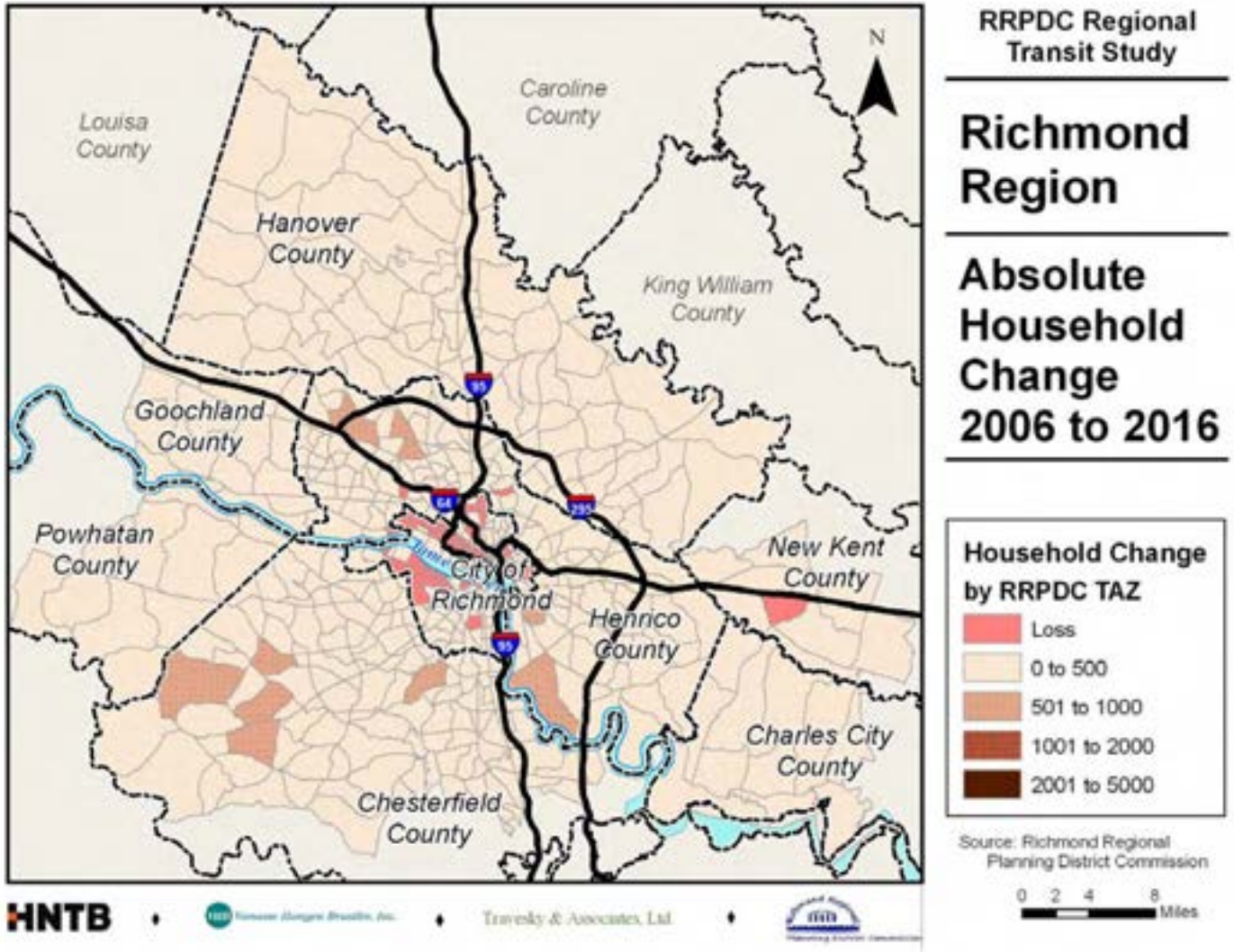


Table 1-2: Change in Households in the Richmond Region

County	2006 to 2016	2016 to 2031
Charles City*	364	682
Chesterfield*	19,202	55,192
Goochland*	1,957	5,589
Hanover	7,011	14,876
Henrico	16,615	39,680
New Kent*	1,347	5,083
Powhatan*	1,707	3,618
Richmond City	1,225	3,812
Total	49,428	128,532

**Reflects MPO Study Area and forecasts; does not cover entire jurisdiction*

Between 2016 and 2031, the number of households is expected to grow by nearly 129,000, from 397,000 households to 525,000 households (Table 1-2). Many TAZs in the City of Richmond are again forecast to lose households. Household growth outside of Richmond is expected to accelerate, especially in Chesterfield County where several TAZs are forecast to gain between 2,000 and 5,000 households (Figure 1-4).

Changes in automobile ownership tend to reflect changes in population and households. Between 2006 and 2016, the number of private automobiles is forecast to grow by 103,000, from 624,000 automobiles to 728,000 automobiles (Table 1-3). The greatest increase in automobile ownership is forecast in Chesterfield County (37,000 automobiles), Henrico County (29,000 automobiles), and Hanover County (27,000 automobiles). Spatially, the greatest increase in automobile ownership is along the interstates and in western Chesterfield County (Figure 1-5). Many TAZs in the City of Richmond are forecast to have a reduction in automobile ownership.

Table 1-3: Change in Automobile Ownership in the Richmond Region

County	2006 to 2016	2016 to 2031
Charles City*	749	1,480
Chesterfield*	36,873	102,189
Goochland*	3,734	9,868
Hanover	26,724	63,436
Henrico	28,728	72,668
New Kent*	2,624	9,353
Powhatan*	3,597	7,487
Richmond City	369	2,018
Total	103,399	268,498

**Reflects MPO Study Area and forecasts; does not cover entire jurisdiction*

Between 2016 and 2031, the number of private automobiles is forecast to grow by over 268,000, from 728,000 automobiles to 996,000 automobiles (Table 1-3). Chesterfield County and Henrico County account for nearly two-thirds of the growth in automobile ownership. While growth in automobile ownership continues to be focused on the interstates and western Chesterfield County, Powhatan County will also see a rise in vehicles (Figure 1-6).

Figure 1-4: Absolute Household Change – 2016 to 2031

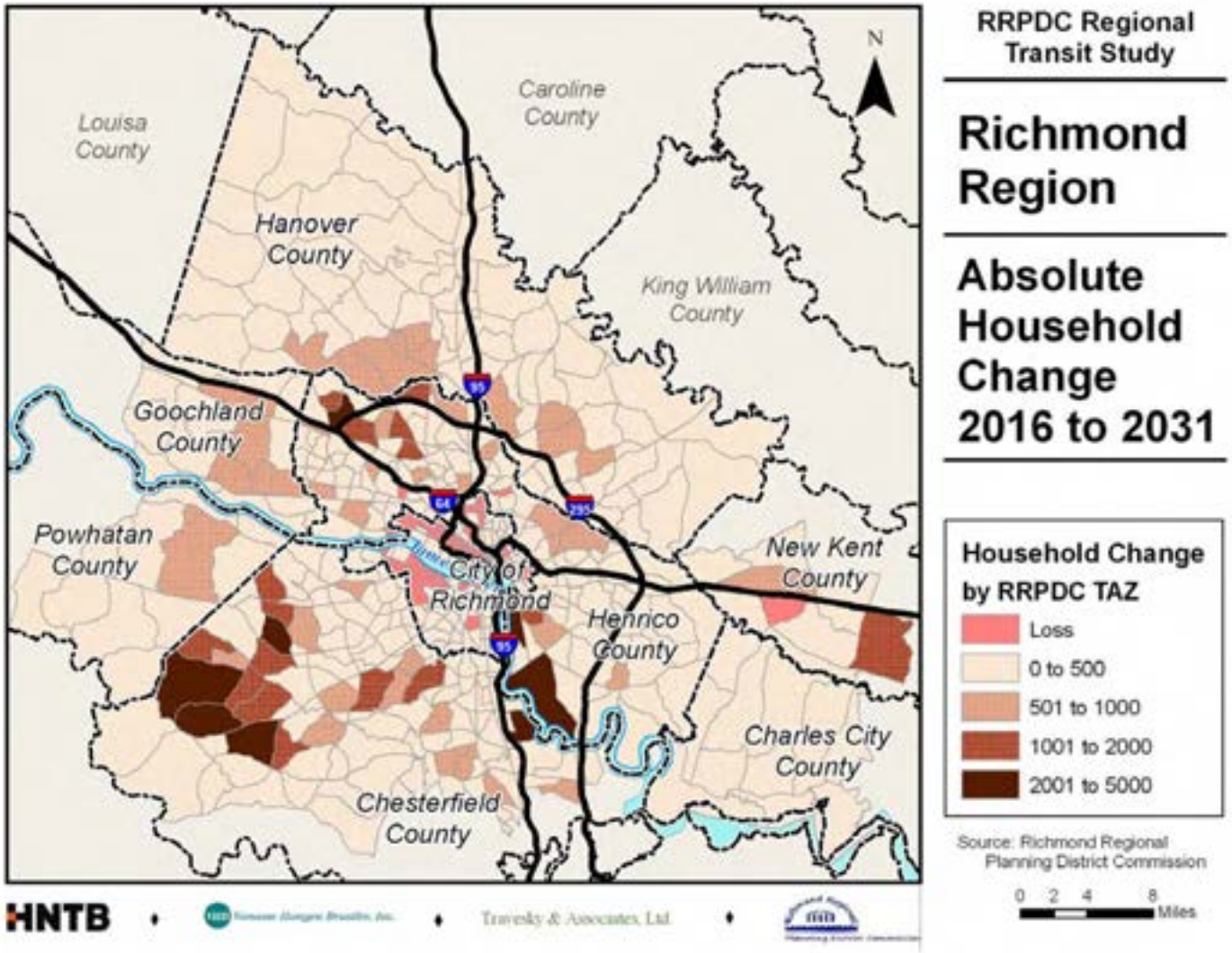


Figure 1-5: Absolute Automobile Change – 2006 to 2016

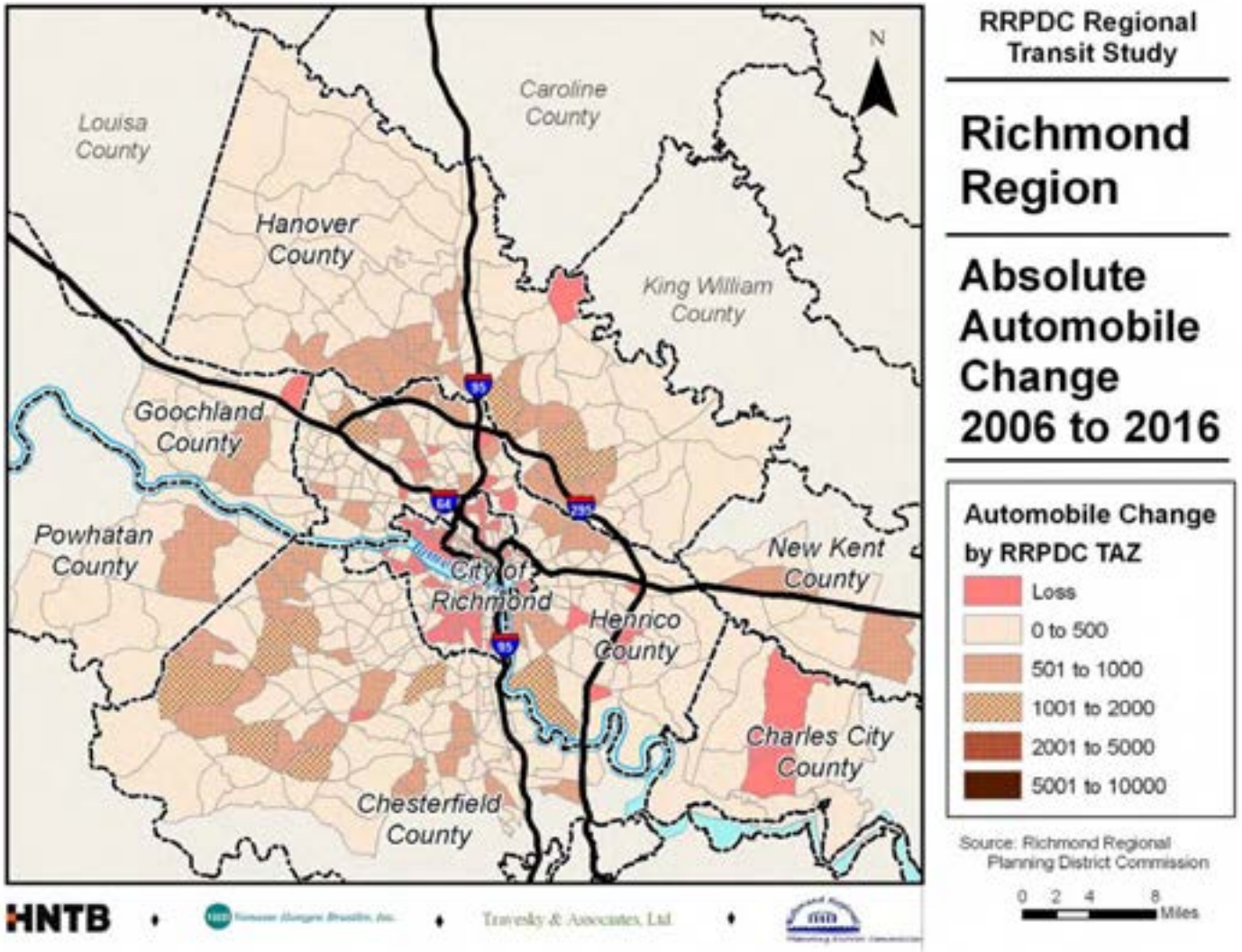
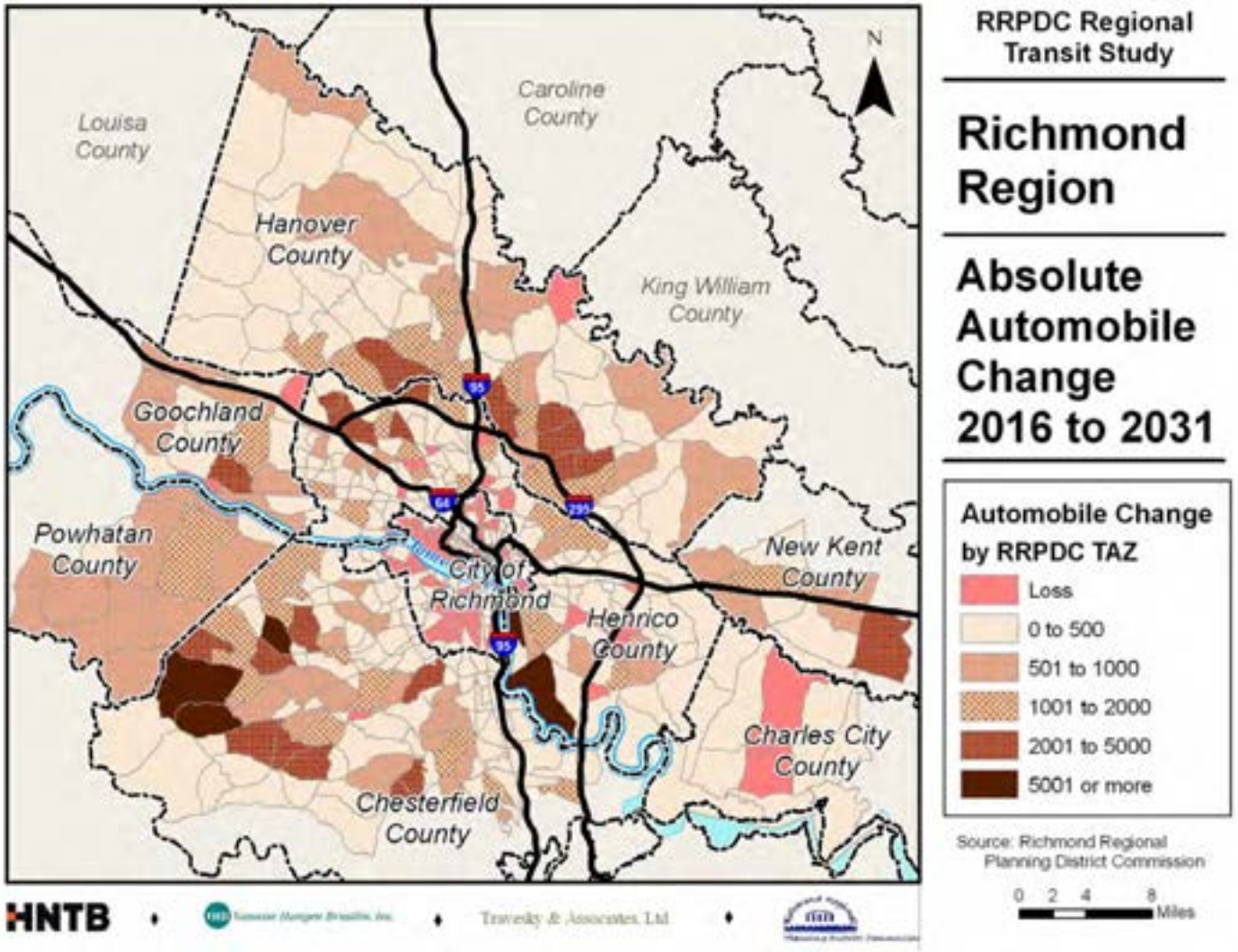


Figure 1-6: Absolute Automobile Change – 2016 to 2031



Between 2006 and 2016, employment in the Richmond MPO urban study area is forecast to grow by nearly 64,000 jobs, from 640,000 jobs to 704,000 jobs (Table 1-4). Over 84 percent of job growth is forecast to occur in Chesterfield County[2] (36,000 jobs) and Henrico County (18,000 jobs), while Richmond is forecast to lose nearly 8,000 jobs. While most TAZs experience limited job growth (fewer than 500 jobs), there are several TAZs in Chesterfield County, Goochland County, Henrico County, and Powhatan County that experience a growth of between 1,000 and 2,500 jobs (Figure 1-7).

Table 1-4: Change in Employment in the Richmond Region

County	2006 to 2016	2016 to 2031
Charles City*	493	1,061
Chesterfield*	35,590	112,943
Goochland*	4,872	22,491
Hanover	7,818	18,059
Henrico	18,202	53,728
New Kent*	1,169	3,454
Powhatan*	3,444	12,936
Richmond City	-7,714	4,790
Total	63,873	229,461

**Reflects MPO Study Area and forecasts; does not cover entire jurisdiction*

Between 2016 and 2031, employment in the Richmond MPO urban study area is forecast to grow by 229,000 jobs, from 704,000 jobs to 933,000 jobs (Table 1-4). The greatest employment growth is likely to occur in Chesterfield County (113,000 jobs), Henrico County (54,000 jobs) and Goochland County (22,000 jobs). In Chesterfield County, compared with population growth, which was concentrated in the western portion of the county, job growth is concentrated in the eastern portion of the county (Figure 1-8). Powhatan County and Goochland County also account for a greater share in employment growth (15 percent) than population growth (7 percent).

[2] Not all of Chesterfield County is included in the Richmond area MPO.

Figure 1-7: Absolute Employment Change – 2006 to 2016

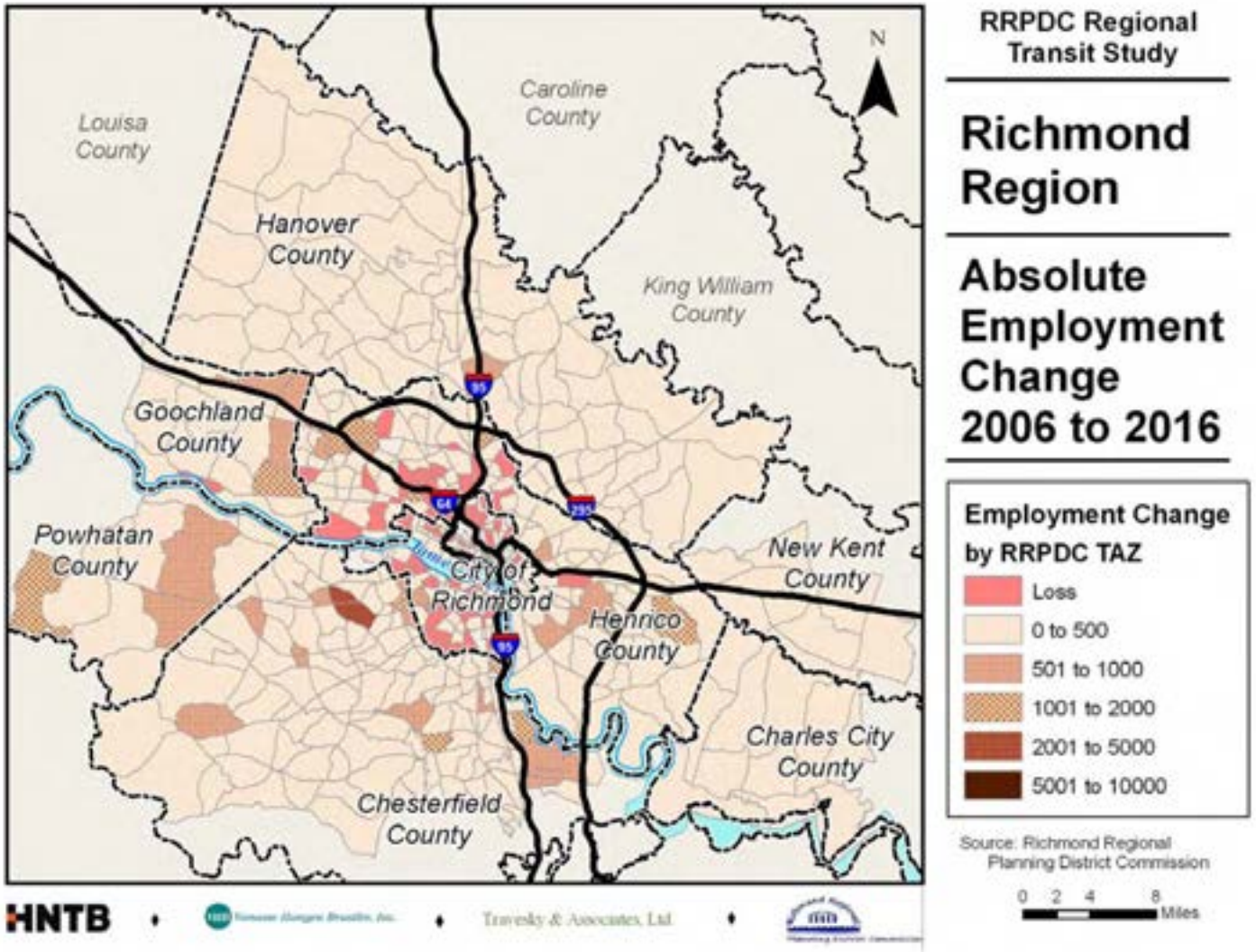
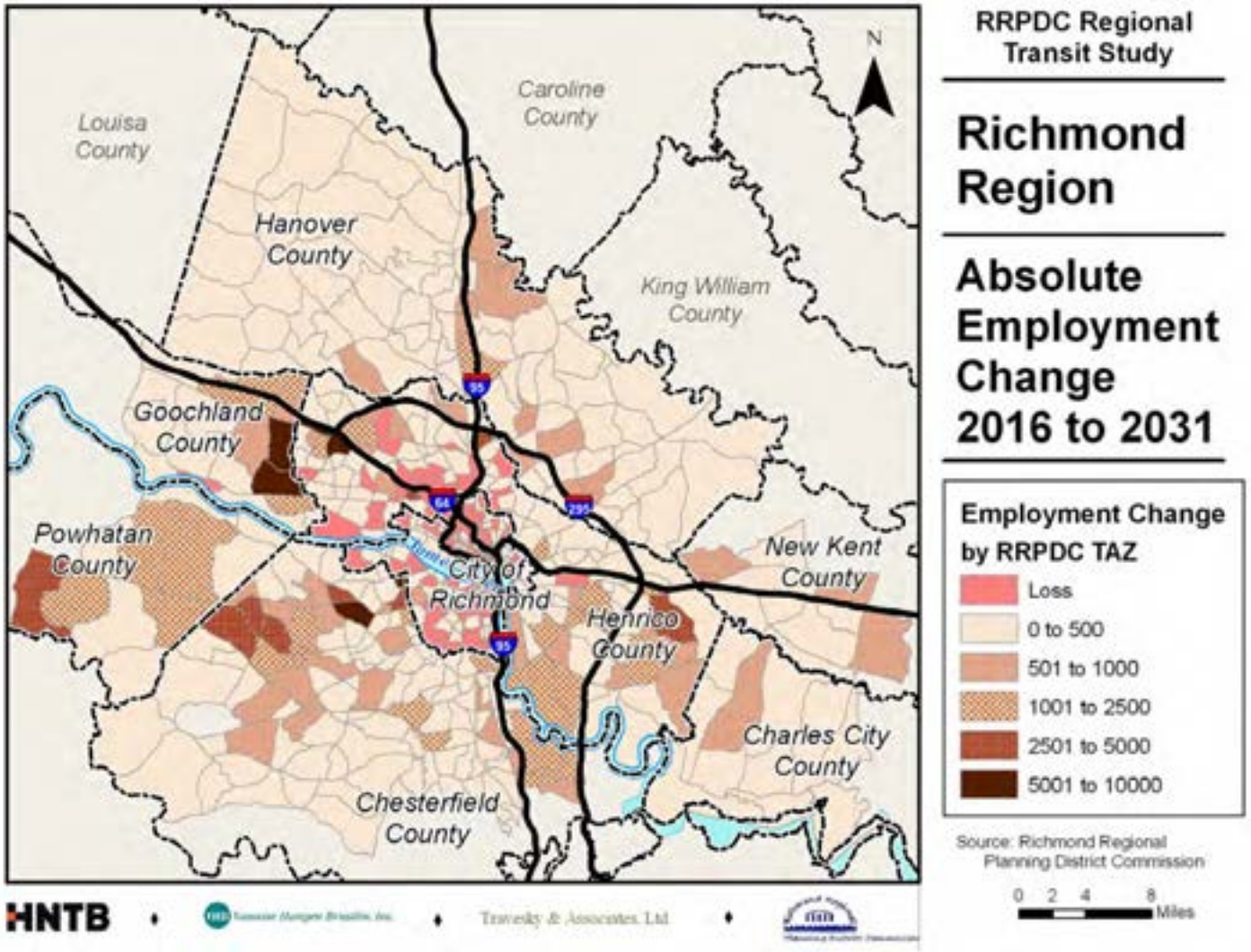


Figure 1-8: Absolute Employment Change – 2016 to 2031



1.2.B INDICATORS OF APPROPRIATE TRANSIT SERVICES

Use of transit service historically has been related to the characteristics of the resident population in the areas served (e.g., household income, auto ownership) and the characteristics of the developed area (e.g. household density, concentrations of employment, street patterns). The potential effectiveness of transit in attracting riders in any given area depends on multiple factors including the quality of service available, the degree of highway congestion, costs and availability of parking, and the patterns of travel between residences and workplaces, shopping, medical services and related uses. Those factors will be addressed in subsequent analyses using travel forecasting models developed by VDOT. The demographic and development data, however, provide information that can be used to prepare conceptual frameworks for regional transit services, identifying the areas in which transit is most likely to be needed.

The Institute of Transportation Engineers (ITE) developed guidelines for minimum transit service levels based on three ranges of residential density as shown in Table 1-5.[3] One bus per hour is recommended for TAZs with between four to six dwelling units per acre, one bus per 30 minutes for TAZs with between seven and eight dwelling units per acre and light rail or feeder bus service for TAZs with over nine dwelling units per acre. TAZs that do not meet the minimum residential density for fixed transit service would have park-and-ride services available.

Table 1-5: Service Levels by Residential Density

Minimum Service Level	Residential Density Thresholds
1 bus/hour	4-6 DU per Acre
1 bus/30 minutes	7-8 DU per Acre
Light rail and feeder buses	9 DU per Acre

Figure 1-9, Figure 1-10, and Figure 1-11 show actual and forecast net residential densities by TAZ in 2006, 2016 and 2031, respectively. Most TAZs with residential densities above four dwelling units per acre are located in Richmond and Henrico County. These TAZs currently have transit service.

[3] ITE. A Toolbox for Alleviating Traffic Congestion. Washington, DC (1989)

Figure 1-9: Households per Acre (2006)

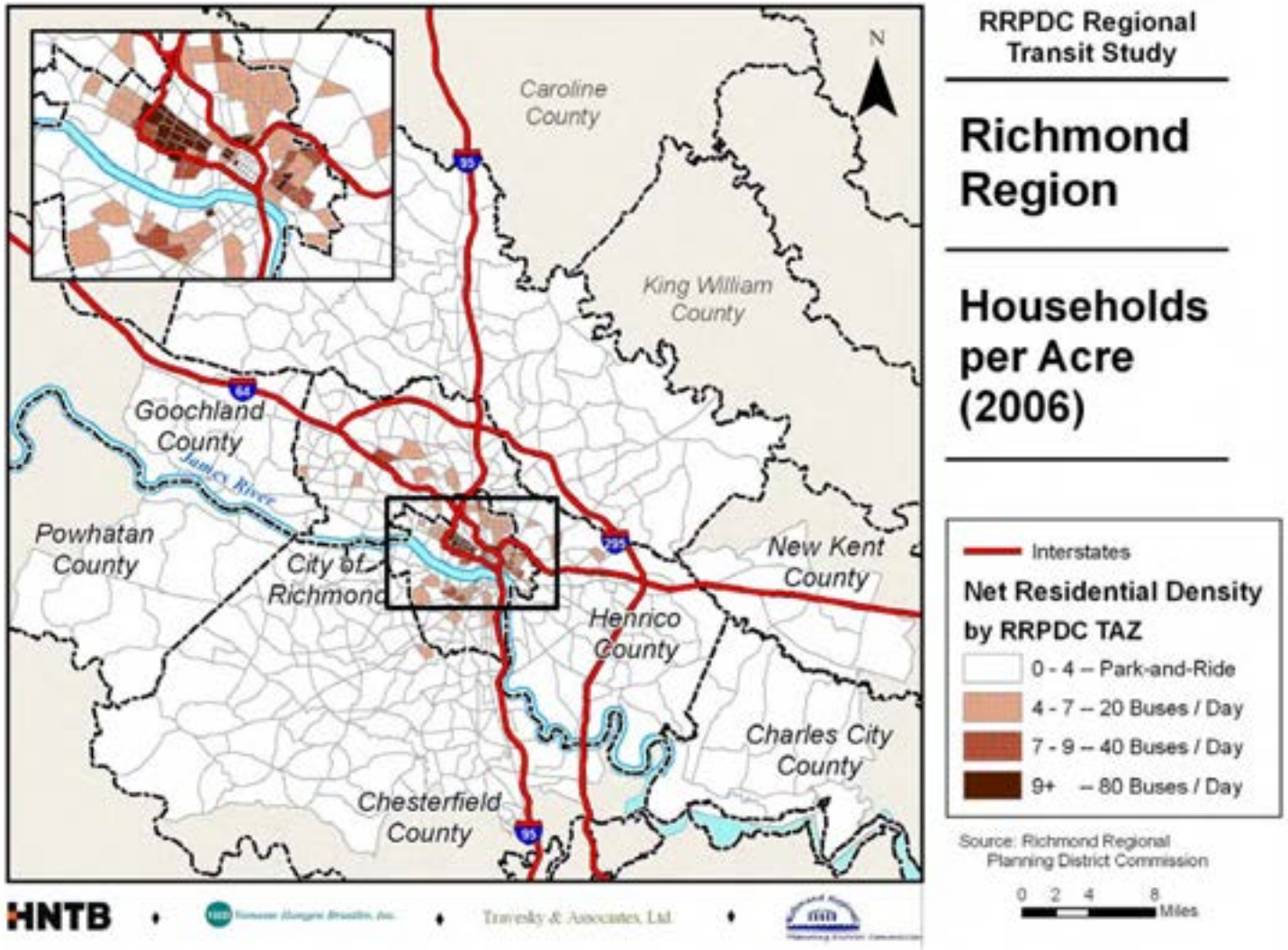


Figure 1-10: Households per Acre (2016)

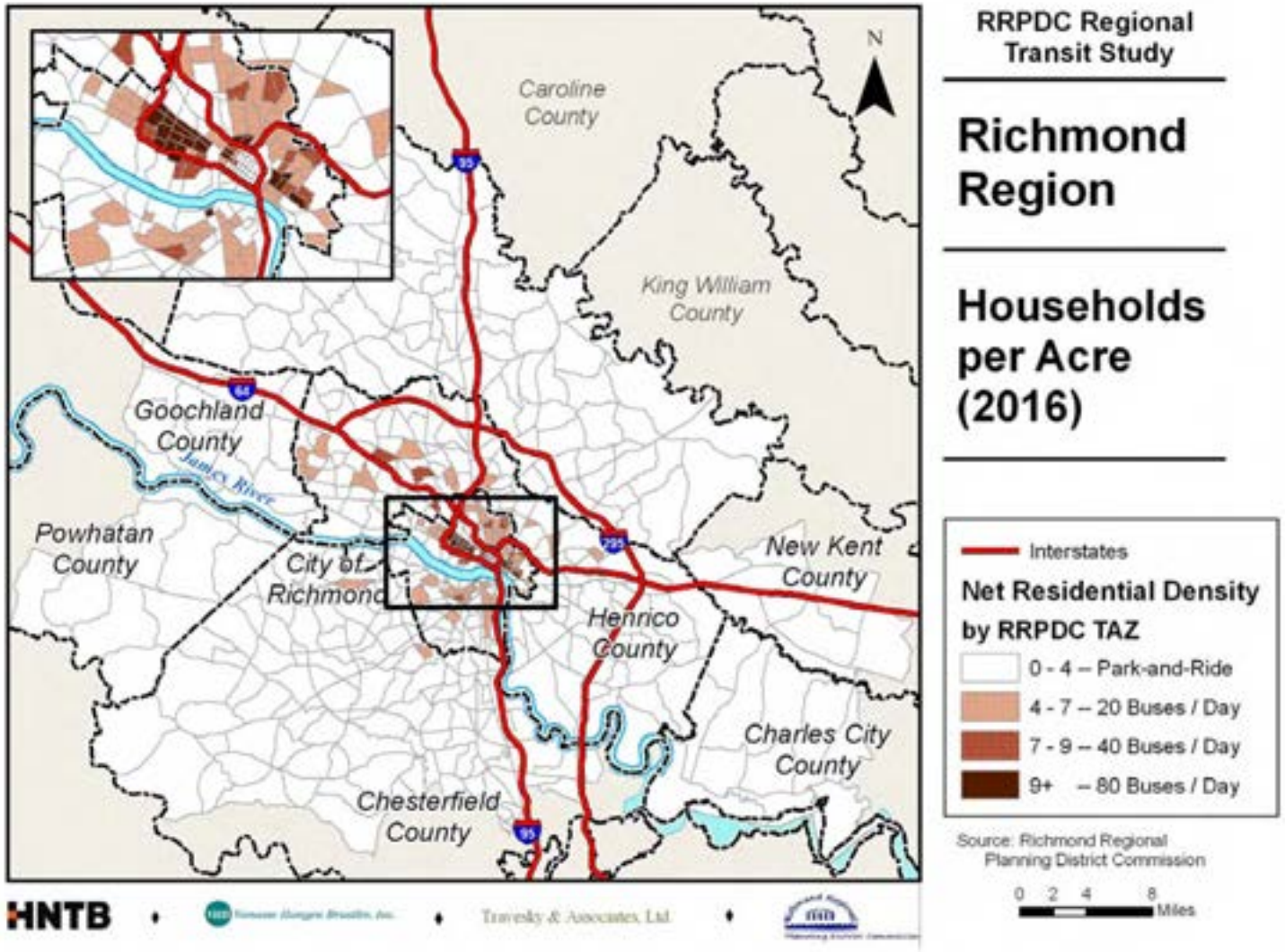


Figure 1-11: Households per Acre (2031)

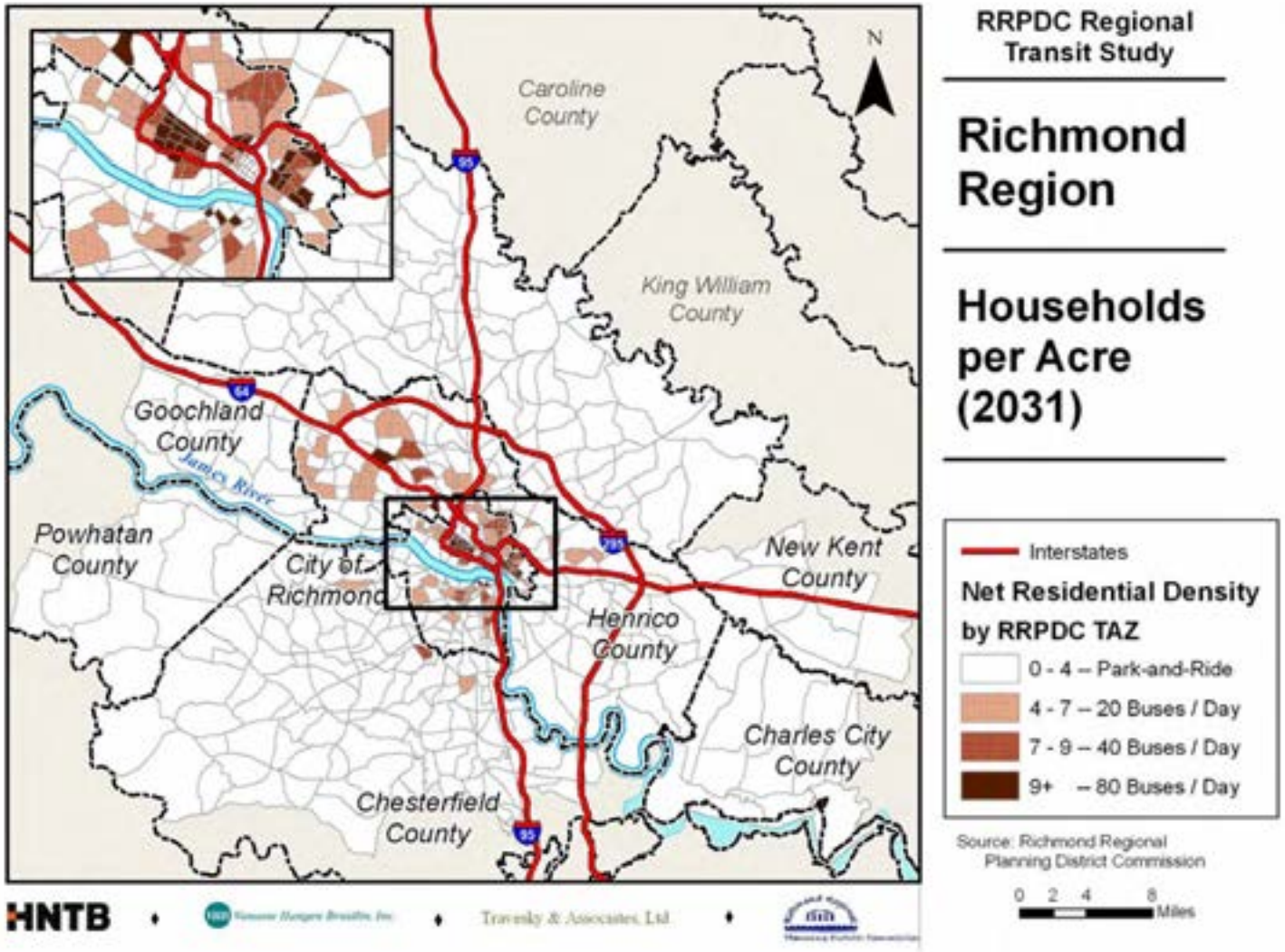


Figure illustrates the density of employment thought the region in 2006. Figure and Figure illustrate the projected employment densities throughout the urban study area in 2016 and 2030. The guidelines for provision of transit service to employment centers tend to be more related to the absolute number of workers or to the amount of office space in a location than to the density. Data collected at employment centers across the nation suggest a rule of thumb for suburban office parks of about one bus per hour per million square feet of office space. In central business districts, the greater concentration of employment typically supports a higher level of transit service. For use in structuring future transit service concepts the forecast employment densities are used to provide a guide, although more detailed, site specific analysis will be required.

While substantial growth is forecast for the Richmond urban study area, this growth is likely to be dispersed throughout the region. Richmond City is expected to experience a limited net increase in population, households, and employment. Many TAZs in Richmond may even experience negative growth, further contributing to the sprawling settlement pattern in the region.

Forecasts of residential densities and employment density show that most areas in which fixed-route transit are appropriate are currently served by public transportation. With the currently forecast patterns of development, opportunities for effective expansion of fixed-route, fixed-schedule public transportation in the forecast years of 2016 and 2031 are limited, although the residential density forecasts combined with the forecasts of growth in employment suggest a need for more frequent service in some portions of Henrico County and extension of service into portions of Chesterfield County. An expansion of park-and-ride facilities and express bus services would likely be appropriate for serving persons commuting from suburban locations to downtown Richmond.

However, even if the general pattern of development in a county of portion of a county is such that fixed-route transit services in not warranted, there can be sections of the area or specific projects that are developed in ways that would support transit services. Having county policies for development that recognize the elements that lead to transit-supportive projects, making these polices known to developers, supporting developers in their efforts to adhere to the guidelines, and engaging the transit operating agency in review of proposed developments can create conditions that permit effective and efficient transit. Even if the initial developments are not of a magnitude that supports quality transit, the cumulative effect over time can be significant.

The US Department of Transportation and many transit agencies across the county have developed and promulgated guidance on how to structure projects that will be supportive of transit operations. Suggested references include:

- Beimborn et al, *Guidelines for Transit Sensitive Suburban Land Use Design,* Urban Mass Transportation Administration, DOT-T-91-13, Washington DC, July 1991
- *Central Florida Mobility Design Manual,* Central Florida Regional Transportation Authority, Orlando FL, 1995
- *Planning and Development Guidelines for Public Transit,* Central Ohio Transit Authority, Columbus OH, February 1999
- *Maryland Transit Guidelines,* Maryland Transit Administration, Baltimore MD, 2001

Figure 1-12: Employment per Acre (2006)

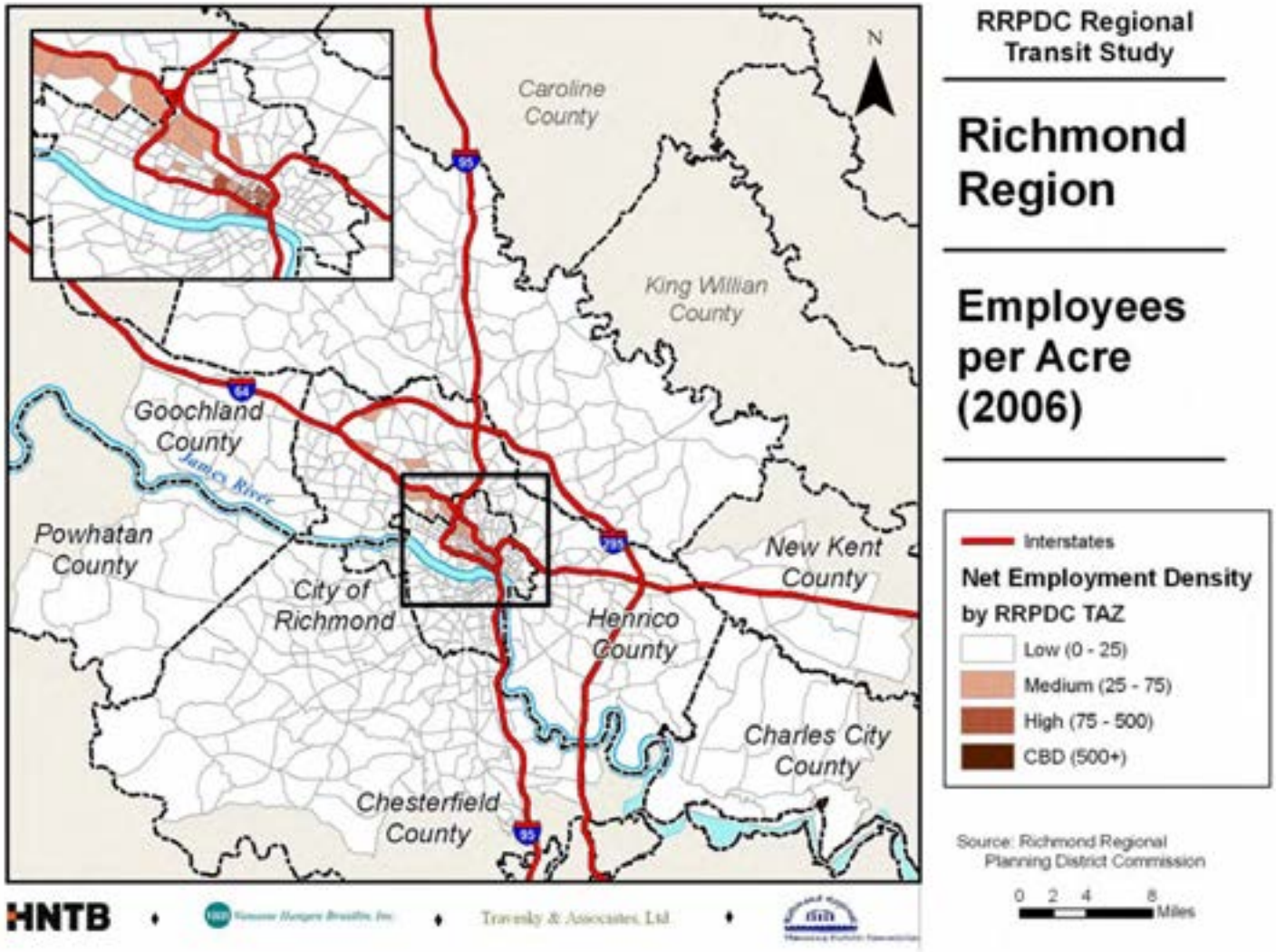


Figure 1-13: Employment per Acre (2016)

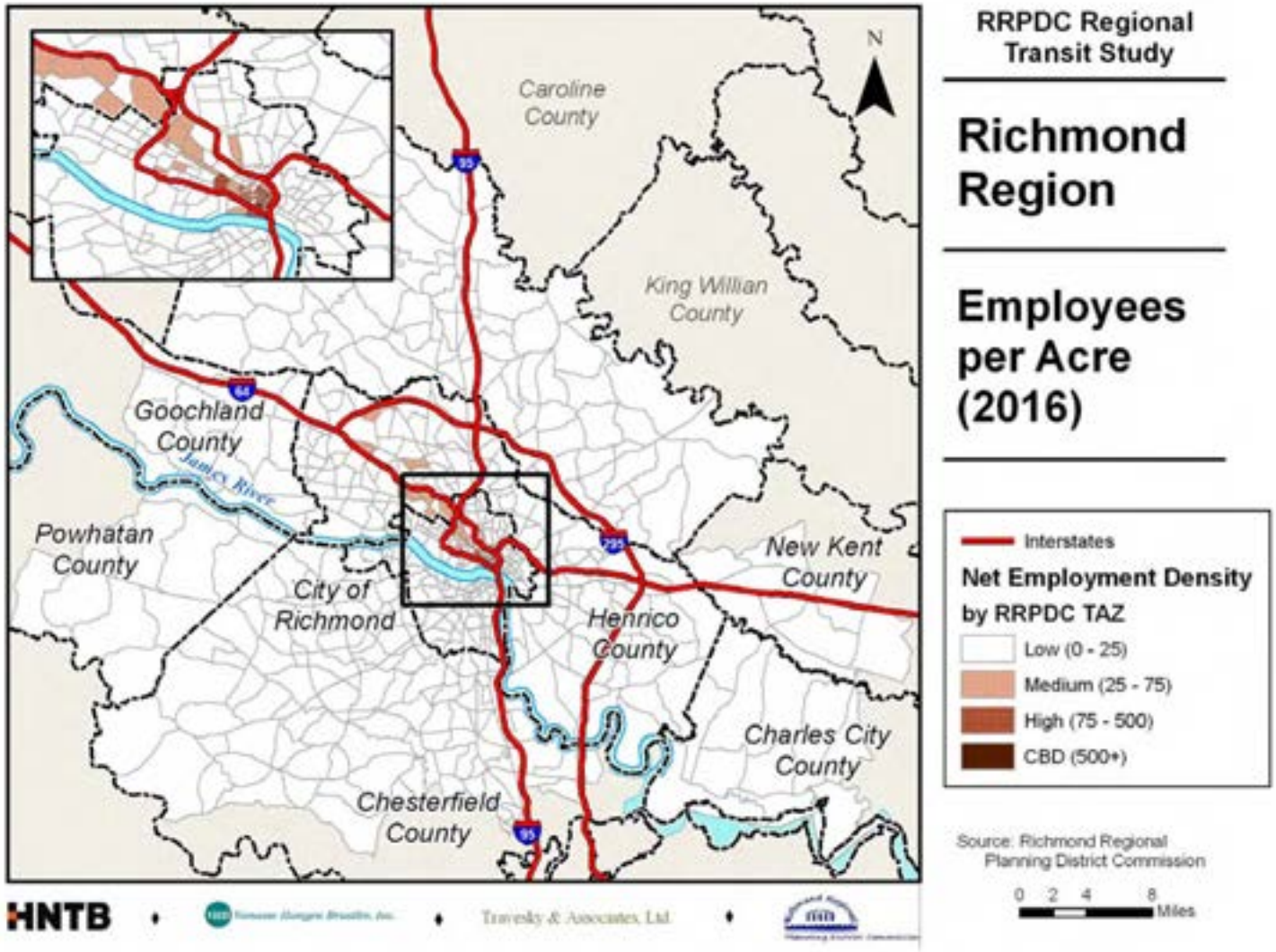
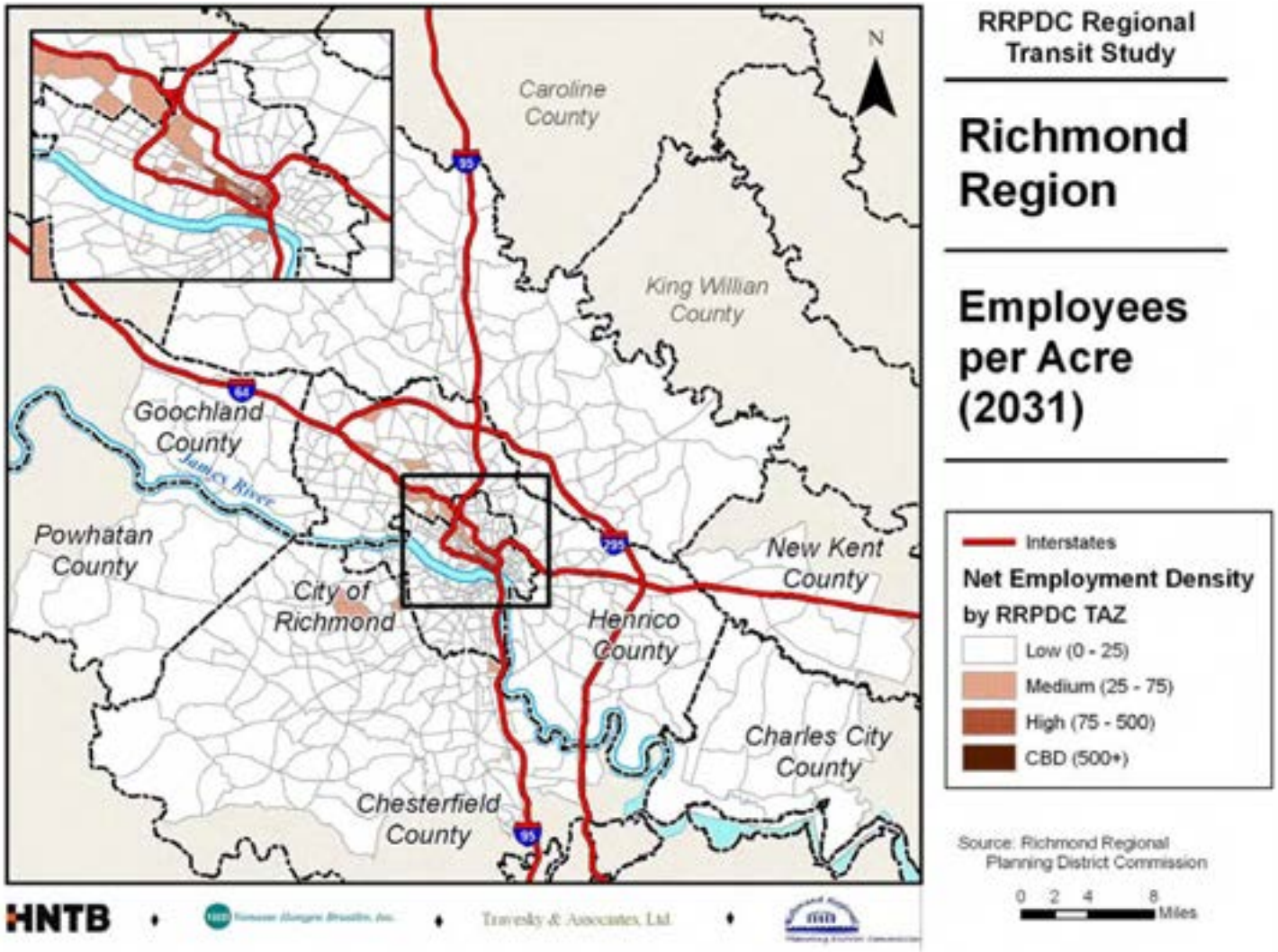


Figure 1-14: Households per Acre (2031)



1.3 LAND USE PLANS

Localities develop Comprehensive Plans (also known as General Plans and Master Plans) to formally establish a vision for the future development of the community. These plans typically focus on a wide range of issues including land use, housing, parks, utilities, transportation, and the overall vision for the community. Future studies and plans for specific developments, improvements, and policies are based on the most recent Comprehensive Plan. This section includes summaries of the transportation and land use elements of the most recent comprehensive land use plans for each of the jurisdictions in the Richmond region. This includes seven county plans and two city plans.

1.3.A TOWN OF ASHLAND

The Comprehensive Plan for the Town of Ashland was developed in 2002 and incorporates the goals and recommendations of the Ashland 2020 Transportation Plan. The plans were compiled to manage the expected growth in residential and commercial uses in Ashland which is projected to generate an annual two percent increase in vehicle traffic.

Transportation

Several transportation-related problems are highlighted in the Comprehensive Plan, which also includes some potential solutions. General transportation issues include:

- Parking
- On- and off-street parking in the downtown area to accommodate future commercial growth
- Student/faculty/staff parking at Randolph-Macon College
- Lack of adequate pedestrian crossings on major streets
- Frequency of commercial driveways on major streets constrains traffic flow
- Congestion on Route 54 during peak hours caused by:
- Rail traffic on at-grade rail crossings during peak hours disrupts traffic flow
- Inadequate operations at the intersection with Route 1
- Lack of left turn bays result in backups
- Heavy and increasing traffic
- Lack of standard sidewalk treatments and construction practices

To address some of these general problems, a series of recommendations and guidelines for future development and roadway improvements were developed, including:

- Continuation of the traditional street grid structure in residential neighborhoods
- Installation of a dozen new traffic signals by 2020 in order to efficiently accommodate expected traffic growth
- Increased and improved pedestrian and bicycle crossings at major streets, especially Route 54, Route 1, and the railroad tracks

More specific solutions were developed in the Ashland 2020 Transportation Plan that will address many of the existing and expected issues (at the time of publication in 2002) in Ashland as development increases. Items that are recommended for immediate implementation include:

- Synchronization and equipment upgrade for traffic signals on Route 54 between Route 1 and I-95
- Interchange Feasibility Study for the I-95/Route 54 Interchange
- Extensions of Hill Carter Parkway and Junction Drive
- Construction of eastbound left-turn lane on Route 54 at the Wendy's crossover

Other specific improvements recommended for implementation in different time frames fall into the following categories:

- Median improvements on major streets
- Construction of a new connector road between Maple Street and Johnson Road in the southern part of Ashland
- Roadway realignments
- Roadway extensions
- Construction of a full service rail station with parking facilities for commuter rail service and potential high-speed rail service
- Grade separation of railroad crossings
- Widening of Route 54 to provide three travel lanes per direction and turn lanes to accommodate future growth in traffic
- Shoulder construction

No specific improvements were recommended for non-vehicular traffic. Pedestrian issues are addressed only generally in the Comprehensive Plan, although a Sidewalk Plan completed in 1997 included more detailed recommendations to the pedestrian infrastructure. The lack of paved bicycle facilities (specifically wide travel lanes for roadway sharing) is noted in the plan, but right-of-way acquisition is an issue on all major roadways. (The proposed widening of Route 54 may include the provision of bicycle facilities.) A previously completed public transportation study will be used to implement transit service should any un-met need be identified, although no fixed-route transit is currently planned. As of 2002, paratransit service was provided by a wide range of organizations.

Land Use

The latest 2020 land use plan for Town of Ashland "seeks to maintain balance and variety…to promote business, industrial, and residential opportunities as well as open and recreational spaces."

Generally the land use plan calls for low density (one to four dwellings per acre) and medium density (4.1 to 7 dwellings per acre) residential properties in order to achieve both the moderate growth and emphasis on owner occupied housing. High density residential properties are permitted in the downtown area.

The downtown area is being encouraged to move away from a single dominant land use type with a mix of retail, offices, and residential properties. Large tracts of undeveloped land within the Town are designated for future mixed use development.

Commercial growth will be concentrated in existing corridors on Route 1 and on England Street / Route 54. Industrial development is similarly designated for established industrial areas.

Significant development areas in the Town consist of:

- Route 1 / England Street and the downtown area.
- Redevelopment around the I-95 interchange including a possible Park-and-Ride lot.
- Mixed use development on land between Route 1 and the railroad, north of Archie Cannon Drive. Initial ideas include creating a transit-oriented development utilizing the rail access.
- Ashland and neighboring areas of Hanover County are experiencing a demand for senior housing and consequently an increase in demand is expected from transit dependent persons.

1.3.B CHARLES CITY COUNTY

The County of Charles City is primarily a rural county with only scattered development in an area dominated by forests. The sparse development pattern requires most of the population to leave the county daily in order to work and to perform errands. The Comprehensive Plan of 1999 was developed in order to encourage and accommodate necessary growth in employment and services to improve the quality of life of Charles City County residents. Charles City County is a member of the Richmond Area MPO's rural transportation program, through which transportation projects are largely funded by VDOT.

Transportation

Due to the rural nature of the community, relatively little in the way of transportation infrastructure improvements was planned as of 1999. The Comprehensive Plan includes elements from the 1996 statewide Six Year Improvement Plan, the 2015 MPO Long Range Plan and the 1999 MPO Transportation Improvements Program. Many of these improvements may have been completed and more added since the Plan was developed in 1999.

Improvements highlighted in the Comprehensive Plan include:

- Intersection improvements on collector streets throughout the county
- Construction of turn lanes
- Construction of a two-lane road running parallel to Route 5
- Widening of Route 106 & Route 600 from two lanes to four lanes
- Necessary bridge replacements and reconstructions

Other non-roadway facilities and improvements are also discussed in the Comprehensive Plan, although funding for these initiatives is less certain. The James River provides an opportunity for cargo barges, in addition to the eventual potential for a deep-water port in the

southern portion of the county. Several barge ports already exist in the county. Interstate Bicycle Route 76 follows Route 5 through the county and the East Coast Bike Route terminates in the west of the county. Charles City County has not pursued the development of dedicated bicycle facilities. VDOT conducted a study of the feasibility and benefits of widening Route 5 in order to create a bicycle path between Richmond and Williamsburg.

At the time of the preparation of the Comprehensive Plan, public transportation was fare-free to a select group of customers to specific facilities and activities. Charles City County provided a daily subscription route service for 13 disabled individuals to a mental retardation support program in a 20-passenger wheelchair accessible bus. The county provided elderly, handicapped, and transportation-impaired citizens with fare-free scheduled transportation services to specialized care facilities in the Richmond area. The county also provided transportation to eligible elderly individuals participating in recreation programs. Additionally, the Quin Rivers Community Action Agency provided free demand responsive transportation to county residents. Replacement of the QRCAA's vans was a part of the Commonwealth Six Year Improvement Program in 1996. Charles City County had no plans to bring fixed-route transit into the county and the plan does not identify a need for such a service.

Land Use

The comprehensive plan for Charles City County states that the overall development strategy is to "encourage new development to locate in Development Centers while maintaining a majority of the county as rural undeveloped land." The plan outlines eight centers split into two types — Regional and Local. The Regional Development Centers could include business and industrial parks, significant retail, and higher density residential developments; the Local Development Centers would provide the services needed more frequently by those in the area, such as banks, grocery stores, and the like. Residential developments would also be present with an emphasis on higher density construction.

The four Regional Development Centers are:

- Roxbury Regional Development Center in the northwest of the county that will be primarily industrial with commercial business developments
- James River Regional Development Center is located in an important industrial area and will be a good location for further industrial and wholesale commercial development. It is situated in the southeast of the county.
- Charles City Courthouse - Parrish Hill Regional Development Center will be partly a government center, encompassing the existing facilities, and will encourage higher density residential development and commercial uses. This area is located near the center of the county.
- Sturgeon Point Regional Development Center is east of the Courthouse area and will be industrial.

The Local Development Centers are:

- Hughes Store Local Development Center will neighbor the Roxbury Development Center. It will contain supportive uses, residential, commercial, and wholesale commercial business.
- Wayside Local Development Center will be situated north of the James River area. Although single family dwelling predominate multi-family dwellings will be encouraged, and the area could also be developed into a commercial hub for the county and nearby areas of neighboring jurisdictions.
- Ruthville Local Development Center is in the center of the county. Similarly to the Wayside Center it is currently predominantly single family dwellings. The highway connections in the area make this a prime location for commercial and higher density residential development.
- Adkins Store Local Development Center is west of Ruthville. Mostly single family dwellings exist there, but higher density residential and commercial developments could be considered if adequate infrastructure could be provided.
- Mt. Zion-Rustic Local Development Center is located in the extreme east of the county along Route 5. Planned infrastructure improvements will enhance the desirability of this area. Single family homes are expected to predominate and commercial development will be encouraged. Further infrastructure improvements would be required for multi-family dwellings.

1.3.C CHESTERFIELD COUNTY

The Plan for Chesterfield is comprised of many individual area plans that have been developed over the past two decades. Many of the specific corridor and small area plans are from the 1980's and early 1990's and therefore provide little insight into actual transportation projects that might currently be planned for the future of Chesterfield County.

Transportation

The major concern in the county plans from those decades was the condition of major arterials and collector roads. The adoption of the county's Thoroughfare Plan (adopted in 2004), which deals with the extension, widening, and construction of major streets, is encouraged by each individual plan. Additionally, several themes are evident throughout the plans with some common recommendations including:

- Control of direct access to land on major arterials and collector streets to maintain traffic flow
- Safety improvements on rural roads
- Pedestrian access should be provided in appropriate locations, specifically in the village centers
- The County Bikeway Plan (1989) should be implemented by creating a county-wide system of bicycle facilities
- Improve traffic flow on major arterials by adding turn bays and (limited) traffic signals where necessary
- Investigate the need for transit service in various areas of the county (either fixed route or demand responsive)

Some of the larger, specific recommendations in the Chesterfield County plans include:

- Widen Route 360 from four to six lanes
- Accommodate a rail station in Chester Village and right-of-way improvements along the CSX freight line in the event that high speed rail is implemented in the county
- Investigation of commuter rail options using existing railroad tracks in the Midlothian area
- Potential construction of an additional river crossing to the south

Land Use

The Plan for Chesterfield is comprised of 20 components. The proposed land use is, broadly:

- rural conservation in the southwest
- rural residential in the southeast
- residential in the north consisting of single family dwellings with some multi-family dwelling in certain locations
- mixed use and commercial developments along most of the major highway corridors in the north of the county
- regional centers (office, retail, industrial and higher density residential developments) at major intersections (either existing or future), notably on Route 288 between US 60 and Route 76
- village centers at various locations around the county.

The twenty components cover developments in greater detail and consist of:

- Jahnke/Chippenham Plan
- Eastern Midlothian Plan
- Powhite/Route 288 Develop. Area
- Bon Air Community Plan
- Northern Area Land Use and Transportation Plan
- Alverser/Old Buckingham Plan
- Midlothian Area Community Plan
- Upper Swift Creek Plan
- Huguenot/Robious/Midlothian Area Plan
- Old Gun/Robious Plan
- Central Area Land Use and Transportation Plan
- Chester Plan
- Jefferson Davis Corridor Plan
- Eastern Area (Consolidated)
- Southern and Western Area Plan

- Ettrick Village Plan
- Route 360 Corridor Plan
- Route 288 Corridor Plan
- Southern Jefferson Davis Corridor Plan
- Matoaca Village Plan

Of these eleven component plans are significant for this study. Further details of these follow.

Eastern Midlothian Plan

Eastern Midlothian is located in the north of the county and is bounded by Route 150 (Chippenham Parkway), US 60 (Midlothian Turnpike), and Route 76 (Powhite Parkway). It is designated primarily for regional and community mixed use, high density residential (up to 14 dwellings per acre) and medium density (up to four dwellings per acre).

Upper Swift Creek Plan

Situated in the west of the county, the Upper Swift Creek Plan encompasses the Swift Creek Reservoir. Much of the area is designated for low density residential housing (up to two dwellings per acre) with a mixed use and commercial corridor along US 360; however, regional mixed use centers are located at Route 288 and US 360 and at Route 288 and Route 76 (Powhite Parkway). A further regional center is planned where the proposed extension of the Powhite Parkway would meet US 360.

Central Area Land Use and Transportation Plan

The Central Area plan combines many land uses. The greatest area by far is given over to medium and low density residential (up to four dwellings per acre) with a few pockets of higher density housing (seven or more dwellings per acre) in the north of the area on or near Route 150. Route 10 (Iron Bridge Road) will become a mixed use and commercial corridor, and office and light industrial uses are designated along Route 288. Regional mixed use centers are shown at Route 150 and Route 10, at Route 288 and Route 10, and along Courthouse Road.

Chester Plan

This area is situated east of the Central Area and is roughly bisected by Route 10. Residential developments will be low density (less than 2.5 dwellings per acre) and there will be various mixed use developments along Route 10. Commercial development is designated in the US 1 (Jefferson Davis Highway corridor).

Jefferson Davis Corridor Plan

This plan covers the Route 1 corridor north of I-95. The plan shows commercial development along the full length of the plan area, regional mixed use at Route 288 and medium density housing with some higher density locations.

Eastern Area

The Eastern Area is the extreme east of the county bounded north and south by the James and Appomattox Rivers. The area is predominantly industrial, especially along the James River,

but with some residential. The area also includes a commercial area at I-95 and Ruffin Mill Road and Enon Town Center, a mixed use development on Route 10.

Southern and Western Area Plan

The southern part of Chesterfield County has very low levels of development. The future plan respects this. The whole western half of the area will be designated a Rural Conservation Area. Some more substantial developments will be possible in the extreme east of the area, most notably a regional mixed use center at Woodpecker Road and Branders Bridge Road.

Ettrick Village Plan

The Ettrick Village Plan is located in the southeast corner of the county. It consists of low density residential (up to 2.5 dwellings per acre) around and village core, centered on Chesterfield Avenue, comprised of mixed use, commercial, light industrial, and medium density residential (up to 4 dwellings per acre).

Route 360 Corridor Plan

US 360 between Courthouse Road and Route 150 will be a mixed use corridor with a concentration of commercial and light industrial use at the interchange of Route 150.

Route 288 Corridor Plan

This plan covers Route 288 in the west of the county between Route 76 and US 60. The planned land use is split roughly in two, the southern portion being mixed use and the northern potion designated a regional employment center.

Matoaca Village Plan

Matoaca Village borders the Ettrick Village Plan area. It follows to the same basic pattern as Ettrick with a village core of commercial development surrounded by residential development, albeit at a lower overall density.

1.3.D GOOCHLAND COUNTY

Goochland County is a rural county in which planning efforts have historically centered on existing development centers, called villages. The Goochland 2023 plan was developed in 2005 with the stated goals of maintaining the rural character of the villages and to accommodate growth pressures in the eastern portion of the county.

Transportation

The major transportation issues highlighted by the plan include:

- Increased development and traffic in the eastern portion of the county since the completion of Route 288.
- Linear development along roadways instead of village “cluster” development that requires more ingress/egress on main streets and thereby slowing traffic
- Maintaining the atmosphere of the village centers
- Maintaining the Rural Enhancement Area by restricting development to designated growth areas

Several major transportation improvements are planned for Goochland County, primarily in the Eastern portion of the county, to accommodate the expected growth in the area. Programmed projects include:

- Widening and re-alignment of Interstate 64 near Route 288 interchange
- Safety improvements to major rural collectors
- Road widening projects in the eastern portion of the county
- Interchange improvements at Route 623 and I-64
- Development of Park-and-Ride facilities near village centers

In addition to these projects, the Goochland 2023 plan supports several general solutions to transportation problems that would be implemented when funding becomes available.

- Speed controls in village centers and residential neighborhoods
- Narrow streets or other traffic calming strategies
- T-intersections when possible
- Additional parking facilities in village centers
- New route alternatives for East/West travel
- Creation of separate - primarily off-street - pedestrian paths

Besides the roadway and pedestrian recommendations already highlighted, several ideas for potential transit service were put forth. Passenger rail to Richmond should be improved to create a more viable alternative to the automobile. A van-pooling service would also be a good option for implementation in Goochland County. Additionally, a study of potential public transportation service could determine the need for both demand-responsive and fixed-route services as the county continues to grow, although none is currently planned.

Land Use

The most significant development in Goochland County occurs predominantly, but not exclusively, in ten villages:

- Centerville
- West Creek
- Broad Run
- Manakin
- Oilville
- Crozier
- Sandy Hook
- Goochland
- Hadensville
- Fife-Georges Tavern

Most of the development in these areas is medium density residential often with some commercial. The villages in the east of the county (Centerville, West Creek, Broad Run, and Manakin) are expected to see greater development. Centerville and West Creek are the most significant with residential and commercial in the former, and the latter being a business park that is expected to be a large source of employment in the future.

1.3.E HANOVER COUNTY

The Hanover County Comprehensive Plan was developed in 2002/2003 and provides goals to guide future development of the growing county. The plan outlines specific areas in which growth should be concentrated. These growth areas are to receive priority for roadway improvement and construction funds in order to contain development in the designated areas.

Transportation

The primary focus of the plan is on roadway facilities, as there are few other transportation options in the county. The main guiding document for roadway expansions, improvements and construction is the county's Major Thoroughfare Plan which details all of the recommended improvements to arterials and major collector streets county-wide. The plan primarily addresses capacity improvements that will become necessary due to increased traffic. Other types of recommended improvements to vehicular facilities include:

- Interchange improvements on I-95
- Safety improvements along rural and suburban roads such as:
- Grade changes
- Sight distance improvements
- Widening lanes
- Surface re-paving
- Maintain traffic flow by consolidating access points on major roads and requiring inter-parcel access streets

No public transportation was available in Hanover County at the time the plan was prepared, and the plan does not indicate a pressing need for this service. Bicycle and pedestrian facilities are not consistently provided throughout the county, although a need for these facilities is recognized in many of the more urban areas in Hanover County. Consideration of several alternatives to vehicle travel is recommended, including:

- Potential for a high-speed rail corridor through the county and a potential passenger rail station
- Potential locations for Park-and-Ride lots
- Construction of sidewalks, paths and trails along major roadways in urbanized areas and "village centers"

The final area of concern is the large number of at-grade railroad crossings that exist throughout the county. These crossings are safety hazards for vehicles and pedestrians alike and should be eliminated wherever possible. Where grade separation is not possible, safety improvements should still be made including warnings and gates to help prevent crashes.

Land Use

The land use plan for Hanover County shows the vast majority of development following I-95, I-295, and the Chickahominy River. These corridors form an inverted T, the south cross-bar being residential and the stem being industrial. Commercial and some higher density residential is present at or near the interchanges along I-295 and I-95. Two large business parks are shown in the plan on the northeast border of the Town of Ashland and south of US 30. In addition the plan shows mixed use, commercial, and higher density residential in the US 360 corridor.

1.3.F HENRICO COUNTY

Henrico County directly borders the City of Richmond to the north and has the heaviest level of development in the southern portions of the county. The most recent comprehensive plan was completed in 1995, and as such many of the conditions, planned projects, and funding scenarios may no longer be applicable. The automobile is the primary mode of travel in Henrico County and as such roadways are the main concern for transportation planning. Henrico County is one of only two counties in Virginia which owns and operates its own primary and secondary road systems, allowing planners a greater level of control over development and growth patterns.

Transportation

Plans for construction, improvement, and widening of major streets in Henrico County are controlled by the Major Thoroughfare Plan, developed in 1985. As of 1995, the county was planning on utilizing a consultant to update this plan using modeling techniques to assess demand for major roadway facilities. The major programmed and planned improvements in the County CIP, the VDOT 6-year plan, and the 2005 Regional Plan mostly includes widening of major arterials and collector streets. An additional proposal recommends that Henrico County take control of the signals on its primary roadways to make improvements easier to implement. Another major concern on major streets is vehicular access; frequent driveways onto major streets obstruct traffic flow. The plan encourages shared use driveways and inter-parcel access to combat this problem. Other specific planned roadway improvements include:

- Widening of Route 5 (facility to include bicycle lanes)
- Realignment of Church Road & Pump Road intersection

Henrico County purchases transit service from GRTC. Complementary paratransit service is provided by GRTC and local charitable organizations. AMTRAK provides service to the Staples Mill Road Station, which is the most heavily used station in Virginia. The Henrico County plan noted that GRTC's plans to develop a multimodal transportation center in downtown Richmond might reduce rail boardings in Henrico County as more people use the downtown station.

Pedestrian and bicycle facilities are not prevalent in Henrico County, and the comprehensive plan recognizes the general need to improve pedestrian access around major activity nodes. The initial focus for improved pedestrian facilities will be in areas immediately around elementary schools.

Land Use

Henrico is a largely suburban county bordering Richmond and contains four Interstate highways, I-64, I-95, I-295, and I-895. The county consists of areas that are already substantially developed around Richmond, expansion areas in the west and east, and outlying areas in the extreme east that will require further infrastructure to develop more and therefore are designated to stay largely rural with very low density housing.

Significant industrial development is expected in the east of the county around Richmond International Airport. Along some of the major corridors and at the interchanges between them significant development is expected, most of which is commercial but includes industrial and some high density residential. The major corridors are:

- I-64 both east and west of Richmond
- US 33 Staples Mill Road
- I-95
- US 60 Williamsburg Road

A further significant development location will be around the Richmond-Staples Mill Amtrak Station.

1.3.G NEW KENT COUNTY

The New Kent Vision 2020 plan was adopted in 2003 to help the primarily rural county maintain its rural character while providing opportunities for income and wealth generation for the county and its residents.

Transportation

Because the county is overwhelmingly dependent on the automobile for its transportation needs the plan attempts to accommodate the "desired level of growth without compromising either the safety or the carrying capacity" of the roadway system. The primary goal of the transportation plan is to provide efficient access management that allows traffic to flow freely while providing access to residences and businesses. While the highway system in New Kent County currently operates below capacity, several highway-specific actions were highlighted by the plan, including:

- Safety improvements on New Kent Highway
- No capacity increases along major collectors and arterials
- Implementation of traffic calming strategies in village centers and residential neighborhoods
- Expansion of I-64 *only* in coordination with widening projects in adjacent jurisdictions to avoid bottlenecks
- Maintenance of the rural character of I-64 in the county by implementing a landscaped median
- Intersection improvements where necessary within ¼ mile of interstate interchanges
- Reconstruction of several major roads in the western portion of the county

The plan noted that there were currently no viable alternatives to the automobile in the county. Most of the major streets do not have sidewalks or shoulder facilities, making walking and bicycling unsafe and difficult. (The only exception is the area around the County Courthouse.) The development of local pedestrian facilities in residential neighborhoods and village centers is encouraged in addition to the provision of several larger scale pedestrian facilities. The plan also details a future bicycle network consisting primarily of on-street accommodations on major thoroughfares and off-street facilities along railroad rights-of-way. As an additional alternative mode of travel, the plan advocates for the construction of a rail station at Providence Forge and the implementation of passenger rail service in New Kent County. The feasibility of rail to Providence Forge was evaluated in the Rail Transit Feasibility Study.

Land Use

New Kent County is situated to the southeast of Richmond and bisected by I-64. US 60 (Richmond Road) and Route 249 (New Kent Highway) run parallel to the interstate through the county, with the three roads coming together in the west near to the Henrico County border.

As shown in the land use plan most of the county will remain rural. Mixed use development is planned at several points along I-64, namely at Exits 205, 211, 214, and 220. Mixed use and industrial development in designated along Route 33 (Eltham Road) as well.

1.3.H POWHATAN COUNTY

Powhatan County is rural community west of Richmond composed primarily of forests and farmland. Most of the development in the county exists in small village centers with some residences scattered along rural roads. Most residents (approximately 75%) commute to other jurisdictions.

Transportation

The county's comprehensive plan highlights three broad goals for the transportation system:

- Maintain the safety and capacity of the roadway system
- Maintain and improve access and mobility of county residents
- Reinforce the rural character of Powhatan County

The primary mode of travel in the county is the automobile, and three major roadway corridors exist: Route 60 (east-west), Route 522 (north to Goochland County) and Route 711 (east-west). Potential traffic increases on these three routes due to increased development in Powhatan and adjacent counties is expected and the Plan seeks to accommodate these increases without drastic changes to the character or scale of major thoroughfares. Some capacity increases on major streets are included in the plan, such as:

- Widening of Route 522 to a four-lane divided road
- Control access to Route 60 in accordance with its future designation as a "controlled access facility with at-grade intersections"
- Extension of Route 615 into Chesterfield County

- Extension of Route 13
- Upgrading of Route 711 to accommodate increased traffic from Route 288

Apart from these recommendations, increased capacity for directional travel should be provided by constructing facilities that run parallel to existing routes that keep traffic and congestion to a minimum and maintain the rural character of the county.

Due to increased traffic and development, several new traffic signals may also be necessary on major streets. Several county roadways are designated as Scenic Byways; maintaining their status as a natural and cultural resource is a priority. The county plans to continue their efforts to upgrade and pave rural roads to meet VDOT standards. Additional VDOT construction projects include several at-grade rail crossing improvements.

Access is a major issue in Powhatan County and several modes are addressed in the Comprehensive Plan. In order to provide vehicular access while maintaining traffic flow on major streets, the plan recommends consolidating access points, inter-parcel connections and reverse frontage on rural roads. Pedestrian access is encouraged in village centers as development occurs in the future. A county-wide system of bicycle routes along major roadways is also encouraged, along with a bike path into Chesterfield County via a railroad right-of-way. Public transportation is not recommended or deemed an appropriate option for rural Powhatan County.

Land Use

The future land use plan for Powhatan County shows that it will remain generally at very low densities. Almost all of the non-residential land use will be focused along the US 60 (Anderson Highway) corridor, from the Chesterfield County border and Bell Road. This corridor will contain industrial, commercial, some residential, and village mixed use. There is also a significant area of village mixed use shown in the northeast of the county bounded by Chesterfield County, Route 288, and Huguenot Trail.

1.3.I CITY OF RICHMOND

The City of Richmond's Comprehensive Plan was developed in 1998 with the goals of improving the urban environment by accommodating and encouraging appropriate growth. While the automobile is the primary mode of travel in Richmond, the importance of public transit, bicycles, and pedestrians are also emphasized in the plan. The main transportation goals of the plan are:

- To provide a multi-modal regional transportation system
- To provide a roadway system that provides efficient access to all parts of the city for automobiles and transit vehicles without disturbing neighborhood settings
- To support and encourage pedestrian and bicycle travel
- To provide access to national and international markets

Decreasing reliance on the automobile and increasing the number of people using alternative travel modes is an important goal for the city of Richmond. Policy and strategy recommendations for achieving this goal include:

- Establish a dedicated, reliable source of funding for transit service (GRTC)

- Open the Main Street Station for passenger rail service
- Encourage the development of High Speed Rail service through Richmond
- Develop a Light Rail Transit System serving several corridors in the city:
- A downtown circulator route
- A Broad Street route
- A Main Street connector
- A route on Midlothian Turnpike
- A route on Jefferson Davis Highway into Chesterfield County
- Implement a commuter rail system in the region with access to the Richmond International Airport
- Improvements to existing GRTC bus service including:
- Better route coverage throughout the city to serve existing and expected developments
- Construct bus shelters at all of the major stops and provide other amenities as warranted
- Relocate the GRTC bus yard and maintenance facility
- Implement express bus service from the suburbs along existing interstate corridors
- Implement circumferential bus routes between suburban locations
- Establish highly visible and recognizable "gateways" to the City at major entry points.

Development of bicycle and pedestrian facilities was also encouraged by the Comprehensive Plan which highlights the need for ADA-compliant facilities to be built on all new roadways and in existing commercial areas and "town centers". Improvements of crosswalks, pedestrian signals, sidewalks, and streetscapes in the downtown area are a key element in improving pedestrian safety. In addition, a regional system of bikeways should be developed on all major roadways that coordinate with similar plans in adjacent counties.

The Comprehensive Plan includes many recommendations to improve the capacity and quality of the roadway system. One area of major concern is the interstate system which runs through the city; several bridges, overpasses, and interchanges are in need of repair, realignment, and reconstruction. Capacity improvements are necessary in several locations and roads have been slated for significant widening, however the plan warns against widening projects in residential and older neighborhoods. Other types of improvements that would increase capacity are recommended including adding turn lanes, coordinating signals, and widening individual lanes. Additionally, the plan calls for converting of many of the one-way streets in downtown Richmond into two-way streets. Some major improvement projects include:

- Reconfiguration of Jefferson Davis Highway as a controlled access facility with a separate right-of-way for pedestrians and bicyclists
- Addition of a landscaped median on Broad Street
- Multiple intersection improvements and realignments
- Construction of several new connector roads and extension of existing streets

Safety improvements are also necessary on many Richmond facilities. Of specific concern are the 70 at-grade railroad crossings that are found in the city. Where possible, these crossings should be removed, and where grade separation is not possible, other safety measures should be implemented.

The final area of concern in the Comprehensive Plan is parking, which is provided by a mix of on-street short-term parking and off-street long-term garages and lots. Residential permit programs should be implemented in many neighborhoods to ensure that residents can park on their streets. Shared use of parking facilities between adjacent uses is also recommended as a strategy for making better use of the existing parking supply. The City was also planning to build several municipal garages in the downtown area, with consideration given to context sensitive design.

Land Use

The Land Use Plans for Richmond are divided among a series of planning districts as follows:

- Broad Rock
- Near West
- North
- Midlothian
- Huguenot
- Far West
- East
- Old South
- Downtown

The city is substantially built out and, hence, the opportunity for further development is limited. Where vacant land does exist it is mainly in the south and west of the city (most significantly in the Huguenot, Midlothian, and Broad Rock planning districts).

The comprehensive plan and land use plans indicate that many of the planning districts are to follow the same pattern. These are as follows:

- Existing land uses to be largely retained as is
- Infill development where vacant land is available
- Increased density of residential development, particularly in Near West, North, and East planning districts.

1.4 TRANSIT GENERATORS AND ATTRACTORS

The following figures and tables list the existing and planned potential transit trip generators and attractors. These were complied in consultation with representatives of the local governments. Initial lists of existing infrastructure and planned development based on the comprehensive plans were provided to each authority. The jurisdictions then responded to confirm, or dismiss from, the list and provide additional locations. Additional information regarding the size and timeline of developments was requested and provided where possible. When available, this information is provided in the tables below.

The region has been spilt across three maps. Figure represents the City of Richmond. Figure displays the areas north of Richmond, principally Henrico, Hanover, and Goochland Counties and the Town of Ashland. Figure shows the areas south of Richmond, mainly Powhatan[4], Chesterfield, Charles City, and New Kent Counties. The accompanying tables are similarly segregated.

1.4.A RICHMOND

The potential transit generators in Richmond are arranged along five primary corridors: Jefferson Davis Highway (US 1/301) south of downtown, Midlothian Turnpike (US 60) to the southwest, Broad Street (US 250/33) to the northwest, Main Street and Carytown to the west, and Nine Mile Run and 25th Street to the east. In addition, groups of institutional transit generators can be found. The Diamond baseball stadium and the Arthur Ashe, Jr. athletic center are northwest of downtown. To the west are the Science Museum of Virginia, Children's Museum of Richmond, Virginia Museum of Fine Arts, and Virginia Historical Society. Also to the west are Virginia Commonwealth University, the Seigel Center, and the Landmark Theater. The highest concentration of transit generators lies in the downtown area, made up of government offices, tourism areas, and banking centers. University and hospital campuses are other common potential transit generators. See Table and Figure 1-15.

[4] Powhatan County was contacted to comment about potential transit generators. At the time of writing of this report no response had been received. The locations shown in the maps and table below represent the best estimate of likely locations.

Figure 1-15: Location of Potential Transit Trip Generators in Richmond

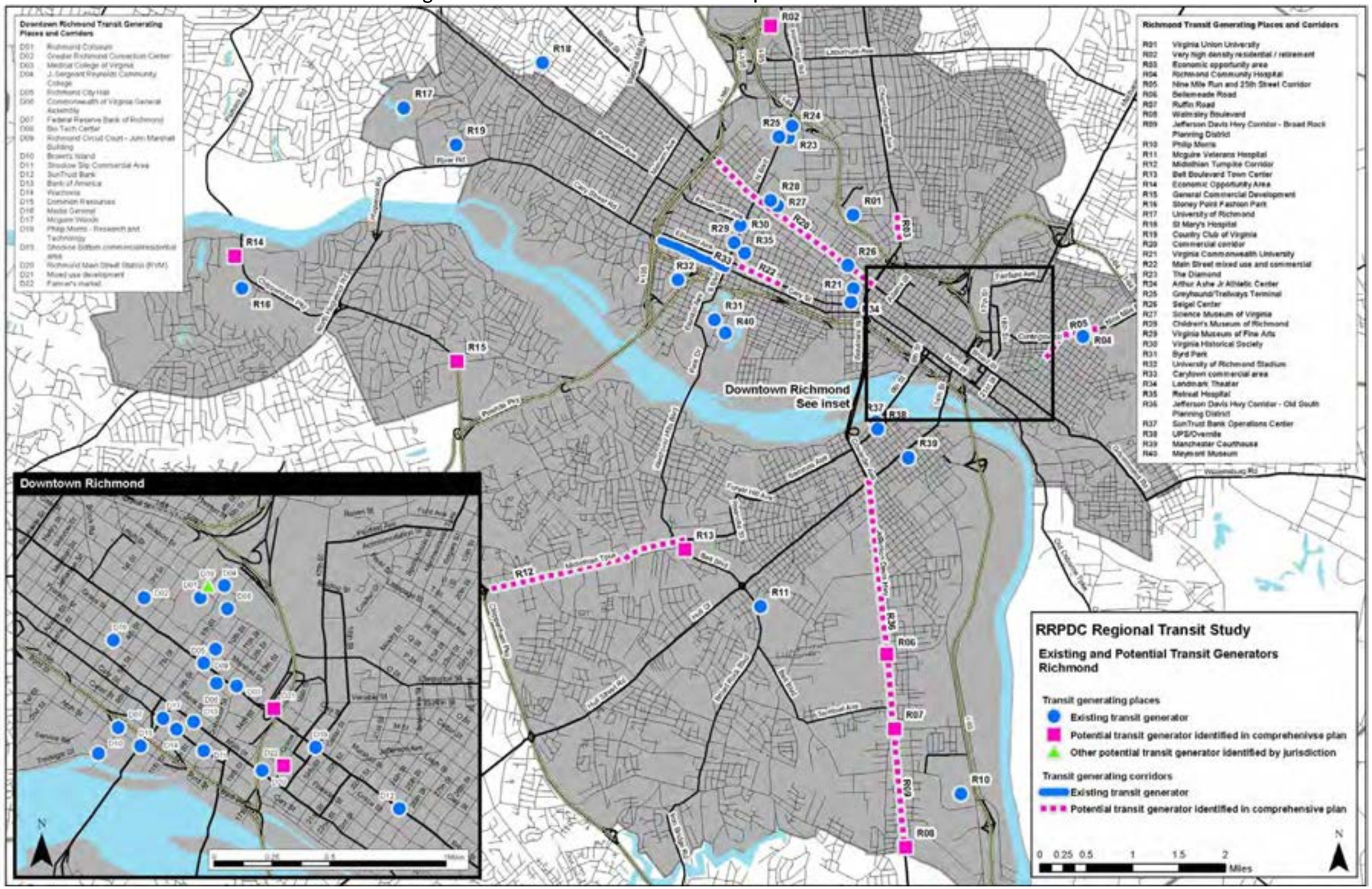


Figure 1-16: Location of Potential Transit Trip Generators North of Richmond

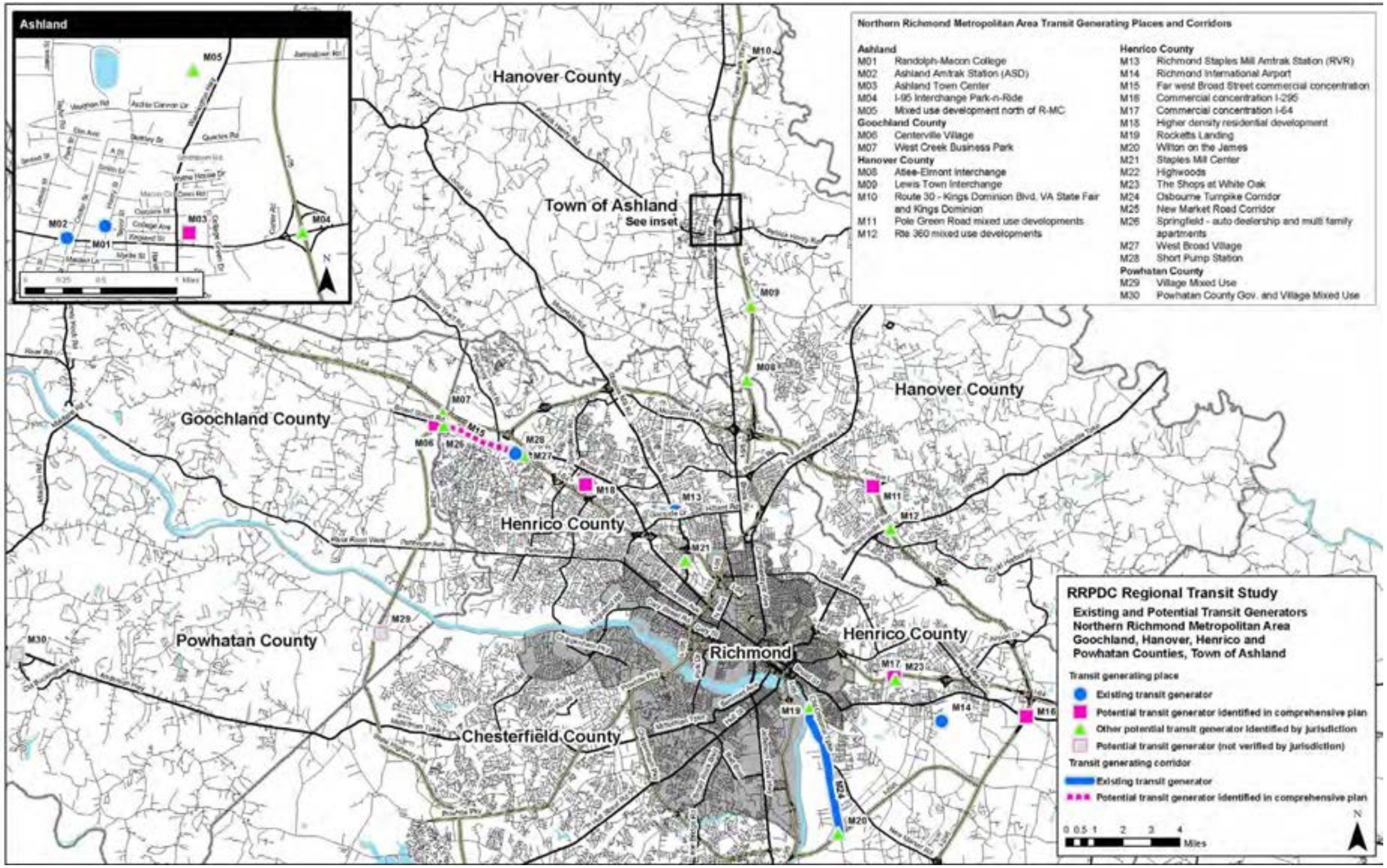


Figure 1-17: Location of Potential Transit Trip Generators South of Richmond

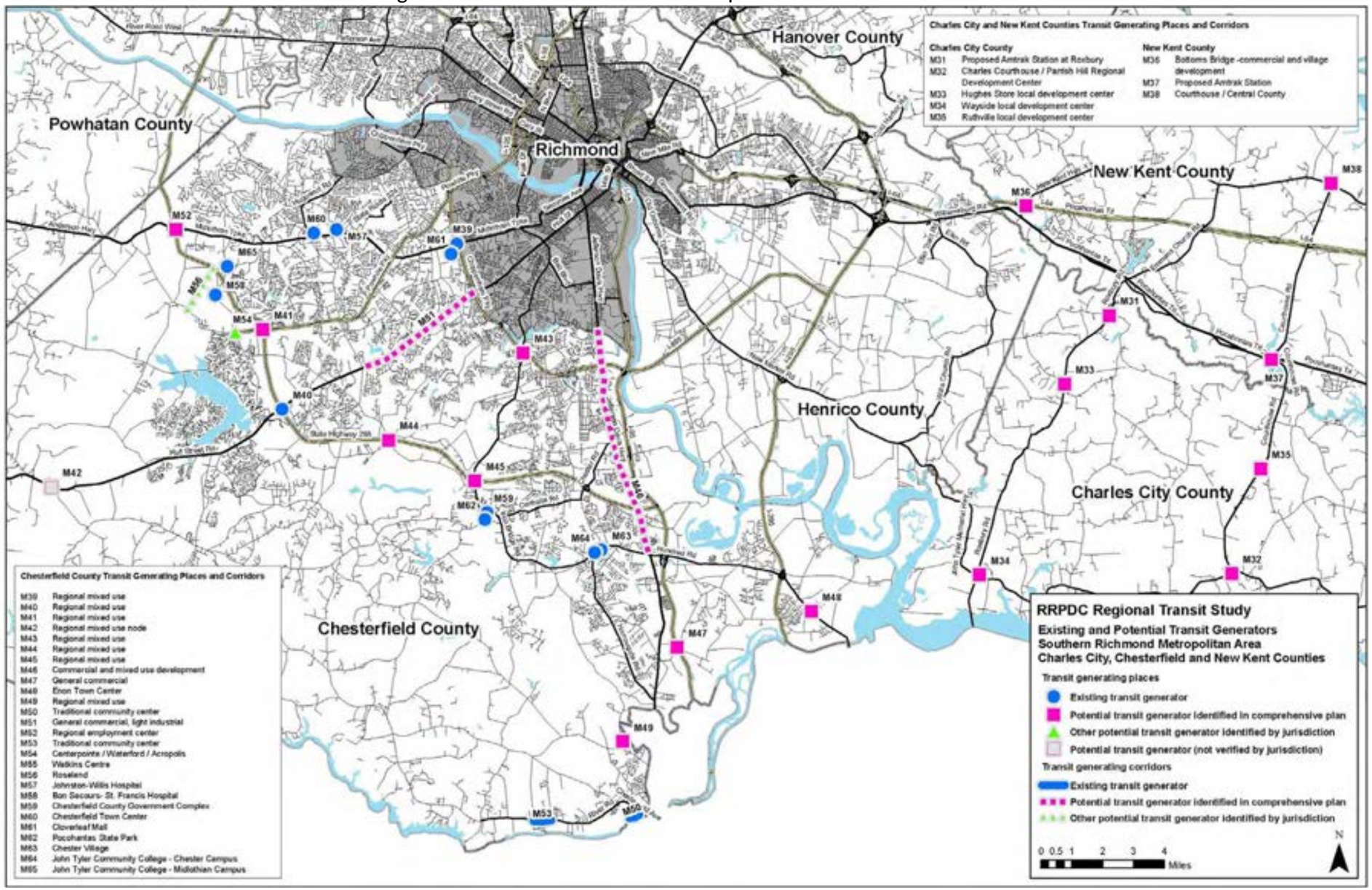


Table 1-6: Potential Transit Trip Generators in Richmond

ID	Name	Type	Status	Size
D01	Richmond Coliseum	Entertainment	Existing	
D02	Greater Richmond Convention Center	Business	Existing	
D03	Medical College of Virginia	University	Existing	
D04	J. Sergeant Reynolds Community College	University	Existing	
D05	Richmond City Hall	Government	Existing	
D06	Commonwealth of Virginia General Assembly	Government	Existing	
D07	Federal Reserve Bank of Richmond	Offices	Existing	
D08	Bio Tech Center	Research	Existing	
D09	Richmond Circuit Court - John Marshall Building	Government	Existing	
D10	Brown's Island	Entertainment	Existing	
D11	Shockoe Slip Commercial Area	Commercial	Existing	
D12	SunTrust Bank	Business	Existing	
D13	Bank of America	Business	Existing	
D14	Wachovia	Business	Existing	
D15	Dominion Resources	Business	Existing	
D16	Media General	Business	Existing	
D17	Mcguire Woods	Business	Existing	
D18	Philip Morris - Research and Technology	Research	Proposed	appr. 6000 employees
D19	Shockoe Bottom commercial/residential area	Commercial / Residential	Existing	
D20	Richmond Main Street Station (RVM)	Amtrak Rail	Existing	
D21	Mixed use development	Mixed Use	Proposed	

Table 1-6: Potential Transit Trip Generators in Richmond (continued)

ID	Name	Type	Status	Size
R01	Virginia Union University	University	Existing	
R02	Very high density residential / retirement community	Residential	Proposed	
R03	Economic opportunity area	Economic	Proposed	
R04	Richmond Community Hospital	Hospital	Existing	
R05	Nine Mile Run and 25th Street Corridor	Mixed Use / Commercial	Proposed	
R06	Farmer's market	Commercial	Existing	
R07	Bellemeade Road	Economic	Proposed	
R08	Ruffin Road	Economic	Proposed	
R09	Walmsley Boulevard	Economic	Proposed	
R10	Jefferson-Davis Hwy Corridor	Mixed Use	Proposed	
R13	Midlothian Turnpike Corridor	Economic	Proposed	
R14	Belt Boulevard Town Center	Mixed Use / Commercial	Proposed	
R15	Economic Opportunity Area	Economic	Proposed	
R16	General Commercial Development	Commercial	Proposed	
R17	Stoney Point Fashion Park	Commercial	Existing	
R18	University of Richmond	University	Existing	
R19	St Mary's Hospital	Hospital	Existing	
R20	Country Club of Virginia	Entertainment	Existing	
R21	Commercial corridor	Commercial	Proposed	
R22	Virginia Commonwealth University	University	Existing	
R23	Main Street mixed use and commercial development	Mixed Use / Commercial	Proposed	
R24	Arthur Ashe Jr Athletic Center	Entertainment	Existing	
R25	Greyhound/Trailways Terminal	Bus Terminal	Existing	
R26	Seigel Center	Entertainment	Existing	
R27	Science Museum of Virginia	Museum	Existing	
R28	Children's Museum of Richmond	Museum	Existing	
R29	Virginia Museum of Fine Arts	Museum	Existing	

Table 1-6: Potential Transit Trip Generators in Richmond (continued)

ID	Name	Type	Status	Size
R30	Virginia Historical Society	Museum	Existing	
R31	Byrd Park	Entertainment	Existing	
R32	University of Richmond Stadium	Entertainment	Existing	
R33	Carytown commercial area	Commercial	Existing	
R34	Landmark Theater	Entertainment	Existing	
R35	Retreat Hospital	Hospital	Existing	
R36	Jefferson Davis Hwy Corridor - Old South Planning District	Mixed Use	Proposed	
R37	Jefferson-Davis Hwy Corridor	Mixed Use	Proposed	
R38	SunTrust Bank Operations Center	Business	Existing	
R39	UPS/Overnite	Business	Existing	
R40	Manchester Courthouse	Government	Existing	

Note locations of these developments are shown in Figure .

1.4.B NORTH OF RICHMOND

North of Richmond, potential transit generators are primarily in Henrico County and the Town of Ashland. Ashland is home to Randolph-Macon College as well as some planned mixed used development. Other transit generators in this part of the study area center on transportation hubs, such as Richmond International Airport, the Amtrak train stations in Ashland and at Staples Mill, and park-and-ride facilities along the interstate highways. The Broad Street commercial corridor in western Henrico County as well as concentrated nodes of commercial or mixed used development round out the remaining potential transit generators. See Table and Figure .

1.4.C SOUTH OF RICHMOND

In the southern part of the study area, potential transit generators follow two principal corridors in Chesterfield County – along US 360 and along US 1. In addition, several regional mixed use centers are planned in Chesterfield County near the intersections of arterial roadways. Similarly, in rural New Kent County and Charles City County potentially transit supportive planned development centers are located along primary cross-county roadways. The identified potential transit generators south of Richmond are mainly commercial or mixed use nodes, rather than major institutional uses. See Table and Figure .

Table 1-7: Potential Transit Trip Generators North of Richmond

ID	Jurisdiction	Name	Type	Status	Size
M01	Town of Ashland	Randolph-Macon College	University	Existing	
M02	Town of Ashland	Ashland Amtrak Station (ASD)	Amtrak Rail	Existing	
M03	Town of Ashland	Ashland Town Center	Mixed Use	Existing/ Proposed	225,000 sq ft
M04	Town of Ashland	I-95 Interchange Park-n-Ride	Park-n-Ride	Proposed	
M05	Town of Ashland	Mixed use development north of R-MC	Mixed Use	Proposed	
M06	Goochland County	Centerville Village	Mixed Use	Proposed	
M07	Goochland County	West Creek Business Park	Business Park	Existing/ Proposed	
M08	Hanover County	Atlee-Elmont Interchange	Access Point	Existing/ Proposed	
M09	Hanover County	Lewis Town Interchange	Access Point	Proposed	
M10	Hanover County	Route 30 - Kings Dominion Blvd, VA State Fair and Kings Dominion	Entertainment	Existing/ Proposed	
M11	Hanover County	Pole Green Road mixed use developments	Mixed Use	Proposed	
M12	Hanover County	Rte 360 mixed use developments	Mixed Use	Proposed	
M13	Henrico County	Richmond Staples Mill Amtrak Station (RVR)	Amtrak Rail	Existing	
M14	Henrico County	Richmond International Airport	Airport	Existing	
M15	Henrico County	Far west Broad Street commercial concentration	Commercial	Proposed	
M16	Henrico County	Commercial concentration I-295	Commercial	Proposed	
M17	Henrico County	Commercial concentration I-64	Commercial	Proposed	
M18	Henrico County	Higher density residential development	Residential	Proposed	
M19	Henrico County	Rocketts Landing	Mixed Use	Proposed	
M20	Henrico County	Wilton on the James	Business	Proposed	
M21	Henrico County	Staples Mill Center	Residential	Proposed	
M22	Henrico County	Highwoods	Business	Proposed	
M23	Henrico County	The Shops at White Oak	Commercial	Proposed	
M24	Henrico County	Osbourne Turnpike Corridor	Mixed Use	Existing	
M25	Henrico County	New Market Road Corridor	Mixed Use	Existing	
M26	Henrico County	Springfield - auto dealership and multi family apartments	Mixed Use	Proposed	
M27	Henrico County	West Broad Village	Mixed Use	Proposed	
M28	Henrico County	Short Pump Station	Mixed Use	Existing	
M29	Powhatan County	Village Mixed Use	Mixed Use	Existing	
M30	Powhatan County	Powhatan County Gov. and Village Mixed Use	Mixed Use	Existing	

Note locations of these developments are shown in Figure .

Table 1-8: Potential Transit Trip Generators South of Richmond

ID	Jurisdiction	Name	Type	Status	Size	Timeline
M31	Charles City County	Proposed Amtrak Station at Roxbury	Amtrak Rail	Proposed		
M32	Charles City County	Charles Courthouse / Parrish Hill Regional Development Center	Mixed Use	Proposed		
M33	Charles City County	Hughes Store local development center	Mixed Use	Proposed		
M34	Charles City County	Wayside local development center	Mixed Use	Proposed		
M35	Charles City County	Ruthville local development center	Mixed Use	Proposed		
M36	New Kent County	Bottoms Bridge -commercial and village development	Mixed Use	Proposed	Patriot's Landing - 640 residential units and approximately 270,000 square feet of retail. Plans for bank, restaurants and medical complex.	to be completed in 2011
M37	New Kent County	Proposed Amtrak Station and Kentland	Amtrak Rail and Residential	Proposed	Kentland - approximately 2650 residential units	to be completed in 2018
M38	New Kent County	Courthouse / Central County	Community Center	Existing / Proposed	New Kent Village - approximately 75 residential units, 13 residential flats (over commercial units) and approximately 26,000 square feet of commercial space. Farms of New Kent - approximately 2,800 units when fully built-out.	to be completed in 2020
M39	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M40	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M41	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M42	Chesterfield County	Regional mixed use node	Mixed Use	Proposed		
M43	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M44	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M45	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M46	Chesterfield County	Commercial and mixed use development	Mixed Use / Commercial	Proposed		
M47	Chesterfield County	General commercial	Commercial	Proposed		
M48	Chesterfield County	Enon Town Center	Mixed Use	Proposed		
M49	Chesterfield County	Regional mixed use	Mixed Use	Proposed		
M50	Chesterfield County	Traditional community center	Mixed Use	Existing		
M51	Chesterfield County	General commercial, light industrial	Mixed Use Business	Proposed		
M52	Chesterfield County	Regional employment center	Mixed Use	Proposed		
M53	Chesterfield County	Traditional community center	Mixed Use	Proposed		

Table 1-8: Potential Transit Trip Generators South of Richmond (continued)

ID	Jurisdiction	Name	Type	Status	Size	Timeline
M54	Chesterfield County	Centerpointe / Waterford / Acropolis	Mixed Use Business	Proposed		
M55	Chesterfield County	Watkins Centre	Commercial	Proposed		
M56	Chesterfield County	Roseland	Mixed use	Proposed		
M57	Chesterfield County	Johnston-Willis Hospital	Hospital	Existing		
M58	Chesterfield County	Bon Secours- St. Francis Hospital	Hospital	Existing		
M59	Chesterfield County	Chesterfield County Government Complex	Government	Existing		
M60	Chesterfield County	Chesterfield Town Center	Commercial	Existing		
M61	Chesterfield County	Cloverleaf Mall	Commercial	Existing		
M62	Chesterfield County	Pocohantas State Park	Park	Existing		
M63	Chesterfield County	Chester Village	Mixed Use	Existing		
M64	Chesterfield County	John Tyler Community College - Chester Campus	University	Existing		
M65	Chesterfield County	John Tyler Community College - Midlothian Campus	University	Existing		

Note locations of these developments are shown in Figure .

1.5 RAIL TRANSIT FEASIBILITY STUDY

The following is a summary of the Richmond Rail Transit Feasibility Study, prepared by Parsons Brickerhoff Quade and Douglas, Inc., for the Virginia Department of Transportation and the Richmond Area Metropolitan Planning Organization, June 23, 2003.

The Richmond Rail Transit Feasibility Study is a preliminary analysis of potential rail corridors in the Richmond region. The study evaluated two transit modes: light rail and commuter rail. Alternative corridors were developed based on 12 identified corridors in the 2023 Richmond Area MPO Long Range Plan. These original corridors were modified, combined or eliminated and in one case a completely new corridor was proposed to develop five light rail and five commuter rail corridors to be analyzed as part of this study. The five commuter rail corridors would travel from downtown Richmond to Ashland, Hanover, Midlothian, Petersburg and Providence Forge. The five light rail transit (LRT) corridors would travel from downtown Richmond to Boulevard, Broad to South Boulevard, Midlothian, Richmond International Airport (RIC), and Short Pump.

An initial analysis was conducted of the ten corridors based on five criteria: potential ridership, capital costs, cost per rider, transit dependency (based on automobiles per household) and potential congestion relief. Each corridor was ranked on a scale from one (best) to ten (worst) as shown in **Error! Reference source not found.**. Even though the light rail corridors outperformed all of the commuter rail corridors, two corridors were selected for each mode. While the top two commuter rail corridors were selected (Ashland and Midlothian) the LRT corridor with the second highest ranking was not selected because it was not part of the Richmond Long Range Transportation Plan and because it partially duplicated the Short Pump corridor, which was the top performing corridor.

Table 1-9: Ranked Corridors

Mode	Corridor	Rank	Selected
Commuter Rail	Ashland	5	X
Commuter Rail	Hanover	7	
Commuter Rail	Midlothian	6	X
Commuter Rail	Petersburg	7	
Commuter Rail	Providence Forge	10	
Light Rail	Boulevard	7	
Light Rail	Broad to Boulevard South	2	
Light Rail	Midlothian	4	
Light Rail	Richmond Int'l Airport	1	X
Light Rail	Short Pump	3	X

The four selected alternatives shown in Figure were then analyzed in greater detail to identify potential alignments and feasibility issues.

1.5.A MAIN STREET STATION

Each corridor alternative would terminate at the Main Street Station. While the station provides an advantageous location, it will be challenging to provide sufficient capacity for commuter rail and LRT options. Commuter rail would operate on existing track utilized by

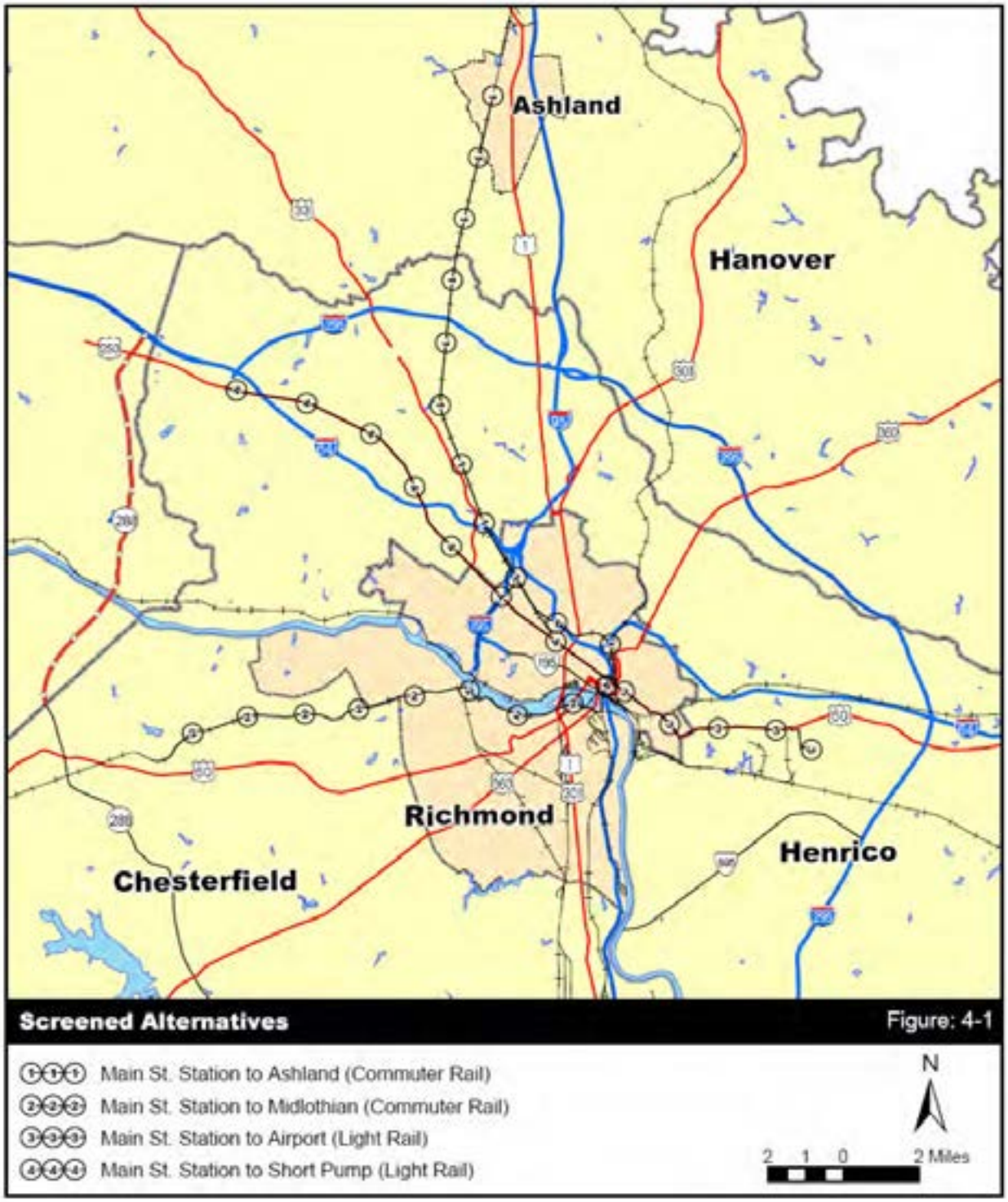
Amtrak and the future Southeast High Speed Rail service. Planners will need to determine whether there is sufficient existing and planned capacity to accommodate commuter rail. Since LRT cannot use existing tracks, separate track and station would need to be built near existing track. While an expansion to the south and west is limited by I-95, there appears to be sufficient space to the north and east of the station.

1.5.B LIGHT RAIL ALTERNATIVES

Since there is no existing rail right-of-way on the light rail corridors, these alternatives were assumed to operate on existing roadways. Both alternatives would require significant capital facilities.

- Richmond International Airport (RIC) Light Rail – There are several important issues to consider with the RIC light rail alternative, including: 1) balancing fast service from RIC to downtown Richmond with sufficient service for neighborhoods along the corridor, 2) integrating LRT with facility expansion at RIC, 3) coordinating existing ground transportation services that would be affected, and 4) evaluating how revenue from parking fees would be affected. Note that the Rocketts Landing project had not been identified at the time the study was prepared so a routing that would have served this developing urban style neighborhood was not explored.
- Short Pump Light Rail – LRT on Broad Street would have significant impacts and would need to be integrated with traffic patterns and traffic signal timing. West of Boulevard the development pattern transitions to suburban characteristics and would likely require feeder bus service. The terminus for this alternative could be extended from the Short Pump area to Route 288, which is likely to develop into a major employment center and could provide park-and-ride access for downtown commuters.

Figure 1-18: Selected Alternative Rail Corridors



Source: Richmond Rail Transit Feasibility Study

1.5.C COMMUTER RAIL ALTERNATIVES

The two commuter rail corridors were identified as operating along existing rail alignments.

- Midlothian Commuter Rail – While there is no existing passenger rail service currently operating on the Norfolk Southern rail line, passenger rail service between Richmond and Bristol has been studied. If this service is initiated, commuter rail service would have to be integrated with passenger rail service. In addition, since there is no useable connection between the Norfolk Southern rail line and Main Street Station it would be necessary to either repair the existing connection or construct a new station platform approximately 2.5 blocks from Main Street Station.
- Ashland Commuter Rail – The major issue confronting this alternative is that it is actively used by both freight and passenger rail. The planned Southeast High Speed Rail corridor would add to the congestion on the tracks. Additional track capacity would be needed, especially between the Staples Mill Station and Acca Yard. In addition, the terminus as the Ashland train station is not suitable for a park-and-ride lot and the existing population density around the station would not likely attract significant ridership. However, there are opportunities for new development along several other stations.

Table 1-10: Characteristics of Alternatives shows operating metrics related to the four alternatives. In general, the light rail alternatives require greater capital and operating costs but generate far greater ridership.

Table 1-10: Characteristics of Alternatives

Metric	RIC	Short Pump	Midlothian	Ashland
Rail Type	LRT	LRT	Commuter	Commuter
Length (miles)	6.4 - 7.2	13.6 - 13.9	14.1	17.9
Weekday Boardings	19,100	33,700	1,700	1,800
Capital Cost ($ millions)	$374 - $420	$791 - $812	$81	$103
Annual Operating Costs ($ millions)	$7.00	$11.70	$1.60	$2.47
Annual Farebox Revenue ($ millions)	$3.23	$5.64	$0.58	$0.82
Annual Subsidy ($ millions)	$3.77	$6.06	$1.01	$1.65

1.6 TRANSPORTATION NEEDS FOR ELDERLY, DISABLED, AND LOW-INCOME PERSONS

Mobility is an essential part of daily living. It can involve commuting to work, shopping, going to medical appointments, visiting friends and family, or going out for recreation. The elderly, disabled, and low-income population often referred to as the transportation disadvantaged, may have difficulty providing their own transportation through the use of a private automobile. This section summarizes the document *Public Transportation for the Elderly, Disabled, and Low-Income: Phase I – Needs Assessment Report* describes the problems of providing transportation options, and the currently available options, to the transportation disadvantaged. Published in February 2006, it does not necessarily reflect current conditions. When appropriate, current information is provided.

1.6.A CHARACTERISTICS OF THE TRANSPORTATION DISABLED

Mobility issues vary widely among the three groups. The elderly population is typically accustomed to the mobility and freedom afforded by auto ownership, yet has difficulties accessing public transportation due to disabilities that result from aging. The disabled population may have difficulty accessing transportation due to the nature of their disability. Disabled people have a strong desire to be independent, yet their options for traveling are constrained by the limited nature of the public transportation network. The low-income population does not have the resources to afford an automobile. Much of this population segment is cut off from jobs, social service centers, and other programs designed to help the needy, while other low income households spend a disproportionately large share of their income to afford a car for access to these services. While all jurisdictions in the Richmond region (Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, and Powhatan Counties, as well as the City of Richmond) provide some form of specialized public transportation to the transportation disadvantaged, not all disadvantaged groups and trip purposes are fully accommodated in each jurisdiction.

The elderly population in the Richmond region and throughout the United States is not only growing, but it is becoming a larger proportion of the total population. Elderly people are less likely to have a driver's license, yet 90 percent of senior citizens' daily trips are made using an automobile (either as drivers or passengers). In the Richmond area, approximately 10.5 percent of the population is age 65 or older, with 85 percent of the region's elderly population living in the City of Richmond, Chesterfield County, and Henrico County. Due to the elderly population's reduced reaction time and deteriorated night vision, among other things, many are less able to participate in their community such as shopping, employment, visiting the doctor, visiting religious institutions, or other social activities. Elderly non-drivers made 15 percent fewer trips outside the home than elderly drivers, and elderly workers were over twice as likely as the total population to work from their home. Various federal programs provide funding to state and local governments, transit agencies, and non-profit organizations to provide transportation services to the elderly.

The disabled population, defined as those people with a long-lasting physical, mental, or emotional condition that interferes with important daily activities, may be impeded from holding a job or traveling alone outside the home. According to a nationwide survey, 30 percent of disabled respondents reported difficulty accessing transportation services, while only 10 percent of non-disabled people responded similarly. The Americans with Disabilities Act (ADA) mandates that the disabled population be provided the same access to the transportation

network as non-disabled Americans, and that transportation providers must have full and equal accommodations for everyone. The transportation system for the disabled in Virginia is coordinated by several agencies, including VDOT, the Department of Rail and Public Transportation, and the Department of Medical Assistance Services. Approximately 19 percent of the nation's population over the age of 5 is considered disabled, and in the Richmond area, the disabled population is approximately 17.6 percent. A disproportionately large portion of the population in two jurisdictions is classified as disabled: 26 percent of Charles City County's population, and 25.5 percent of the City of Richmond's population.

Low income households below the poverty line are less likely to own automobiles than more affluent households. Ninety percent of recipients of public assistance do not own a car, and those below the poverty line account for over half of all households with no car. These populations often require more flexible transportation options than the average person in order to work non-traditional work shifts. Twelve percent of the United States population and 10 percent of Virginia's population live below the poverty line. In the Richmond area, Charles City County and the City of Richmond have higher than average poverty rates (10 percent and 20.5 percent respectively), and 93 percent of the region's total poverty population is concentrated in Richmond, Chesterfield County, and Henrico County. Transit use is five times greater by those living below the poverty line than those living above the threshold. Most low income households spend large shares of their income to afford a car, since poor transit service still requires them to own an auto for basic mobility needs.

1.6.B TRANSPORTATION SERVICE IN THE RICHMOND REGION

There are a variety of transportation services provided in the Richmond region. While each jurisdiction is served by some form of transit service, the form transit takes varies by target population, service type (fixed-route versus demand-responsive) and operating hours.

GRTC provides public transportation services in the greater Richmond area. It is owned jointly by the City of Richmond and Chesterfield County, and provides fixed route service as well as the CARE, CVAN, and Ridefinders specialized transportation services. As of 2006 the fixed route service operates 41 separate routes, with local service in Richmond from 5:00 AM to 1:00 AM every day, and from 6:00 AM to 7:00 PM on five days a week in Henrico County. There are three express routes which operate into Chesterfield County only on weekdays. The entire fleet has wheelchair lifts and some of the buses have low-floors. Elderly and disabled residents, in addition to students, are entitled to discount fares.

CARE is the ADA mandated complementary paratransit service and is available to those disabled patrons who cannot ride on fixed-route public transit vehicles and those over 80 years of age. Henrico County and the City of Richmond provide CARE service throughout their respective jurisdictions. Curb-to-curb service is provided by reservation only. The CARE service hours are the same as the fixed route transit services.

CVAN is a service provided by the Virginia Initiative for Employment not Welfare (VIEW) participants. Curb-to-curb transportation is provided among homes, places of employment, and child care facilities for those on public assistance within Richmond, Henrico County, Chesterfield County, and Hanover County. The service is free to eligible customers and is available 24 hours per day. The vehicles are not equipped with wheelchair lifts.

Ridefinders is a commuter oriented service that provides ride matching services to the public. It does not own any vehicles, nor does it specifically provide service to the transportation

disadvantaged; however, it does help riders with mobility challenges find an alternate means of traveling when public transit is not a viable option.

Bay Transit serves the Middle Peninsula and Northern Neck region of Virginia, including New Kent and Charles City Counties. It is a private transportation provider, and gives demand responsive curb-to-curb transportation to county residents. The service is open to all county residents, and currently operates within the counties on weekdays only. Bay Transit was planning to expand service to specific locations in the cities of Richmond and Williamsburg.

Access Chesterfield is the ADA paratransit provider for Chesterfield County. It is open to residents who are over the age of 60, below the poverty line, or are disabled, regardless of age. The service operates with advance reservations in Chesterfield County and the surrounding areas of Fort Lee, Colonial Heights, Richmond, and Petersburg, and service is provided from 6:00 AM to 8:30 PM during the week and 8:30 AM to 4:30 PM on Saturdays.

Logisticare is a transportation broker that brokers non-emergency medical transportation to all residents who qualify for Medicaid with local transportation providers. Trips are available 24 hours per day, 7 days per week, and require advance notice. The trips must be medically related, and the service is provided throughout Virginia.

The Powhatan-Goochland Community Action Agency provides limited transportation services in Powhatan, Goochland, and Hanover Counties. Seniors are transported to congregate meal sites four days per week (three days per week in Hanover County). Disabled persons are transported to places of employment within Powhatan County, and Powhatan County is jointly planning to transport senior citizens to post offices, grocery stores, medical appointments, and other services within the county.

The Goochland Fellowship and Family Services program provides free transportation services for transportation disadvantaged Goochland County residents to medical appointments and pharmacies. Service is provided by reservation only, with Richmond medical centers served on Monday and Friday, and trips within Goochland County provided on Tuesday through Thursday.

The Quin Rivers Community Action Agency provides limited transportation to congregate meal sites, shelter workshops for physically and mentally disabled adults, and limited service to medical appointments, and for mentally disabled residents of New Kent and Charles City Counties. This service may be merged with Bay Transit.

Senior Connections partners with the Quin Rivers Community Action Agency and the Goochland-Powhatan Community Action Agency to provide transportation to friendship cafes. The senior citizens are provided with free transportation to the sites, and there is an age requirement.

Smart Ride serves Richmond and Henrico and Chesterfield Counties, and is currently planning on providing service to Powhatan, Goochland, and eventually Hanover and New Kent Counties. The service is provided to elderly, visually impaired people, and those who are unable to drive themselves due to physical or mental disability. Smart Ride does not have ADA accessible vehicles, so therefore those requests are referred to other agencies. Service to low-income riders is provided when other agencies pay for the service. The service is door to door, and service is provided for any reason with advance reservations. The cost per ride is approximately $10 to $15.

Human service agencies also provide transportation services in the greater Richmond area. The American Red Cross provides services to the transportation disadvantaged to non-emergency medical appointments in Richmond and Henrico, Hanover, and Chesterfield Counties. The service is provided from 9:00 AM to 3:00 PM, on weekdays only, and reservations are recommended to be made two weeks in advance. The service is limited by the number of volunteer drivers. The Shepherd's Center of Richmond and the Shepherd's Center of Chesterfield provide transportation to medical appointments, grocery shopping, and other essential needs to senior citizens. The age requirement is 60 years in Richmond and 50 years in Chesterfield County. Service is free to those who have no other means of transportation, and volunteers drive the vehicles. Reservations must be made in advance.

1.6.C TRANSPORTATION ISSUES

There are many needs and issues when it comes to serving the transportation disadvantaged. Communication is often a problem because the transportation providers cannot adequately communicate their services to their potential customers. Providers and decision makers do not always understand the needs of their customers, who often have unique circumstances surrounding their transportation disadvantaged status. Transportation providers often do not coordinate among each other, leading to fragmented service. This may require groups to rely on different providers for different trip purposes and locations. This also leads to different policies regarding qualifications for services in different jurisdictions. Cost was also cited as an issue for all transportation disadvantaged groups. The service providers need additional funding to provide services and the customers often cannot afford the cost of rides due to fixed incomes or other constraints. The quality and quantity of services were also problematic. Many service providers only have service on weekdays, do not serve many employment locations, and do not provide door-to-door service. The built environment is the last issue that was raised in this report, as many areas have poor access to transit stops, no sidewalks along roadways, and developments that cannot accommodate transit vehicles.

The destinations that many transportation disadvantaged people travel to are scattered throughout the region, hindering the ability to travel. Most hospitals and medical centers are located in the City of Richmond, and in Henrico, Chesterfield, and Hanover Counties. Approximately 17 of 27 major medical facilities are served by GRTC fixed route services; however, many specialty medical facilities are located outside the service area and are served by other providers. Government services for the State, Richmond, and Henrico County are also served by fixed route transit. However, Chesterfield County government offices are only accessible via Access Chesterfield, and the other county's offices are not accessible to all of the transportation disadvantaged via public transportation.

Employment destinations are scattered throughout the region, with many major employers located outside the region's core and in suburban areas not served well by transit. Many major retail locations also fall outside of the GRTC system. Access to retail facilities for food, clothing, and home care products is important to the transportation disadvantaged.

Not all transportation disadvantaged groups are fully accommodated in all jurisdictions. There are limits and barriers to providing full mobility to these groups, even in the most dense environments. The City of Richmond, Henrico County, and Chesterfield County have the fewest constraints. The other jurisdictions have more limited options, and often options within their local jurisdiction only, with no access to the central core of the Richmond area. Access to government and retail facilities is severely limited for most disadvantaged people outside the

central core, and no public transportation to retail and government facilities is available in Powhatan, Goochland, or Hanover Counties.

Chapter 2:
Assessment Of Influencing Factors

1.1 INTRODUCTION

This Chapter reviews policies that influence decisions about the provision of transit service to the Richmond region. Section 2.2 evaluates the ordinances of the local jurisdictions with regard to how they support or perhaps hinder the provision of transit service. Section 2.3 compares construction and maintenance costs for highways and three transit modes: bus, light rail, and commuter rail. Section 2.4 gives and overview of the economic, health, and environmental benefits of transit. Section 2.5 examines federal and state legislative provisions for funding transit service implementation including requirements imposed. Section 2.6 contains projections of capital and operating funding for transit in the Richmond region through the year 2031. Section 2.7 describes potential institutional arrangements for managing and operating transit service in the Richmond region. Section 2.8 briefly summarizes transportation needs for the elderly, mobility impaired, and low-income populations. Finally, Section 2.9 describes transit supportive land uses and land use policies.

Information gathered and presented here will be used to help identify and evaluate potential transit corridors and modes throughout the Richmond region. Subsequent technical memoranda will further delve into comparing the Richmond region with other regions in the eastern United States from a transit service provision perspective and the alternative transit modes that could be considered for the Richmond region.

2.2 EVALUATION OF LOCAL ORDINANCES

A review and evaluation of the local ordinances was conducted for each jurisdiction. The ordinances were found on www.municode.com or on the websites of the various counties, town, and city.

The ordinances are substantial, even for small jurisdictions, and the review was focused on sections that address issues that could impact the provision of public transportation. Among them, no ordinances specifically address public transportation in the sense of mandating it or forbidding it.

A list of parameters that could potentially support transit was developed and, where appropriate, limits were applied to indicate under what conditions the parameter would be supportive, a hindrance, or neutral to the provision of transit. The parameters used are presented in Table 2-1.

Table 2-1 through Table 2-10 list, by jurisdiction, ordinances that would impact transit provision. Only those ordinances that are general to the jurisdiction or refer to development types that are supportive of transit are included - those with residential densities above seven dwellings per acre and those permitting mixed use. Residential densities below this supportive limit maybe included where they form part of a mixed use development. Additionally, other information, statements of intent, and the like have been included where they add further support to transit provision.

It should be noted that the tables do not imply that development types not listed are incapable of sustaining transit service. Lower residential densities and industrial type uses may be more difficult to serve but provision to certain areas or facilities can be highly desirable.

Table 2-1: Parameters Supportive of Transit

Parameter	Description	Supportive	Neutral	Hinder
Maximum Allowable Residential Density	Maximum allowable dwellings per acre; density being a reasonable indicator of transit trip generation.	> 7 du/ac	6 du/ac > density > 5 du/ac	< 4 du/ac
Setbacks	Indicate the proximity of the origin/destination from the route (roadway) smaller setbacks improve accessibility.	< 20 feet	20.1 feet< width < 50 feet	> 50.1 feet
Minimum Allowable Block Length	Shorter block lengths improve pedestrian access to buildings and mobility. Good pedestrian facilities and environment are supportive of transit.	< 600 feet	601 feet < length < 1000 feet	> 1001 feet
Provision for Mixed Use Development	Mixed use developments provide a greater number of services and functions which enhances the desirability of the location and hence is more likely to generate transit trips.	Yes: Commercial (retail), Business, (employment) and Residential	Yes: any two of those mentioned under supportive	No provision
Off- Street Parking	Provision of off-street parking reduces the cost of auto trips to a destination (increasing their desirability) and, if the lot is in the front of the buildings in question, increase setbacks and hence reduce accessibility for pedestrians (making transit trips less desirable).	Maximum parking allowable is set by ordinance		Minimum parking requirements are set by ordinance

Table 2-2: Review of Ordinances, Ashland

Code citation		Topic	Description	Support	Neutral	Hinder
Division 5 Blocks	17-42	Block lengths	Minimum block length 500 feet	✓		
Residential, Multifamily District (R-5)	21-70	Area and density regulations	Maximum allowable density 12 dwellings per acre	✓		
	21-71	Setback regulations	Minimum setback 50 feet		✓	
Residential, Office District (RO-1)	21-79	Statement of intent	Permits mixed use development: Business and residential		✓	
	21-81 (refers to 21-42)	Area, frontage, setback, yard and height regulations	Minimum setback 30 feet		✓	
	21-92	Use regulations	Permits mixed use development: Commercial, business and residential	✓		
Central Business District (B-1)	21-94.1	Setback regulations	No set back requirement (unless parking is provided at the front).	✓		
	21-98 (b)	Special provisions for townhouses and multifamily units	Minimum setback 15 feet	✓		
Highway Commercial District (B-2)	21-100	Statement of intent	Permits mixed use development: Commercial and business		✓	
	21-104	Setback regulations	Minimum setback 25 feet		✓	
Neighborhood Commercial District (B-4)	21-112	Use regulations	Permits mixed use development: Commercial, business and residential	✓		
	21-114	Setback regulations	Minimum setback 50 feet		✓	
	21-204	Amount of off-street parking required	Minimum parking provision required			✓

Table 2-3: Review of Ordinances, Charles City County

Code citation		Topic	Description	Support	Neutral	Hinder
6 Design Standards	6-8.1	Block length	Minimum block length 500 feet	✓		
7 Multi-Family Residential District (R-2)	7-5	Setback requirements	Minimum setback 100 feet			✓
	7-14 (4.)	Special conditions	Maximum allowable density 10 dwellings per acre	✓		
10 Tourist Business District	10-2	Permitted Uses	Permits mixed use development: Commercial, business and residential	✓		
	10-5	Setback requirements	Minimum setback 100 feet			✓
18 Off-Street Parking	18-1	Intent	Minimum parking provision required			✓

Table 2-4: Review of Ordinances, Chesterfield County

Code citation		Topic	Description	Support	Neutral	Hinder
Article III Districts, Division 11. R-TH Residential-Townhouse District	19-105 (c)	Required Conditions	Minimum setback 50 feet		✓	
	19-105 (k)	Required Conditions	Maximum allowable density 8 dwellings per acre (an exemption allows up to 10 dwellings per acre)	✓		
Article III Districts, Division 12. R-MF Multifamily Residential District	19-111 (c)	Required Conditions	Maximum allowable density 10 dwellings per acre	✓		
		Required Conditions	Minimum setback 50 feet		✓	
Article III Districts, Division 16. O-1 Neighborhood Office District	19-131	Uses permitted with certain restrictions	Permits mixed use development: Business and residential		✓	
Article III Districts, Division 17. O-2 Corporate Office District	19-138	Uses permitted with certain restrictions	Permits mixed use development: Business and residential		✓	
Article III Districts, Division 18. C-1 Convenience Business District	19-144	Permitted uses by right	Permits mixed use development: Commercial and business		✓	
Article III Districts, Division 20. C-3 Community Business District	19-159	Uses permitted with certain restrictions	Permits mixed use development: Commercial, business and residential	✓		
	19-159 (j (2 (c)))	Uses permitted with certain restrictions	Maximum allowable density 14 dwellings per acre	✓		

Table 2-4: Review of Ordinances, Chesterfield County (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Article III Districts, Division 21. C-4 Regional Business District	19-166	Uses permitted with certain restrictions	Permits mixed use development: Commercial, business and residential	✓		
	19-166 (b)	Uses permitted with certain restrictions	Maximum allowable density 18 dwellings per acre (an exemption (with addition of a parking deck) allows up to 25 dwellings per acre)	✓		
Article III Districts, Division 22. C-5 General Business District	19-173	Uses permitted with certain restrictions	Permits mixed use development: Commercial, business and residential	✓		
	19-173	Uses permitted with certain restrictions	Maximum allowable density 14 dwellings per acre	✓		
Article VII Development of Standards Manual, Division 1 Development Standards, Subdivision II Parking	19-513	Parking spaces required	Minimum parking provision required			✓

Table 2-5: Review of Ordinances, Goochland County

Code citation		Topic	Description	Support	Neutral	Hinder
Residential, General, District R-3	Sec 5.4	Area Regulations	Maximum allowable density 4 dwellings per acre		✓	
	Sec 7	Yard regulations and setbacks	Minimum setback 40 feet		✓	
Residential, Office, District R-O	Article 11, Sec 2	Uses and structures permitted by right	Permits mixed use development: Business and residential		✓	
	Article 11, Sec 5	Area Regulations	Maximum allowable density 3.5 dwellings per acre			✓
	Article 11, Sec 7	Yard regulations and setbacks	Minimum setback 50 feet		✓	
Residential Planned Unit Development, District RPUD	Article 12, Sec 2	Uses and structures permitted by right	Permits mixed use development: Commercial and residential		✓	
	Article 12, Sec 4	Site requirement	Maximum allowable density 2.5 dwellings per acre			✓
	Article 12, Sec 5	Yard requirements	Minimum setback 30 feet		✓	

Table 2-5: Review of Ordinances, Goochland County (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Entrance Corridor and Village Overlay District	Article 22, Sec 1	Statement of intent	District promotes multimodalism. "Specific attention shall be placed on access management, landscape design and multimodalism."	✓		
	Article 22, Sec 11c	Building setbacks in Rt 6/650 Entrance Corridor	Minimum setback 75 feet			✓
	Article 22, Sec 12d(i)	Site access in Oilville village overlay	Pedestrian access to all lots required.	✓		
	Article 22, Sec 12d(ii)	Setbacks in Oilville village overlay	Minimum setback 75 feet			✓
	Article 22, Sec 13f	Setbacks in Courthouse village overlay	Reduced setbacks are allowed if it contributes to a pedestrian friendly environment.	✓		
	Article 22, Sec 14c	Design standards for Rt 250 corridor	Pedestrian access between and within sites required.	✓		
	Article 22, Sec 14c	Design standards for Rt 250 corridor	Minimum setback 75 feet			✓
Major Subdivision	Article 7, Sec 8	Blocks	Minimum block length for blocks with frontage 500 feet	✓		

Table 2-6: Review of Ordinances, Hanover County

Code citation		Topic	Description	Support	Neutral	Hinder
Article 5, Section 6, R-4 Residential Cluster Development District	6.4	Density of Cluster lots	Maximum allowable density 8 cluster lots per acre	✓		
	6.6	Set back requirements	Minimum setback 15 feet	✓		
Article 5, Section 7, R-5 Multiple-Family Residential Districts	7.7 (2.)	Lot size requirements	Maximum allowable density 14 dwellings per acre	✓		
	7.8 (1(a))	Yard requirements	Minimum setback 15 feet	✓		
Article 5, Section 8A, MX Mixed Use District	8A.1	Purpose of the District	Permits mixed use development: Commercial, business and residential	✓		
Article 5, Section 12A, OS Office/Service District	12A.1	Purpose of the District	Permits mixed use development: Commercial and business		✓	
	12A.11	Yard requirements	Minimum setback 40 feet		✓	
Article 5, Section 14, M-2 Light Industrial District	14.2	Permitted uses	Permits mixed use development: Commercial and business		✓	
	14.8	Yard requirements	Minimum setback 35 feet		✓	
Article 5A, Overlay Districts, Section 6 Overlay Route 1 Corridor District	6.5	Mixed zone developments	Permits mixed use development: Commercial and business		✓	
Article 7. Supplementary Regulations Section 1 Off-street Parking requirements	1.1,1.2	Specific requirements by use, Interpretation of specific requirements	Minimum parking provision required			✓

Table 2-7: Review of Ordinances, Henrico County

Code citation		Topic	Description	Support	Neutral	Hinder
Article VA R-5A General Residence District; Uses	24-13.1 (d(4))	Principal uses permitted	Maximum allowable density 6 dwellings per acre		✓	
Article VII R-5 General Residence District: Uses	24-28 (e(1))	Principal uses permitted	Maximum allowable density 12 dwellings per acre	✓		
	24-30.1 (c(2))	Exceptions to article VII	Minimum setback 25 feet		✓	
	24-30.1 (c(5))	Exceptions to article VII	Minimum parking provision required			✓
Article VIII Urban Mixed Use District; Uses	24-31	Purpose of district	Permits mixed use development: Commercial, business and residential	✓		
	24-31 (dd(1(a)))	Principal uses permitted	Maximum allowable density 40 dwellings per acre	✓		
	24-31 (dd(2(a)))	Principal uses permitted	Maximum allowable density 12 dwellings per acre	✓		
Article IX RTH Residential Townhouse District; Uses	24-41 (a)	Development standards – Town-houses for sale	Maximum allowable density 9 dwellings per acre	✓		
	24-41 (c)	Development standards – Town-houses for sale	Minimum setback 15 feet	✓		
	24-41 (i)	Development standards – Town-houses for sale	Minimum parking provision required			✓
Article XB O-2 Office District	24-50.7	Conditional uses permitted by special exception	Permits mixed use development: Commercial and business		✓	
Article XC O-3 Office District	24-50.11	Principal uses permitted	Permits mixed use development: Commercial and business		✓	

Table 2-7: Review of Ordinances, Henrico County (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Article XD O/S Office Service District	24-50.18	Principal uses permitted	Permits mixed use development: Commercial and business		✓	
	24-50.23 (c)	Area, yard and height regulations	Minimum setback 40 feet		✓	
Article XE Office Service 2 District	24-50.27	Purpose of district	Permits mixed use development: Commercial and business		✓	
	24-50.34	Area, yard and height regulations	Minimum setback 40 feet		✓	
Article XII B-1 Business District	24-54.1	Principal uses permitted	Permits mixed use development: Commercial and business		✓	
Article XIII B-2 Business District	24-58.1	Principal uses permitted	Permits mixed use development: Commercial and business		✓	
Article XXII Supplementary Regulations	24-96	Off-street parking requirements	Minimum parking provision required			✓

Table 2-8: Review of Ordinances, New Kent County

Code citation		Topic	Description	Support	Neutral	Hinder
Article II General Area, Frontage, Yards, Height, Setback, Performance Requirements and Standards	98-56 (a)	General setback requirements	Minimum setback 20 feet	✓		
Article X Multiple-Family Residential, R-3	98-375	Maximum gross density in apartment and condominium development	Maximum allowable density 10 dwellings per acre	✓		
Article XI Area, Frontage, Yards, Height, Setback and Building Size in Residential Districts	98-411	Table of regulations	Minimum setback 35 feet		✓	
Article XXIII Off-Street Parking, Driveways and Landing Areas	98-903	Minimum off-street parking requirements	Minimum parking provision required			✓

Table 2-9: Review of Ordinances, Powhatan County

Code citation		Topic	Description	Support	Neutral	Hinder
Residential-Commercial (R-C)	13.2	Permitted Uses	Permits mixed use development: Commercial and residential		✓	
Residential-Commercial (R-C)	13.4	Required Yards	Minimum setback 75 feet			✓
Route 711 Village Service Area Overlay District	15A.6	Permitted Uses	Permits mixed use development: Commercial, business and residential	✓		
Route 711 Village Service Area Overlay District	15A.7	Required Yards	Permits smaller setbacks than usually required for mixed use developments that propose "small town/village" amenities	✓		
Court House Square Center District (CHSC-1)	20.2	Permitted Uses	Permits mixed use development: Commercial and residential	✓		

Table 2-10: Review of Ordinances, Richmond

Code citation		Topic	Description	Support	Neutral	Hinder
Chapter 94 Subdivision of Land Article II, Division 3. Lots	94-171	Length of blocks of land in which located	Minimum block length 400 feet			✓
Chapter 114 Zoning, Article IV, Division 7 R-6 Single-Family Attached Residential District	114-412.4	Lot area and width; density; unit width	Maximum allowable density 10 dwellings per acre	✓		
	114-412.5	Yards	Minimum setback 15 feet	✓		
Chapter 114 Zoning, Article IV, Division 8 R-43 Multi-Family Residential District	114-414.4 (refers to 114-412.4)	Lot area and width; density; unit width	Maximum allowable density 10 dwellings per acre	✓		
	114.414.5	Yards	Minimum setback 25 feet		✓	
Chapter 114 Zoning, Article IV, Division 13 R0-1 Residential-Office District	114-424.1	Permitted principal uses	Permits mixed use development: Commercial and residential		✓	
	114-424.4 (refers to 114-412.4)	Lot area and width; density; unit width	Maximum allowable density 10 dwellings per acre	✓		
	114-424.5	Yards	Minimum setback 25 feet		✓	
Chapter 114 Zoning, Article IV, Division 14 R0-2 Residential-Office District	114-426.1	Permitted principal uses	Permits mixed use development: Commercial and residential		✓	
	114-426.5	Yards	Minimum setback 25 feet		✓	

Table 2-10: Review of Ordinances, Richmond (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Chapter 114 Zoning, Article IV, Division 14 R0-3 Residential-Office District	114-428.1	Permitted principal uses	Permits mixed use development: Commercial and residential		✓	
	114-428.6	Yards	Minimum setback 15 feet	✓		
Chapter 114 Zoning, Article IV, Division 18 UB Urban Business District	114-433.1	Intent of district	Permits mixed use development: Commercial and business		✓	
	114-433.5	Yard requirements	No requirement ("*except that no newly constructed building or addition to an existing building shall extend closer to the street than any building on an abutting lot. In no case shall a front yard greater than 15 feet in depth be required on any lot*")	✓		
Chapter 114 Zoning, Article IV, Division 19 B-1 Neighborhood Business District	114-434.1	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	
	114.434.3	Yards	No requirement ("*except that no newly constructed building or addition to an existing building shall extend closer to the street than any building on an abutting lot. In no case shall a front yard greater than 15 feet in depth be required on any lot*")	✓		
Chapter 114 Zoning, Article IV, Division 19 B-2 Community Business District	114-436.1	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	
	114.436.3	Yards	Minimum setback 25 feet		✓	
Chapter 114 Zoning, Article IV, Division 21 B-3 General Business District	114-438.1	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	

Table 2-10: Review of Ordinances, Richmond (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Chapter 114 Zoning, Article IV, Division 22 B-4 General Business District	114-440.1	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	
	114-440.3	Yards	No requirement	✓		
Chapter 114 Zoning, Article IV, Division 23 B-5 General Business District	114-442.1	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	
	114-442.4	Yards	No requirement	✓		
Chapter 114 Zoning, Article IV, Division 25.1 RF-1 Riverfront District	114-447.1	Intent of district	Permits mixed use development: Commercial, business and residential	✓		
	114-447.3	Yards and setbacks	No requirement	✓		
Chapter 114 Zoning, Article IV, Division 25.2 RF-2 Riverfront District	114-447.10	Intent of district	Permits mixed use development: Commercial, business and residential	✓		
	114-447.12	Yards and setbacks	No requirement	✓		
Chapter 114 Zoning, Article IV, CM Coliseum Mall District	114-448.2	Permitted principal and accessory uses	Permits mixed use development: Commercial and business		✓	
Chapter 114 Zoning, Article IV, DCC Downtown Civic and Cultural District	114-449.1	Intent of district	Permits mixed use development: Commercial and business		✓	

Table 2-10: Review of Ordinances, Richmond (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
	114-710.1	Number of spaces required for particular uses	Minimum parking provision required			✓
Chapter 114 Zoning, Article VII, Division 2 Off-Street Parking Regulations	114-710.2	Off-street parking not required in certain districts	*"In CM, DCC, B-4, B-5, B-6 and B-7 zoning districts, off-street parking spaces shall not be required for uses other than dwelling uses, hotels and motels. In B and UB districts, off-street parking spaces shall not be required for two or fewer dwelling units where such units are contained within the same building as a nondwelling use"*	✓		
Chapter 114 Zoning, Article IX, Division 1 Parking Overlay Districts	114-900.1	Intent of districts	*"The districts are intended to recognize that, due to several factors, business uses located in such areas typically generate lower demands for privately maintained off-street parking spaces than are reflected in the requirements generally applicable in the city"*	✓		

Table 2-10: Review of Ordinances, Richmond (continued)

Code citation		Topic	Description	Support	Neutral	Hinder
Chapter 114 Zoning, Article IX, Division 7 Parking Exempt Overlay Districts	114-960.1	Intent of district	*"[The] parking exempt overlay districts is to provide relief from the off-street parking requirements for certain uses so as to facilitate the development and redevelopment of economically depressed, older, urban commercial districts characterized by a substantial number of vacant and deteriorated structures. With the exception of certain high intensity uses, off-street parking is generally not needed for most uses in these areas because of high vacancy rates, availability of on-street parking, considerable walk-in trade due to proximity to residential areas and available public transportation"*	✓		

2.3 COMPARISON OF TYPICAL CONSTRUCTION AND MAINTENANCE COSTS

In this memorandum, construction/capital and maintenance/operating costs associated with bus transit, light rail transit, commuter rail, and highways are reviewed. First the transit modes are presented, and then highways are discussed.

2.3A TRANSIT

This discussion begins with the capital costs for transit implementation, going mode by mode, and looking at vehicles, running way, and stations. Next operating costs are reviewed, again going mode by mode. Several performance measures or indicators are presented for each mode so that the modes can be compared.

CAPITAL

Reported transit capital costs typically include the acquisition cost (purchase price) of the vehicles, right-of-way acquisition costs, the construction cost of the guideway (if the guideway is transit-exclusive), and the cost of administrative and maintenance facilities associated with the particular transit project.

Bus

For bus transit systems, vehicle capital costs and exclusive busway capital costs have been examined.

Vehicle Costs

Table 2-11 lists recent costs for various types of buses. For planning purposes it is reasonable to estimate intercity motor coaches (often used for longer-distance commuter service) at $400,000, urban transit buses at $350,000, and articulated buses at $500,000.

Table 2-11: Average New Bus and Trolleybus Costs, 2005-2006[1]

Type of Vehicle	Cost ($000)
2-level	584
Articulated (55'-61')	495
Articulated Trolleybus (55'-61')	1,600
Intercity (35'-45')	398
40' Transit (37'6"-42'5')	354
35' Transit (32'6"-37'5")	277
30' Transit (27'6"-32'5")	234
Suburban (27'6"-45')	222
Trolley replica (all lengths)	409
Small Vehicle (<27'6")	67

Source: APTA survey of 15% of non-rail transit agencies, as reported on www.apta.com.
Cost includes amount paid to manufacturer or agent. Not all orders were reported. Each year of a multi-year order is counted as a separate order.

[1] http://www.apta.com/research/stats/bus/buscost.cfm

Busway Costs

Table 2-12 gives sample busway construction costs. These facilities were built for the exclusive use of buses, and with the exception of the El Monte Busway in Los Angeles continue to be operated as such. While the El Monte Busway follows a freeway right-of-way, the other listed facilities are generally two-lane, at-grade roadways in exclusive right-of-way. From a cursory review of the costs per mile, it does not appear that a greater station frequency drives up the cost. (A linear regression analysis of this data suggests a negative correlation between stations per mile and cost per mile, but with a low R-squared value.) Cost appears to be driven by other factors. Given Miami's flat terrain and Pittsburgh's hilly terrain, earthwork cost is one likely candidate for driving costs. A cost of $25 million to $30 million a mile is reasonable for exclusive busways with stations, as long as no tunneling is involved.

Table 2-12: Sample Busway Construction Costs[2]

Busway Name	Location	Construction Cost (Implementation Year)	Construction Cost (2007 dollars) [a]	Length	Stations	Cost/mi (2007)	Year Opened
El Monte Busway	Los Angeles	$58 million	$271.7 million	11 mi	3	$24.7 million	1973
Orange Line	Los Angeles	$349.6 million	$372.2 million	14 mi	14	$26.6 million	2005
East Busway	Pittsburgh	$113 million	$235.9 million	6.8 mi	8	$34.7 million	1983
West Busway [b]	Pittsburgh	$275 million	$332.1 million	5 mi	6	$66.4 million	2000
South Busway	Pittsburgh	$27 million	$92.7 million	4.3 mi	7	$21.6 million	1977
South Miami-Dade Busway	Miami	$60 million	$77.7 million	8.5 mi	17	$9.2 million	1997

(a) Escalation to year 2007 value computed using buying power estimator on http://data.bls.gov/cgi-bin/cpicalc.pl
(b) The West Busway in Pittsburgh includes one-half mile of tunnel.

[2] *Mass Transit: Bus Rapid Transit Shows Promise*, Government Accounting Office, September 2001

Light Rail

For light rail transit systems, overall construction costs, vehicle costs, and station costs were researched.

Vehicle Costs

Table 2-13: Average New Light Rail Vehicle Costs, 2005-2006[3]

Type pf Vehicle	Cost ($000)
Single-level, no articulations	4,250
Single-level, one articulation	2,744
Single-level, two articulations	2,300

Source: APTA survey of 85% of rail transit agencies, as reported on www.apta.com.
Cost includes amount paid to manufacturer or agent. Not all orders were reported. Each year of a multi-year order is counted as a separate order.

As a comparison, Dallas Area Rapid Transit reports light rail vehicle costs of $3.2 million per car.[4] Tri-Met in Portland reports light rail vehicle costs of $3.5 million per car for their newest acquisitions.[5]

Construction Costs

Table 2-14 gives the costs for recent light rail implementations in the United States. The following costs include vehicles and maintenance facilities, in addition to stations, running way, and systems.

Station Costs

Station costs for light rail vary widely. Recent estimates for a light rail line extension to Draper, UT, in the Salt Lake City region place station costs in the $1.6 to $1.9 million range.[6] Similarly, Calgary Transit reported an average light rail station cost of $2.1 million (Canadian) for their system construction between 1981 and 2003.[7] In contrast, Sacramento Regional Transit District estimates station costs at around $11.5 million each for the planned South Line Phase 2 project.[8] The EIS for the East Side Gold Line extension in Los Angeles reports $12 million average estimated station costs for two subway and six surface stations.[9]

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[3] http://www.apta.com/research/stats/rail/railcost.cfm
[4] http://www.dart.org/anniversary/anniversary.asp?zeon=lightrailworks
[5] http://portlandmall.org/about/newtrains.htm
[6] *Draper City Transit Alternatives Study Final Report*, October 5, 2006.
[7] http://www.calgarytransit.com/html/technical_information.html
[8] *South Sacramento Corridor Phase 2 SDEIR/SDEIS*, January 2007
[9] *Los Angeles Eastside Corridor Final SEIS/SEIR* http://www.mta.net/projects_programs/eastside/eir.htm

Table 2-14: Recent Light Rail Construction Costs[10]

Line Name	Location	Construction Cost (Implementation Year)	Construction Cost (2007 dollars) [(a)]	Length	Stations	Cost/mi (2007)	Year Opened
Main Street Line	Houston	$324 million	$380 million	7.5 mi	16	$50.7 million	2003
Hiawatha Line	Minneapolis	$715.3 million	$788 million	12 mi	17	$65.7 million	2004
Third Street Line	San Francisco	$648 million	$648 million	5.1 mi	18	$127.1 million	2007
Cross County Line	St Louis	$669 million	$690 million	8 mi	9	$86.3 million	2006
Southeast Line	Denver	$879 million	$907 million	19 mi	13	$47.7 million	2006
South Line	Sacramento	$222 million	$250.9 million	6.8 mi	7	$39.8 million	2003
Mission Valley East Line	San Diego	$506 million	$538.8 million	5.9 mi	4	$91.3 million	2005
Interstate Line	Portland	$350 million	$385.3 million	5.8 mi	10	$66.4 million	2004

(a) Escalation to year 2007 value computed using buying power estimator on http://data.bls.gov/cgi-bin/cpicalc.pl

[10] These data were collected from the Web sites of the various transit operators.

Commuter Rail

For commuter rail systems, vehicle costs and station costs were researched.

Vehicle Costs

Table 2-15 lists costs for recently acquired commuter rail cars.

Table 2-15: Average New Commuter Rail Car Costs, 2005-2006[11]

Type of Vehicle	Cost ($000)
Single-level cab	2,138
Bi-level cab	2,275
Bi-level trailer	2,333

Source: APTA survey of 85% of rail transit agencies, as reported on www.apta.com.
Cost includes amount paid to manufacturer or agent. Not all orders were reported. Each year of a multi-year order is counted as a separate order.

Station Costs

The New Mexico Department of Transportation reported construction bids of $16 million to construct seven stations (approximately $2.3 million each) on the Rail Runner line.[12] These stations included platforms, shelters, and surface parking. The Austin-San Antonio Intermunicipal Commuter Rail District estimated $3 million each for 14 commuter rail stations.[13] However, commuter rail station costs in other locations have been estimated at much higher cost. For example, estimates for new commuter rail stations on the Sounder system in the Puget Sound region range from $24 to $28 million at Tukwila and from $27 to $31 million at Edmonds.[14] These stations include much more substantial earthworks and parking in addition to dual track and dual platforms. As with light rail stations, a wide range in construction costs is observed for commuter rail stations.

OPERATING

Reported transit operating costs typically include the wages and benefits paid to operators (drivers) and maintenance personnel, fuel, tires, and other supplies. Administrative costs such as utilities and insurance are included as well. Table 2-16 through Table 2-18 depict average performance measures for bus systems, light rail systems, and commuter rail systems.

Bus

Table 2-16 lists performance measures for all bus transit operations in Virginia and some nearby states. Operating expenses per vehicle revenue mile and per vehicle revenue hour are good measures for comparing one bus system to another. Systems in more urban areas have higher values for these measures on account of higher labor rates, lower operating speeds due to congestion, and high frequency of boardings and alightings. Commuter bus systems that have long dead-head times also have high operating expenses per vehicle revenue hour.

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[11] http://www.apta.com/research/stats/rail/railcost.cfm

[12] *Belen to Santa Fe Commuter Rail Project Overview and Status of Project Elements*, April 2, 2007.

[13] *2004 Feasibility Study Update*, December 2004

[14] *Making Connections: Sound Transit 2 The Regional Transit System Plan For Central Puget Sound*, May 2007

Table 2-16: Average Performance Measures for Bus Systems in Mid-South Region (2005)[a]

	Operating Expenses Per Vehicle Revenue Mile	Operating Expenses per Vehicle Revenue Hour	Operating Expenses per Unlinked Passenger Trip	Operating Expenses per Passenger Mile	Fare Revenues per Total Operating Expense (Recovery Ratio)	Unlinked Passenger Trips per Vehicle Revenue Mile	Fare Revenues per Unlinked Passenger Trip	Unlinked Passenger Trips per Vehicle Revenue Hour
All Operators	$4.84	$66.81	$2.66	$0.60	24.0%	1.8	$0.69	25.1
Petersburg Area Transit	$3.61	$49.30	$3.46	$0.93	21.3%	1.0	$0.74	14.3
GRTC	$6.22	$69.32	$2.25	$0.84	31.8%	2.8	$0.71	30.9

Source: National Transit Database 2005

(a) Includes all bus transit operators in Delaware, Maryland, District of Columbia, Virginia, and North Carolina that reported to the National Transit Database.

Light Rail

Table 2-17 lists performance measures for all light rail operations in the United States. Excluded from this analysis are those transit operators whose only light rail operations could be classified as "heritage trolley" or short, tourist-oriented "streetcar" lines. These include lines in Little Rock, Tampa, Charlotte, Memphis, Galveston, Tacoma, Seattle, and Kenosha. Downtown trolley operations by transit operators that also run full-fledged light rail systems were not removed.

Light rail in the United States and bus systems in and around Virginia have very similar performance in terms of operating expense per passenger trip and per passenger mile. They also have similar recovery ratios. However, light rail systems have a much higher productivity in terms of passenger trips per vehicle mile. This finding is not unexpected in that light rail systems are more likely to be implemented in corridors with higher ridership generating characteristics.

Commuter Rail

Table 2-18 gives performance measures for all commuter rail operations in the United States. Commuter rail has higher operating expense per passenger trip and lower operating expense per passenger mile than light rail or bus on account of longer trip lengths per passenger. The farebox recovery, however, is much higher for commuter rail than the other modes, reflecting the ability to charge higher fares for longer trip lengths. Commuter rail is also more productive in terms of passenger trips per vehicle mile because commuter rail operations are often limited only to peak travel times and directions.

2.3.B HIGHWAY

CAPITAL

Reported highway capital costs typically include the construction cost of the roadway and appurtenances (drainage, signing, etc.) Sometimes right-of-way acquisition costs are included as well. Rarely are administrative and maintenance facilities included in the cost as those facilities almost always already exist to support other existing highways. The costs of vehicles that use the highway and the storage and maintenance facilities for those vehicles are clearly not included as part of the reported capital cost for the facility.

Highway construction costs on a per-mile basis vary widely with the complexity of the project. The Washington State Department of Transportation (WSDOT) conducted a thorough benchmarking study of highway construction costs in 2005.[15] Some of their results are tabulated in Table 2-19.

[15] *Highway Construction Costs: Are WSDOT's highway construction costs in line with national experience?* Washington State Department of Transportation, November 3, 2005

Table 2-17: Average Performance Measures for Light Rail Systems in the United States (2005)[a]

Operating Expense per Passenger Car Revenue Mile	Operating Expense per Passenger Car Revenue Hour	Operating Expense per Unlinked Passenger Trip	Operating Expense per Passenger Mile	Fare Revenues per Operating Expense (Recovery Ratio)	Unlinked Passenger Trips per Passenger Car Revenue Mile	Fare Revenues per Unlinked Passenger Trip	Passenger Mile per Passenger Car Revenue Hour	Passenger Car Revenue Mile per Passenger Car Revenue Hour
$14.33	$216.96	$2.56	$0.57	26%	5.60	$0.66	381.3	15.1

Source: National Transit Database 2005

(a) Transit operators that operate only "heritage trolley" or tourist-oriented "streetcar" lines have been excluded. These are in Little Rock, Tampa, Charlotte, Memphis, Galveston, Tacoma, Seattle, and Kenosha.

Table 2-18: Average Performance Measures for Commuter Rail Systems in the United States (2005)

Operating Expense per Passenger Car Revenue Mile	Operating Expense per Passenger Car Revenue Hour	Operating Expense per Unlinked Passenger Trip	Operating Expense per Passenger Mile	Fare Revenues per Operating Expense (Recovery Ratio)	Unlinked Passenger Trips per Passenger Car Revenue Mile	Fare Revenues per Unlinked Passenger Trip	Passenger Mile per Passenger Car Revenue Hour	Passenger Car Revenue Mile per Passenger Car Revenue Hour
$13.20	$416.50	$8.60	$0.40	47%	8.9	$4.10	1,078.50	31.6

Source: National Transit Database 2005

Table 2-19: Highway Construction Cost Ranges

Type of Project	Range of Construction Cost
Major bridge	$45 – $85 million/lane-mile or higher
Urban freeway construction	$8 – $22 million/lane-mile
Rural highway construction	$1 – $5 million/lane-mile
Major urban freeway interchange	>$500 million
Major suburban interchange	$100 – $150 million
Urban diamond interchange	$20 – $30 million
Rural diamond interchange	$10 – $20 million

Source: Washington State Department of Transportation

In the Richmond area, the recent Route 288 extension was estimated to cost $4.6 million per lane-mile for a limited access facility with ten interchanges and a bridge over the James River. In Northern Virginia, the reconstruction of a segment of Route 123 in Fairfax County was estimated to cost $1.9 million per lane-mile for a suburban divided arterial with nine signalized intersections.

OPERATING

Reported highway operating costs typically include the costs to the responsible agency (often a DOT) to clean, make routine repairs, remove debris or snow, mow and maintain drainageways, and similar activities. Some studies have developed marginal operating costs for the vehicles that use the highway, costs for policing, and even environmental costs. See Table 2-20.

Table 2-20: Marginal operating costs (cents per mile)[16]

Cost Category	Automobile	Pickup/van/SUV	Commercial Truck
Total	15.3	19.5	43.4
Fuel	5.0	7.8	21.4
Maintenance/Repair	3.2	3.7	10.5
Tires	0.9	1.0	3.5
Depreciation	6.2	7.0	8.0

Notes: These are baseline costs in 2003 cents assuming highway driving conditions, smooth pavement, and gasoline priced at $1.50 per gallon. Different tables are given for city driving conditions and poor pavement quality, which generally raise the per-mile operating costs.

Marginal Costs

One such study, called the *Federal Highway Cost Allocation Study*, was conducted by the Federal Highway Administration in 1997. A principal reason for this study was to determine how changes in the Federal highway program and user fees that support that program have affected the equity of Federal highway user fees, that is, whether different vehicle classes were paying a proportionate share of highway program costs for which they were responsible. This study also estimated the social costs of highway use, including costs borne primarily by highway user such as congestion and crashes, and costs borne by both users and non-users such as air pollution and noise. The study examined the marginal costs, that is, the costs for each additional vehicle-mile of travel.

[16] *The Per-mile Costs of Operating Automobiles and Trucks*, Report 2003-19 by Gary Barnes and Peter Langworthy, Minnesota Department of Transportation.

Table 2-21 reports the marginal costs for automobiles and various types of trucks operating on urban and rural interstates. As can be seen cost can vary widely by vehicle type and by location. The categories examined are items not paid for out-of-pocket by highway users and therefore may not always be considered when deciding to make a trip.

Pavement costs represent the contribution of a mile of travel by different vehicles to pavement deterioration and the costs of repairing the damage. Congestion costs reflect the value of added travel time due to additional small increments of traffic. Crash costs include medical costs, property damage, lost productivity, pain and suffering, and other costs associated with highway crashes. Air pollution costs are measured in terms of the cost of premature death, illness, and other effects of various highway-related emissions. Noise costs reflect changes in the value of adjacent properties caused by motor vehicle-related noise.

In 2003 the Minnesota Department of Transportation sponsored a study to develop a cost model for per-mile marginal operating costs for automobiles and trucks, paid for out-of-pocket by users. These costs exclude fixed costs such as the cost of the vehicle itself and insurance.

Routine Maintenance Costs

In Virginia, the Highway Maintenance and Operating Fund pays for repaving, road and bridge repairs, equipment, materials, snow removal and emergencies, guardrail repair, grass cutting, litter pickup, and all other maintenance activities that ensure the safety of the state's roads, bridges, and other transportation facilities. In FY2003 the state's maintenance budget was $885.90 million with an anticipated shortfall of $41.8 million. Given the 124,000 lane-miles of VDOT-maintained highways, the estimated maintenance cost was $7,500 per lane-mile for that year.[17] In comparison, in 2000 the Maryland State Highway Administration maintained 14,500 lane-miles of roads with an estimated maintenance budget of $184.5 million.[18] This results in an annual maintenance cost of $12,700 per lane-mile.

System Preservation Costs

The Federal Highway Administration's Status of the Nation's Highways, Bridges, and Transit: 2002 Conditions and Performance Report estimated an annual system preservation cost of nearly $15,000 per lane-mile of rural highways and over $50,000 per lane-mile of urban highways on the National Highway System. System preservation costs include resurfacing, rehabilitation, and reconstruction, but do not include routine maintenance costs.

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[17] http://www.ctb.virginia.gov/resources/MaintenanceSpending-BWR-FG-4-17-03.pdf
[18] *Highway Indicators Statistical Report 2000*, Maryland State Highway Administration. http://www.sha.state.md.us/AboutUs/orgChart/oppe/pdf/2000_Highway_Report.pdf

Table 2-21: Marginal Costs for Certain Vehicle Classes on Certain Roadway Types[19]

Vehicle Class	Roadway Type	Marginal Costs (cents per mile) (year 2000) [a]					
		Pavement	Congestion	Crash	Air Pollution	Noise	Total
Auto	Rural Interstate	0 [b]	0.78	0.98	1.14	0.01	2.91
Auto	Urban Interstate	0.1	7.70	1.19	1.33	0.09	10.41
40-kip 4-axle single unit truck	Rural Interstate	1.0	2.45	0.47	3.85	0.09	7.86
40-kip 4-axle single unit truck	Urban Interstate	3.1	24.48	0.86	4.49	1.50	34.43
60-kip 4-axle single unit truck	Rural Interstate	5.6	3.27	0.47	3.85	0.11	13.30
60-kip 4-axle single unit truck	Urban Interstate	18.1	32.64	0.86	4.49	1.68	57.77
60-kip 5-axle combination	Rural Interstate	3.3	1.88	0.88	3.85	0.17	10.08
60-kip 5-axle combination	Urban Interstate	10.5	18.39	1.15	4.49	2.75	37.28
80-kip 5-axle combination	Rural Interstate	12.7	2.23	0.88	3.85	0.19	19.85
80-kip 5-axle combination	Urban Interstate	40.9	20.06	1.15	4.49	3.04	69.64

(a) Reported values reflect the middle of the range. Variations in marginal costs are high and not uniform among vehicles and locations.
(b) A zero value is reported in the FHWA document without comment. It appears that the cost associated with pavement deterioration attributed to automobiles is very small compared to the contribution of trucks.

[19] *Addendum to the 1997 Federal Highway Cost Allocation Study Final Report*. May 2000. Extracted from Table 13.

2.4 ECONOMIC, HEALTH, AND ENVIRONMENTAL BENEFITS OF PUBLIC TRANSPORTATION

This memorandum was prepared as part of a transit strategic plan for the Richmond region. While the primary benefits for the region are that transit provides alternative travel choices, a way for those who do not drive to participate in the activities of society and travel time savings, there are also several societal benefits for the environment, public health and the economy. Environmental benefits include reduced vehicular emissions and reduced pressure to expand roadway facilities. Public health benefits include improved air quality, physical activity, greater mobility for seniors and reduced injuries and fatalities due to crashes. Economic benefits accrue from direct investments in the economy and enhanced mobility options.

2.4.A ENVIRONMENTAL BENEFITS OF PUBLIC TRANSPORTATION

Vehicular emissions account for a significant level of air pollution, including over one-third of smog in metropolitan areas[20]. Over half of all Americans live in counties that do not meet national air quality standards, including poor levels of ozone and short term and year round levels of particle pollution. Emissions such as carbon monoxide, oxides of nitrogen, volatile organic compounds, sulfur dioxide, lead, and particulate matter are causing significant air quality issues in many cities. In the Richmond region, five jurisdictions currently do not meet ozone 8-hour standards, including Richmond City, Hanover County, Henrico County, Chesterfield County and Charles City County. While the major source of vehicles emissions is the tailpipe during vehicle operations, pollution is also generated during fuel production/distribution, vehicle refueling and hot soaks (evaporative emissions produced after the engine is turned off)[21].

While vehicular emissions receive the most attention, transportation planning decisions also affect water quality and green space. Increases in vehicle miles traveled (VMT) and congestion pressure policy makers to expand the roadway system, consuming open space and resulting in increasing impervious surfaces. In the United States, impervious surfaces account for approximately 43,000 square miles, or an area greater than that of Virginia (39,594 square miles). According to the Center for Watershed Protection, as much as 65 percent of impervious surfaces are dedicated to automobiles, including roads, parking facilities and driveways. Impervious surfaces collect a variety of pollutants, including articulate matter, nitrogen oxides from car exhaust, rubber particles from tires, debris from brake systems and phosphates from fertilizers that cannot be absorbed into the ground. When rainfall occurs, these pollutants are washed into rivers, lakes and streams, making them unfit for drinking water, recreation and aquatic life[22].

Transportation planning decisions that foster use of public transportation, such as increased investments in rail and bus networks, transit-oriented development and transportation demand management, can reduce environmental degradation. Traveling by public transportation generates significantly less pollution than travel by private vehicle. Providing public services such as the Greater Richmond Transit Corporation (GRTC) and Ridefinders are two ways that the Richmond region is starting to address pollution. GRTC operates 45 routes in Richmond City and

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[20] Geller, A. *Smart Growth: A prescription for livable cities. American Journal of Public Health*, 93, 9, 1410-1415, 2003.
[21] Litman, T., *If Health Matter: Integrating Public Health Objectives in Transportation Planning*, Victoria Transport Policy Institute, 2002.
[22] Frazer, L., *Paving Paradise: The Peril of Impervious Surfaces*, Environmental Health Perspectives Volume 113, Number 7, July 2005.

Henrico County. Ridefinders provides carpool and vanpool matching services for commuters throughout the region. A study by Shapiro et al found that per passenger mile, public transportation produces 95 percent less carbon monoxide, 90 percent less volatile organic compounds and 45 percent less nitrogen oxide[23]. In addition, public transportation eases traffic congestion and thereby reduces emissions for private vehicles. According to the Texas Transportation Institute (TTI), travel delays in the Richmond urbanized area would have increased by four percent without public transportation[24].

2.4.B HEALTH BENEFITS OF PUBLIC TRANSPORTATION

Transportation planning decisions influence public health through air quality, physical activity, access to basics needs and recreation and traffic crashes. In fact, seven of the ten leading causes of death in the United States are related to transportation planning: cancer, respiratory disease and influenza/pneumonia are affected by air pollution, heart disease, cerebrovascular disease and diabetes are affected by sedentary lifestyles, and motor vehicle crashes are related to vehicle miles traveled[25].

AIR QUALITY

Over half of all Americans live in counties that do not meet national air quality standards, including poor levels of ozone and short term and year round levels of particle pollution. Nearly 17 percent of Americans live in counties that fail to meet all three air quality standards. Air pollution is estimated to kill 70,000 people per year[26]. Children, the elderly and persons with respiratory illnesses are particularly at risk[27]. Asthma is a growing problem for both children and adults, affecting nearly 21 million[28]. A study in southern California found that children that lived within 250 feet of a major road are 50 percent more likely to have experienced asthma symptoms in the past year[29]. Elderly persons are 20 percent more likely to seek medical care for respiratory illnesses in cities with severe air pollution[30]. By reducing tail pipe emissions, public transportation can reduce the incidence of respiratory illness. For instance, during the 1996 Olympics Games, Atlanta implemented alternative transportation strategies to reduce downtown traffic congestion. Peak weekday morning traffic counts dropped by nearly 23 percent and asthma care events were reduced by 44 percent for HMO members[31].

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[23] Shapiro, R.J. Hassett, K.A., and F. S. Arnold, *Conserving Energy and Preserving the Environment: The Role of Public Transportation,* www.apta.com/research/info/online/shapiro.cfm, July 2002.
[24] Schrank, D. and T. Lomax, *The 2005 Urban Mobility Report*, Texas Transportation Institute, Texas A&M University, May 2005.
[25] Litman, T., *If Health Matter: Integrating Public Health Objectives in Transportation Planning*, Victoria Transport Policy Institute, 2002.
[26] Fischlowitz-Roberts, B., *Air Pollution Fatalities Now Exceed Traffic Fatalities by 3 to 1*, Earth Policy Institute, http://www.earth-policy.org/Updates/Update17.htm, 2002.
[27] American Lung Association, State of the Air 2005 Report, Executive Summary, http://lungaction.org/reports/sota05exec_summ.html, 2005
[28] National Center for Health Statistics, National Health Interview Survey 2004, http://www.cdc.gov/asthma/NHIS/04/data.htm, 2004
[29] Nagourney, E., *High-Traffic Areas Tied to Children's Asthma Risk*, New York Times, May 11, 2006.
[30] Warner, J., *Seniors in Polluted Areas More Likely to Seek Treatment*, WebMD Medical News, November 12, 2002.
[31] Friedman M.S., Powell K.E., Hutwagner L., Graham L.M., and W.G. Teague, *Impact of Changes in Transportation and Commuting Behaviors during the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma*, Journal of the American Medical Association, Vol. 285, No. 7, February 21, 2001.

PHYSICAL ACTIVITY

In 2001 the Surgeon General declared the prevalence of overweight and obesity to have reached epidemic proportions. Results from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) estimated that over 66 percent of the adult population is overweight, up from 47 percent between 1976 and 1980. During these same time periods the obesity rate grew from 15 percent to 33 percent of the adult population. The prevalence of overweight in children is also growing. Data from the 1976-1980 and 2003-2004 NHANES surveys shows that for children aged 2 to 5 overweight increased from 5.0 percent to 13.9 percent; for children aged 6 to 11 years from 6.5 percent to 18.8 percent for children aged 6 to 11 years and from 5.0 percent to 17.4 percent for those aged 12 to 19 years[32][33]. Being overweight or obese increases an individual's risk for hypertension, high cholesterol, Type 2 diabetes, coronary heart disease, strokes, gallbladder disease, osteoarthritis, sleep apnea and some cancers and leads to 300,000 deaths per year[34].

Researchers believe that insufficient physical activity is at least partially responsible for the overweight and obesity epidemics. Approximately 52 percent of the adult population in the United States does not meet physical activity recommendations and 14 percent receive less than 10 minutes per week of moderate or vigorous activity[35]. Research shows a link between automobile dependency and an increasingly sedentary lifestyle. A study by the Surface Transportation Policy Project (STPP) found that in metro areas where people walk less there was a greater prevalence of overweight[36]. Between 1977 and 1995, walking trips fell from 9.3 percent to 5.4 percent of all trips[37], even though more than one-quarter of all trips are less than one mile[38].

Reaching levels of physical activity that provide significant health benefits are achievable for the majority of the population. Public transportation can improve public health because it supports active lifestyles and is consistent with high levels of walking[39]. Currently, the CDC recommends moderate-intensity physical activity for at least 30 minutes five times per week or vigorous-intensity physical activity for at least 20 minutes three days per week. Low-intensity physical activity, such as walking, has also been linked to mortality benefits including reduced

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[32] National Health and Nutrition Examination Survey 1976-1980.
[33] National Health and Nutrition Examination Survey 2003-2004.
[34] *The Surgeon General's Call to Action to Prevent and Control Overweight and Obesity 2001*, Department of Health and Human Services, Public Health Service, Rockville, Maryland, 2001.
[35] Centers for Disease Control and Prevention, U.S Physical Activity Statistics, Retrieved March 30, 2007 from http://apps.nccd.cdc.gov/PASurveillance/StateSumV.asp, 2005
[36] *Mean Streets 2000*, Surface Transportation Policy Project, Washington, DC, 2000.
[37] Nationwide Personal Transportation Survey, U.S. DOT
[38] *1995 National Personal Transportation Survey,* U.S Department of Transportation.
[39] Frank, L.D., Engelke, P.O., Schmid, T.L., 2003, *Health and Community Design: The Impacts of the Built Environment on Physical Activity,* Island Press, Washington D.C.

cardiovascular and coronary disease[40 41 42]. Walking among middle-aged and older woman has the same mortality benefits as vigorous physical activity[43 44].

SENIORS

Mobility is fundamental to public health, because it provides access to basic necessities, such as groceries and health care and permits greater recreational opportunities. However, in many low-density areas where mobility depends on access to a private vehicle, mobility is a challenge. For the elderly, conditions such as loss of vision and slower response times make it difficult to safely drive a vehicle or to maintain a driver's license. In the Richmond region, over 95,000 (11 percent of the population) according to the 2000 census were over age 65. In Virginia, 17 percent of persons 65 and older do not drive[45]. Nationwide, on any given day, 50 percent of non-drivers over age 65 stay at home partially because they lack transportation options[46]. As a result, many elder persons are at risk of becoming socially isolated which may affect their health. Elderly persons that do not drive are four times as likely to need long term care as elderly persons that drive[47]. Compared to older drivers, older non-drivers also have a greater difficulty accessing basic necessities and participating in social activities. They make 15 percent fewer medical trips, 59 percent fewer shopping/restaurant trips and 65 percent fewer social/recreational trips[48]. Transit services can provide seniors with transportation alternatives, permitting them to remain active members of the community and to avail themselves of essential services.

CRASHES

Traveling in buses is considerably safer than traveling in a private vehicle. In 2005, nearly 18,500 people were killed in passenger car crashes, compared with 58 fatalities on buses. Since passenger trips in private vehicles substantially exceed those on buses, it is necessary to standardize the number of fatalities by mode. In 2005, there were approximately 0.04 fatalities per 100 passenger miles traveled in buses, compared with 0.68 fatalities per 100 million passenger miles traveled in passenger cars[49 50].

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[40] Blumenthal J.A., Rejeski W.J., Walsh-Riddle M., et al., *Comparison of high- and low-intensity exercise training early after acute myocardial infarction*. Am J Cardiol, 1988, 61:26-30.
[41] Paffenbarger R.S. Jr, Hyde, R.T., Wing A.L., et al., *The association of changes in physical-activity level and other lifestyle characteristics with mortality among men*. N Engl J Med 1993, 328:538-45.
[42] Leon AS, Connett J, Jacobs D.R. Jr., et al. L*eisure-time physical activity levels and risk of coronary heart disease and death*. The Multiple Risk Factor Intervention Trial. JAMA 1987, 258:2388-95
[43] Rockhill, B., Willet, W.C., Manson, J.E., Leitzmann, M.F., Stampfer, M.J., Hunter, D.J. and G.A. Colditz, *Physical Activity and Mortality: A Prospective Study Among Women*, American Journal of Public Health, Vol. 91, No. 4, April 2001.
[44] Kushi L.H., Fee R.M., Folsom A.R., et al. *Physical activity and mortality in postmenopausal women*. JAMA 1997, 277:1287-92.
[45] National Household Travel Survey, 2001
[46] Bailey, L., *Aging Americans: Stranded at Home*, Surface Transportation Policy Project, Washington, DC, April 2004.
[47] The Boomer Project, Southeastern Institute of Research
[48] Bailey, L., *Aging Americans: Stranded at Home*, Surface Transportation Policy Project, Washington, DC, April 2004.
[49] *Traffic Safety Facts 2005*, National Highway Traffic Safety Administration, Washington, DC, 2005.
[50] *National Transportation Statistics 2006*, Bureau of Transportation Statistics, US Department of Transportation, Washington DC, 2006.

2.4.C ECONOMIC BENEFITS OF TRANSIT

Broadly speaking, public transportation strengthens economic activity in two ways: investments in the industry and enhanced mobility options. Public transportation investments expand economic activity through purchases of goods and services. This encourages businesses that supply the transit provider to make investments in their business and to purchase supplies, resulting in income and profits which are pumped into the economy. This in turn stimulates economic growth by encouraging business expansions and attracting new business. Thus transit investments are multiplied throughout the economy, generating value in excess of the initial investment[51].

Various studies have sought to quantify the economic benefits of transit investments. Shapiro et al estimates that public transportation produced $80.7 billion of net direct economic benefits in 2003 and that each dollar invested in public transportation generates at least $2.6 in direct benefits.[52] A study by Cambridge Systematics estimates the benefits in additional sales and jobs supported by both operating and capital expenditures. Operating costs have a direct impact on the local economy, as maintenance and operations are performed by local labor force. For each $1 million expended on operations, 57 jobs are supported and business sales increase by $3.2 million. Capital expenditures also generate significant benefits for the economy. In the short-term each $1 million in capital investments supports approximately 31.4 jobs and increases business sales by $3 million[53]. A study by the U.S. Department of Transportation estimates that each $1 million invested in the nation's infrastructure (including transportation) supports approximately 47.5 jobs[54]. In FY 2006, the Richmond region spent approximately $50 million on public transportation, including nearly $38 million on operating expenditures and $12 million in capital expenditures. Using these multipliers, public transportation in the Richmond region supported approximately 2,500 jobs and generated $158 million in additional sales.

In addition, public transportation provides additional transportation options which generate economic benefits for individuals, households, businesses and governments. Since public transportation increases the capacity of the transportation network and makes more areas accessible it reduces congestion and travel time. The Texas Transportation Institute estimates that transit saves over $6 million per year in the Richmond region due to reduced congestion delay[55]. In addition, reduced delay stimulates economic growth by attracting and expanding businesses and jobs.

Individuals and households benefit from greater access to higher paying jobs and participation in the economy. For motorists, reduced congestion enables them to commute greater distances. For people that are transit-dependent, additional transit investments increases the number of job sites that can be accessed. Many transit users report that if transit was not available they would not be able to reach their current worksites and their incomes

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[51] *The Benefits of Public Transportation: Essential Support for a Strong Economy*, APTA website.
[52] Shapiro, R.J. and K.A. Hassett, *Healthy Returns: The Economic Impact of Public Investment in Surface Transportation*, , APTA website, March 2005.
[53] Cambridge Systematics, Inc. with Economic Development Research Group, *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, Washington, DC, October 1999.
[54] *Construction Employment Model, Version 1.1.* U.S. Department of Transportation, Federal Highway Administration Office of Policy, 2001
[55] Schrank, D. and T. Lomax, *The 2005 Urban Mobility Report*, Texas Transportation Institute, Texas A&M University, May 2005.

would decrease[56]. Individuals also benefit from a lower cost of travel, since travel by private vehicle is considerably higher than travel by transit. For those households that reduce the number of vehicles they own, there are additional costs associated with owning fewer vehicles, including loan payments, maintenance and insurance[57]. McCann estimates that household can save approximately $3,000 per year on transportation for households that live in areas with high quality transit service[58]. Litman estimates annual transportation savings of approximately $1,300 for households located in cities with mature rail systems, compared with cities that do not have a rail system[59]. Individuals and households also benefits from lower prices due to reduced transportation costs to businesses.

Governments benefit from improved fiscal health through the larger tax base generated by increased economic activity[60]. Numerous studies show that property values tend to rise with proximity to rail stations[61]. Commercial property values tend to rise faster than residential property values[62]. State and local government revenues can increase between 4 percent and 16 percent as a result of investments in public transportation, offsetting some of the costs to the state and local jurisdictions[63]. The transit investment of $50 million in the Richmond region in FY 2006 can therefore be estimated to increase these state and local revenues by between $2 million and $8 million. The state and local share of transit expenditures during this period was approximately $23 million.

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[56] Litman, T., *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook*, Victoria Transport Policy Institute, December 2006.
[57] Litman, T., *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook*, Victoria Transport Policy Institute, December 2006.
[58] Barbara McCann, *Driven to Spend: The Impact of Sprawl on Household Transportation Expenses*, STPP, 2000.
[59] Litman, T., *Rail Transit in America: Comprehensive Evaluation of Benefits*, Victoria Transport Policy Institute, 2004.
[60] The Benefits of Public Transportation: Essential Support for a Strong Economy, APTA website.
[61] Porter, DR, *Synthesis of Transit Practice 20: Transit-Focused Development*, Transit Cooperative Research Program, Transportation Research Board, Washington, DC, 1997.
[62] Cervero, R., *Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta,* Journal of the American Planning Association, 60, 1 (1993) pp. 83-94.
[63] Cambridge Systematics, Inc. with Economic Development Research Group, *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, Washington, DC, October 1999.

2.5 FEDERAL AND STATE LEGISLATIVE PROVISIONS

2.5.A INTRODUCTION

Federal and state programs provide substantial financial support for public transportation services in the Richmond area. A variety of programs offer capital and/or operating funding. Some funds are apportioned by a formula to ensure that funds are distributed equitably among the states, such as the Jobs Access and Reverse Commute Program (JARC). Other programs are discretionary in that they are distributed based on an evaluation of need, such as the New Starts program. Other funding sources are targeted to specific projects by congressional earmark. Federal and state programs target a variety of needs and purposes. Section 5307 provides federal funding for large urban areas while the Older Americans Act allocates funds for providing paratransit service to elderly persons who do not drive or are physically unable to use public transportation. Some funding sources provide stable long term sources of operating expenses, while other funds are intended on a temporary basis to encourage innovation and experimentation.

Most federal programs only cover a portion of operating and capital costs; state and/or local governments are required to provide a local match. State programs such as the State Formula Assistance program are intended to cover a portion of the gap between the total program cost and the federal contribution. Local jurisdictions are nearly always required to provide a local match to ensure that they are invested in transit programs and do not merely operate transit services because there is no cost to them.

State and federal funding comes with requirements. Sometimes these requirements are written directly into the funding program legislation, while in other cases they result from other federal legislation (e.g., the Americans with Disabilities Act of 1990 (ADA)).

This memorandum discusses state and federal programs that either provide transit funding sources or mandate operating requirements. Table 2-22 provides a summary of the sources which funded transit in the Richmond region in FY 2006.

Table 2-22: Summary of Transit Funding Sources in the Richmond Region (FY 2006)

Funding Source	Total Capital	Total Operating	Beneficiary
Farebox & Other	$0	$9,576,485	GRTC, City of Richmond
Federal	$0	$0	
Federal Transit Administration			
Metropolitan Planning, Section 5303	$0	$132,824	MPO
Large Urban Cities, Section 5307	$7,102,636	$4,756,000	GRTC
Clean Fuels Program, Section 5308	$0	$0	
New Starts, Section 5309	$0	$0	
Small Starts, Section 5309	$0	$0	
Fixed Guideway Modernization Program, Section 5309	$0	$0	
Bus and Bus Facilities Program, Section 5309	$0	$0	
Transportation for Elderly Persons & Persons with Disabilities, Section 5310	$252,800	$0	See below (1)
Rural and Small Urban Areas, Section 5311	$0	$132,340	
Job Access & Reverse Commute Program (JARC), Section 5316	$0	$1,024,458	GRTC
New Freedom Program, Section 5317	$0	$0	
Federal Highway Administration			
Title 1 (FHWA) Funds	$0	$0	
Congestion Management & Air Quality Improvement Program (CMAQ)	$635,120	$1,885,900	GRTC, RideFinders, City of Richmond
Regional STP	$1,450,080	$0	GRTC
Statewide STP	$0	$0	
Other Federal Programs			
Older Americans Act	n/a	n/a	
Medicaid	n/a	n/a	
Rural Community Advancement Program (RCAP)	n/a	n/a	
State	$0	$0	
State Formula Assistance	$0	$7,147,821	GRTC, City of Richmond
State Capital Assistance	$1,639,965	$0	GRTC
State TEIF Program	$0	$40,000	RideFinders
State Intern Program	$0	$19,000	GRTC
State HMO Funds	$0	$0	
State Demonstration	$0	$128,250	City of Richmond
State TDM	$0	$0	
Other State Aid	$0	$98,200	GRTC, RideFiners
TANF	$0	$0	
State - Section 5303 Match	$0	$16,603	MPO
State - Section 5310 Match	$0	$0	
State - Special Projects	$0	$0	
Local	$0	$0	
Local	$656,994	$13,263,033	GRTC, RideFinders, City of Richmond
Local - State Intern Program	$0	$1,000	GRTC
Local - Section 5303 Match	$0	$16,603	MPO
Local - Section 5310 Match	$63,200	$0	See below (1)
Local - Special Projects	$0	$6,750	City of Richmond
Total	$11,800,795	$38,245,267	

(1) Adult Care Service, American Red Cross, Chesterfield Community Services Board, City of Richmond, Goochland Fellowship & Family Service

2.5.B FEDERAL PROGRAMS

FEDERAL TRANSIT ADMINISTRATION

The Federal Transit Act is codified in Title 49, Chapter 53 of the U.S. Code and contains provisions for public transportation. It contains planning, formula, and major capital investment programs for public transportation, which are overseen by the Federal Transit Administration (FTA).

Planning Programs

Metropolitan Planning, Section 5303

FTA provides funding for metropolitan planning to support cooperative, continuous, and comprehensive transportation planning in metropolitan areas. State DOTs and metropolitan planning organizations are eligible to receive Section 5303 funds. Recipients can use the funds for 80 percent of eligible planning expenses. Funds are allocated to states by a formula that includes the population of each state's urbanized area[64]. In Virginia, the Department of Rail and Public Transportation (DRPT) distributes Section 5303 funds to locally designated metropolitan planning organizations based on their urbanized area population and their individual planning needs.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3563.html

Formula Programs

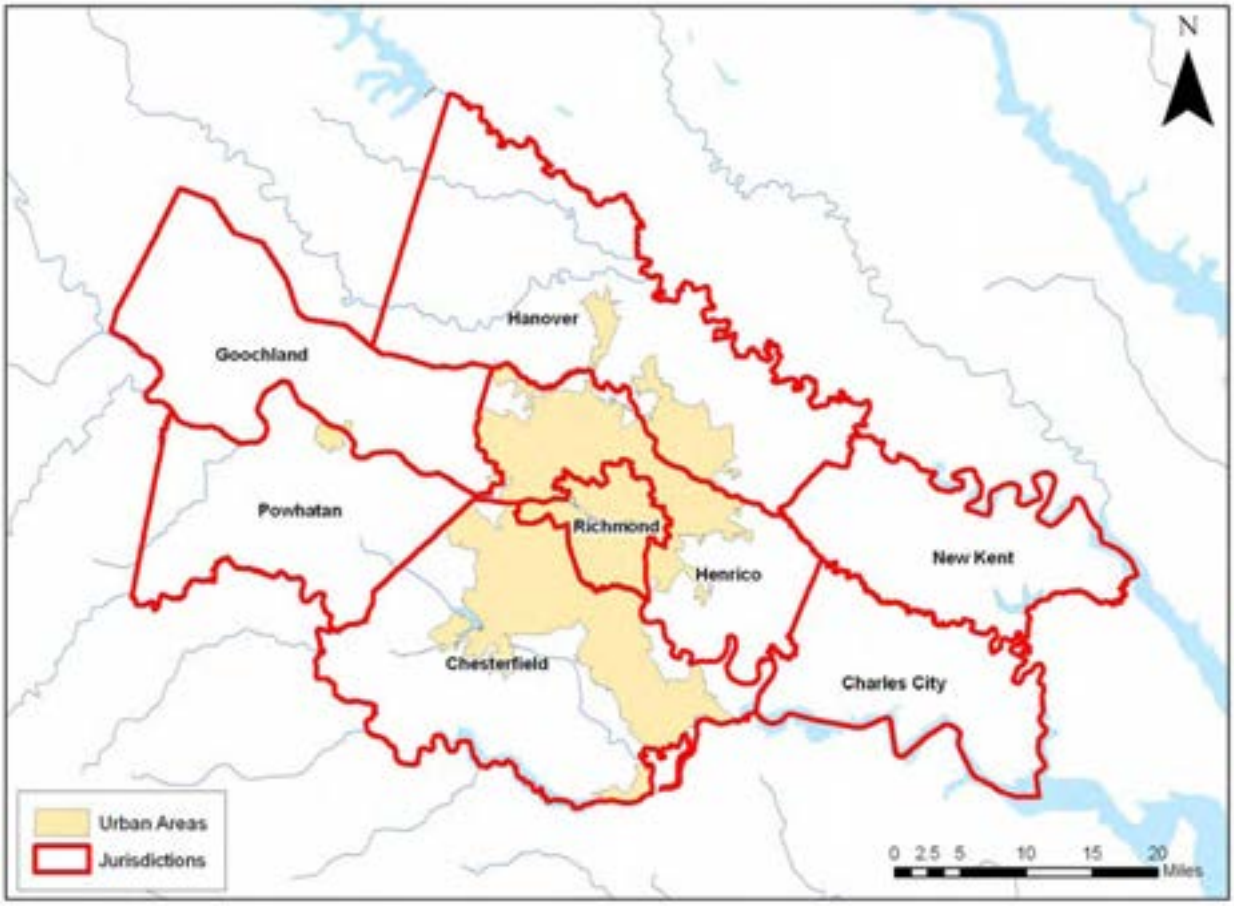
Formula programs apportion funds based on a formula that is specified in law.

Urbanized Areas, Section 5307

FTA provides formula funding for public transportation in urbanized areas with populations over 50,000 through the Section 5307 program. Local officials, transit agencies, and Governors are eligible to apply for, receive, and distribute Section 5307 transit operating, capital, and planning funds. For Transportation Management Areas (TMA)[65], funds are apportioned based on population, population density, bus revenue vehicle miles, bus passenger miles, fixed guideway revenue vehicle miles, and fixed guideway route miles. Funds are provided directly to a locally designated recipient. For urbanized areas with populations between 50,000 and 200,000, the funding formula is based solely on population and population density. Funds are apportioned to the Governor for distribution, though some areas that have been designated as TMAs receive funds directly. Figure 2-1 illustrates the urbanized area of the Richmond region based on the 2000 Census. The population of the entire region was approximately 866,000, of which nearly 819,000 people lived in urbanized areas.

[64] The US Census designates urbanized areas as a contiguous land mass that has at least 50,000 people and an overall density of at least 1,000 persons per square mile.
[65] Transportation Management Areas are urbanized areas with populations of 200,000 and over.

Figure 2-1: Urbanized Areas in the Richmond Region



Eligible purposes for Section 5307 funds include:

- Planning, engineering design, and evaluation of transit projects and other technical transportation-related studies
- Capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment, and construction of maintenance and passenger facilities
- Capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software
- All preventive maintenance and some ADA complementary paratransit service costs are considered capital costs
- Operating assistance for urbanized areas with under 200,000 people

FTA contributes a maximum of 80 percent of capital costs, though the cost of vehicle-related equipment to comply with the Americans with Disabilities Act (ADA) or the Clean Air Act can be funded with a 90 percent federal match. The maximum federal match for net operating costs is 50 percent. Urbanized areas with populations of 200,000 or more may not apply Section 5307 funds for operating expenses and are required to dedicate at least one percent of funds to transit enhancements, such as historic preservation, landscaping, public art, pedestrian access, bicycle access, and enhanced access for persons with disabilities. A local match is required for the balance of costs and must be provided from an undistributed cash surplus, a replacement or depreciation cash fund or reserve, or new capital. As an urban area of approximately 820,000 based on the 2000 census, the Richmond region's urbanized areas do not qualify for operating assistance under Section 5307. In FY2006, GRTC received $11.86 million in Section 5307 funds, of which $4.76 million was used for preventive maintenance and other items included in the operating budget, and $7.1 million was used for eligible capital investments.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3561.html

Transportation for Elderly Persons and Persons with Disabilities, FTA Section 5310

FTA provides formula funding for non-profit agencies and public bodies (when no non-profit is available) for the purchase of transportation vehicles and equipment to serve elderly persons and persons with disabilities through the Section 5310 program. Funds can also be used to purchase transportation services under contract, lease, or other arrangements. Section 5310 funds are apportioned to the state through a formula based on the number of elderly and disabled persons living in each state. Beginning in FY 2007, access to Section 5310 funding is contingent upon the project being part of a locally-developed human services coordination plan. Funds must be applied for annually. Within Virginia, DRPT is responsible for applying for and distributing funds to eligible recipients.

Funding obtained through this program can be used for 80 percent of capital expenses or 90 percent of vehicle-related equipment to satisfy requirements of the Americans with Disabilities Act. Several agencies within the Richmond region received Section 5310 funding in FY 2006, including:

- Adult Care Service, $36,000

- American Red Cross, $90,400
- Chesterfield Community Services Board, $54,400
- Goochland Fellowship and Family Services, $36,000
- Richmond Area Association for Retarded Citizens, $36,000

Applications for Section 5310 funding are due on February 1st to DRPT.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3556.html

Rural and Small Urban Areas, Section 5311

FTA provides funding for public transportation in non-urbanized areas through the Section 5311 program. This program apportions funds to states according to a formula based on the most recent population census in areas under 50,000 people. Both public and private non-profit agencies (including state and local governments, transportation district commissions, and public service corporations) are eligible to receive funds from the program. In Virginia, DRPT distributes the funds received from the federal government. Each eligible agency must apply annually for funding. Projects funded with Section 5311 funds must provide service for the general public. This includes marketing the service as a "public transit service," labeling vehicles with a program name that clearly identifies them as public transportation, and maintaining policies that do not limit services to any particular group.

Funding obtained through this program can be used for operating, capital, and administrative costs. FTA contributes a maximum of 80 percent of capital costs, though projects that meet requirements for the Americans with Disabilities Act (ADA), the Clean Air Act, or bicycle access projects can be funded with a 90 percent federal match. The maximum federal match for net operating costs[66] is 50 percent. Local matches are required for the balance of costs and must be provided from an undistributed cash surplus, a replacement or depreciation cash fund or reserve, or new capital. Applications for Section 5311 funding are due on February 1st to DRPT.

The Richmond region study area, which includes several rural counties, did not receive any funding from Section 5311 in FY 2006.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3555.html

Job Access and Reverse Commute Program (JARC), Section 5316

FTA provides funding to transport welfare recipients and low income individuals to and from their jobs, training, and welfare offices and to develop transportation services for people traveling to suburban jobsites through Section 5316. Funds can be used to promote nontraditional work schedules, transit vouchers, and employer-provided transit benefits. Job Access funds can be used for capital and operating costs for equipment, facilities, and associated capital maintenance for providing access to jobs. Reverse Commute funds can be used for operating costs, capital costs, and other costs associated with reverse commute by bus,

[66] Net operating expenses are the operating expenses that remain after operating revenues, such as farebox revenue, are subtracted from eligible operating expenses

train, carpool, vans, or other transit service. In Virginia, DRPT distributes the funds received from the federal government.

Funds for this discretionary program are based on the number of low-income individuals and are distributed as follows:

- Urbanized areas with 200,000 or more persons (60 percent)
- Urbanized areas with under 200,000 persons (20 percent)
- Nonurbanized areas (20 percent)

Funding obtained through this program can be used for operating and capital costs at a 50/50 federal/local match. In FY 2006, GRTC received $1.02 million in JARC funding.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3550.html

New Freedom Program, Section 5317

The New Freedom Program extends federal funding to new public transportation services and alternatives that exceed the requirements of the Americans with Disabilities Act, through Section 5317. These funds can be used to provide transportation assistance to individuals with disabilities, including transportation to and from worksites and employment support services. This discretionary program distributes funds as follows:

- Urbanized areas with 200,000 or more persons (60 percent)
- Urbanized areas with under 200,000 persons (20 percent)
- Nonurbanized areas (20 percent)

FTA contributes a maximum of 80 percent of capital costs and 50 percent of operating costs. Beginning in 2007, projects seeking funding through this program must be included in a locally-developed human service transportation coordination plan. Ten percent of funds can be used for planning, administration, and technical assistance.

The Richmond region study area did not receive any funding from Section 5317 in FY 2006.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3549.html

Clean Fuels Program, Section 5308

FTA provides formula funding to transit operators in clean air non-attainment or maintenance areas for clean fuels technologies through Section 5308. This includes purchasing or leasing clean fuel buses, constructing or leasing electrical recharging facilities, improving existing facilities to support clean fuel buses, among other things. Funds are apportioned based on bus fleet size and bus passenger miles (weighted by severity of nonattainment for either ozone or carbon monoxide).

The Richmond region study area did not receive any funding from Section 5308 in FY 2006.

The federal share of capital purchases in the Clean Fuels Program is up to 80 percent.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3560.html

Major Capital Investment Programs

Major capital investment projects receive funding through several discretionary programs in Section 5309:

- New Starts Program
- Small Starts Program
- Fixed Guideway Modernization Program
- Bus and Bus Facilities Program

Capital assistance is provided to eligible public bodies and agencies, including certain public corporations, boards, and commissions established under state law.

The Richmond region study area did not receive any funding from Section 5309 in FY 2006.

New Starts, Section 5309

The New Starts program provides funds for constructing new fixed guideway systems or extensions to existing fixed guideway systems through Section 5309. By statute, the maximum federal contribution to a new starts project is 80 percent of the project cost. However, project sponsors are encouraged to minimize the funding share they are applying for.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3590.html

Small Starts, Section 5309

Beginning in 2007, the Small Starts program provides capital funds for applications of less than $75 million and for projects that cost less than $250 million, through Section 5309. Projects must be a fixed guideway for at least 50 percent of the project length, or a non-fixed guideway corridor improvement, such as bus rapid transit.

Fixed Guideway Modernization Program, Section 5309

FTA provides funds for modernizing segments of fixed guideway that are at least seven years old through Section 5309. There are seven tiers for allocating funds. For the first four tiers funding allocation is based on data used to apportion funds in FY 1997. For the last three tiers funding is allocated based on the most recent National Transit Database data for route miles and revenue vehicle miles on segments at least seven years old. The project must modernize at least one mile of fixed guideway.

The federal share of fixed guideway modernization programs is a maximum of 80 percent of eligible capital expenses.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3558.html

Bus and Bus Facilities Program, Section 5309

FTA provides funding for purchasing and replacing buses and related facilities and equipment through Section 5309. About half of the funds are allocated through congressional earmarks and the rest are discretionary. Eligible capital projects for buses include the following:

- Vehicles: Acquisition of buses for fleet and service expansion, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance
- Facilities: Bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations
- Passenger Amenities: Passenger shelters and bus stop signs
- Accessory and Miscellaneous Equipment: Mobile radio units, supervisory vehicles, fare boxes, computers, and shop and garage equipment

Funding for capital projects through this program is discretionary and can pay for up to 80 percent of eligible capital expenses.

For more information, go to:

http://www.fta.dot.gov/funding/grants/grants_financing_3557.html

FEDERAL HIGHWAY ADMINISTRATION

Flexible Funds Programs

Flexible funds are eligible to be used for either transit or highway programs. The purpose of flexible funds is to allow local jurisdictions to use surface transportation funds for local planning priorities and not based on specific program eligibilities. Both the FHWA Surface Transportation Program (STP) and Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds can be transferred to FTA to be used for transit projects. FTA's urban formula funds can likewise be transferred to FHWA for highway projects. FHWA funds transferred to FTA can be used under the following programs:

- Urbanized Area Formula Program (Section 5307)
- Nonurbanized Area Formula Program (Section 5311)
- Elderly and Persons with Disabilities Program (Section 5310)

The decision to transfer flexible funds is made by:

- MPO in urbanized areas over 200,000 people
- MPO and state DOT in areas under 200,000 people
- State DOT in rural areas

Congestion Management and Air Quality Improvement Program (CMAQ)

FHWA and FTA jointly provide surface transportation funding to improve air quality and reduce congestion to help meet the requirements of the Clean Air Act. In states with areas that the Environmental Protection Agency (EPA) designates as in nonattainment or maintenance of national ambient air quality standards, CMAQ funds must be used on projects that reduce volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), or particulate matter (PM) emitted by transportation sources. These projects can include public transportation improvements or to convert fleets to clean fuels. The Richmond Regional Planning District Commission distributes CMAQ funds.

CMAQ funds are eligible to fund several projects and services:

- Transit service expansions – as long as ridership will increase
- Operating assistance – for new transit services or transportation demand management strategies. Funds are limited to a three-year period.
- New transit service – intended to encourage transit providers to experiment with new services and therefore can fund new transit service on a temporary basis.
- Vehicles – funds can be used to purchase new or replacement transit vehicles, including vehicles that use alternative fuels. However, since diesel-powered replacement vehicles will only have minimal improvements on air quality, emissions implications must be fully documented. Under certain conditions, CMAQ funds can be used to offset the cost of reduced or free transit fares, such as during peak periods of ozone pollution.

The federal share for most CMAQ projects is 80 percent. In FY 2006, several recipients in the study area received CMAQ funds for transit projects: GRTC ($100,000), City of Richmond ($848,000) and RideFinders, a division of GRTC that provides ridesharing services ($937,900).

For more information, go to:

http://www.fhwa.dot.gov/environment/cmaqpgs/

http://www.fhwa.dot.gov/safetealu/factsheets/cmaq.htm

Surface Transportation Program (STP)

FHWA provides flexible funding to states and localities for transit capital projects, intracity and intercity bus terminals and facilities, as well as transit safety infrastructure improvements and programs. Funds are apportioned based on several factors: total lane miles of federal-aid highways, vehicle miles traveled on federal-aid highways, and contributions to the Highway Account of the Highway Trust Fund. Ten percent of funds are set aside for safety (including hazard elimination at transit facilities), 10 percent for enhancements, and 50 percent for urbanized areas with over 200,000 persons. In addition to highway projects, STP funds are eligible for transit projects, including:

- Public transportation capital improvements and intercity or intracity bus terminals and bus facilities
- Planning activities and transit research and development
- Transit safety improvements and most transportation control measures

The Richmond Regional Planning District Commission distributes STP funds. The maximum federal share of costs is 80 percent or subject to the sliding scale rate. In FY 2006, GRTC received $1.45 million in STP funding from the federal government.

For more information, go to:

http://www.fhwa.dot.gov/safetealu/factsheets/stp.htm

Other FHWA Programs

National Highway System Program

FHWA provides formula funds for the National Highway System, including the interstate system. The formula apportions funds to states based on:

- Lane-miles of principal arterials (excluding Interstate)
- Vehicle-miles traveled on those arterials
- Diesel fuel used on the state's highways
- Per capita principal arterial lane-miles

Transit projects that are located on the same corridor as a fully access-controlled highway are eligible for funding if they improve the level of service of the highway, improve regional traffic flow, and are more cost-effective than the improvements to the highway.

For more information, go to:

http://www.fhwa.dot.gov/hep10/nhs/index.html

http://www.fhwa.dot.gov/safetealu/factsheets/nhs.htm

Transportation, Community, and System Preservation (TCSP) Program

FHWA provides funding to states, metropolitan planning organizations, local governments, and public transit agencies to plan and implement innovative strategies that integrate transportation with community and environmental preservation. Projects are evaluated based on how they:

- Improve the efficiency of the transportation system
- Reduce the impacts of transportation on the environment
- Reduce the need for costly future public infrastructure
- Ensure efficient access to jobs, services, and centers of trade
- Encourage private sector development patterns

The federal share for the TCSP Program is 80 percent or subject to the sliding scale rate. Funding applications are submitted via the FHWA state office.

For more information, go to:

www.fhwa.dot.gov/tcsp

OTHER FEDERAL PROGRAMS

Older Americans Act

The Older Americans Act (OAA) is a federal law that assists elderly citizens with the greatest social and economic need. The law establishes certain programs that federal and state governments must implement. The legislation also provides partial funding for the programs. Many of the programs are provided under each state's Department of Aging and Area Agencies on Aging (AAA). These organizations work with other non-profit agencies to coordinate and provide necessary services, of which transportation is one of the most common needs expressed by older people. Area Agency on Aging programs provide transportation to medical appointments, grocery stores, and social activities, among other places, to individuals who do not drive or who are physical unable to use public transportation. In Virginia, the Department for the Aging allocates a portion of OAA funds to Senior Connections, the Area Agency on Aging for the Richmond region. Funds can be used for both purchasing and operating vehicles or for mobility management services. Federal funds are allocated based on the following formula:

- Population 60+ (30 percent)
- Population 60+ in rural jurisdictions (10 percent)
- Population 60+ in poverty (50 percent)
- Population 60+ minority in poverty (10 percent)

In FY 2006, the Virginia Department for the Aging disbursed $4.1 million to Senior Connections, of which a portion is from OAA. Transportation provided under OAA is restricted to use by persons age 60 or over.

For more information, go to:

http://www.aoa.gov/about/legbudg/oaa/legbudg_oaa.asp or

http://www.unitedweride.gov/1_715_ENG_HTML.htm

Medicaid

Medicaid is a federal program administered at the state level that pays for medical assistance for low income and disabled individuals and families. In recognition of the important role transportation plays in providing access to essential medical facilities, the program funds transportation that helps connect eligible residents to medical services. In Virginia, Medicare programs involving transportation are administered by the Department of Medical Assistance Services (DMAS). DMAS contracts with Logisticare to receive requests for Medicaid transportation. Logisticare, in turn, contracts with providers of transportation, public and private, and assigns requested Medicaid trips to the least expensive willing provider.

For more information, go to:

http://www.ctaa.org/ntrc/medical/medicaidpubs.asp

Rural Community Advancement Program (RCAP)

This Department of Agriculture (DOA) program provides grants and loans to promote economic vitality and quality of life in rural areas. This program is managed by the Community Transportation Association of America (CTAA). Transportation facilities and services are eligible funding recipients.

For more information, go to:

http://www.rcap.org/

2.5.C State Programs

Several state programs are intended to reduce the gap between program capital and operating cost and the federal match, as well as to target specific needs. It is important to note that large increases in statewide transit funding are anticipated in FY 2008 as a result of the Transportation Bill. As a comparison to items found in Table 2-22, in FY 2008 GRTC is slated to receive nearly $6.8 million in formula operating funds (a decrease from FY 2006) and approximately $2.9 million in capital funds (State MTF Capital, State Transportation Trust Fund Capital , and State Mass Transit Capital).

TRANSIT FORMULA ASSISTANCE

The Virginia Formula Assistance program provides public transportation operating expenses for eligible recipients, including local/state agencies, transportation district commissions, and public service corporations. This program funds up to 95 percent of eligible operating costs. In FY 2006, formula assistance funding was received by the City of Richmond ($0.20 million) and GRTC ($6.95 million).

TRANSIT CAPITAL ASSISTANCE

The Virginia Capital Assistance program provides public transportation capital expenses for eligible recipients, including local/state agencies, transportation district commissions, and public service corporations. This program funds up to 95 percent of eligible capital costs. In FY 2006, GRTC received $1.64 million from the capital assistance program.

TDM/COMMUTER ASSISTANCE

The TDM/Commuter Assistance program provides funding to administer existing or new local and regional Transportation Demand Management or Commuter Assistance programs. Eligible recipients include local/state agencies, transportation district commissions, public service corporations, and planning district commissions. This program funds up to 80 percent of eligible costs.

DEMONSTRATION PROJECT ASSISTANCE

The Demonstration Project Assistance program assists communities in preserving and revitalizing publicly or privately operated transportation services with innovative projects for a one year period. Eligible recipients include local/state agencies, transportation district commissions, and public service corporations. This program funds up to 95 percent of eligible operating costs. In FY 2006, the City of Richmond received $128,250 to operate the Lunch Time Express.

TECHNICAL ASSISTANCE

The Technical Assistance program supports planning or technical assistance to improve or initiate public transportation related services. Eligible recipients include local/state agencies, transportation district commissions, public service corporations, and planning district commissions. This program funds up to 50 percent of eligible costs.

INTERN PROGRAM

The Intern Program supports increased awareness of public transportation as a career choice for aspiring managers. Eligible recipients include local/state agencies, transportation district commissions, public service corporations, and planning district commissions. This program funds up to 95 percent of eligible operating costs. In FY 2006, GRTC received $19,000 in funding from this program.

TRANSPORTATION EFFICIENCY IMPROVEMENT FUNDS (TEIF) PROGRAM

The Transportation Efficiency Improvement Funds (TEIF) program supports reducing the demand for new or expanded transportation facilities that serve single occupant vehicles and also supports innovative initiatives that reduce traffic congestion. Eligible recipients include local/state agencies, transportation district commissions, public service corporations, and planning district commissions. This program funds up to 80 percent of eligible operating costs. In FY 2006, RideFinders, a division of GRTC that provides ridesharing services, received $40,000 in TEIF funds.

2.5.D LOCAL PROGRAMS

A final source of funding would be generated by local taxes. The Richmond region could dedicate taxes to support transit. In Virginia, local governments are granted taxing authority through laws that apply to all jurisdictions or through municipal charters which are special legislation adopted for towns and cities under the Uniform Charter Powers Act. While cities and towns can authorize any taxes not specifically prohibited by the General Assembly, counties can only authorize taxes specifically authorized by the General Assembly. However, taxing authority on daily rental property and transient occupancy is allowed by the General Assembly.

2.5.E OPERATING REQUIREMENTS

URBANIZED AREAS, SECTION 5307

One specific operating requirement is that the transportation services receiving Section 5307 funding must charge elderly and disabled persons and individuals that present a Medicare card 50 percent of the peak hour fare during non-peak hours. In fact, most transit agencies, including GRTC, charge half-fare or less at all times to avoid hassles regarding when non-peak hours occur and to reduce the number of decisions drivers have to make.

AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act (ADA) of 1990 is broad scoping legislation intended to make facilities more accessible to individuals with disabilities. One component of the law affects the provision of public transportation, including alterations to transportation facilities, key stations, vehicle accessibility, and complementary paratransit service.

Alteration of Transportation Facilities

All new facilities used to provide public transportation services must be ADA accessible. When a public entity alters an existing facility used to provide public transportation services, the alternations must be ADA accessible to the maximum extent possible. This includes assuring that paths of travel to the altered area and bathrooms, telephones, and drinking fountains are accessible. Public entities are required to spend up to an additional 20 percent of the project cost on these additional accessibility improvements. If the cost of these additional accessibility improvements would exceed 20 percent, the improvements must be prioritized as follows:

- Accessible entrance
- Accessible path to altered area
- Accessible bathroom for each sex
- Accessible telephones
- Accessible drinking fountains

Vehicle Accessibility

Any public entity which operates a fixed route system must purchase vehicles that are ADA accessible. This requirement also applies to the purchase or lease of used vehicles as well as any vehicle that is being rebuilt, as long as the usable life is extended five years. For new rail vehicles, transit providers can seek a temporary waiver from the Secretary of Transportation if fixed-route vehicles with lifts could not be provided and a delay in purchasing vehicles would significantly impair transportation services. Purchased vehicles must be capable of accepting a lift and a lift must be installed when one becomes available. For non-rail vehicles, transit providers can seek a waiver from the Secretary of Transportation if a comprehensive search (including used vehicles) does not reveal any ADA accessible vehicles. There is an exemption for historic vehicles and fixed-route segments of fixed-route systems that are on the National Register of Historic Places. The entire GRTC fleet of 186 vehicles is equipped with wheelchair lifts and 31 are kneeling buses.

Complementary Paratransit Service

Public entities which provide fixed-route transit service (excluding systems which operate only commuter bus service) must provide paratransit service to people with disabilities that is comparable to the level of service that persons without disabilities receive (including response time).

Eligible recipients of paratransit services include:

- Persons that are unable to board, ride, or alight a vehicle that is accessible and usable by persons with disabilities, due to a physical or mental impairment, without the assistance of another person
- Persons with disabilities that need the assistance of a wheelchair lift or other boarding assistance device
- Persons that are unable to travel to and from a bus stop
- Individuals accompanying the person with the disability (as long as there is space on the vehicle for the accompanying individuals and that they do not prevent service to other people with disabilities)

Paratransit service must be provided to origins and destinations within ¾ mile of the fixed-route, including areas outside of the ¾ mile fixed-route service area in the core, but excluding areas where only commuter services are provided. Public entities are not required to provide paratransit service outside of their jurisdiction, if they do not have the legal authority to do so. While local jurisdictions determine whether the basic service is curb-to-curb or door-to-door, to meet the origin to destination requirement, service beyond the curb may need to be provided in some instances.

While transit providers may negotiate pickup times with individuals, they can only negotiate a departure time within one hour of the individual desire request. Additional operating requirements include:

- Paratransit providers can charge up to twice the full fare for a similar trip on the fixed-route system
- Paratransit operating hours must be the same as the fixed-route service
- Providers cannot limit the number of trips a rider takes, institute a waiting list to access the service, or limit service due to excessive trip length or missed trips

If the public entity is able to demonstrate that providing paratransit would constitute an undue financial burden, then it is only required to provide paratransit to the extent that doing so does not impose an undue financial burden. GRTC operates two paratransit services. Community Assisted Ride Enterprise (CARE) provides curb-to-curb paratransit service for disabled person in Richmond City and Henrico County who are unable to use fixed-route vehicles. GRTC also operates C-VAN which provides transportation for Virginia Initiative for Employment not Welfare (VIEW) participants on behalf on the Department of Social Services. C-VAN provides both curb-to-curb and ridesharing services.

2.6 EXISTING AND POTENTIAL FUTURE FUNDING POLICIES AND PROGRAMS

Future transit funding in the Richmond region is largely dependent on federal and state transit decisions that have yet to be made. Since future funding is difficult to predict over the long term, this section provides a rough estimate of the level of funding available based on historic trends and current legislation. Capital and operating funds are projected between 2007 and 2031. Methodologies used to projection revenues are provided in Section 2.6.D.

2.6.A TRANSIT CAPITAL PROJECTIONS (2008 TO 2031)

Figure 2-2 shows actual capital funds for transit in the Richmond region between 2001 and 2007 and a projection of capital funds between 2007 and 2031, in current 2006 dollars. From 2001 to 2003, capital funding in the region reached $27.7 million (2001) due to federal funding for the Main Street Station and Downtown Transfer Center projects. After the completion of these projects, capital funding fell to $11.1 million in 2005. Overall, capital funding in current dollars is projected to be $19.5 million in 2008, $24.7 million in 2016 and $34.7 million in 2031. This represents a 3.6 percent annual growth rate. Federal capital funds are projected to increase from $15.6 million to $21.3 million per year between 2008 and 2031. State capital funds will increase from $2.4 million to $4.3 million per year between 2008 and 2031, and will account for 12.5 percent of the region's capital funds. Local contributions are projected to increase from $1.5 million in 2008 to $2.6 million, and will account for 7.5 percent of capital funds.

Figure 2-2: Projected Capital Funds (2001 to 2031)

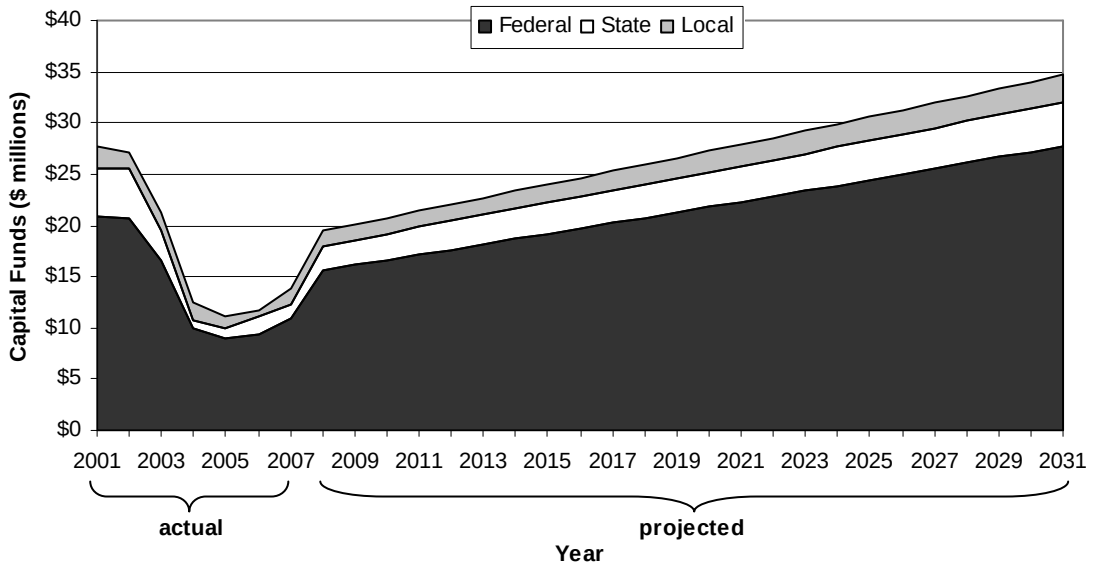


Table 2-23 shows the projected change in the composition of capital funds in the Richmond region in 2008, 2016, and 2031. The Section 5307 grant program is projected to contribute an increasing share of capital funds in the Richmond region, accounting for 41.0 percent of capital funds in 2008 and rising to 45.6 percent in 2031. Section 5309 funding is projected to drop as a share of total capital funds from 26.5 percent in 2008 to 16.7 percent in 2031. Other

significant capital funding sources are Regional STP, state capital assistance, and the local contribution. A complete breakdown of projected capital funding between 2008 and 2031 is provided in Section 2.6.D.

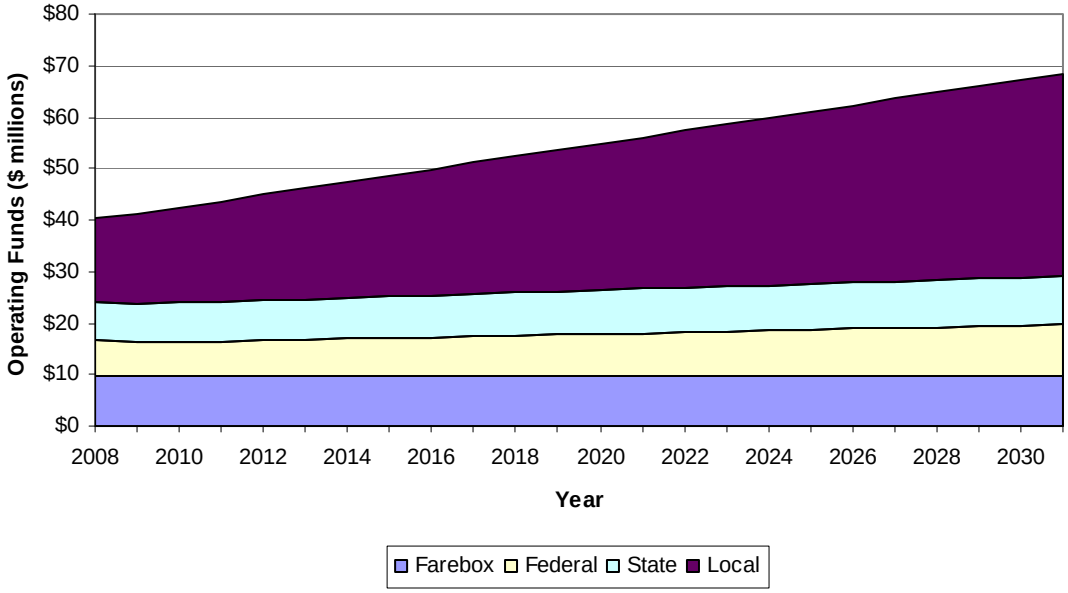
Table 2-23: Projected Capital Funding Sources

	2008		2016		2031	
Funding Source	**Amount**	**Percent**	**Amount**	**Percent**	**Amount**	**Percent**
Federal						
FTA Section 5307	$7,991,000	41.0%	$10,715,000	43.5%	$15,823,000	45.6%
FTA Section 5309	$5,170,000	26.5%	$5,381,000	21.8%	$5,799,000	16.7%
FTA Section 5310	$219,000	1.1%	$290,000	1.2%	$422,000	1.2%
FTA Section 5313b	$0	0.0%	$0	0.0%	$0	0.0%
Title 1 (FHWA) Funds	$0	0.0%	$0	0.0%	$0	0.0%
CMAQ	$521,000	2.7%	$251,000	1.0%	$0	0.0%
Regional STP	$1,687,000	8.7%	$3,084,000	12.5%	$5,703,000	16.4%
Statewide STP	$0	0.0%	$0	0.0%	$0	0.0%
Other	$0	0.0%	$0	0.0%	$0	0.0%
Total Federal	$15,588,000	80.0%	$19,721,000	80.0%	$27,747,000	80.0%
State						
State Capital Assistance	$2,367,000	12.1%	$2,911,000	11.8%	$3,892,000	11.2%
State Demonstration	$69,000	0.4%	$170,000	0.7%	$442,000	1.3%
Total State	$2,436,000	12.5%	$3,081,000	12.5%	$4,334,000	12.5%
Local						
Local	$1,409,000	7.2%	$1,761,000	7.1%	$2,426,000	7.0%
Local - Section 5310 Match	$53,000	0.3%	$88,000	0.4%	$177,000	0.5%
Total Local	$1,462,000	7.5%	$1,849,000	7.5%	$2,603,000	7.5%
Total	$19,486,000	100.0%	$24,651,000	100.0%	$34,684,000	100.0%

2.6.B PROJECTED OPERATING FUNDS (2008 TO 2031)

Figure 2-3 shows actual operating funds for transit in the Richmond region between 2001 and 2007 and a projection of operating funds between 2007 and 2031, in current 2006 dollars. As with projections for capital funding, projections for programs that provide continuous operating funds year after year, such as Section 5307 and State Formula Assistance, are based on extending historical trends into the future. For one-time projects, such as State Demonstration funding, projections are based on average funding levels between 2001 and 2007, with a 0.5 percent increase after accounting for inflation. Overall, operating funds are projected to increase from $40.4 million in 2008 to $49.9 million in 2031 and $68.5 million in 2031. This represents a 2.4 percent annual growth rate.

Figure 2-3: Projected Operating Funds (2007 to 2031)



Operating funds are comprised of four sources: federal, state, and local government, as well as farebox revenue (see Table 2-24). In this analysis, farebox revenue is projected to remain constant at $9.8 million per year, but will decrease from 24.3 percent of total operating revenues in 2008 to 14.4 percent in 2031. Federal operating funds will increase from $6.7 million to $9.8 million per year between 2008 and 2031, but will drop as a percent of total operating revenues from 16.6 percent to 14.3 percent. Likewise, state operating funds will increase from $7.4 million to $9.5 million per year between 2008 and 2031, but will drop as a percent of total operating revenues from 18.3 percent to 13.8 percent. Local contributions are projected to compensate for a decline in farebox, federal, and state revenues, as a portion of total operating funds. Local contributions are projected to increase from 40.8 percent of total operating revenues in 2008 to 57.5 percent in 2031. They are projected to increase from $16.5 million in 2008 to $39.4 million in 2031. A complete breakdown of projected operating funding between 2008 and 2031 is provided in Section 2.6.D.

Table 2-24: Projected Operating Funding Sources

	2008		2016		2031	
Funding Source	**Amount**	**Percent**	**Amount**	**Percent**	**Amount**	**Percent**
Farebox & Other	$9,832,936	24.3%	$9,833,000	19.7%	$9,833,000	14.4%
Federal						
FTA Section 5303	$137,043	0.3%	$134,000	0.3%	$129,000	0.2%
FTA Section 5307	$5,025,278	12.4%	$5,848,000	11.7%	$7,390,000	10.8%
FTA Section 5311	$129,096	0.3%	$134,000	0.3%	$145,000	0.2%
FTA Section 5313b	$0	0.0%	$0	0.0%	$0	0.0%
JARC	$834,316	2.1%	$1,254,000	2.5%	$2,042,000	3.0%
CMAQ	$513,672	1.3%	$0	0.0%	$0	0.0%
Other	$71,272	0.2%	$74,000	0.1%	$80,000	0.1%
Total Federal	$6,710,676	16.6%	$7,444,000	14.9%	$9,786,000	14.3%
State						
State Formula Assistance	$6,836,486	16.9%	$7,420,000	14.9%	$8,513,000	12.4%
State TEIF Program	$126,101	0.3%	$239,000	0.5%	$452,000	0.7%
State Intern Program	$25,628	0.1%	$27,000	0.1%	$29,000	0.0%
State HMO Funds	$7,516	0.0%	$8,000	0.0%	$8,000	0.0%
State Demonstration	$18,321	0.0%	$19,000	0.0%	$21,000	0.0%
State TDM	$4,002	0.0%	$4,000	0.0%	$4,000	0.0%
Other State Aid	$301,791	0.7%	$314,000	0.6%	$338,000	0.5%
TANF	$37,277	0.1%	$39,000	0.1%	$42,000	0.1%
State - Section 5303 Match	$19,192	0.0%	$38,000	0.1%	$74,000	0.1%
State - Special Projects	$1,383	0.0%	$1,000	0.0%	$2,000	0.0%
Total State	$7,377,698	18.3%	$8,109,000	16.3%	$9,483,000	13.8%
Local						
Local	$16,487,156	40.8%	$24,452,000	49.0%	$39,387,000	57.5%
Local - State Intern Program	$1,349	0.0%	$1,000	0.0%	$2,000	0.0%
Local - Section 5303 Match	$11,204	0.0%	$11,000	0.0%	$10,000	0.0%
Local - Special Projects	$2,347	0.0%	$2,000	0.0%	$3,000	0.0%
Total Local	$16,502,057	40.8%	$24,466,000	49.1%	$39,402,000	57.5%
Total	$40,423,366	100.0%	$49,852,000	100.0%	$68,504,000	100.0%

2.6.C SENSITIVITY ANALYSIS

Numerous assumptions were made in this analysis that could affect projections of capital and operating funds. For example, if GRTC implements a project that significantly increases transit service or another jurisdiction implements new transit service, ridership would grow. While it is impossible to predict if and when this will happen, assuming that ridership increases 20 percent between 2008 and 2031 (or 0.76 percent per year), farebox revenue will increase by $0.7 million in 2016 and $2.0 million in 2031. In addition, additional ridership would enable the region to leverage additional federal and state funding.

2.6.D PROJECTED FUNDING DETAILS

This section describes how capital and operating revenues were projected between 2008 and 2031. Projections were based on historic data provided by the Virginia Department of Rail and Public Transportation (VDRPT) for the years 2001 to 2006. While data from 1996 to 2000 was also provided, it was incomplete and difficult to compare with the more recent data, and so was not considered when developing the projections. Draft revenues for 2007 available on the VDRPT website were also included in the projections.

PROJECTED CAPITAL FUNDING (2008 TO 2031)

Capital revenue projections are based on a two-step following methodology. First, for programs that provide continuous funding year after year, such as Section 5307 and Regional STP, projections are based on extending historical trends into the future. For one-time projects, such as Section 5309, funding for the Main Street Station and state and local matches, projections are based on average funding levels between 2001 and 2007, with a 0.5 percent increase after accounting for inflation. This methodology led to a federal share of total capital revenues in excess of 80 percent. Since the federal government typically does not fund capital programs in excess of 80 percent, the second step was to increase state and local contributions proportionally to account for 20 percent of total capital revenues. The factor used to increase the state and federal share of total capital revenues was based on an average ratio (5:3) of state to local revenues over the period 2001 to 2007. The results are shown in Table 2-25 through Table 2-29.

Table 2-25: Projected Capital Revenues (2008 to 2012)

Funding Source	2008	2009	2010	2011	2012
Federal					
FTA Section 5307	$7,991,000	$8,332,000	$8,672,000	$9,013,000	$9,353,000
FTA Section 5309	$5,170,000	$5,196,000	$5,222,000	$5,248,000	$5,275,000
FTA Section 5310	$219,000	$228,000	$237,000	$246,000	$255,000
FTA Section 5313b	$0	$0	$0	$0	$0
Title 1 (FHWA) Funds	$0	$0	$0	$0	$0
CMAQ	$521,000	$487,000	$454,000	$420,000	$386,000
Regional STP	$1,687,000	$1,862,000	$2,036,000	$2,211,000	$2,386,000
Statewide STP	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total Federal	$15,588,000	$16,105,000	$16,621,000	$17,138,000	$17,655,000
State					
State Capital Assistance	$2,367,000	$2,436,000	$2,506,000	$2,574,000	$2,642,000
State Demonstration	$69,000	$80,000	$91,000	$103,000	$116,000
Total State	$2,436,000	$2,516,000	$2,597,000	$2,677,000	$2,758,000
Local					
Local	$1,409,000	$1,453,000	$1,497,000	$1,542,000	$1,586,000
Local - Section 5310 Match	$53,000	$57,000	$61,000	$65,000	$70,000
Total Local	$1,462,000	$1,510,000	$1,558,000	$1,607,000	$1,656,000
Total	$19,486,000	$20,131,000	$20,776,000	$21,422,000	$22,069,000

Table 2-26: Projected Capital Revenues (2013 to 2017)

Funding Source	2013	2014	2015	2016	2017
Federal					
FTA Section 5307	$9,694,000	$10,034,000	$10,375,000	$10,715,000	$11,056,000
FTA Section 5309	$5,301,000	$5,328,000	$5,354,000	$5,381,000	$5,408,000
FTA Section 5310	$263,000	$272,000	$281,000	$290,000	$298,000
FTA Section 5313b	$0	$0	$0	$0	$0
Title 1 (FHWA) Funds	$0	$0	$0	$0	$0
CMAQ	$352,000	$319,000	$285,000	$251,000	$217,000
Regional STP	$2,560,000	$2,735,000	$2,909,000	$3,084,000	$3,259,000
Statewide STP	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total Federal	$18,170,000	$18,688,000	$19,204,000	$19,721,000	$20,238,000
State					
State Capital Assistance	$2,710,000	$2,778,000	$2,844,000	$2,911,000	$2,977,000
State Demonstration	$128,000	$142,000	$156,000	$170,000	$185,000
Total State	$2,838,000	$2,920,000	$3,000,000	$3,081,000	$3,162,000
Local					
Local	$1,630,000	$1,674,000	$1,718,000	$1,761,000	$1,805,000
Local - Section 5310 Match	$74,000	$79,000	$83,000	$88,000	$93,000
Total Local	$1,704,000	$1,753,000	$1,801,000	$1,849,000	$1,898,000
Total	$22,712,000	$23,361,000	$24,005,000	$24,651,000	$25,298,000

Table 2-27: Projected Capital Revenues (2018 to 2022)

Funding Source	2018	2019	2020	2021	2022
Federal					
FTA Section 5307	$11,396,000	$11,737,000	$12,078,000	$12,418,000	$12,759,000
FTA Section 5309	$5,435,000	$5,462,000	$5,489,000	$5,517,000	$5,544,000
FTA Section 5310	$307,000	$316,000	$325,000	$334,000	$342,000
FTA Section 5313b	$0	$0	$0	$0	$0
Title 1 (FHWA) Funds	$0	$0	$0	$0	$0
CMAQ	$184,000	$150,000	$116,000	$82,000	$49,000
Regional STP	$3,433,000	$3,608,000	$3,782,000	$3,957,000	$4,132,000
Statewide STP	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total Federal	$20,755,000	$21,273,000	$21,790,000	$22,308,000	$22,826,000
State					
State Capital Assistance	$3,042,000	$3,107,000	$3,172,000	$3,236,000	$3,300,000
State Demonstration	$200,000	$216,000	$232,000	$249,000	$266,000
Total State	$3,242,000	$3,323,000	$3,404,000	$3,485,000	$3,566,000
Local					
Local	$1,848,000	$1,892,000	$1,935,000	$1,978,000	$2,021,000
Local - Section 5310 Match	$98,000	$103,000	$109,000	$114,000	$119,000
Total Local	$1,946,000	$1,995,000	$2,044,000	$2,092,000	$2,140,000
Total	$25,943,000	$26,591,000	$27,238,000	$27,885,000	$28,532,000

Table 2-28: Projected Capital Revenues (2023 to 2027)

Funding Source	2023	2024	2025	2026	2027
Federal					
FTA Section 5307	$13,099,000	$13,440,000	$13,780,000	$14,121,000	$14,461,000
FTA Section 5309	$5,572,000	$5,600,000	$5,628,000	$5,656,000	$5,684,000
FTA Section 5310	$351,000	$360,000	$369,000	$378,000	$386,000
FTA Section 5313b	$0	$0	$0	$0	$0
Title 1 (FHWA) Funds	$0	$0	$0	$0	$0
CMAQ	$15,000	$0	$0	$0	$0
Regional STP	$4,306,000	$4,481,000	$4,655,000	$4,830,000	$5,005,000
Statewide STP	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total Federal	$23,343,000	$23,881,000	$24,432,000	$24,985,000	$25,536,000
State					
State Capital Assistance	$3,364,000	$3,429,000	$3,497,000	$3,564,000	$3,630,000
State Demonstration	$283,000	$301,000	$320,000	$339,000	$359,000
Total State	$3,647,000	$3,730,000	$3,817,000	$3,903,000	$3,989,000
Local					
Local	$2,064,000	$2,108,000	$2,154,000	$2,200,000	$2,245,000
Local - Section 5310 Match	$125,000	$131,000	$137,000	$143,000	$150,000
Total Local	$2,189,000	$2,239,000	$2,291,000	$2,343,000	$2,395,000
Total	$29,179,000	$29,850,000	$30,540,000	$31,231,000	$31,920,000

Table 2-29: Projected Capital Revenues (2028 to 2031)

Funding Source	2028	2029	2030	2031
Federal				
FTA Section 5307	$14,802,000	$15,142,000	$15,483,000	$15,823,000
FTA Section 5309	$5,713,000	$5,741,000	$5,770,000	$5,799,000
FTA Section 5310	$395,000	$404,000	$413,000	$422,000
FTA Section 5313b	$0	$0	$0	$0
Title 1 (FHWA) Funds	$0	$0	$0	$0
CMAQ	$0	$0	$0	$0
Regional STP	$5,179,000	$5,354,000	$5,528,000	$5,703,000
Statewide STP	$0	$0	$0	$0
Other	$0	$0	$0	$0
Total Federal	$26,089,000	$26,641,000	$27,194,000	$27,747,000
State				
State Capital Assistance	$3,696,000	$3,762,000	$3,827,000	$3,892,000
State Demonstration	$379,000	$400,000	$421,000	$442,000
Total State	$4,075,000	$4,162,000	$4,248,000	$4,334,000
Local				
Local	$2,290,000	$2,335,000	$2,381,000	$2,426,000
Local - Section 5310 Match	$156,000	$163,000	$170,000	$177,000
Total Local	$2,446,000	$2,498,000	$2,551,000	$2,603,000
Total	$32,610,000	$33,301,000	$33,993,000	$34,684,000

PROJECTED OPERATING FUNDING (2008 TO 2031)

As with projections for capital funding, projections for programs that provide continuous operating funds year after year, such as Section 5307 and State Formula Assistance, are based on extending historical trends into the future. For one-time projects, such as State Demonstration funding, projections are based on average funding levels between 2001 and 2007, with a 0.5 percent increase after accounting for inflation. The results are shown in

Table 2-30 through Table 2-34.

Table 2-30: Projected Operating Revenues (2008 to 2012)

Funding Source	2008	2009	2010	2011	2012
Farebox & Other	$9,833,000	$9,833,000	$9,833,000	$9,833,000	$9,833,000
Federal					
FTA Section 5303	$137,000	$137,000	$136,000	$136,000	$136,000
FTA Section 5307	$5,025,000	$5,128,000	$5,231,000	$5,334,000	$5,437,000
FTA Section 5311	$129,000	$130,000	$130,000	$131,000	$132,000
FTA Section 5313b	$0	$0	$0	$0	$0
JARC	$834,000	$887,000	$939,000	$992,000	$1,044,000
CMAQ	$514,000	$178,000	$0	$0	$0
Other	$71,000	$72,000	$72,000	$72,000	$73,000
Total Federal	$6,710,000	$6,532,000	$6,508,000	$6,665,000	$6,822,000
State					
State Formula Assistance	$6,836,000	$6,909,000	$6,982,000	$7,055,000	$7,128,000
State TEIF Program	$126,000	$140,000	$154,000	$169,000	$183,000
State Intern Program	$26,000	$26,000	$26,000	$26,000	$26,000
State HMO Funds	$8,000	$8,000	$8,000	$8,000	$8,000
State Demonstration	$18,000	$18,000	$19,000	$19,000	$19,000
State TDM	$4,000	$4,000	$4,000	$4,000	$4,000
Other State Aid	$302,000	$303,000	$305,000	$306,000	$308,000
TANF	$37,000	$37,000	$38,000	$38,000	$38,000
State - Section 5303 Match	$19,000	$22,000	$24,000	$26,000	$29,000
State - Special Projects	$1,000	$1,000	$1,000	$1,000	$1,000
Total State	$7,377,000	$7,468,000	$7,561,000	$7,652,000	$7,744,000
Local					
Local	$16,487,000	$17,483,000	$18,478,000	$19,474,000	$20,470,000
Local - State Intern Program	$1,000	$1,000	$1,000	$1,000	$1,000
Local - Section 5303 Match	$11,000	$11,000	$11,000	$11,000	$11,000
Local - Special Projects	$2,000	$2,000	$2,000	$2,000	$2,000
Total Local	$16,501,000	$17,497,000	$18,492,000	$19,488,000	$20,484,000
Total	$40,421,000	$41,330,000	$42,394,000	$43,638,000	$44,883,000

Table 2-31: Projected Operating Revenues (2013 to 2017)

Funding Source	2013	2014	2015	2016	2017
Farebox & Other	$9,833,000	$9,833,000	$9,833,000	$9,833,000	$9,833,000
Federal					
FTA Section 5303	$135,000	$135,000	$135,000	$134,000	$134,000
FTA Section 5307	$5,539,000	$5,642,000	$5,745,000	$5,848,000	$5,951,000
FTA Section 5311	$132,000	$133,000	$134,000	$134,000	$135,000
FTA Section 5313b	$0	$0	$0	$0	$0
JARC	$1,097,000	$1,149,000	$1,202,000	$1,254,000	$1,307,000
CMAQ	$0	$0	$0	$0	$0
Other	$73,000	$73,000	$74,000	$74,000	$75,000
Total Federal	$6,976,000	$7,132,000	$7,290,000	$7,444,000	$7,602,000
State					
State Formula Assistance	$7,201,000	$7,274,000	$7,347,000	$7,420,000	$7,493,000
State TEIF Program	$197,000	$211,000	$225,000	$239,000	$254,000
State Intern Program	$26,000	$26,000	$27,000	$27,000	$27,000
State HMO Funds	$8,000	$8,000	$8,000	$8,000	$8,000
State Demonstration	$19,000	$19,000	$19,000	$19,000	$19,000
State TDM	$4,000	$4,000	$4,000	$4,000	$4,000
Other State Aid	$309,000	$311,000	$313,000	$314,000	$316,000
TANF	$38,000	$38,000	$39,000	$39,000	$39,000
State - Section 5303 Match	$31,000	$33,000	$36,000	$38,000	$40,000
State - Special Projects	$1,000	$1,000	$1,000	$1,000	$1,000
Total State	$7,834,000	$7,925,000	$8,019,000	$8,109,000	$8,201,000
Local					
Local	$21,465,000	$22,461,000	$23,457,000	$24,452,000	$25,448,000
Local - State Intern Program	$1,000	$1,000	$1,000	$1,000	$1,000
Local - Section 5303 Match	$11,000	$11,000	$11,000	$11,000	$11,000
Local - Special Projects	$2,000	$2,000	$2,000	$2,000	$2,000
Total Local	$21,479,000	$22,475,000	$23,471,000	$24,466,000	$25,462,000
Total	$46,122,000	$47,365,000	$48,613,000	$49,852,000	$51,098,000

Table 2-32: Projected Operating Revenues (2018 to 2022)

Funding Source	2018	2019	2020	2021	2022
Farebox & Other	$9,833,000	$9,833,000	$9,833,000	$9,833,000	$9,833,000
Federal					
FTA Section 5303	$134,000	$133,000	$133,000	$133,000	$132,000
FTA Section 5307	$6,053,000	$6,156,000	$6,259,000	$6,362,000	$6,465,000
FTA Section 5311	$136,000	$136,000	$137,000	$138,000	$138,000
FTA Section 5313b	$0	$0	$0	$0	$0
JARC	$1,359,000	$1,412,000	$1,464,000	$1,517,000	$1,569,000
CMAQ	$0	$0	$0	$0	$0
Other	$75,000	$75,000	$76,000	$76,000	$76,000
Total Federal	$7,757,000	$7,912,000	$8,069,000	$8,226,000	$8,380,000
State					
State Formula Assistance	$7,565,000	$7,638,000	$7,711,000	$7,784,000	$7,857,000
State TEIF Program	$268,000	$282,000	$296,000	$310,000	$325,000
State Intern Program	$27,000	$27,000	$27,000	$27,000	$27,000
State HMO Funds	$8,000	$8,000	$8,000	$8,000	$8,000
State Demonstration	$19,000	$19,000	$19,000	$20,000	$20,000
State TDM	$4,000	$4,000	$4,000	$4,000	$4,000
Other State Aid	$317,000	$319,000	$320,000	$322,000	$324,000
TANF	$39,000	$39,000	$40,000	$40,000	$40,000
State - Section 5303 Match	$43,000	$45,000	$48,000	$50,000	$52,000
State - Special Projects	$1,000	$1,000	$1,000	$1,000	$1,000
Total State	$8,291,000	$8,382,000	$8,474,000	$8,566,000	$8,658,000
Local					
Local	$26,443,000	$27,439,000	$28,435,000	$29,430,000	$30,426,000
Local - State Intern Program	$1,000	$1,000	$1,000	$1,000	$1,000
Local - Section 5303 Match	$11,000	$11,000	$11,000	$11,000	$11,000
Local - Special Projects	$2,000	$2,000	$2,000	$3,000	$3,000
Total Local	$26,457,000	$27,453,000	$28,449,000	$29,445,000	$30,441,000
Total	$52,338,000	$53,580,000	$54,825,000	$56,070,000	$57,312,000

Table 2-33: Projected Operating Revenues (2023 to 2027)

Funding Source	2023	2024	2025	2026	2027
Farebox & Other	$9,833,000	$9,833,000	$9,833,000	$9,833,000	$9,833,000
Federal					
FTA Section 5303	$132,000	$132,000	$131,000	$131,000	$131,000
FTA Section 5307	$6,567,000	$6,670,000	$6,773,000	$6,876,000	$6,979,000
FTA Section 5311	$139,000	$140,000	$141,000	$141,000	$142,000
FTA Section 5313b	$0	$0	$0	$0	$0
JARC	$1,622,000	$1,674,000	$1,727,000	$1,780,000	$1,832,000
CMAQ	$0	$0	$0	$0	$0
Other	$77,000	$77,000	$78,000	$78,000	$78,000
Total Federal	$8,537,000	$8,693,000	$8,850,000	$9,006,000	$9,162,000
State					
State Formula Assistance	$7,930,000	$8,003,000	$8,076,000	$8,149,000	$8,221,000
State TEIF Program	$339,000	$353,000	$367,000	$381,000	$395,000
State Intern Program	$28,000	$28,000	$28,000	$28,000	$28,000
State HMO Funds	$8,000	$8,000	$8,000	$8,000	$8,000
State Demonstration	$20,000	$20,000	$20,000	$20,000	$20,000
State TDM	$4,000	$4,000	$4,000	$4,000	$4,000
Other State Aid	$325,000	$327,000	$328,000	$330,000	$332,000
TANF	$40,000	$40,000	$41,000	$41,000	$41,000
State - Section 5303 Match	$55,000	$57,000	$59,000	$62,000	$64,000
State - Special Projects	$1,000	$1,000	$2,000	$2,000	$2,000
Total State	$8,750,000	$8,841,000	$8,933,000	$9,025,000	$9,115,000
Local					
Local	$31,422,000	$32,417,000	$33,413,000	$34,408,000	$35,404,000
Local - State Intern Program	$1,000	$1,000	$1,000	$1,000	$1,000
Local - Section 5303 Match	$11,000	$11,000	$11,000	$11,000	$11,000
Local - Special Projects	$3,000	$3,000	$3,000	$3,000	$3,000
Total Local	$31,437,000	$32,432,000	$33,428,000	$34,423,000	$35,419,000
Total	$58,557,000	$59,799,000	$61,044,000	$62,287,000	$63,529,000

Table 2-34: Projected Operating Revenues (2028 to 2031)

Funding Source	2028	2029	2030	2031
Farebox & Other	$9,833,000	$9,833,000	$9,833,000	$9,833,000
Federal				
FTA Section 5303	$130,000	$130,000	$130,000	$129,000
FTA Section 5307	$7,081,000	$7,184,000	$7,287,000	$7,390,000
FTA Section 5311	$143,000	$143,000	$144,000	$145,000
FTA Section 5313b	$0	$0	$0	$0
JARC	$1,885,000	$1,937,000	$1,990,000	$2,042,000
CMAQ	$0	$0	$0	$0
Other	$79,000	$79,000	$80,000	$80,000
Total Federal	$9,318,000	$9,473,000	$9,631,000	$9,786,000
State				
State Formula Assistance	$8,294,000	$8,367,000	$8,440,000	$8,513,000
State TEIF Program	$410,000	$424,000	$438,000	$452,000
State Intern Program	$28,000	$28,000	$29,000	$29,000
State HMO Funds	$8,000	$8,000	$8,000	$8,000
State Demonstration	$20,000	$20,000	$20,000	$21,000
State TDM	$4,000	$4,000	$4,000	$4,000
Other State Aid	$333,000	$335,000	$337,000	$338,000
TANF	$41,000	$41,000	$42,000	$42,000
State - Section 5303 Match	$66,000	$69,000	$71,000	$74,000
State - Special Projects	$2,000	$2,000	$2,000	$2,000
Total State	$9,206,000	$9,298,000	$9,391,000	$9,483,000
Local				
Local	$36,400,000	$37,395,000	$38,391,000	$39,387,000
Local - State Intern Program	$1,000	$1,000	$2,000	$2,000
Local - Section 5303 Match	$11,000	$11,000	$11,000	$10,000
Local - Special Projects	$3,000	$3,000	$3,000	$3,000
Total Local	$36,415,000	$37,410,000	$38,407,000	$39,402,000
Total	$64,772,000	$66,014,000	$67,262,000	$68,504,000

2.7 EXISTING AND POTENTIAL FUTURE INSTITUTIONAL ARRANGEMENTS

As transit services in the Richmond region continue to grow, it is important to consider the institutional arrangements for managing, planning, monitoring, operating, and funding transit. Currently, most fixed-route and demand-response service is operated by GRTC (though human service agencies provide limited services). GRTC is owned by two jurisdictions: the City of Richmond and Chesterfield County. As the region continues to develop and pressures mount for transit services to extend beyond traditional service areas, it may be necessary to explore different institutional arrangements for providing transit service. There are several arrangements that could be utilized in the Richmond region to provide public transportation services. Each arrangement has specific powers, applicability to the region, and advantages and disadvantages, which are described in this section.

2.7.A INSTITUTIONAL OPTIONS FOR TRANSIT MANAGEMENT, PLANNING, AND OVERSIGHT

There are several institutions and structures that could be utilized to provide management, planning, and oversight of transit service in the Richmond region. These include a public corporation (as GRTC is currently operated), the City of Richmond, other local governments, Richmond Area MPO, Service District, transit authority, transportation district, or a transportation authority. This section describes each institution and identifies their advantages and disadvantages. Table 2-35 summarizes the advantages and disadvantages of each arrangement.

Table 2-35: Transit Institutional Options for Management, Planning and Oversight

Topic	Pros	Cons
Public Corporation	Existing structure of transit in Richmond region. Removes jurisdictions from direct responsibilities for transit operations. Ownership can be spread among multiple jurisdictions. Able to negotiate with unions.	
City of Richmond	Primary market is in or nearby Richmond. City retains control over allocation of resources and focus of service.	City responsible for all costs. Other jurisdictions must negotiate with Richmond for service. Government entities unable to negotiate with labor unions – would prevent region from receiving federal funds.
Other Local Government	Individual jurisdictions do not have to negotiate allocation of resources and focus of service.	Managing jurisdiction responsible for all costs. May require redesignation of "designated recipient." Unable to take advantage of GRTC's operating and management experience, would not benefit from economies of scale, and may provide service that duplicates GRTC.
Richmond Area MPO	Governing body covering a nine jurisdiction region already in place. Agency charged with planning of transportation in the region.	Planning agencies not typically set up or staffed to oversee transit operations. Agencies not typically funded as operating entities. May require redesignation of "designated recipient." By-laws may need to be revised.
Service District	Ability to set regional transit policies.	Agreements for funding services must be negotiated. May require redesignation of "designated recipient."

Table 2-35: Transit Institutional Options for Management, Planning and Oversight (continued)

Topic	Pros	Cons
Transit Authority		Agreements for funding services must be negotiated May require redesignation of "designated recipient." New legislation may be required.
Transportation Commission (District)	Commissions authorized under state statutes to operate transit and engage in long-term transportation planning. Authority to levy 2% gasoline tax	Agreements for funding services must be negotiated. May require redesignation of "designated recipient." Ability to raise funds is less than Transportation Authorities
Transportation Authority	Other Authorities have significant power to impose taxes/fees and issue bonds. State statutes authorize Authorities to conduct long-term transportation planning.	New legislation may be required.

PUBLIC CORPORATION

Currently, GRTC is operated as a non-profit corporation under the provisions of the Virginia Non-Stock Corporation Act in Chapter 10, Title 13.1 of the Virginia Code. Unlike stock corporations which have owners represented by stock, non-stock corporations typically have members (or directors), who have the right to vote. However, members are not owners of the non-profit corporation. Organizing as a non-profit corporation enables organizations to transact business, enter into contracts, and own property.

The articles of incorporation establish the rules governing the management of the corporation and are filed with the state. This can include a statement of purpose, defining the powers of the corporation, its directors, and its members, the number and names of initial directors, whether the corporation will have members, and the classes, qualifications, rights, and voting privileges of members (§ 13.1-819). Once the corporation has been formed, additional requirements include electing a Board of Directors, adopting bylaws, and appointing officers (§ 13.1-822). Like the article of incorporation, bylaws provide for the regulation or management of the business of the corporation and must be lawful and consistent with the articles of incorporation (§ 13.1-823).

Specific powers of a non-profit corporation are stated in § 13.1-826 of the Virginia Code and include:

- To purchase, receive, lease, or otherwise acquire, own, hold, improve, use, and otherwise deal with, real or personal property, or any legal or equitable interest in property, wherever located.
- Make contracts and guarantees, incur liabilities, borrow money, issue its notes, bonds, and other obligations, and secure any of its obligations by mortgage or pledge of all or any of its property, franchises, and income.
- Authority to elect directors, appoint officers, and hire employees, define their responsibilities, and set their compensation. The public corporation's staff members are not government employees.
- Have and exercise all powers necessary or convenient to affect any or all of the purposes for which the corporation is organized.
- Each corporation which is deemed a private foundation (as defined in § 509 of the Internal Revenue Code), unless its articles of incorporation expressly provide otherwise, shall distribute its income and, if necessary, principal, for each taxable year at such time and in such manner as not to subject such corporation to tax under § 4942 of the Internal Revenue Code.

GRTC was incorporated as a non-profit corporation in 1973. Ownership of GRTC is split equally between the City of Richmond and Chesterfield County. The Board of Directors is composed of six directors. The Richmond City Council and the Chesterfield Board of Supervisors each appoint three directors every year.

There are advantages and disadvantages with public corporations. First among advantages, in GRTC (a public corporation) an entity is already organized to manage, plan, and monitor transit. Second, other jurisdictions can purchase transit service from GRTC and therefore are not responsible for direct transit operations. Third, while ownership is currently divided between Richmond and Chesterfield County, it can be spread to additional jurisdictions. Finally, unlike government entities, public corporations are able to negotiate with unions. The main

disadvantage of public corporations is that they do not have the taxing authority that is granted Transportation Districts and Transportation Authorities.

CITY OF RICHMOND

The City of Richmond could potentially provide management, planning, and oversight of transit service in the region. In Virginia, it is common for cities to operate transit services, such as CTS in Charlottesville and DASH in Alexandria. The advantages of designating the City of Richmond as the institution that manages, plans, and monitors transit service in the region is that the primary transit market is located within the boundaries of the city. In addition, it benefits Richmond, which would maintain complete control over both the allocation of resources and the type of service that is provided. There are also several disadvantages. First, the city would be responsible for all costs associated with the transit service. Second, other jurisdictions would be required to negotiate the purchase of transit service with Richmond and would have little control over the type of service provided. In addition, government entities cannot negotiate with labor unions in Virginia. Since Section 13(c) of the Federal Transit Act prohibits using federal funds in a way that would be detrimental to organized labor, transferring the assets of GRTC – acquired using federal funds – to a city would be "detrimental to labor."

OTHER LOCAL GOVERNMENT

While most transit service in the Richmond region is currently provided by GRTC, another possible institutional arrangement would be for the jurisdictions that are not now part of GRTC to establish their own transit services either individually or in concert. Service could be operated as governmental units (e.g. the Charlottesville Transit Service or FRED), or be purchased from a vendor (e.g Loudoun Transit, Fairfax Connector). The advantage of this arrangement is that these jurisdictions would have greater control over transit operations within their borders. There are also several disadvantages. First, GRTC is currently the designated agency for receiving federal funds in the region. The establishment of other entities that provide transit service might require a redesignation of the recipient of state and federal funding. Second, the managing jurisdiction would gain the added responsibility for all costs of operating the service. Third, these jurisdictions would not benefit from GRTC's management experience or economies of scale and may provide service that duplicates GRTC.

RICHMOND AREA MPO

Metropolitan Planning Organizations (MPOs) are federally mandated entities that are responsible for regional transportation planning. In Richmond, nine jurisdictions comprise the Richmond Area MPO. The main advantage of designating an MPO to manage, plan, and oversee transit operations is that it is an existing regional body, whereas GRTC is primarily intended to serve only two jurisdictions. There are several disadvantages. First, MPOs typically lack the organization or staff to oversee transit operations. Second, they are often not funded to operate transit. Third, GRTC is currently the designated agency for receiving federal funds in the region. The establishment of other entities that provide transit service might require a redesignation of the recipient of state and federal funding. Fourth, bylaws would need to be revised to address transit operations.

SERVICE DISTRICTS

In Virginia, one or more jurisdictions have the authority to create Service Districts to "provide additional, more complete or more timely services of government than are desired in the locality or localities as a whole," as described in (§ 15.2-2400). Formation of the Service District requires an ordinance by the participating jurisdictions that sets forth the name and boundaries

of the district, describes the purpose of the district, a plan for providing services, and the expected benefits from those services (§ 15.2-2402). Specific powers of Service Districts include (§ 15.2-2403):

- Construct, maintain, and operate such facilities and equipment
- To acquire facilities, equipment, and real estate
- To enter into contracts with any person, municipality, or state agency
- To levy and collect an annual tax upon any property
- To accept funds from an authority, transportation district, locality, state agency, or federal agency

The advantage of creating a Service District to manage, plan, and oversee transit service is its ability to set regional transit policies. Disadvantages include agreements for funding services must be negotiated, which may require redesignation of state and federal transit funds, and Service Districts do not have condemnation authority.

TRANSIT AUTHORITY

Many transit agencies throughout the country are organized as transit authorities, such as WMATA, which services metropolitan Washington, DC. In Virginia, the Williamsburg area is considering forming a transit authority, which would be the first of its kind in Virginia and would reveal how a transit authority could function in the Richmond region. The major disadvantage with this institutional arrangement is that it may require additional legislation by the Virginia General Assembly. Other disadvantages are that agreements for funding services must be negotiated, which may require redesignation of state and federal transit funds.

TRANSPORTATION DISTRICT

Virginia statutes permit one or more cities and counties to form transportation districts (§ 15.2-4504). Member jurisdictions determine the boundaries of the transportation district, create a commission responsible for management of the transit system (§ 15.2-4506), and establish the number of members on the commission. Each jurisdiction appoints its allotment of Commissioners (§ 15.2-4507). Virginia statute also mandates additional commission members. In the case of the Hampton Roads Transportation Commission (HRTC) and the Potomac and Rappahannock Transportation Commission (PRTC), the House of Delegates and Senate appoint members to the commission. The Chairman of the Commonwealth Transportation Board is also a member ex officio with voting privileges. The purpose of the commission is to "manage and control the functions, affairs and property of the corporation and to exercise all of the rights, powers and authority and perform all of the duties conferred or imposed upon the corporation."

Specific powers granted to the transportation district include:

- Prepare and amend a transportation plan for the transportation district
- Construct or acquire transportation identified in the transportation plan
- Contract private companies to operate facilities
- Form agreements with cities and counties in the transportation district, cities and counties adjacent to the transportation district, or adjacent transportation districts to provide transit facilities and services within these jurisdictions. These agreements can be used to fund construction and operation of transit facilities and services.

The Virginia General Assembly has authorized transportation districts to levy a two percent gasoline tax on its member jurisdictions. The revenues from this tax can be used to support local transportation projects.

The advantages of forming a transportation district are that commissions are authorized under state statute to operate transit service, can engage in long-term transportation planning, and have the authority to fund these services with a gasoline tax. The disadvantage of transportation districts is that program implementation is limited, since they do not have the authority to raise funds through additional taxes, fees, and by issuing debt. In addition, agreements for funding services must be negotiated and may require redesignation of state and federal transit funds.

TRANSPORTATION AUTHORITY

Another institutional arrangement that may be appropriate for the Richmond region is a transportation authority. While both transportation districts and transportation authorities share the purpose of planning, transportation authorities are typically established by the General Assembly to implement transportation projects. Potential funding, managing, and operating structures for a transportation authority in the Richmond region can be gleaned from the two existing transportation authorities in Virginia. In 2002, the General Assembly established the Northern Virginia Transportation Authority (NVTA) to conduct long-range transportation planning for regional transportation projects for nine localities in Northern Virginia. As part of HB 3202, in 2007, the General Assembly extended to NVTA the authority to impose taxes and fees, issue bonds, and impose, collect and set the amount of tolls to NVTA. Also in 2007, the General Assembly formed the Hampton Roads Transportation Authority (HRTA) and granted it similar funding powers.

The authority granted to a Richmond Transportation Authority may have a similar structure and authorities as NVTA and HRTA. The table below shows the members and voting privileges in both the NVTA and HRTA.

Member (# of members)	NVTA	HRTA
Chief Elected Officer of each locality (NVTA: 9; HRTA: 12)	Vote	Vote
Senate (1)	Vote	No Vote
House of Delegates (2)	Vote	No Vote
Gubernatorial Appointee – CTB Member (1)	Vote	Vote
Director of VDRPT (1)	No Vote	No Vote
Commonwealth Transportation Commissioner (1)	No Vote	No Vote
Gubernatorial Appointee (1)	Vote	n/a

Specific authorities that have been granted to NVTA and HRTA include:

- General oversight of regional programs involving mass transit or congestion mitigation, including, but not necessarily limited to, carpooling, vanpooling, and ridesharing (§ 15.2-4840)
- Long-range regional planning (§ 15.2-4840)
- Allocating to priority regional transportation projects any funds made available to the Authority and, at the discretion of the Authority, directly overseeing such projects (§ 15.2-4840)

- Recommending to the Commonwealth Transportation Board priority regional transportation projects for receipt of federal and state funds (§ 15.2-4840)
- Acquiring or constructing railroads, rolling stock, and transit and rail facilities (§ 33.1-391.10)
- Contracting with public or private entities to operate and maintain transit and rail facilities (§ 33.1-391.10)
- Acquiring property through eminent domain (§ 15.2-4518)
- Impose taxes and fees, issue bonds, and impose, collect, and set the amount of tolls (§ 15.2)

The advantage of a transportation authority is that it can provide the power to both conduct long-term planning and to fund program implementation. However, forming a transportation authority requires action by the Virginia General Assembly, which may be difficult politically.

2.7.B INSTITUTIONAL OPTIONS FOR TRANSIT OPERATIONS

In addition to the institutional arrangements for managing, planning, and monitoring transit service for the Richmond region, there are also several institutional options for operating transit service. The management, planning and monitoring agency could contract out the operation of the transit service to another entity. Potential service providers include a public corporation (as GRTC is currently operated), government entities (City of Richmond, other local governments or a department), a transit authority, or a private contractor. This section describes each institution and identifies their advantages and disadvantages. See Table 2-36 for a summary of advantages and disadvantages by institutional arrangement.

PUBLIC CORPORATION

One potential transit operator is a public corporation, which is the current operating structure at GRTC. As with transit authorities, the main benefit is that transit appropriate management, organization, and pay scale structures can be developed and that government entities are not responsible for operating the service. The disadvantages are that establishing a public corporation to operate transit would require hiring a full support staff and staff members are not government employees.

CITY OF RICHMOND OR OTHER LOCAL GOVERNMENT

A government entity such as the City of Richmond or another local government could operate transit service in the Richmond region. The advantages of this arrangement are that a management structure and support services, such as purchasing and billing, are already in place. In addition, the jurisdiction which operates the transit service may benefit from favorable treatment. There are also several disadvantages. For example, pay scales and position descriptions of the government entity may not reflect transit service. In addition, transit service would need to compete with other local needs for staff and funding.

TRANSIT AUTHORITY

A third potential transit operator is a transit authority. The main benefit is that transit appropriate management, organization, and pay scale structures can be developed. However, establishing a transit authority would require hiring a full support staff. In addition, a transit authority would probably need to hire a vendor to operate transit service.

PRIVATE CONTRACTOR

A private vendor could potentially be contracted to operate transit service in the Richmond region. In Virginia, both Fairfax Connector and Loudoun Transit are operated by contractors. Contractors can draw on greater transit management and staff resources than public service providers. This arrangement also allows government entities to remain outside of the transit operations business. However, the cost of hiring a private contractor may be greater and there might be disruption to service if a contractor is changed.

Table 2-36: Transit Institutional Options for Operations

Topic	Pros	Cons
Public Corporation	Appropriate management, organization and pay scales can be developed. Government entities are not responsible for operations.	Full support staff required (or by contract with local government. Staff not government employees.
City of Richmond, Other Local Government	Management structure and support services (e.g. purchasing) in place. Jurisdiction in which transit is housed may get favorable treatment.	Pay scales and position descriptions may not fit transit operation. Transit must compete with other local needs for staff and funding.
Transit Authority	Appropriate management, organization and pay scales can be developed.	Full support staff required (or by contract with local government). Staff members are government employees.
Private Contractor(s)	Can draw on greater transit management staff resources. Government entities are not responsible for operations.	Disruption if contractor is changed. Cost may be higher.

2.7.C INSTITUTIONAL OPTIONS FOR NON-FAREBOX FUNDING

Virginia state statutes grant specific powers to each organizational unit. This section describes these powers and identifies their advantages and disadvantages. See Table 2-37: for a summary of advantages and disadvantages by institutional arrangement.

Table 2-37: Transit Institutional Options for Non-Farebox Funding

Topic	Pros	Cons
Special Tax in Participating Jurisdictions	Guaranteed source. Probable revenues can be projected. Permits better planning of system expenditures. Depending on source, some revenue may come from non-residents.	May require legislation
Formula-Based Annual Contributions from Participating Jurisdictions	Each jurisdiction can decide how much service it wants to purchase each year.	Longer term planning is difficult. Formula may be complex.
Service District (property tax)		No authority to level a gasoline tax.
Transportation Commission (gasoline tax)	Steady source of funds. Non-residents contribute.	Requires Transportation Commission.
Transportation Authority (fees, taxes, bonds)	Steady source of funds. Non-residents contribute.	Requires Transportation Authority.

SPECIAL TAXES IN PARTICIPATING JURISDICTIONS

One potential option for funding transit service is levying a special tax in those jurisdictions that receive transit service. While this would require legislation from the Virginia General Assembly, there are several benefits. First, it is a guaranteed source of funding that can be projected. This enables planners to develop more realistic service plans. Second, depending on the tax, non-residents may contribute a portion of the costs of the service. These types of taxes can include gasoline taxes, parking taxes, tolls, or transient occupancy taxes.

FORMULA-BASED ANNUAL CONTRIBUTIONS FROM PARTICIPATING JURISDICTIONS

Formula-based funding arrangements are often varied based on the service miles and hours and the nature of travel in each jurisdiction. The advantage of this arrangement is that jurisdictions can decide how much service they want to purchase each year. However, this makes it difficult to conduct long-term planning, since revenues can vary significantly from year to year. In addition, formulas can be complex.

SERVICE DISTRICT

Service districts have the authority to levy property taxes. Unlike Transportation Commissions, they do not have the authority to levy a two percent sales tax.

TRANSPORTATION COMMISSION

Virginia state statutes grant Transportation Commissions the authority to levy a 2% gasoline tax. These funds are a steady source of revenue provided by both residents and non-residents. However, forming a Transportation Commission would require state legislation.

TRANSPORTATION AUTHORITY

Virginia has formed two Transportation Authorities with the power to levy taxes and fees, and issue bonds. These funds are a steady source of revenue, significantly greater than the revenue that Transportation Commissions can raise. In addition, both residents and non-residents contribute to these funds. However, forming a Transportation Authority would require General Assembly action.

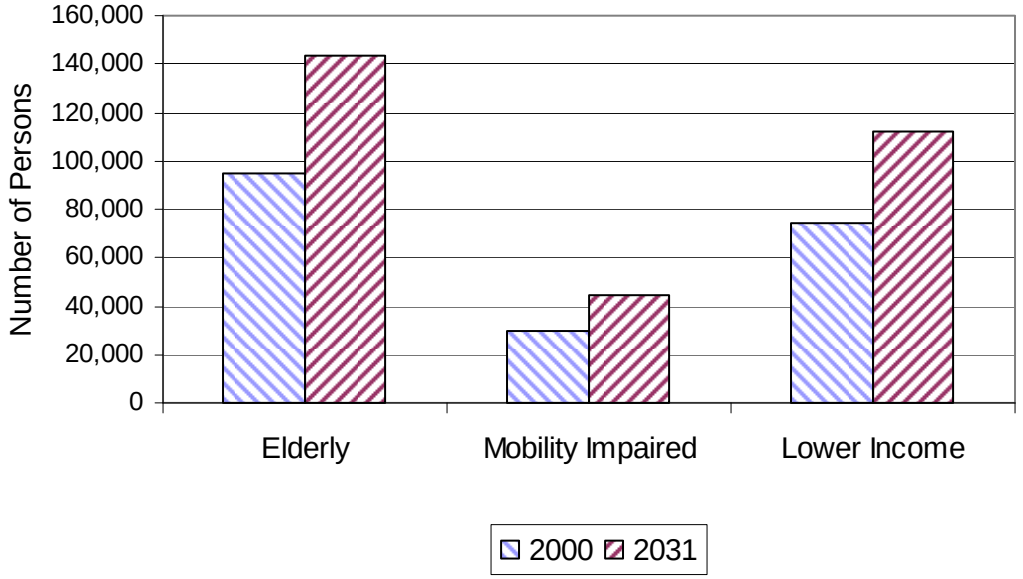
TRANSIT NEEDS FOR THE TRANSPORTATION DISADVANTAGED

2.8.A POTENTIAL DAILY TRIPS BY TRANSPORTATION DISADVANTAGED POPULATION

Mobility is fundamental to economic well-being and public health. It provides access to basic necessities, such as groceries and health care, and permits greater employment and recreational opportunities. However, mobility is a challenge for a growing number of Richmond area residents, including elderly persons, persons with mobility limitations, or persons living below the poverty level. Elderly residents, especially those over 65, tend to require greater transportation assistance because they have difficultly driving automobiles but require transportation to medical appointments, grocery stores, and social activities. Mobility limited persons are also potential candidates for public transportation because they have health conditions that limit their ability to travel. Mobility limited persons are defined as those people that have a "go-outside-the-home" disability on the US Census long form, as opposed to those persons with disabilities that are confined to their homes. Transit allows mobility limited persons to lead normal lifestyles. The relationship between wealth and transportation need is inverse; persons with lower incomes are more likely to use public transportation, often because they do not have access to automobile. Public transportation is vital for persons living below the poverty level to access jobs and job training sites.

Figure 2-4 shows the actual number of transportation disadvantaged persons in the Richmond region from the 2000 Census and the projected number of transportation disadvantaged persons in 2031. In 2000, there were over 95,000 elderly persons (age 65 and over). This population group is projected to increase to nearly 144,000 persons in 2031. The mobility limited population is projected to increase from nearly 30,000 persons in 2000 to approximately 45,000 persons in 2031. In addition, the number of persons living in poverty as defined by the Census is projected to increase from 74,000 in 2000 to 112,000 in 2031.

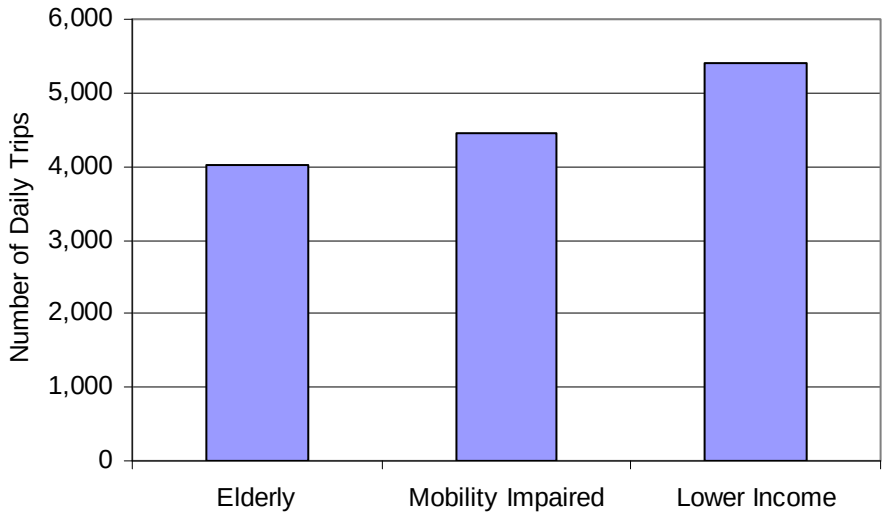
Figure 2-4: Projected Population of Transportation Disadvantaged (2000 and 2031)



Applying an average trip rate per person for each transportation disadvantaged group yields potential daily trips needed per group in 2031 (Figure 2-5). At an average of 8.4 annual trips per

capita, the elderly potentially need over 4,000 trips per day. The mobility limited population tends to need an average of 30 annual trips per capita, resulting in nearly 4,500 daily trips. In addition, persons living in poverty require an average of 14.5 annual trips per person, resulting in a need of nearly 5,500 daily trips. Overall, there is a need for nearly 14,000 daily trips.

Figure 2-5: 2031 Potential Daily Trips by Transportation Disadvantaged Persons



2.9 TRANSIT SUPPORTIVE LAND USES

2.9.A FTA STANDARDS FOR RATING TRANSIT SUPPORTIVE LAND USE

The Federal Transit Administration utilizes a transit-supportive land use review process for projects seeking New Starts funding through a tiered approach and is described in the *Guidelines and Standards for Assessing Transit-Supportive Land Use*. Three overall categories are evaluated: existing land use, transit-supportive plans and policies, and performance and impacts of policies. Each category is rated based on one or more applicable factors representing specific aspects of the land use categories. A total of seven factors are rated to evaluate the three categories. The possible ratings for the categories and factors are low, low-medium, medium, medium-high, and high. Each factor has several supporting factors which provide a basis for rating, with a total of 20 supporting factors taken into consideration. The quantitative benchmarks used to analyze the supporting factors are shown in the *Guidelines and Standards* document.

EXISTING LAND USE

The Existing Land Use category is influenced by four supporting factors:

- Existing Corridor and Station Area Development
- Existing Station Area Development Character
- Existing Station Area Pedestrian Facilities
- Existing Corridor and Station Area Parking Supply

These four supporting factors are used to compute a rating for the Existing Land Use factor and category.

Existing Corridor and Station Area Development is intended to measure the quantity of existing development in the station areas and along the transit corridor. The total employment in the CBD, as well as the population, employment, and the number of households within a half-mile radius of the station areas are examined. Higher population, employees, and population density result in a higher rating. "Major trip generators" (sports venues, colleges, etc.) which generate 5 to 10 thousand non-employee trips per day and have a significant potential to generate transit trips are also given consideration.

Existing Station Area Development Character examines the extent to which the character of existing development within a half-mile of the transit stations facilitates transit use. The presence of human scale development, short setbacks, building entrances oriented toward the street, sidewalks, streetscaping, and other pedestrian amenities are attributes of an area which would receive higher ratings. Continuous development without large breaks for parking lots or vacant land, as well as a mix of land uses, are also counted favorably.

Existing Station Area Pedestrian Facilities, including Access for Persons with Disabilities, examines specific aspects of the pedestrian network. Higher ratings are given to areas with direct, rather than circuitous, pedestrian access. Continuous sidewalks, marked pedestrian crossings, and the presence of signalized crossings where necessary will also lead to higher ratings. Compliance with the Americans with Disabilities Act through the provision of curb cuts, wheelchair ramps, and other accessible pedestrian features is necessary to achieve the highest ratings.

The last supporting factor for this category is the Existing Corridor and Station Area Parking Supply. To the extent that information is available, parking data showing the number of spaces per employee in areas where it is provided, and the typical cost per day for a parking space in the CBD core are examined. Lower space per employee ratios and higher CBD daily parking prices result in higher ratings for this factor.

TRANSIT SUPPORTIVE PLANS AND POLICIES

Four factors are used to rate the transit supportive plans and policies category:

- Growth Management
- Transit-Supportive Corridor Policies
- Supportive Zoning Regulations near Transit Stations
- Tools to Implement Land Use Policies

The category rating is based on the average of the ratings of the four factors.

Growth Management is evaluated based on two supporting factors. The first one is concentration of development around established activity centers and regional transit. This supporting factor examines how regional policies and agreements have been developed to concentrate development at transit supportive densities, and that local comprehensive plans, capital improvement plans, and zoning codes have been updated to support these policies. State or regional policies, comprehensive plans adopted in major jurisdictions in the region, and evidence of successful implementation of these policies will be viewed favorably when this supporting factor is analyzed. The second supporting factor is land conservation and management, which examines the extent to which local comprehensive plans, zoning rules, and regional and state policies limit the development of certain areas. These land conservation rules can take many forms, including transfer of development rights, growth management boundaries, and other incentives or mandates for conservation.

The Transit-Supportive Corridor Policies factor is similar to the existing land use factor in that the same supporting factors are used to rate them. This factor examines the planning process to ensure that future development incorporates the desired transit-supportive features. Conceptual plans, local plans, and capital improvement programs are all likely steps in this land planning process. Four supporting factors are used to evaluate this factor. The first one, plans and policies to increase corridor and station area development, examines the extent to which conceptual plans and local plans encourage development at transit-supportive densities near the proposed transit stations. This supporting factor is analyzed quantitatively using benchmarks for commercial floor area ratios and the number of residential dwelling units. Plans and policies to enhance transit-friendly character of the corridor and station area development is the next supporting factor, which examines plans to ensure the pedestrian-friendly nature of future development in the station areas. Mixed land uses, pedestrian-friendly building designs, and other pedestrian oriented development characteristics will result in higher ratings. The existence of plans to improve pedestrian facilities, including facilities for persons with disabilities, is the third supporting factor. This one examines plans for elements which improve pedestrian circulation in the station areas, such as interconnected sidewalks, new sidewalks, street crossings, and accessible pedestrian features. Parking policies is the last supporting factor. Requirements which restrict the availability of parking for single-occupant vehicles, such as parking limits, parking cash-out programs, provisions for shared parking, and parking fees, are elements which result in higher ratings.

The third factor used to evaluate the Transit Supportive Plans and Policies category is supportive zoning regulations near transit stations. Zoning regulations should allow high density, pedestrian friendly development in the station areas. If zoning ordinances currently do not allow such development, aggressive efforts to change the zoning regulations may result in a more favorable rating. Three supporting factors are evaluated:

- Zoning ordinances that support increased development density in transit station areas, a lack of zoning ordinances that prohibit transit oriented development, and incentives for increased density in station areas
- Zoning ordinances that enhance the transit-oriented character of station area development and pedestrian access. Ordinances are examined to ensure they allow or require transit-oriented development features, such as:
    - mixed uses
    - traditional compact neighborhoods
    - placement of buildings to encourage a pedestrian-friendly environment
- Zoning allowances for reduced parking and traffic mitigation, such as reductions in minimum and maximum parking requirements.

The last factor that is considered for this category is Tools to Implement Land Use Policies. This factor assesses the availability and effectiveness of tools for transit agencies and local jurisdictions to implement transit-supportive development. The first supporting factor focuses on outreach to groups that affect comprehensive planning, zoning, and other public sector policies that set the framework for development. The outreach programs can educate people and local governments about transit-supportive land use and increase the probability that these groups will support the necessary changes to comprehensive plans and zoning regulations. The strength and quantity of these outreach efforts will affect the rating for this factor. Regulatory and financial incentives to promote transit supportive development are the next supporting factors. These incentives can come in the form of density bonuses, streamlined processing of development applications, reduced or waived traffic impact fees, and financial programs to encourage development. An array of effective incentives leads to a higher rating. The last supporting factor is efforts to engage the development community in station area planning and transit-supportive development. Educating developers, property owners, and financial institutions about development opportunities in the station areas and forming a strong joint development program will lead to a higher rating.

PERFORMANCE AND IMPACTS OF POLICIES

Two factors are used to rate the Performance and Impacts of Policies category: Performance of Land Use Policies, and Potential Impact of Transit Investment on Regional Transit Use. The category rating is based on a weighted average of the ratings of the factors, with two-thirds of the weight on the former and the remaining third on the latter.

The Performance of Land Use Policies factor is based on two supporting factors: demonstrated cases of development affected by policies, and station area development proposals. The first documents specific cases where new urbanist, urban infill, or other high-density pedestrian-friendly development has occurred in the region. This development can occur along a transit line or prior to the introduction of transit service in the area. The development need not occur near a transit line to demonstrate the area's commitment towards transit-friendly development principles. The second supporting factor is station area development

proposals and their status. This supporting factor examines the type of development that occurs near the stations. During early stages of a transit project, development proposals for transit-oriented developments near the stations will warrant a higher rating. As the transit project advances, evidence of the development projects advancing must be provided in order to maintain the higher rating.

The second factor is Potential Impact of Transit Investment on Regional Land Use, which addresses the potential impact of the proposed transit project on regional growth and development patterns. It is influenced by two supporting factors. The Adaptability of Station Area Land for Development addresses the amount of land near transit stations that is vacant or available for redevelopment. A transit project serving a large amount of vacant land or high density land uses would receive a higher rating than a project serving an area built-out with low density uses. The second supporting factor is Corridor Economic Environment, which considers the extent to which the real estate market will support transit-oriented development. Assuming the appropriate zoning and other regulatory policies are in place, this factor examines the population and employment trends, as well as the growth rates in the region. If there is great potential for regional growth and therefore market support for new development, this supporting factor will receive a higher rating.

Lastly, other land use considerations may be taken into account when rating the overall transit-supportive land use for the project. This can include any unidentified or unusual circumstances, conditions, or constraints which could influence local or regional development patterns. Examples include unique topography, central city development, intermodal connections, historic preservation, etc. These other considerations are not given their own ratings, but are used to adjust the ratings of other categories or factors when necessary.

2.9.B RELATIONSHIP BETWEEN LAND DEVELOPMENT PATTERNS, DENSITY, AND TRANSIT USE

The FTA standards for rating transit supportive land uses emphasize the importance of development patterns and density in the rating process, as dense, transit-friendly development will lead to greater utilization of transit.

Traditional suburban areas are often transit-unfriendly, as they are often designed assuming that the automobile will be the primary mode of transportation into and within the developments. A careful balance between the various modes of transportation can encourage alternative modes of travel. Transit has to be comfortable, convenient, cost-effective, fast, direct, and reliable in order to attract choice riders away from their automobiles. Unfortunately, it is very difficult to retrofit public transit service with these characteristics into neighborhoods that were not designed to accommodate it, meaning coordinated efforts between transit service providers, communities, businesses, and developers are necessary to find effective solutions and improve mobility. Such coordination can result in transit-friendly site designs for buildings, roadways, walkways, and waiting areas.

The major factors which set the stage for commuting behavior are:

- Site layouts
- Development density
- Mix of uses
- Parking provisions

- Ease of walking at either trip end
- Ability to access retail and other services during the day without an auto at the worksite

Development site layouts should accommodate some type of transit service within the development wherever possible. Collector streets running through a development should allow transit vehicles to travel between developments with minimal backtracking, as this increases the efficiency of the transit routes. Bus turnouts, berths, and turnarounds are necessary elements of transit-friendly street networks which allow buses to serve the public with minimum interference to vehicular traffic. Stronger pavement designs should be used for roadways which will carry transit traffic, and lane widths and turning radii should be adequate for buses passing one another. Transit stop placement is often dictated by the density of the development surrounding it, with high-density areas having the most frequent stops. However, some forms of traffic calming should be used where necessary to slow traffic enough where pedestrians feel comfortable walking through the neighborhood.

Additional facilities should be provided to allow persons to access the transit stops. In higher-density areas, pedestrian and bike facilities should be used to connect activity centers to each other and to transit stops. These facilities should be direct and perceived as safe by users. Connections between subdivisions and between cul-de-sacs should be provided to increase bicycle and pedestrian access, therefore increasing the area from which transit riders can conveniently walk to a stop. In low-density areas, park-and-ride lots and bike-and-ride facilities should be provided to collect people from a larger area. Clustered retail establishments with shared parking can provide easier access to transit stops, reduce the amount of parking required at the site, and reduce the number of vehicle trips on the surrounding roadway network. Major activity centers can receive additional transit service if they are used as transfer points between routes.

Suburban congestion is often a result of transportation demand being concentrated on a few corridors, and the scattered pattern of activity centers and trip generators. The document *Guidelines for Transit-Sensitive Suburban Land Use Design* (US DOT, 1991) cites four steps that can be taken to overcome some of these issues and steer development towards transit-friendly development: market orientation, changing land use patterns towards ones with concentrated trip ends, providing a quality access system to transit routes, and developing transit-oriented streets. Concentrated development can occur around nodes or along corridors. Development along transit corridors is easier to serve with transit routes as the routes can operate with few turns or deviations from the straightest path.

Such ways to increase development include redevelopment at a higher than existing density, or constructing mixed use developments. Density can be increased by allowing (or requiring) smaller lots, allowing houses to be constructed against a property line on one side, allowing accessory houses or duplexes, or allowing for the transfer of density rights from properties farther from the transit stations. Mixed uses can either be in the same building, or within reasonable walking distances of the other land uses. Mixing uses in the same building is generally accepted in larger cities, but is not in smaller cities and suburban areas. Mixed use development can range from large commercial centers, which provide multiple living, shopping, entertainment, employment, civic, and cultural activities, to smaller neighborhood retail areas providing basic services to the neighboring residents. The goal is to integrate, as opposed to separating, daily activities from one another. Dense developments will encourage more transit use, as the transit stop will serve a larger number of people, and therefore more frequent service can be provided.

Some of the land use guidelines outlined in the document are summarized below.

- Administration and Policy Guidelines
    - Transit should be included as an element of land development in state and local policies
    - Transit Corridor Districts should be formed to encourage transit-sensitive land use designs
    - Transit-sensitive design checklists and reviews of site plans should be provided for developers
    - Parking requirements should reflect the availability of transit services
    - Transportation Management Associations could be established to oversee the integration of transit and land use planning along corridors
    - Provide a mechanism for transfer of development rights for other areas surrounding transit corridors
- System Planning Guidelines
    - Designate future transit corridors
    - Separate transit and auto-oriented developments
    - Establish Transit Service Zones along existing arterials
    - Explore public/private opportunities for joint development at transit stops
    - Provide adequate population size and density to support transit
    - Design for a phased implementation of transit corridors
    - Control or restrict through automobile traffic on transit corridors
    - Give priority to bikes, pedestrians, and transit vehicles on corridors
    - Avoid the need for feeder shuttle services where possible
    - Provide high quality transit service
    - Use quiet transit vehicles with low air pollution levels
    - Use well designed stops and signage

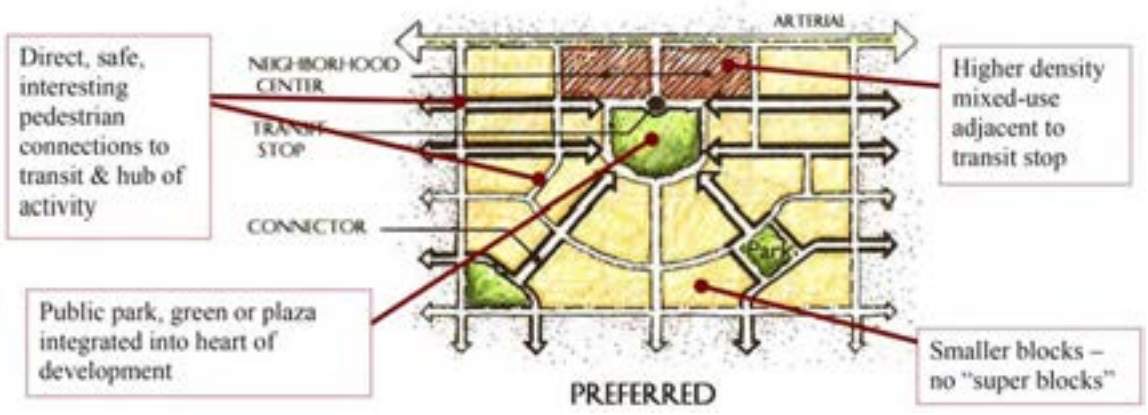
- District Level Guidelines
    - Provide mixed land uses including housing, office, retail, light industrial, and recreational uses
    - Use density gradients (density gradually decreases as one moves further from transit stops)
    - Provide recreational uses and amenities
    - Accommodate multiple developers and development patterns
    - Relate the design and connections of adjacent developments across seams
    - Encourage shared parking facilities
    - Minimize distances between transit stops and building entrances

- Provide logical connections between buildings and transit
- Locate buildings with sensitivity to transit-generated noise and views
- Provide bike and pedestrian pathways to promote safe and convenient circulation
- Promote bike access through high quality pathways and secure storage systems
- Provide for feeder busses and park and ride lots where necessary
- Design roadways to accommodate transit vehicles
- Provide sufficient ADA access
- Provide for the safety and comfort of transit passengers
- Provide regular maintenance at transit stops

The US Department of Transportation and many transit agencies across the county have developed and promulgated guidance on how to structure projects that will be supportive of transit operations. Suggested references include:

- Beimborn et al, *Guidelines for Transit Sensitive Suburban Land Use Design*, Urban Mass Transportation Administration, DOT-T-91-13, Washington DC, July 1991
- *Central Florida Mobility Design Manual*, Central Florida Regional Transportation Authority, Orlando FL, 1995
- *Planning and Development Guidelines for Public Transit*, Central Ohio Transit Authority, Columbus OH, February 1999
- *Maryland Transit Guidelines*, Maryland Transit Administration, Baltimore MD, 2001

Figure 2-6: Example Graphical Transit-Oriented Development Guidelines[67]



[67] *Transit-Oriented Development Guidebook*, City of Austin Neighborhood Planning and Zoning Department, November 2006

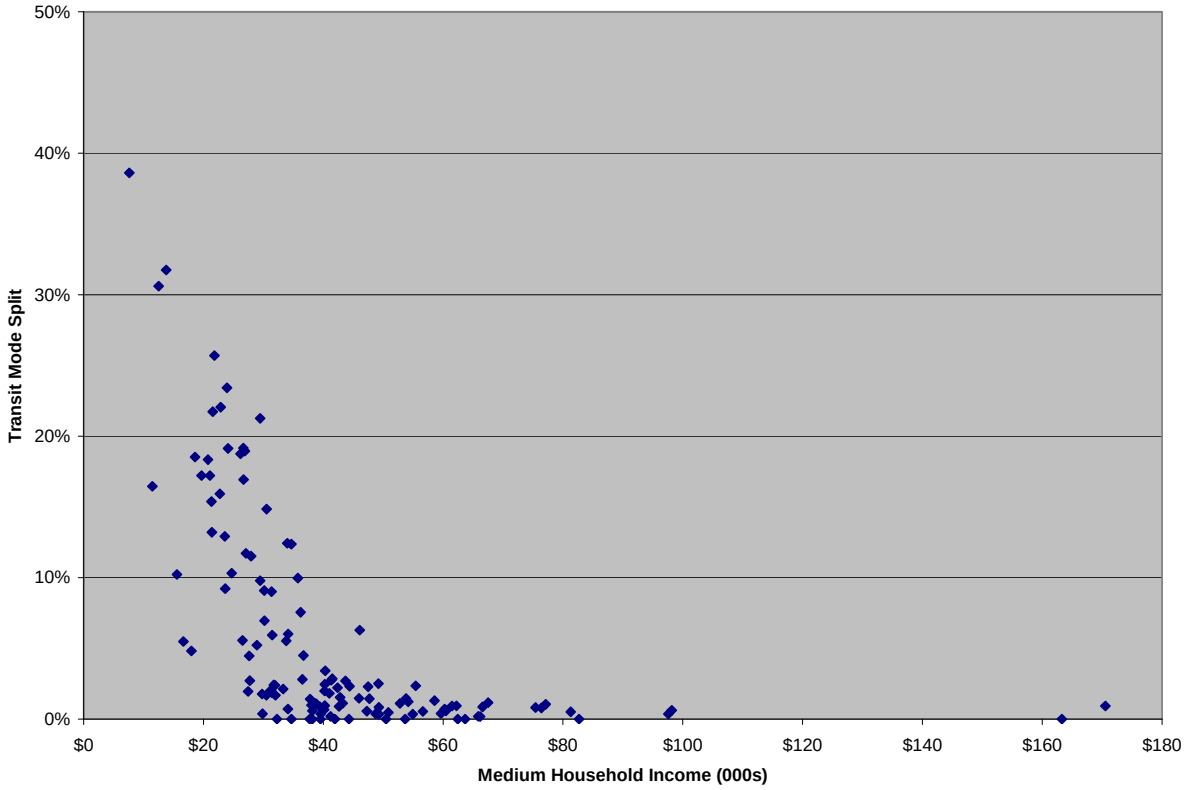

Isolated Development
Sidewalks do not Connect to Buildings
Oversized Parking Lots Separate Commercial Buildings from Streets
Pedestrian Discouraged from Walking to Adjacent Buildings
Not This
Buildings too far from street, resulting in long walks through parking areas.


A "clustered" environment
New Development Continues to Build to Street
Density and Location of Buildings Support Public Transit
Parking located behind buildings
This
Orienting buildings along the street helps establish a "park once" environment where people are encouraged to walk between buildings.

2.9.C RELATIONSHIP BETWEEN TRANSIT USE, INCOME, AND POPULATION DENSITY IN THE RICHMOND REGION

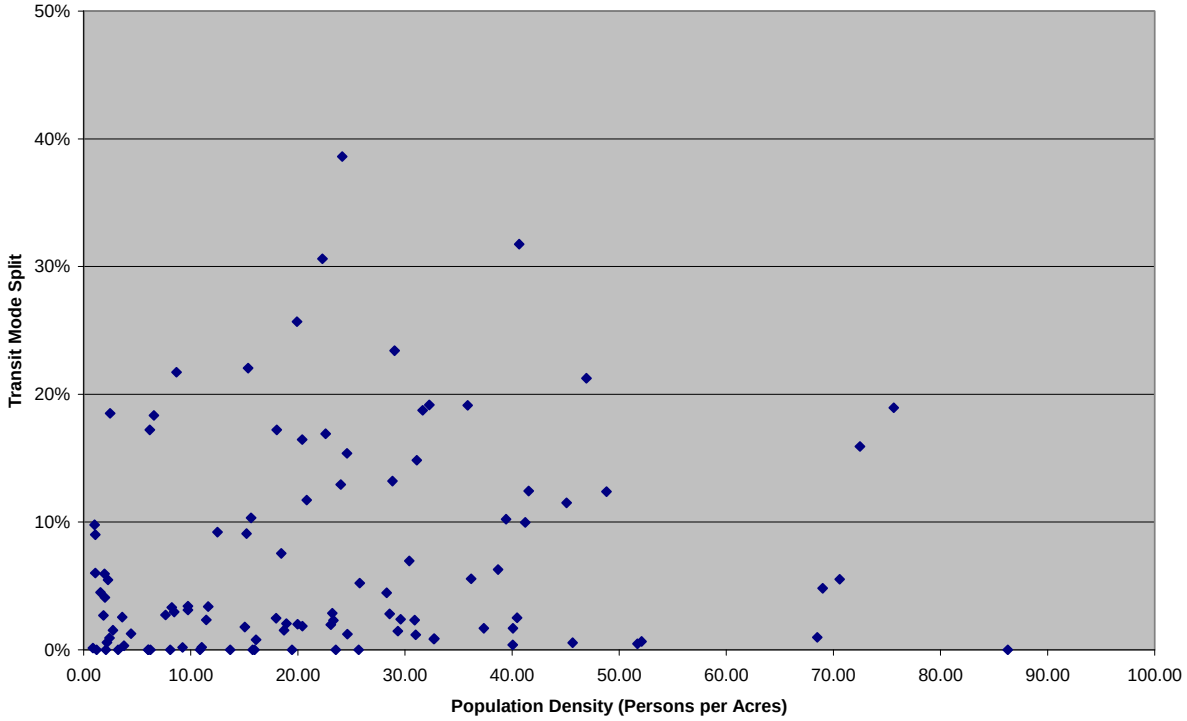
United States Census data was examined to determine the relationship between transit ridership and income, as well as transit ridership and population density in Richmond and Henrico County. The Census provides mode share data for commute trips. A scatter plot of the data shows a negative relationship between income and transit usage (Figure 2-7), meaning as people become wealthier they are less likely to use public transit to commute. The plot detailing the relationship between transit usage and population density shows no clear relationship between the two variables (Figure 2-8). This may be indicative of a transit system serving mostly non-choice riders who utilize transit to commute because they cannot afford other means of transportation.

Figure 2-7: Commuting Travel Transit Mode Share and Median Household Income in Richmond and Henrico County



Source: 2000 Census

Figure 2-8: Commuting Travel Transit Mode Share and Population Density for Census Tracts with a Bus Stop



Source: 2000 Census

Chapter 3:
Peer Review

3.1 INTRODUCTION

This section reviews transit services provided in metropolitan areas of similar size (land area), population and demographics as Richmond. The report summarizes data relating to demographics, transit operations, transit ridership, and transit funding as well as insights gained through interviews with staff from transit agencies and Metropolitan Planning Organizations (MPO) found in the peer regions. The review begins with a comparison of demographics between the peer metropolitan areas. Included in this analysis are socioeconomic indicators, commuting characteristics, and regional congestion. Then transit services provided in each of the peer regions are reviewed. Service provision, ridership, institutional arrangements, funding, and insights on successes and challenges are reviewed. The report then describes long range transit plans found in each of the regions and ends with some final conclusions.

3.2 DEMOGRAPHIC COMPARISON OF REGIONS

Peer regions were selected by comparing populations and land areas as reported in the 2000 Census for Metropolitan Statistical Areas (MSAs) in the eastern United States.1 Regions known to be planning and/or constructing new transit modes that could serve as a model for Richmond were also considered. From this initial review, the following three MSAs were selected for the peer study:

- Albany, Schenectady, and Troy New York MSA
- Charlotte, Gastonia, Rock Hill North Carolina/South Carolina MSA
- Memphis Tennessee/Arkansas/Mississippi MSA

This chapter reviews demographic conditions found in each of the peer regions and provides comparisons to Richmond. Socioeconomic characteristics, regional congestion, and journey to work characteristics are summarized.

3.2.A SOCIOECONOMIC CHARACTERISTICS

Figure 3-1 provides a comparison of these regions to the Richmond MSA. The Richmond MSA includes nine counties and the independent cities of Colonial Heights, Hopewell, Petersburg, and Richmond. Both the Albany and Memphis MSAs are comprised of five counties each. The Charlotte MSA is comprised of seven counties. Among the peer regions, the Richmond MSA is most similar in size and population to the Memphis MSA with Memphis being larger in both measures.

[1] In this review, 2000 Census MSA boundaries are used. MSA boundaries have changed since the 2000 Census for the regions included in this review. The Richmond MSA, for instance, has added seven additional counties. The 2000 Census MSA boundaries are used in order to remain consistent with journey to work and socioeconomic data taken from the 2000 Census.

Figure 3-1: Peer Metropolitan Statistical Areas

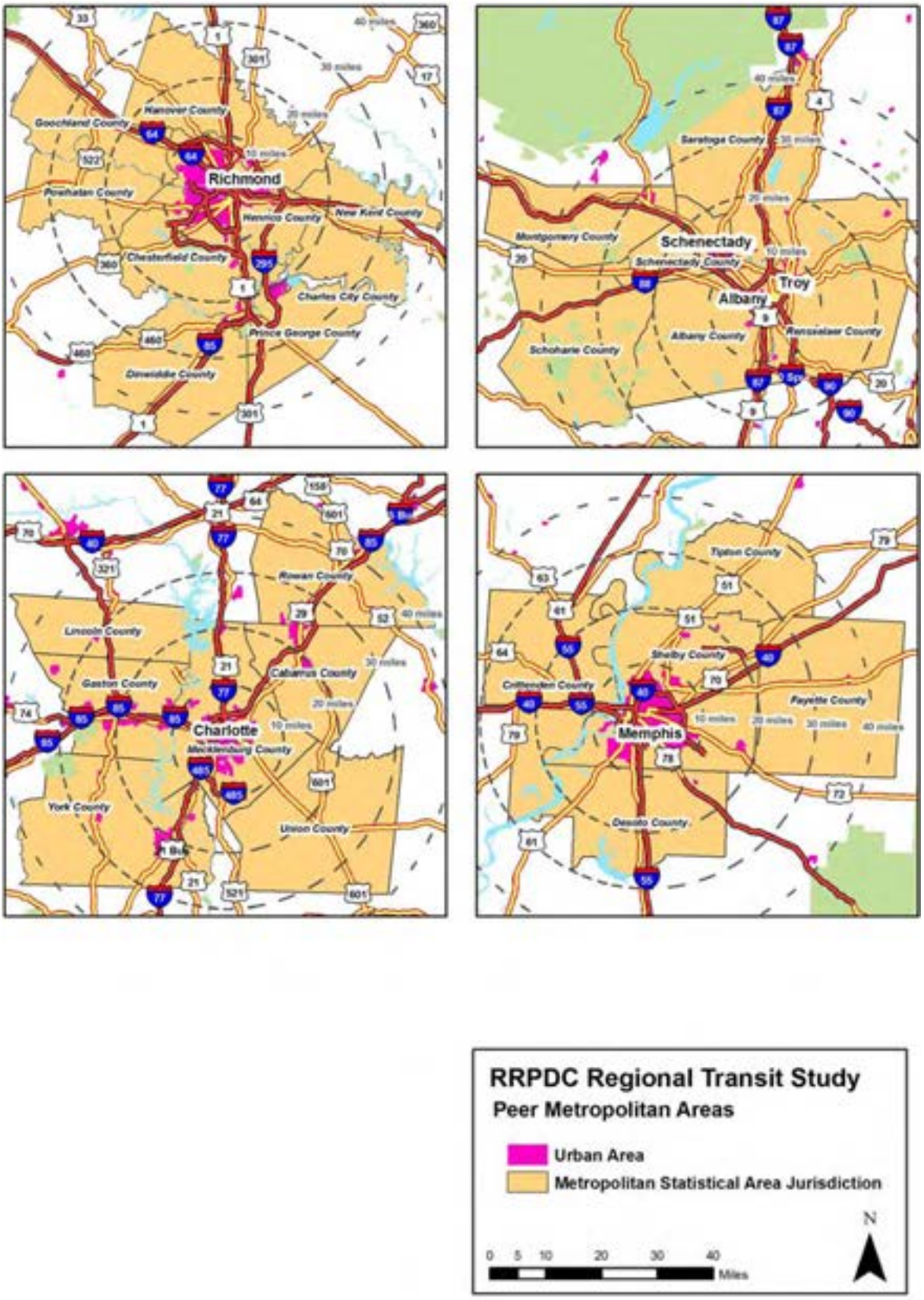


Table 3-1 lists several socio-economic characteristics of the peer regions from the 2000 Census. Among the peer MSAs, Charlotte is most similar to Richmond in terms of the selected socio-economic measures of poverty, median income, and age. Charlotte has a slightly lower median household income and slightly higher share of the population under the poverty level compared to Richmond. Charlotte has a slightly higher share of the population age 16 and under and a modestly lower share of the population age 65 and over. Memphis is the most dissimilar from the Richmond MSA among the peer regions, especially in terms of poverty and household income.

Table 3-1: Socioeconomic Characteristics of Peer MSA's

2000 Census Metropolitan Statistical Area	% below poverty level	Median household income in 1999	% of Population Age 16 and Under	% of Population Age 65 and Over	2000 Total Population	Land Area (sq. miles)	Population Density (persons per sq. mile)
Richmond--Petersburg, VA MSA	9%	$46,800	24%	11%	996,512	2,944	338
Albany--Schenectady--Troy, NY MSA	9%	$43,250	22%	14%	875,583	3,222	272
Charlotte-Gastonia-Rock Hill, NC-SC MSA	9%	$46,119	24%	10%	1,499,293	3,377	444
Memphis, TN--AR--MS MSA	15%	$40,201	27%	10%	1,135,614	3,006	378

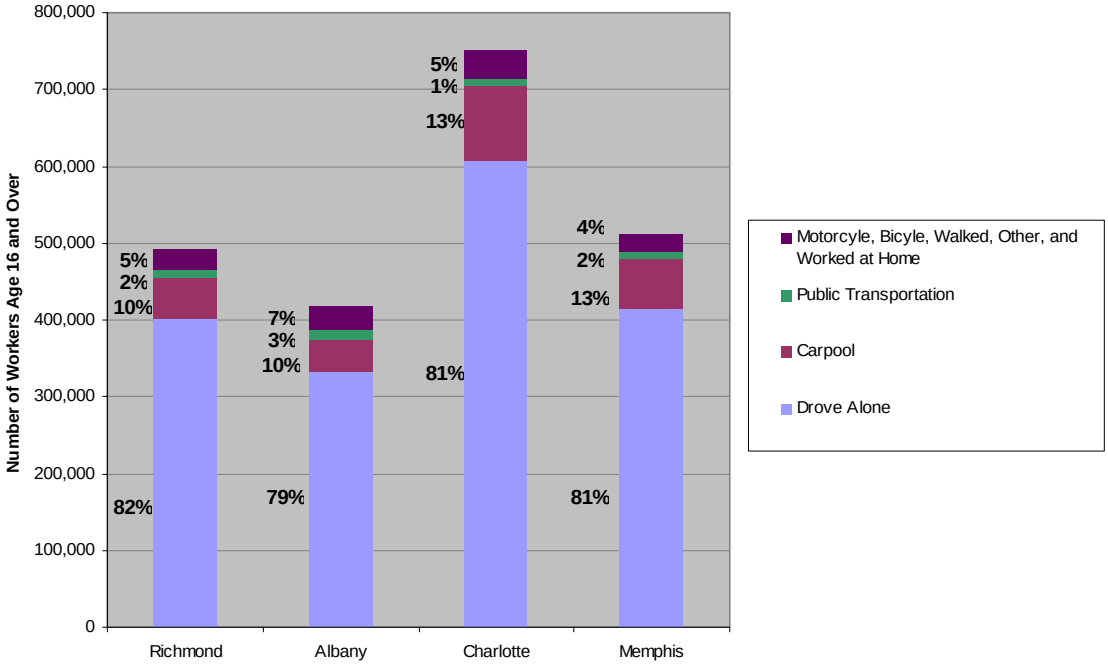
3.2.B COMMUTING CHARACTERISTICS AND REGIONAL CONGESTION

Figure 3-2 illustrates commuting characteristics among the peer MSA's. The peer regions have similar mode shares with single occupant vehicles the predominant mode for workers commuting to work. The share of workers using public transportation to reach work is also approximately the same among the peer regions, making up between 1% and 3% of workers.

Regional congestion data for each peer region can be found in the Urban Mobility Reports published regularly by the Texas Transportation Institute (TTI). The latest publication of this report (in 2007) provides congestion data for urban areas across the country for the years 1982 through 2005. The following figures highlight different aspects of regional congestion for Richmond and the three peer cities. In general, the figures illustrate the same conclusions about congestion in Richmond relative to the peer regions. Congestion in Richmond is most similar to Albany and Memphis with congestion in Charlotte being significantly worse.

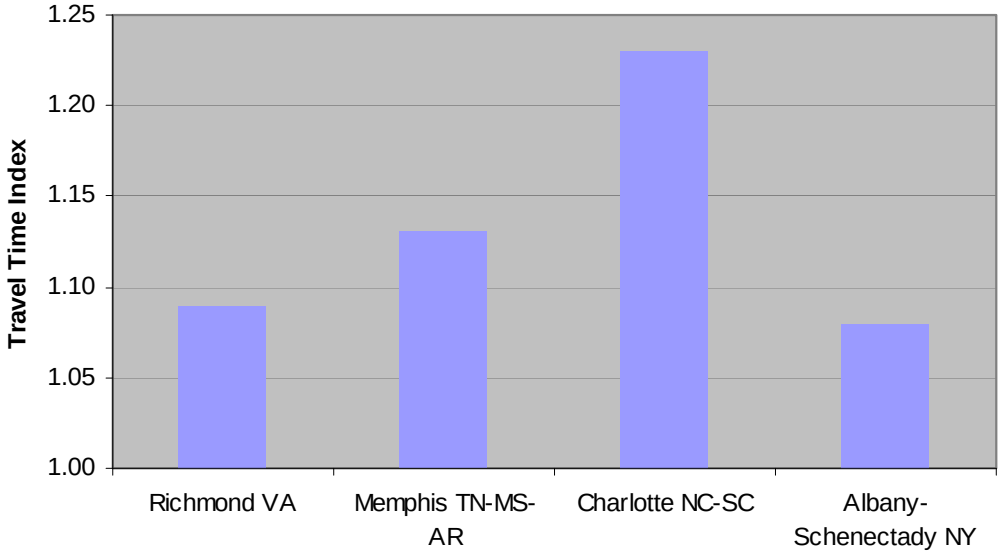
One measure of regional congestion developed by TTI is the travel time index. The index is a measure of the extra time needed to make a trip during peak periods as opposed to free-flow conditions. An index value of 1.10, for instance, means that the travel time for a trip during peak periods would be 10% longer than the travel time for the same trip during off-peak periods. The greater the index value is from one, the greater the difference in travel times between peak and off-peak periods. Figure 3-3 compares travel time index values for each peer region for the year 2005. For Richmond, the travel time index for 2005 is 1.09, meaning that trips during the peak period take 9% more time than the same trips during off-peak periods. Both Memphis and Albany have index values similar to Richmond. Charlotte experiences much greater differences in travel times between peak and off-peak periods.

Figure 3-2: Transportation Mode to Work



Source: 2000 Census

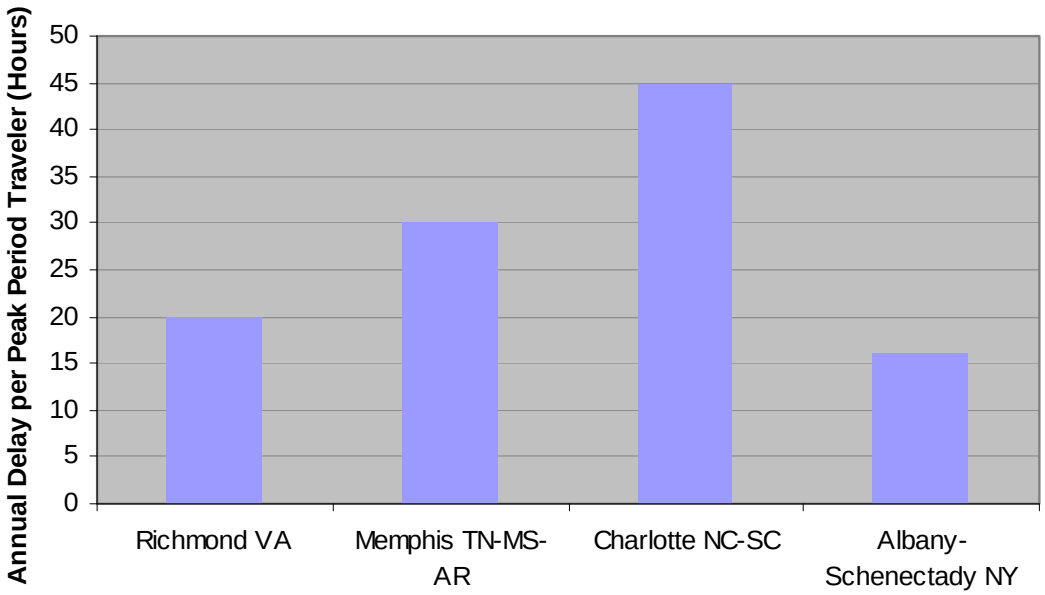
Figure 3-3: Travel Time Index - 2005



Source: Texas Transportation Institute, 2007

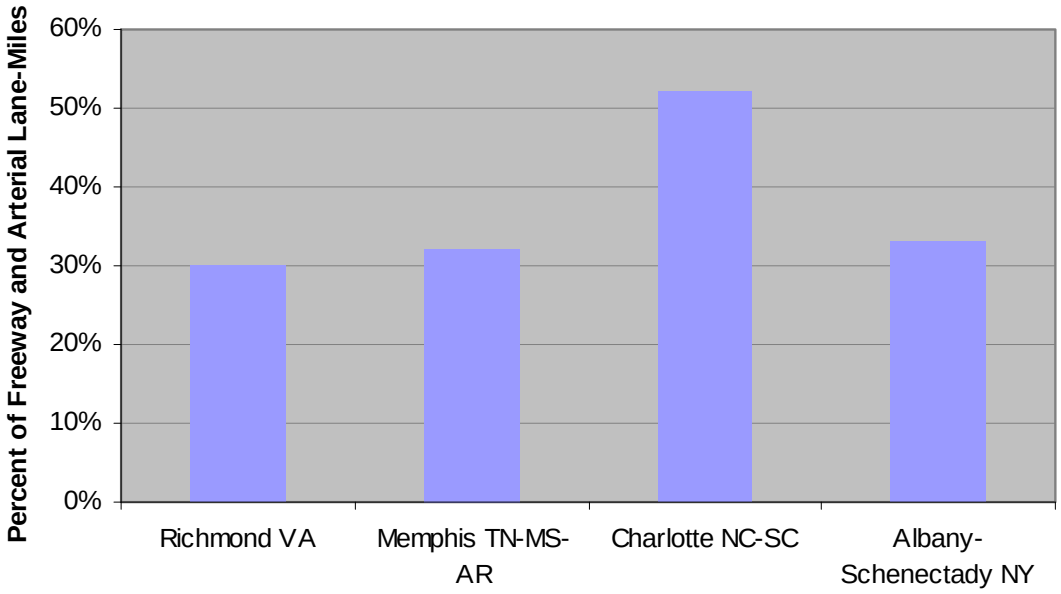
Figure 3-4 and Figure 3-5 illustrate similar pictures of regional congestion among the peer regions. Over a year, each commuter traveling during peak periods in Richmond spends approximately 20 hours in congested conditions. This is comparable to both Memphis and Albany. Commuters in Charlotte, however, spend more than double the time Richmond commuters spend in congested conditions. The Charlotte area experiences congested in more than half of their freeway and arterial system during peak periods. Albany, Memphis and Richmond all experience congestion on close to a third of the freeway and arterial system.

Figure 3-4: Annual Delay per Peak Period Traveler - 2005



Source: Texas Transportation Institute 2007

Figure 3-5: Percent of Freeway and Arterial Lane-Miles that are Congested - 2005



Source: Texas Transportation Institute 2007

3.3 EXISTING TRANSIT SERVICES

This chapter provides an overview of transit services in each peer region. Data was collected on the amount of transit service provided in each region and the resulting ridership this service attracts. Comparisons to Richmond transit service are offered. Using information gleaned from interviews with transit agency staff and MPO staff along with additional research, this chapter then describes the institutional organization used to manage, plan, and operate transit in each region. The role and influence of the MPO in regional transit decision making is also described. The funding mechanisms for transit capital projects and operations are also reviewed and compared to the funding provided for transit funding in the Richmond region. The review concludes by summarizing the successes and challenges interviewed staff members shared about planning and operating transit in their respective region.

3.3.A OVERVIEW OF TRANSIT SERVICES PROVIDED

In each peer region, transit service is primarily provided by a single transit agency operating mostly bus service within the urban portions of the region. The transit agencies serving each of the peer regions are as follows:

- Charlotte – Charlotte Area Transit System (CATS)
- Albany – Capital District Transportation Authority (CDTA)
- Memphis – Memphis Area Transit Authority (MATA)

Transit service is usually limited to the city limits and the county in which the city is located. Rarely does transit in the peer regions extend into the suburban or rural counties surrounding the city. Table 3-2 tabulates the percentage of each peer MSA that is considered part of each transit agency's service area. CDTA stands out in its coverage of the Albany MSA primarily because the Albany region consists of three cities in three different counties – Albany, Schenectady, and Troy – as opposed to one primary city as in the Richmond, Charlotte, and Memphis regions. Among the transit agencies, GRTC covers the least amount of the MSA area. The Richmond MSA however, also includes the City of Petersburg which is served by another transit agency (Petersburg Area Transit – PAT). Including the service area of this transit agency, (7 square miles according to the National Transit Database) would still keep the share of MSA coverage at approximately 8%.

Table 3-2: Percent of MSA within Transit Agency Service Area

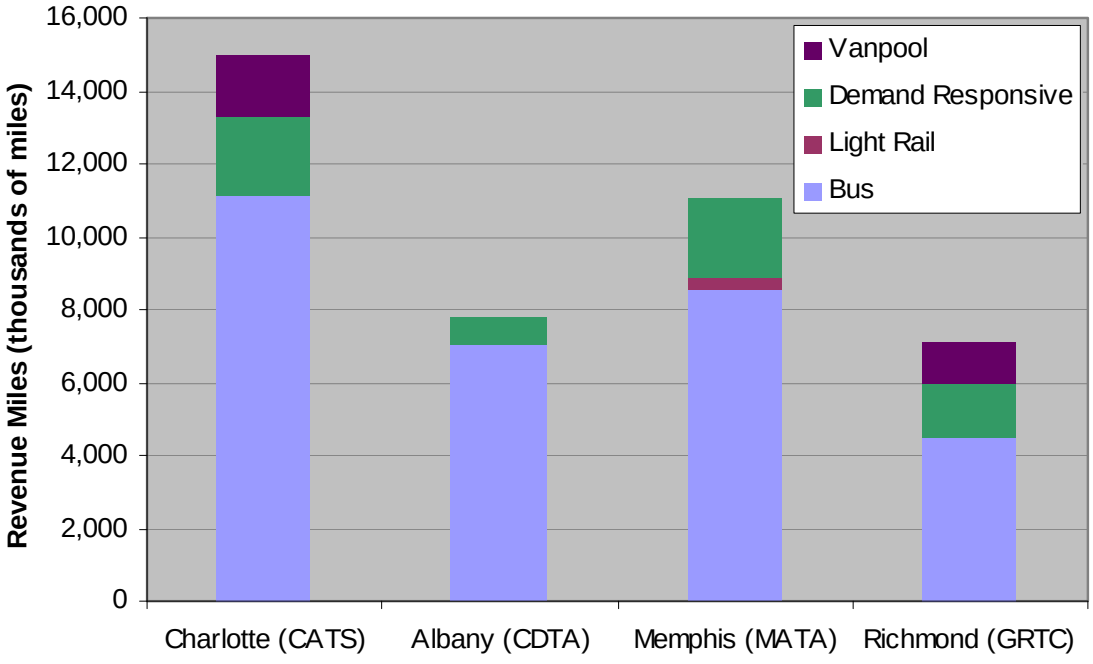
Peer Region (Transit Agency)	MSA Area (sq. miles)	Transit Agency Service Area (sq. miles)	% of MSA within Transit Agency Service Area
Richmond (GRTC)	2,944	227	8%
Albany (CDTA)	3,222	1,760	55%
Charlotte (CATS)	3,377	445	13%
Memphis (MATA)	3,006	288	10%

Source: 2000 Census MSA boundaries, National Transit Database 2005 reported service area

Each agency operates bus service and a demand responsive service to fulfill ADA requirements. CATS provides a vanpool service. The Charlotte downtown trolley service was temporarily suspended in February 2006 to allow for the construction of the South Corridor Light Rail line, which is scheduled to begin service in November 2007. MATA also operates a much larger downtown trolley service.

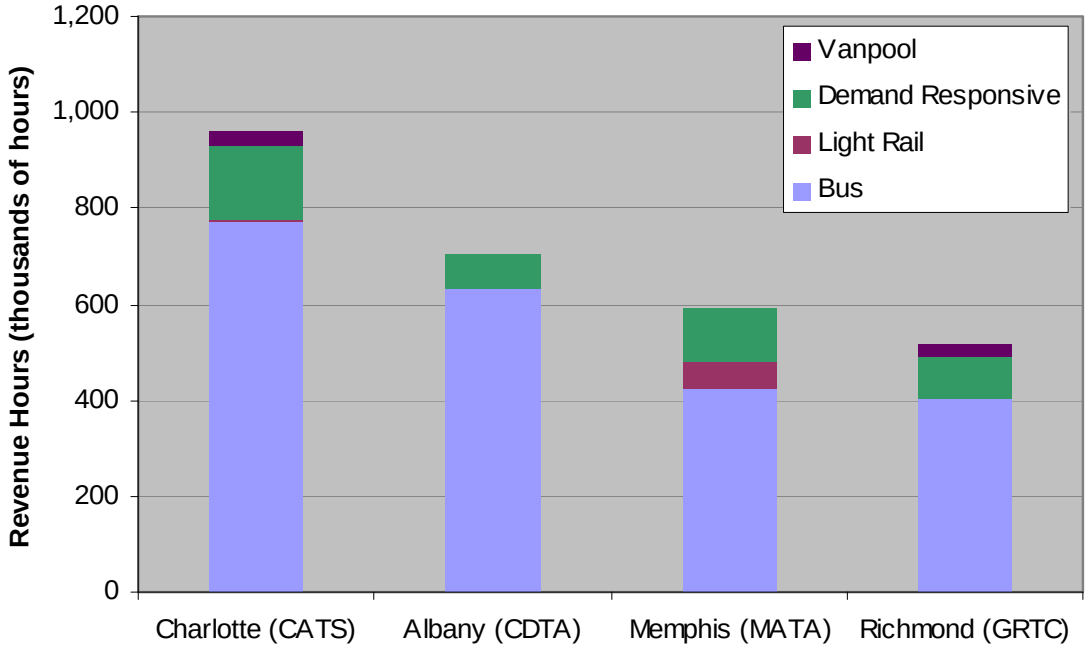
In general, the transit agencies in the peer regions cover larger portions of their service area than Richmond. Figure 3-6 and Figure 3-7 compare revenue miles and revenue hours of service for each of the transit agencies in 2005. By both measures, GRTC provides the least amount of bus service among the agencies, CATS provides the most. Figure 3-8 compares bus route miles among the agencies in 2005. Again, GRTC provides the least amount of service.

Figure 3-6: Annual Revenue Miles of Service - 2005



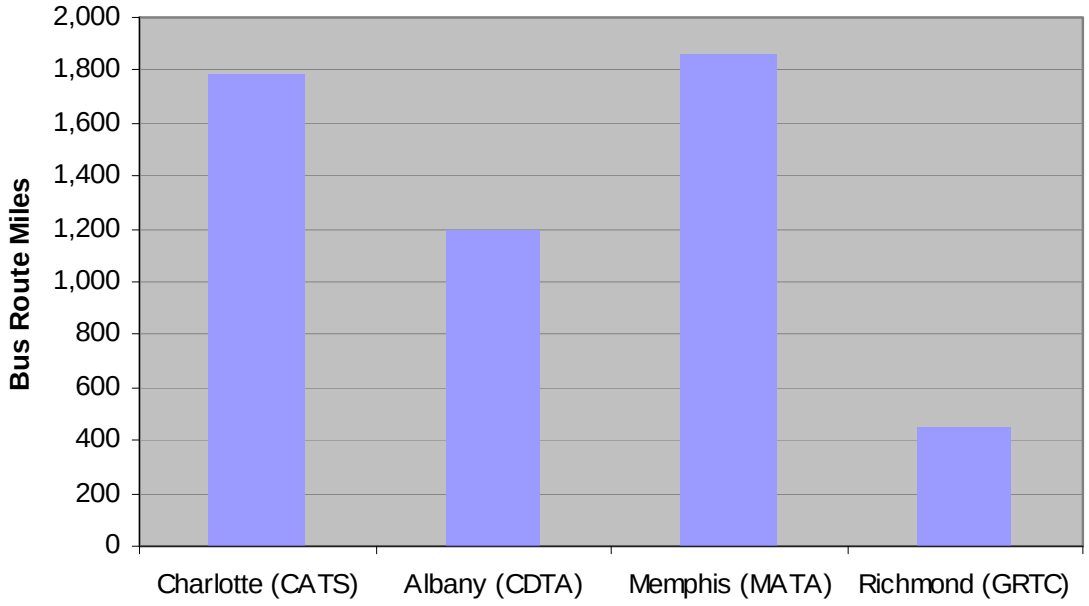
Source: National Transit Database 2005

Figure 3-7: Annual Revenue Hours of Service - 2005



Source: National Transit Database 2005

Figure 3-8: Bus Route Miles of Service - 2005

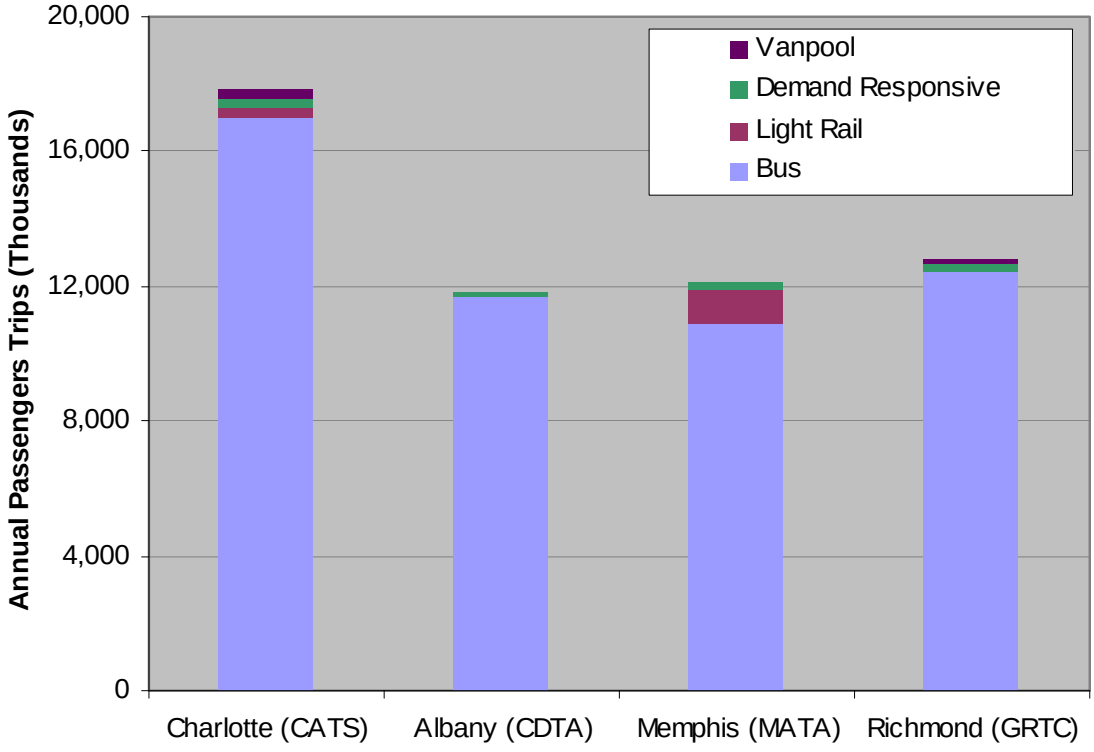


Source: National Transit Database 2005

While GRTC provides the least amount of service among the agencies examined, ridership is comparable to CDTA and MATA services.

Figure 3-9 compares annual unlinked passenger trips for GRTC and the peer region transit agencies. GRTC has slightly higher ridership than CDTA and MATA. While CATS provides 2 – 4 times more bus service depending on how it is measure, ridership is only approximately 25% more than GRTC.

Figure 3-9: Annual Passenger Trips by Mode - 2005



Source: National Transit Database 2005

3.3.B TRANSIT ORGANIZATIONAL STRUCTURE

The management, planning, and operation of transit vary between peer regions. The MPO's role in transit planning is also different in each region. Table 3-3 summarizes the arrangements found in each region.

In Albany and Memphis, independent authorities were created by state government (as in Albany) or city government (as in Memphis) in order to manage, plan, and operate transit services. In both cities, decision making must ultimately go through a board. In Memphis, the MATA board is appointed by the mayor of Memphis and approved by city council. In Albany, the CDTA board is appointed by the governor of New York and approved by the state senate. The CDTA board must include representatives of each county that belongs to CDTA. In Charlotte, CATS operates as a city department and is responsible for the management and operation of transit services. Major policy decisions and long range planning however goes through the

Metropolitan Transit Commission (MTC) – a policy board created through agreements by the City of Charlotte, surrounding Mecklenburg County, and the suburban incorporated towns of Mecklenburg County (Davidson, Huntersville, Cornelius, Pineville, Matthews and Mint Hill).

The MPO in all regions serves as the regional coordinator for transportation in charge of maintaining the constrained long range plan for the region and developing the five year transportation improvement program. The relationship and influence of the MPO in shaping transit policy differs by region. After speaking with staff from both CDTA and the Albany MPO (Capital District Transportation Committee – CDTC), this study found a cooperative relationship between the MPO and the transit agency. Both agencies work closely and collaboratively so that planning and policy decisions are consistent between both agencies. In developing plans for bus rapid transit in the Albany region (to be discussed in the next chapter) CDTC led planning efforts through conceptual design after which CDTA took the lead role of overseeing final design and implementation. After speaking with MATA staff and Memphis MPO staff (Memphis Urban Area Metropolitan Planning Organization), this study found a relationship where the MPO ensures that transit interests within the City of Memphis are balanced by suburban interests. The first phase of planned light rail in the Memphis region (to also be discussed in a later section of this memo) was scaled back to include only the portion of the preferred corridor that was within Memphis in order to balance suburban concerns as to whether light rail made sense for the region. In speaking with CATS and the Charlotte MPO (Mecklenburg-Union Metropolitan Planning Organization – MUMPO), this study found that MUMPO has little influence in shaping transit for the region where influence lies mostly within the MTC.

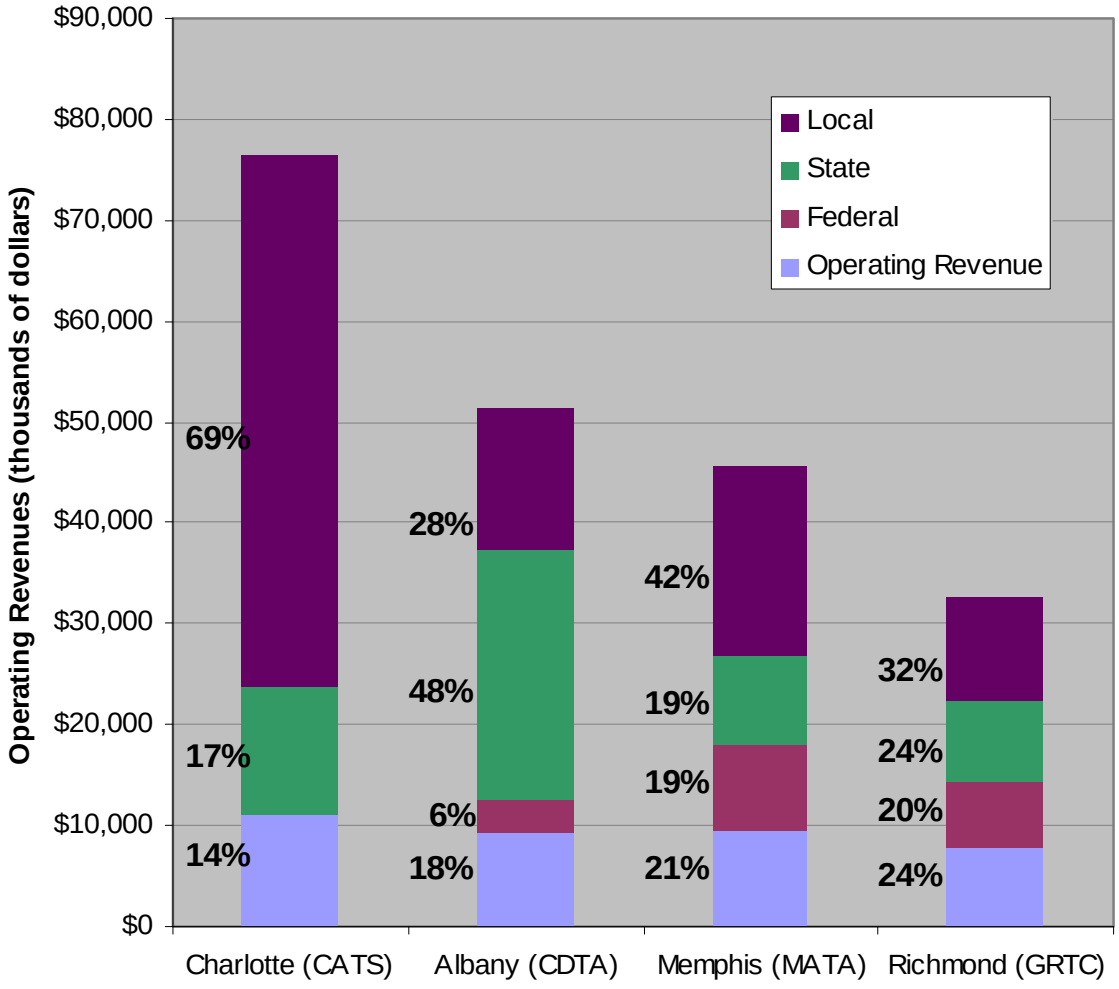
Table 3-3: Summary of Institutional Arrangements for Transit Service in Peer Regions

	Institutional arrangement	**Decision making board**	**Board composition and representation**	**Influence of MPO**
Albany region	Independent authority created by state legislation - CDTA	CDTA board appointed and approved by state government	Non-elected officials; Representatives from each participating county	Collaborative relationship
Charlotte region	Department of the City of Charlotte - CATS	Separate policy board (MTC) created through agreements by participating local governments (city, county, and towns)	Mayors and managers from city, county and towns, and representative for state board of transportation	Little influence
Memphis region	Independent authority created by City legislation - MATA	MATA board appointed and approved by city government	Represents City of Memphis only	Balances suburban transit interests

3.3.C TRANSIT FUNDING

The funding for transit operations also varies by region. Figure 3-10 illustrates the sources of operating revenues for GRTC and the transit agencies found in the peer regions. CATS is unique among the agencies compared in that it does not receive federal funding for transit operations. A majority of operating costs is funded through locally generated revenue. A half-percent sales tax in Mecklenburg County provides dedicated funding for transit services in Charlotte. Revenue from the sales tax is administered by the policy board created by the city, county and towns of Mecklenburg County that was discussed previously – MTC. In Albany, local funding for transit is provided through the enabling legislation that created CDTA. The four participating counties agreed to contribute one and a quarter percent of revenues generated from mortgage recording taxes. In Memphis, MATA receives all local funding from the City of Memphis. In Memphis and Richmond, state and federal government roughly provide equal shares of funding for transit operations. In Albany, state government provides the largest portion of the funding for transit operations.

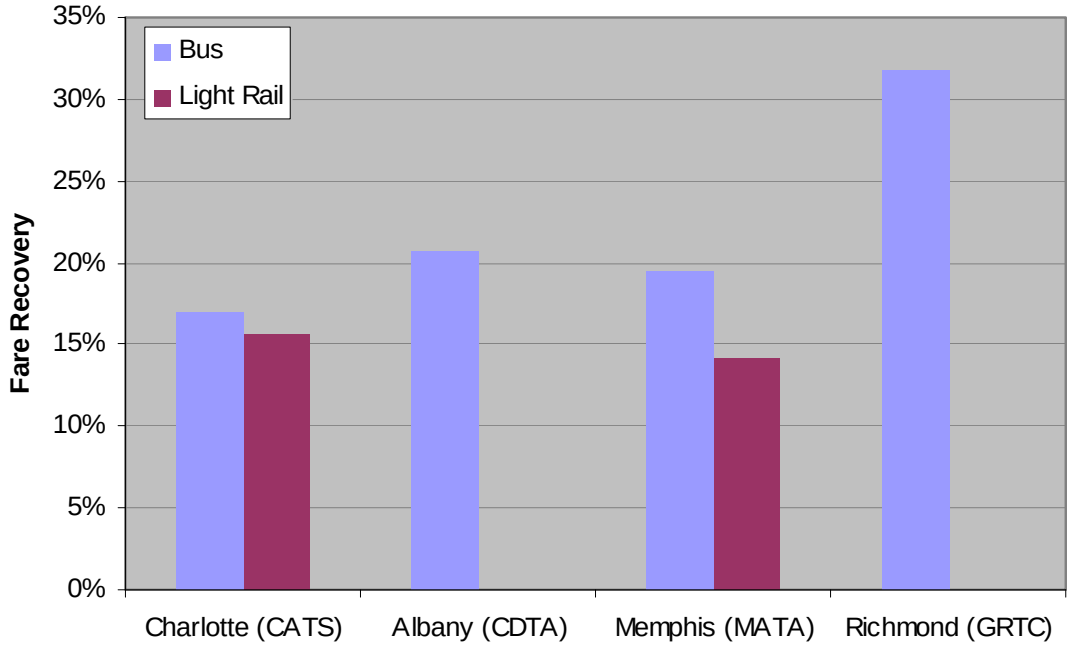
Figure 3-10: Operating Revenues by Source - 2005



Source: National Transit Database 2005

Figure 3-11 compares cost recovery among the peer agencies by transit mode. Cost recovery is defined as the percent of operating expenses covered by fare revenues. In Richmond, fare revenues cover a significantly larger portion of operating costs than in the peer regions. Charlotte, Albany, and Memphis recover similar shares of operating costs from fares. In Charlotte and Memphis, both downtown trolley services have recovery ratios comparable to bus service.

Figure 3-11: Percent of Operating Expenses Funded by Fare Revenue - 2005



Source: National Transit Database 2005

3.3.D SUCCESSES AND CHALLENGES IN TRANSIT PLANNING AND PROVISION

During the course of conversations with the peer region transit agencies and MPOs, staff members highlighted successes and challenges their regions have experienced in planning and providing transit services. Several of the staff members interviewed stressed the importance of gaining public and political support and securing funding for transit projects. Having these elements in place increased the likelihood that a certain transit project would be a success. In Albany, plans for bus rapid transit moved much more quickly once the funding picture became clearer. More details about Albany's planned bus rapid transit service can be found in the next chapter.

For Memphis, a major success story has been the implementation of a downtown trolley service. The trolley has helped revitalize downtown and more specifically helped revitalize a pedestrian mall that was beginning to deteriorate. The trolley is well utilized for special events in downtown as well as by those visiting downtown for nightlife and entertainment. The trolley system began to materialize when (1) city officials looked for a way to revive the downtown pedestrian mall, (2) a constituency developed that was enamored by vintage trolleys, and (3) a possible funding source was identified. Much of the success therefore can be contributed to

securing political, public, and financial support. Three 2.5 mile phases were constructed. The first phase and parts of the second phase were funded through interstate substitution funds – money set aside for Memphis that was originally to be used for interstate highway construction. The second phase was partially funded through FTA formula funds and the third phase through FTA New Starts funds. The trolley operates at 5 – 10 minute headways. MATA feels that the trolley service has passengers per mile comparable to the bus service. The service currently carries approximately one million passengers annually.

In Charlotte, success in advancing an integrated land use transportation plan can be attributed to a stable political environment in which the mayor of Charlotte has consistently served as a local champion for transit. The business community in Charlotte has also been a strong and consistent advocate for improved transit service. The integrated land use transportation plan – discussed in more detail in the following chapter – identified corridors for rapid transit in the Charlotte region. The current mayor has held the office since 1995. The city therefore has had roughly the same political leadership since the inception of the dedicated sales tax for transit and now through completion of light rail in one of the corridors originally identified almost 10 years ago in the integrated land use transportation plan. Success in shaping land use and transit, according to CATS staff, can also be attributed to the fact that the voting members of the MTC board are also those directly in charge of shaping the land use decisions in their respective jurisdictions.

Staff from the transit agencies and MPO's also identified several challenges they face in providing transit. In the Albany and Memphis regions, transit agencies find it challenging for transit to compete against driving to work where regional congestion and disincentives to driving do not exist. MATA staff commented that while choice riders do exist on their bus routes, they do not comprise a major source of ridership. In Albany, state government comprises a large share of the regional work force. Staff from CDTC commented that union agreements with the state government ensure subsidized parking for employees. State government also does not offer employees incentives for transit use such as using pre-tax dollars for transit passes. According to CDTC staff, these policies collectively contribute to an environment where transit cannot compete effectively with other modes. In Richmond, state employees pay less than market value for parking, but many state agencies also provide subsidies for employees who use transit.

Another challenge brought up by staff members is balancing decision making among the various local jurisdictions within a region. CATS staff mentioned that the Charlotte City Council can become frustrated with the fact that city representation in the MTC is not proportional to the amount of transit service that is provided within the City of Charlotte. In Memphis, the MPO balances suburban transit interests with the interests of MATA, whose decision making board is comprised only of appointees made by the mayor of Memphis.

Variability in operating funding is also a challenge in the peer regions. In Memphis, there are no local dedicated sources for transit funding. The operating budget is usually negotiated with the city each year. In Albany, CDTA staff has found it difficult to project the funding they are likely to receive from mortgage recording tax receipts which are tied very closely to economic conditions within the region. Annual budget estimates are made conservatively to deal with this variability.

3.4 LONG RANGE TRANSIT PLANS

The peer review included speaking with staff from the peer region transit agencies and MPO's. The staff provided insight on ongoing transit planning efforts within their region. This chapter summarizes the insights gathered from staff members and from transit planning documents from the peer regions.

3.4.A ALBANY REGION

Staff interviews and planning documents from CDTA and the Albany MPO support CDTA's general strategy of concentrating on upgrading transit service in urbanized areas where ridership has the best chance to materialize. In general, the agency and MPO agree that it does not make sense economically for transit to chase emerging suburban development.

Consistent with this strategy, CDTA and the MPO have led efforts on planning and implementing bus rapid transit (BRT) in the region. The first corridor identified is the highest ridership corridor for CDTA. This corridor connects the cities of Albany and Schenectady. The corridor also traverses through two other jurisdictions – the Town of Colonie and the Village of Colonie. Elements to be included in the first phase of the project include upgraded stations, pedestrian improvements around stations, real time scheduling information and distinctive hybrid electric buses. Together, these elements will work to enhance the visibility of transit along the corridor. Previous work to coordinate traffic signals along the corridor will facilitate the implementation of a traffic signal priority element in future phases of the BRT. CDTA has acquired the hybrid buses and plans to begin implementing certain elements of the BRT in 2008. It is expected that the first phase of BRT service will cost approximately 10 million dollars. CDTA and CDTC are pleased with the progress BRT planning has made and is now beginning feasibility studies for BRT in the region's second busiest transit corridor.

CDTC has led efforts to coordinate land use along the planned BRT corridor. This has resulted in assistance to municipalities for developing master plans around station areas. In general, CDTA commented that there is much talk along the corridor about transit oriented development around planned BRT stations but at the same time developers are taking a "wait and see" approach to see whether the service becomes a success.

Prior to the BRT planning efforts, there was public interest in light rail for the Albany region. Feasibility studies led by CDTA and CDTC, however, concluded that densities within the region were not sufficient to economically support light rail service. Also, since the region is anchored by three medium sized cities – Albany, Schenectady, and Troy – CDTA and CDTC found that it would be difficult to find a critical mass for light rail since commuters disperse between the three major cities.

3.4.B CHARLOTTE REGION

The Charlotte region's long range transit plans first began to formulate as the region agreed upon implementing a sales tax dedicated to funding transit. The region's integrated land use and transportation plan was initially crafted to demonstrate to the public what dedicated tax revenue to transit could provide for the region. The plan identified several corridors in the region for various types of transit modes – light rail, commuter rail, and bus rapid transit. The current planning document for the region adopted by the MTC – 2030 Transit Corridor System Plan - identifies five corridors for rapid transit and also recommends a streetcar system for downtown. The following modes are recommended in the identified corridors:

- South – light rail
- Southeast – BRT with consideration for light rail in the future
- Northeast – light rail
- North – commuter rail
- West – streetcar

Currently, the south corridor is closest in service implementation with light rail expected to be in operation by November 2007. The light rail corridor lies fully within the City of Charlotte. Light rail made the most sense for this corridor for several reasons. An existing rail corridor was available. The light rail service will utilize an unused Norfolk-Southern line for two-thirds of the planned light rail corridor and an active Norfolk-Southern corridor for the remaining third of the planned light rail corridor. The light rail corridor will parallel a congested freeway and arterial corridor where additional freeway expansion is cost prohibitive. Old industrial land uses that are attractive for redevelopment are present throughout the planned corridor.

The total cost for the 9.6 mile light rail line (named LYNX Blue Line) is approximately 426 million dollars, with 43% to be funded through the federal government, 23% by state government, and 34% from the dedicated transit sales tax revenue. The City of Charlotte also approved intersection improvements and pedestrian and bike improvements throughout the corridor worth approximately 50 million dollars – to be funded through municipal bonds.

To coordinate land use along the corridor, station area plans have been developed and approved for the stations closest to downtown. Station area plans are still in development for the outer stations. The Charlotte Planning Commission is supportive of efforts to attract development around stations and would sponsor developers requesting transit oriented development rezoning close to a station. CATS estimates that approximately 1.5 billion dollars in development has been attracted to the light rail corridor.

Charlotte's ambitious transit plans are limited to the city, surrounding Mecklenburg County, and the incorporated towns of Mecklenburg County. Staff from CATS and MUMPO commented that there's some interest from York County in South Carolina which borders Mecklenburg County to the southwest to connect to the south corridor light rail. There has also been interest in extending planned commuter rail past Charlotte's north corridor. There are no formal talks however, to expand voting members on the MTC or expand the reach of the MTC administered transit sales tax. Four other MPOs operate within the counties belonging to the Charlotte MSA - three in North Carolina, one in South Carolina.

3.4.C MEMPHIS REGION

Long range transit plans in the Memphis region include a regional light rail system. A 1997 Long Range Transit Plan identified three corridors where rapid transit would be appropriate in the Memphis area. In 2000 another study identified the priority corridor. An alternatives analysis which is nearing completion has identified a preferred alignment within the corridor and a preferred mode – light rail. Within the 25 mile priority corridor, the region has agreed to focus efforts on the portion of the corridor within the City of Memphis. Further planning for light rail in the priority corridor beyond Memphis and in the other identified corridors will occur later. Along with completing the alternative analysis, MATA is also in the process of securing Federal Transit Administration funding. The goal is to fund the Memphis portion of light rail with 50% federal funds and 25% each from state funds and the City of Memphis.

The current planned light rail corridor within Memphis was chosen as the priority corridor primarily because it contained several major job centers. The corridor connects downtown Memphis with the airport and a major Federal Express facility. Light rail would also complement the existing downtown trolley service and would offer more opportunities for development. Light rail is planned to share street right-of-way for half of the alignment. Right-of-way acquisitions with minimal displacements are required for the remaining half.

As part of the 1997 Long Range Transit Plan, bus service in the Memphis region is recommended to transform to better serve suburban areas. This would entail constructing several suburban transit center, major intermodal transfer centers, and park-and-ride lots.

3.5 CONCLUSIONS

A summary comparison of the peer regions is found in Table 3-4. In general, Richmond is similar in size and population to Albany and Memphis but shares more similarities in socioeconomic characteristics with Charlotte. Congestion in Richmond is most similar to Albany and Memphis. Congestion in Charlotte is worse. Richmond is the most productive among the regions in providing transit service. Ridership, funding and service provision data show that GRTC serves less area, spends less money, but provides comparable ridership to the peer regions. Compared to CDTA and MATA, GRTC provides less service and spends less money but attracts comparable ridership. The data implies that Richmond is conservative in choosing the areas it serves concentrating much more than other agencies in serving the high ridership portions of the region.

Table 3-4: Summary Comparison of Peer Regions

	Albany	**Charlotte**	**Memphis**
Population and Land Area	Similar in size and population	Similar in size Higher population	Similar in size and population
Socio-economic Characteristics	Similar household income and poverty level Higher share of population that is older	Similar in household income, poverty, and age of population	Similar household income and age of population Higher poverty level
Regional Congestion	Similar to Richmond	More congested than Richmond	Similar to Richmond
Existing Transit Provision	More service than Richmond	Significantly more service than Richmond	More service than Richmond
Existing Transit Ridership	Similar to Richmond	Higher than Richmond	Similar to Richmond
Long Range Plans	Modest expansion	Aggressive expansion	Modest expansion
Rapid Transit Modes Being Considered	- BRT in one corridor with first elements of service to be implemented in 2008 - BRT feasibility currently being studied for a second corridor	- Light rail in one corridor to be in operation by November 2007 - Multiple rapid transit modes (light rail, commuter rail, street car, BRT) identified for five separate corridors	- Multiple rapid transit corridors identified - Advanced planning wrapping up for light rail along portion of priority corridor

While socioeconomic characteristics and congestion may play some part in the success of transit in a region, forging regional cooperation, finding consistent funding sources, and coordinating land use and transportation decisions are also very important. With Richmond being an independent city, separate from surrounding counties, regional cooperation can extremely challenging. However, Charlotte and Albany demonstrate that regional cooperation can happen in a variety of ways (Charlotte - by creating a separate multi-jurisdictional policy board, Albany - by having a regionally represented board in CDTA and having a collaborative relationship between transit agency and MPO). Dedicated and stable transit funding in Charlotte has resulted in ambitious transit plans. Clearly identified transit funding was critical for the implementation of trolley service in downtown Memphis and advancing BRT in Albany. Rapid transit plans can have a greater chance in success if the service is also coordinated with land use. Successful trolley service in Memphis was tied with economic development in downtown.

An integrated land use transportation plan in Charlotte has identified both the growth centers and corridors for the region and the preferred rapid transit modes to serve the centers and corridors. The transit agency and MPO in Albany recognize that transit does not make sense economically if it chases emerging development.

In Charlotte, transit decision making is made by one body (the MTC) that collects and administers dedicated funding for transit. This same body has multi-jurisdictional representation and the voting members (being mayors and managers of their respective jurisdictions) have strong influence in shaping land use. The half-cent sales tax in Charlotte has proven to be a stable funding mechanism in which the region can plan and develop transit improvements for corridors based on projected revenue from this source. In addition, the State of North Carolina is demonstrating a long term commitment to transit. The North Carolina Department of Transportation has moved towards a system of Full Funding Grant Agreements similar to the FTA approach that provide a commitment to provide one half of the non-federal share (in the case of the South Corridor, the federal share is approximately 50% and the state share is 25%). This allows CATS to have a lot more confidence in the likely availability of state funding in the future.

In Albany, BRT is being implemented along a multi-jurisdictional corridor. The success of this plan can be attributed to cooperation between CDTA, CDTC, and the local jurisdictions. CDTA is currently working on implementing the BRT elements while the MPO, CDTC, has worked with the municipalities in developing master plans for station areas. CDTA noted that when the cities and towns along the BRT corridor successfully worked to coordinate traffic signals between their jurisdictions, they warmed up to the possibility of cooperating to bringing BRT to the region. While the region has a dedicated revenue stream (1.25% of mortgage recording tax revenue), CDTA is concerned that is not a stable, predictable source.

Memphis has been able to successfully implement its downtown trolley service and use it as an engine for economic development. Critical to the success of that service was identifying funding and having strong support from those in Memphis. Regional rapid transit is farther from being realized in Memphis where transit policy and planning is shaped principally through MATA and its board which does not have regional representation. Advanced planning for light rail has been limited to only the Memphis portion of the identified priority corridor for rapid transit.

The Richmond region can learn several lessons from these three peer review regions. The more the elements of regional cooperation, dedicated funding, and coordinated land use/transportation planning are tied into each other, the more ambitious and far reaching the provision of transit service can become. The peer regions integrate these elements to various degrees with Charlotte the farthest along in integrating regional cooperation, funding, and land use coordination and consequently, Charlotte has the most ambitious plans. Albany has some elements in place with a dedicated funding source, regional representation in the CDTA board, and a collaborative relationship with the MPO. Albany is close to seeing implementation of a modest BRT plan. In Memphis, there is no dedicated source for transit funding, and the major transit decision making body is appointed by the City of Memphis. Implementation of their rapid transit plans has seen the least progress among the regions studied and is currently limited to the portion inside the city.

Chapter 4:
Analysis of Modal Alternatives

4.1 TRAVEL MARKETS

An effective public transportation system is an essential component of any major metropolitan area. Such a system—one that connects residential areas with the major employment, service and retail centers—provides an alternative for travel on congested roadways, offers an option to those who choose not to drive, and is an essential lifeline to participation in public life for those who cannot drive. Over the coming decades effective public transportation is likely to become even more important for providing transportation to an aging population and as one component of a national strategy to reduce oil consumption and mitigate global climate change.

In the Richmond area there is an awareness that plans must be made now to develop a passenger transportation system that will support the economic growth and development of the future region. Between 2000 and 2031 the Richmond region is expected to experience population growth of 57%, adding 466,000 new persons. The elderly population is expected to grow from approximately 95,000 persons in 2000 to 144,000 persons in 2031. Employment growth of 51% is expected, adding 316,000 new jobs. While downtown Richmond is projected to continue to have the largest concentration of jobs, much of the growth in both population and employment is forecast to occur in suburban jurisdictions that often lack effective transit. The number of automobiles in the region is projected to increase even faster with a growth of 73% by 2031. Continued dependence on private automobile transportation as the sole means for travel will lead to ever increasing congestion on existing roadways and greater demands for construction of new roads.

The Richmond Regional Planning District Commission (RRPDC) regularly prepares a long-range plan that identifies projected growth and resulting transportation needs. Special studies, such as the Richmond Rail Transit Feasibility Study in 2003, the Downtown Richmond Streetcar Study in 2004, and the Comprehensive Operational Analysis of the Greater Richmond Transit Company (GRTC) in 2007 have examined the potential future markets for public transportation and ways to increase the effectiveness of existing services. Building on this foundation, this Regional Mass Transit Study is once again examining forecasts of growth, both type and location, identifying the corridors in which roadway congestion is likely, considering the availability of rights-of-way on which regionally oriented transit services might operate, and documenting the expected costs of implementing and operating transit services of different modes in the identified corridors.

Recent years have seen changes in the nature and style of urban and suburban development. In many communities across the nation there has been a growing market for mixed-use projects that combine residential, retail, and employment opportunities in a project designed to reduce dependence on auto travel. Rocketts Landing is a local example of a development with these features. In projects of this type, the composition of the development and the layout of buildings and streets, promotes bicycling and walking for serving local needs and public transportation for travel to other portions of the region. As illustrated in the following discussions, the forecasts of development in the Richmond area corridors identified for this study do not yet anticipate that these transit-supportive patterns of development will be widely

adopted. The assessment of the transit potential in the corridors is based on the patterns of development in the adopted regional forecasts. Those forecasts are based on current transportation system plans and historic market preferences. The identification of a corridor for possible provision of regional transit services could result in changes in development plans and patterns in ways that would promote greater transit use and support early investment in enhanced public transportation services.

There are no simple measures by which to gauge whether or not a particular public transit investment in a corridor will be "successful." Transit is a public service; the typical measures of success that would apply to a private venture are not applicable. No transit service in the United States that operates on its own right-of-way makes a profit; a few express bus lines serving New York City or similar areas, or bus operations servicing specialized markets (e.g. airports), can charge higher fares and are operated as for-profit ventures. The success of most public transportation services must be measured relative to the goals established by the supporting funding agencies or supporting jurisdictions. For example, the Federal Transit Administration evaluates proposals for funding major new transit projects based on the cost per hour of projected user benefit, the relationship between the transit investment and the patterns of land activity existing in or proposed for the area to be served, and the financial ability of the local agency to build and operate the project.

The goals for a public transit operation vary by region and jurisdiction. While some goals are financial (e.g. fares collected as a proportion of operating expenses) other goals are more directly related to public policy and urban development considerations. Typical goals will include such factors as:

- Providing a choice for persons traveling in corridors experiencing highway congestion or traveling to areas having limited parking
- Providing accessibility for those who do not drive by offering transit service within walking distance of at least X% of the transit-dependent population or Y% of the total population
- Supporting higher density development by providing service to areas where roadway facilities sufficient to serve all demand cannot feasibly be constructed
- Providing transit service in all areas where the density of population or the density of development exceed some specified level

In addition to these general goals, specific transit services may be evaluated in other ways that relate to the efficient use of resources. No transit agency has unlimited resources, so each agency must set priorities for the use of available capital and operating funds. A typical transit agency will regularly assess each route based on the average number of passengers boarding per hour and consider remedial actions for those that are far below the system average. In a similar manner the corridors proposed in the Richmond area need not be evaluated against absolute measures such as total riders carried or cost of construction, but rather may be assessed in terms related to contribution to regional goals and the value of investment in one corridor rather than another.

It is measures of this type that are applied in the analysis of corridors and modal alternatives. Estimates of the costs of implementing and operating services for one or more modes in each corridor are provided along with estimates, where available, of the size of the potential market or riders to be carried. The existing and forecast density of development along

each corridor along with the projected rate of growth over the next twenty-five years is documented. Based on this information, a suggested priority ordering is proposed including:

- Tier I - those corridors /modal alternatives for which the existing pattern of development and size of the travel market are indicative of effective use of resources by an immediate investment
- Tier II – corridors/modal alternatives for which the projected changes suggest that investment prior to 2031 is likely to be effective
- Tier III – corridors/modal alternatives for which investment prior to 2031 is not likely to be effective with currently projected growth patterns

Since the effectiveness of a service in this assessment is related to efficient use of resources, the appropriate mode for serving a corridor may changes over time. For the present, an express bus operating on an existing freeway may be sufficient to satisfy transit demand. As the area changes, and especially if nodes of activity designed to support transit services arise, the appropriate mode may change from express bus, to regular local bus, to Bus Rapid Transit or Light Rail or, where a right-of-way exists, commuter rail.

Forecasts of regional travel, including both the total number of trips expected to occur in the region on a typical weekday in 2031 and the origins and destination of those trips, are prepared by the Virginia Department of Transportation (VDOT) in cooperation with RRPDC using methodologies known as travel forecasting models. These travel forecasts are based on the projected patterns of development; expected locations of housing, jobs and activities; and the nature of the transportation network expected to be in place in the planning year. The models estimate that in 2006 there were just over 3.5 million trips made in the Richmond Metropolitan Area each weekday. By 2016 this is forecast to increase to over 3.9 million trips per day, and to reach almost 4.6 million daily trips in 2031. It is from this market that transit passengers will be drawn. Figure 4-1 shows the growth in average weekday person trips.

Figure 4-1: Growth in Average Weekday Person Trips

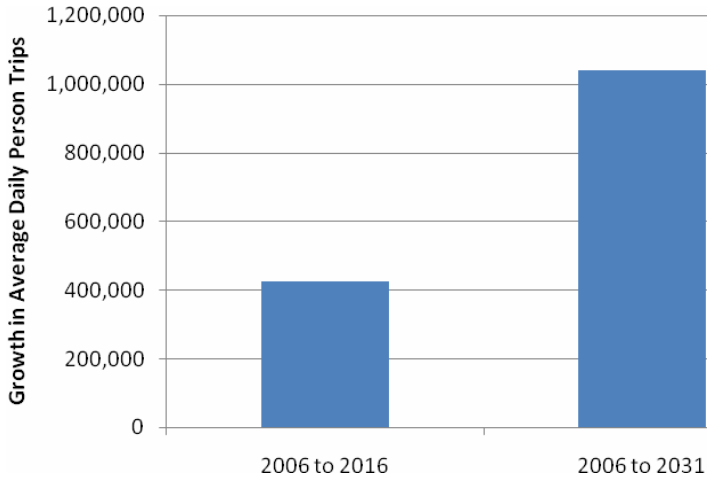


Figure 4-2 illustrates expected traffic conditions on major roadways in the Richmond region in 2031. Those corridors in which there are roadways with a volume to capacity (VC) ratio in excess of 1.0 are likely to have severe traffic congestion during peak periods and are potential candidates for transit service. Corridors in which significant roadway congestion is anticipated

include I-64 between downtown Richmond and the Short Pump area; I-295 between the Short Pump area and I-95 North; Chippenham Parkway; parts of Midlothian Turnpike and Hull Street Road in Chesterfield County; and most of I-95 between Petersburg and Ashland.

In 2006, the Greater Richmond Transit Company (GRTC) reported serving approximately 38,000 boarding passengers each day or about 32,000 trips after accounting for transfers. Ridership of Petersburg Area Transit (PAT), also part of the Richmond Planning Area, was estimated at 1,700 per day. The existing services of GRTC and PAT constitute the baseline service for the regional analysis (Figure 4-3). The forecasts suggest that the shift in population and jobs expected between 2006 and 2016 would result in a slight decline in transit ridership if the transit system remains unchanged. By 2031, if the current transit services are operated with no changes, ridership would be only 7% greater than in 2006.

Based on the projected growth patterns and the prior studies of opportunities for transit service expansion, two preliminary scenarios for expansion of transit were identified (see Figure 4-3 and Figure 4-4). Forecasts of travel developed based on those scenarios show that a moderate expansion of transit services, including the expansion of local bus service and the implementation of new commuter bus services to the outlying counties of the region, could result in regional transit ridership in 2031 that is 3% greater than the baseline condition. A major expansion scenario that includes the construction of dedicated transit facilities in major travel corridors, has the potential of reaching ridership levels that are 60% greater than the baseline in 2031 (see Figure 4-5)[1]. As discussed in greater detail in subsequent sections, the ridership increment in any specific area or corridor could be significantly greater, even under the conditions assumed in current development forecasts. Changes in development patterns in response to the availability of high quality transit could result in even greater impacts. These preliminary scenarios informed the three-tiered approach to enhancing transit in the Richmond area.

[1] Based on travel forecasts prepared February 4, 2008

Figure 4-2: 2031 Highway Link Volume to Capacity Ratio

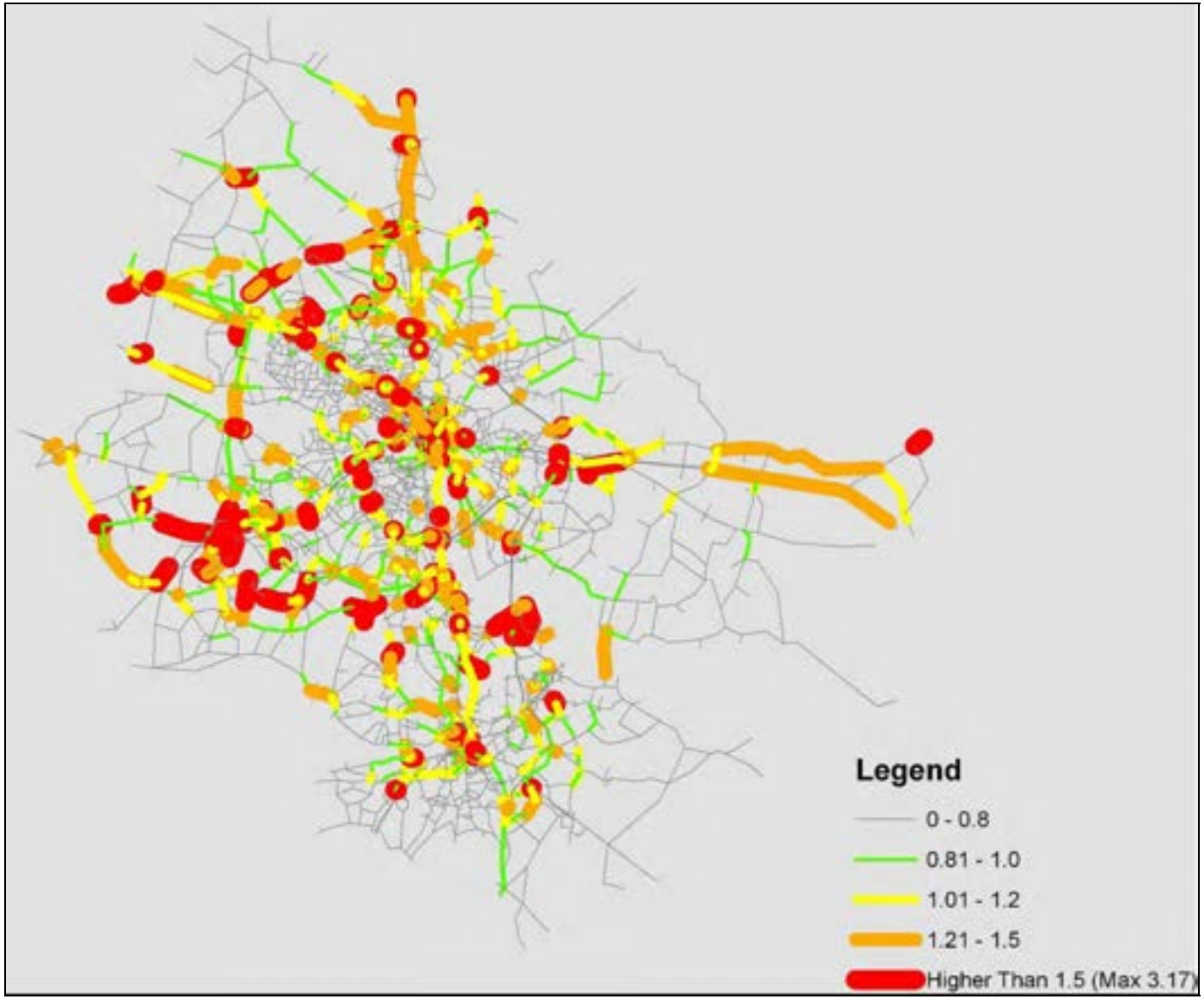


Figure 4-3: Baseline Service

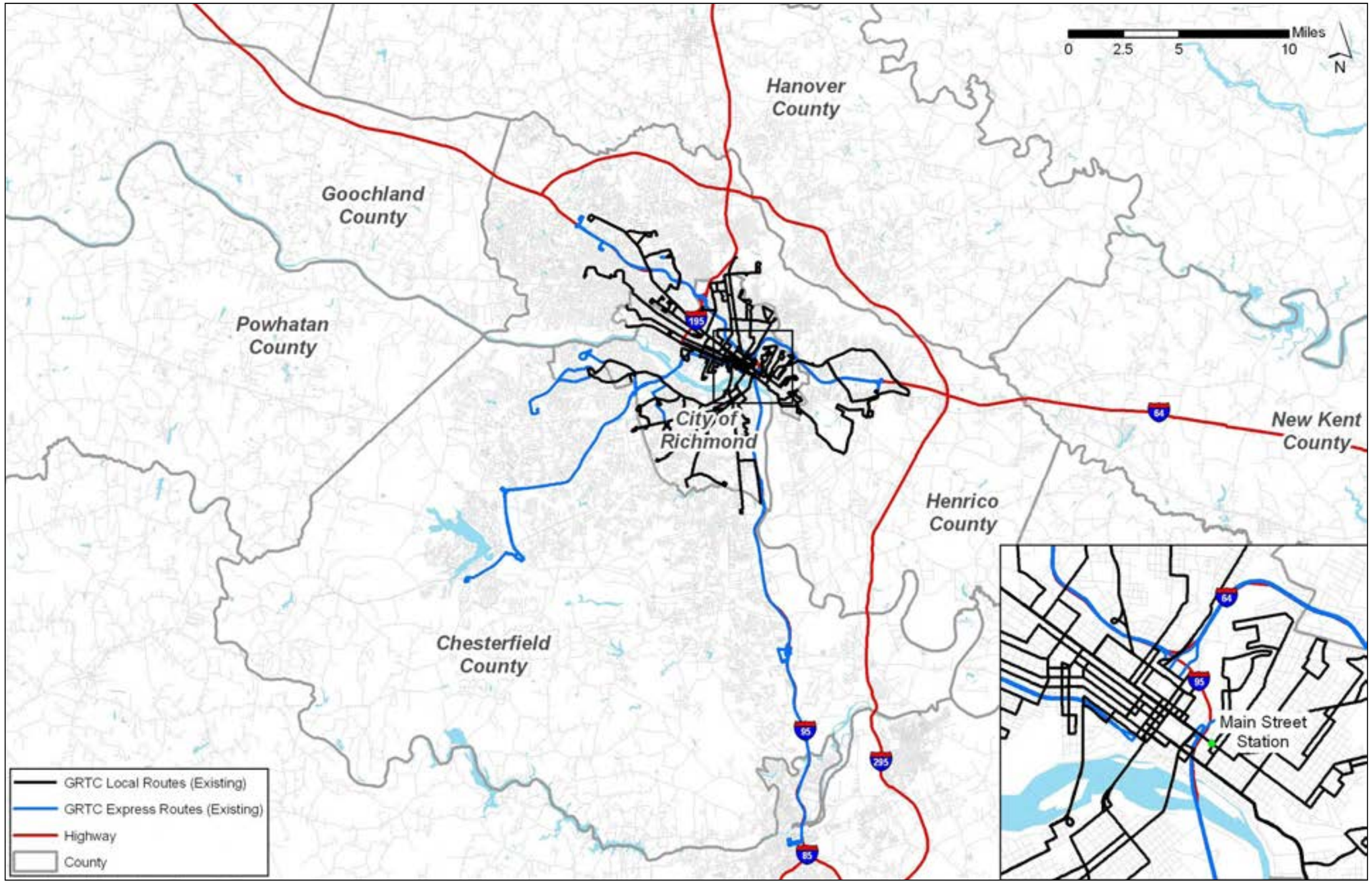


Figure 4-4: Moderate Service Expansion

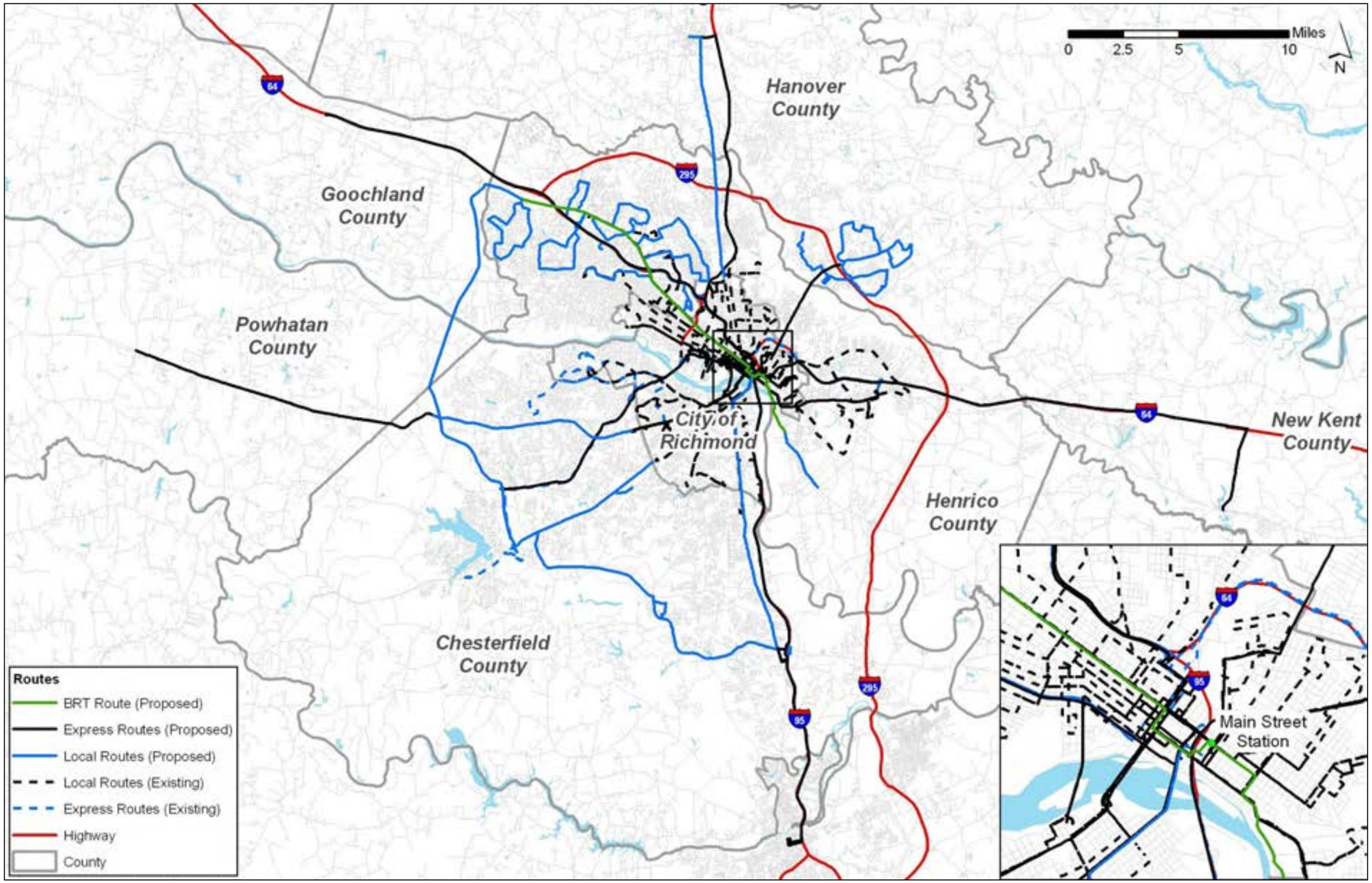
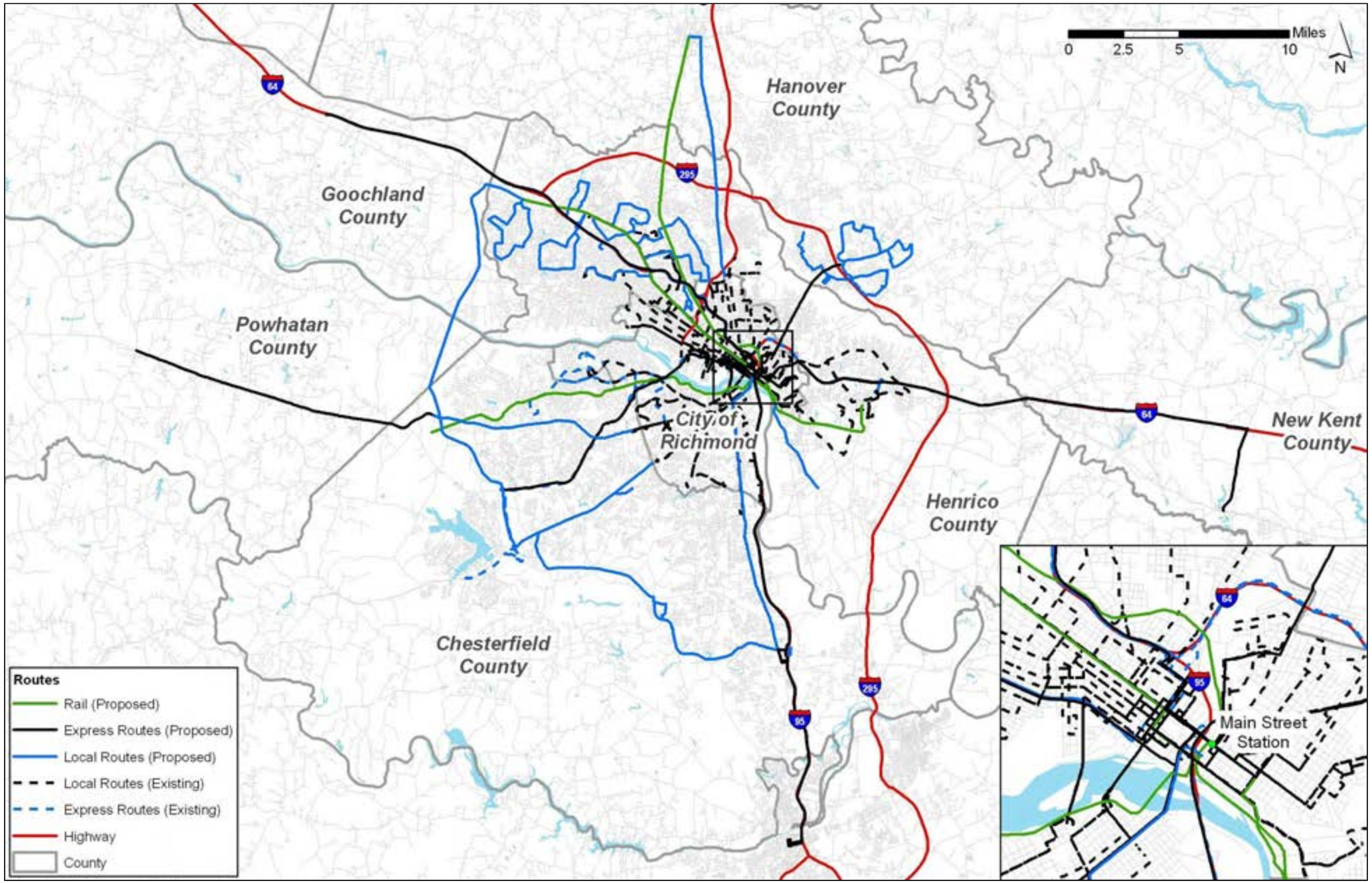


Figure 4-5: Major Service Expansion



The following sections summarize for each of the identified transit corridors the findings of previous studies together with an assessment of transit potential related to the forecast timing and nature of development. The costs of implementing and operating services are presented along with a description of the proposed operations. An assessment of the time-frame for implementation enhanced transit in the corridor is provided. It includes an analysis of the following corridors:

- Corridor A: I-95 North
- Corridor B: Mechanicsville
- Corridor C: I-64 East
- Corridor D: Richmond International Airport
- Corridor E: I-95 South
- Corridor F: Powhatan
- Corridor G: Midlothian
- Corridor H: Broad Street
- Corridor I: I-64 West

4.2 SERVICE CORRIDORS

This section provides an analysis of the proposed routes by corridor. For each corridor the general characteristics of the service are provided, including the route (length, span of service, headway), transit mode (light rail, commuter rail, local bus, etc), and operating and capital cost estimates. For the Broad Street, I-95 North, and Midlothian corridors, two potential modes were evaluated. For those corridors in which major investments are considered (i.e. Bus Rapid Transit, Light Rail, Commuter Rail) an estimate of the ridership potential is provided based on VDOT forecasts of the number of trips that start and end within the corridor (intra-corridor trips).

One of the major considerations with several of the potential corridors is right of way. Purchasing right of way takes a lot of time and is costly. This section reviews right of way issues for three projects in the Maximum Service scenario: Airport LRT, Broad Street BRT/LRT, and the Chesterfield Commuter Rail. It summarizes the finding of the Richmond Rail Transit Feasibility Study, prepared by Parsons Brinckerhoff Quade and Douglas, Inc for the Virginia Department of Transportation and the Richmond Area Metropolitan Planning Organization in June 2003.

Use of transit service historically has been related to the characteristics of the resident population in the areas served (e.g., household income, auto ownership) and the characteristics of the developed area (e.g. household density, concentrations of employment, street patterns). The potential effectiveness of transit in attracting riders in any given area depends on multiple factors including the quality of service available, the degree of highway congestion, costs and availability of parking, and the patterns of travel between residences and workplaces, shopping, medical services and related uses. The demographic and development data, however, provide information that can be used to prepare conceptual frameworks for regional transit services, identifying the areas in which transit is most likely to be needed.

The Institute of Transportation Engineers (ITE) developed guidelines for minimum transit service levels based on three ranges of residential density as shown in Table 4-1[2]. One bus per hour is recommended for TAZs with between four to six dwelling units per acre, one bus per 30 minutes for TAZs with between seven and eight dwelling units per acre and light rail or feeder bus service for TAZs with over nine dwelling units per acre. TAZs that do not meet the minimum residential density for fixed transit service would have park-and-ride services available. It is important to note that TAZs are relatively large geographic areas, especially outside of downtown Richmond. If household and employment forecasts were available at the block or block group level, they would likely provide a more accurate representative of transit supportive residential and employment densities.

Table 4-1: Service Levels by Residential Density

Minimum Service Level	Residential Density Thresholds
1 bus/hour	4-6 DU per Acre
1 bus/30 minutes	7-8 DU per Acre
Light rail and feeder buses	9 DU per Acre

For comparison purposes, the residential densities of corridors in two metropolitan areas that are implementing light rail are presented below. Charlotte's South Corridor light rail line began operations in 2007. Norfolk's light rail line is now under development. The residential

[2] ITE. A Toolbox for Alleviating Traffic Congestion. Washington, DC (1989)

densities are taken from the year 2000 Census and do not reflect growth since that time or future projections. Similar maps illustrating residential densities are presented in the discussions of Richmond area corridors below.

Figure 4-6: Norfolk Light Rail

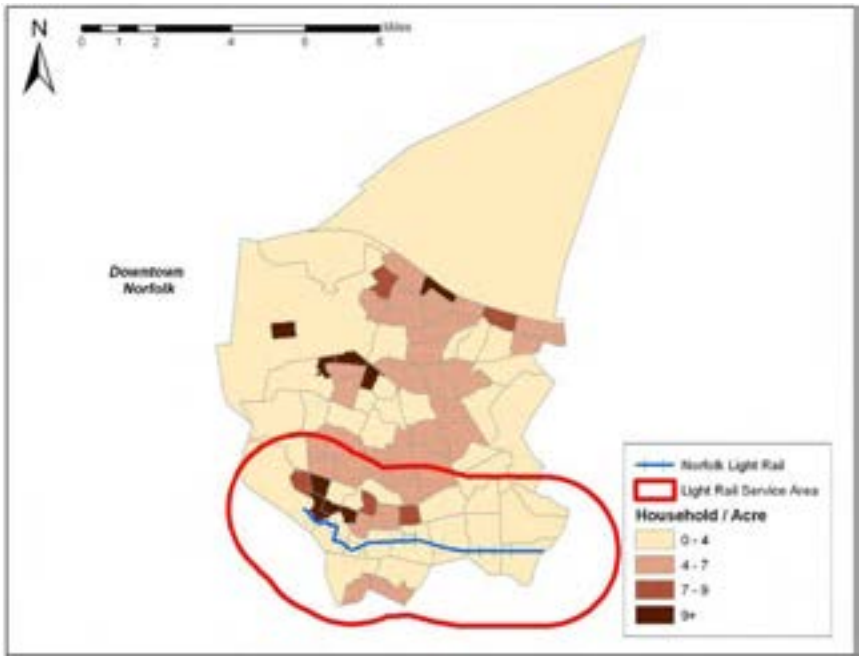
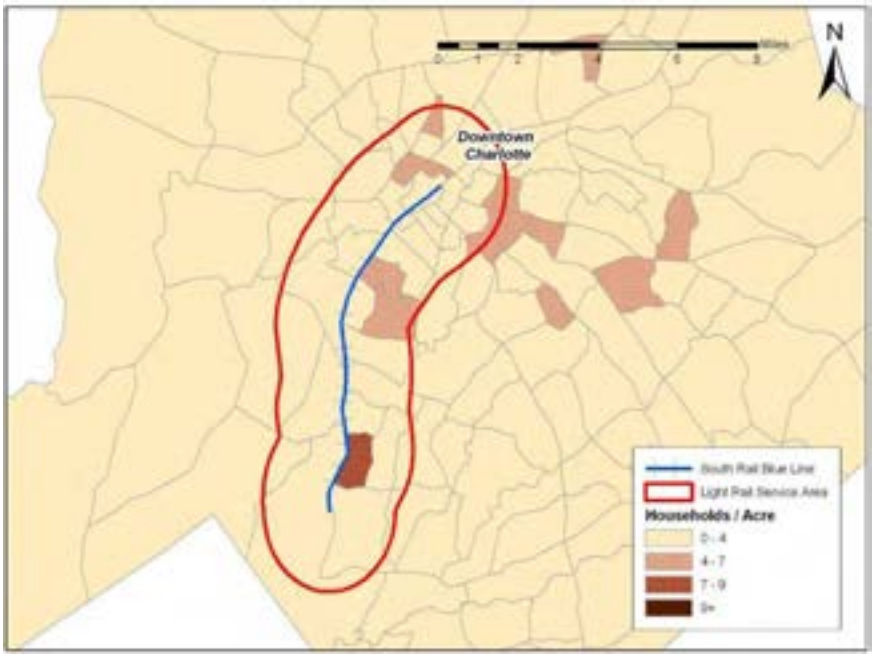


Figure 4-7: Charlotte South Corridor Light Rail



4.2.A CORRIDOR A: I-95 NORTH

The I-95 North corridor is generally defined as connecting Ashland and Hanover County with downtown Richmond. Two potential rights-of-way are available for high-quality transit services – I-95 which could support a commuter bus operation and the CSX rail right of way which is used by Amtrak and has been previously studied for commuter rail service. Technical Memorandum #2: Assessment of Influencing Factors identified two potential transit service options for the I-95 North corridor. In the short term, a commuter bus route could provide service between Ashland and Main Street Station in Richmond. In the long term, based on the ridership of the commuter bus route, it may be appropriate to enhance transit service in this corridor to commuter rail. While Amtrak currently operates passenger rail service in this corridor, the times at which trains operate are generally not suited to commuting to Richmond.

The travel forecasts for 2031 project over 1.0 million daily trips in this corridor (see Table 4-2). If 1% of the peak period travel in the corridor were attracted to transit it would serve almost 1,700 daily trips.

Table 4-2: I-95 Intra-Corridor Trips (2031)

Trip Type	Peak	Off Peak	Total
Work	72,292	128,513	200,805
Non Work	95,332	752,274	847,606
Total	167,624	880,787	1,048,411

PHASE 1: ASHLAND COMMUTER BUS

Land Use Pattern

Land use in the Ashland area is characterized by low density residential and employment development. Moderate to high employment densities are found in the CBD, which is surrounded by moderate to high residential densities. Figure 4-8 to Figure 4-11 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. While South Richmond is within the two-mile buffer, it is not considered part of the Ashland commuter bus service area, since pedestrian connections between South Richmond and downtown Richmond are limited. Figure 4-12 shows that the greatest growth in the number of households between 2006 and 2031 occurs in the vicinity of Ashland, with growth exceeding 50 percent in some areas. Many areas in the vicinity of Main Street Station show a decline or no change in the number of households.

Figure 4-8: Residential Density along I-95 North Bus Corridor (2016)

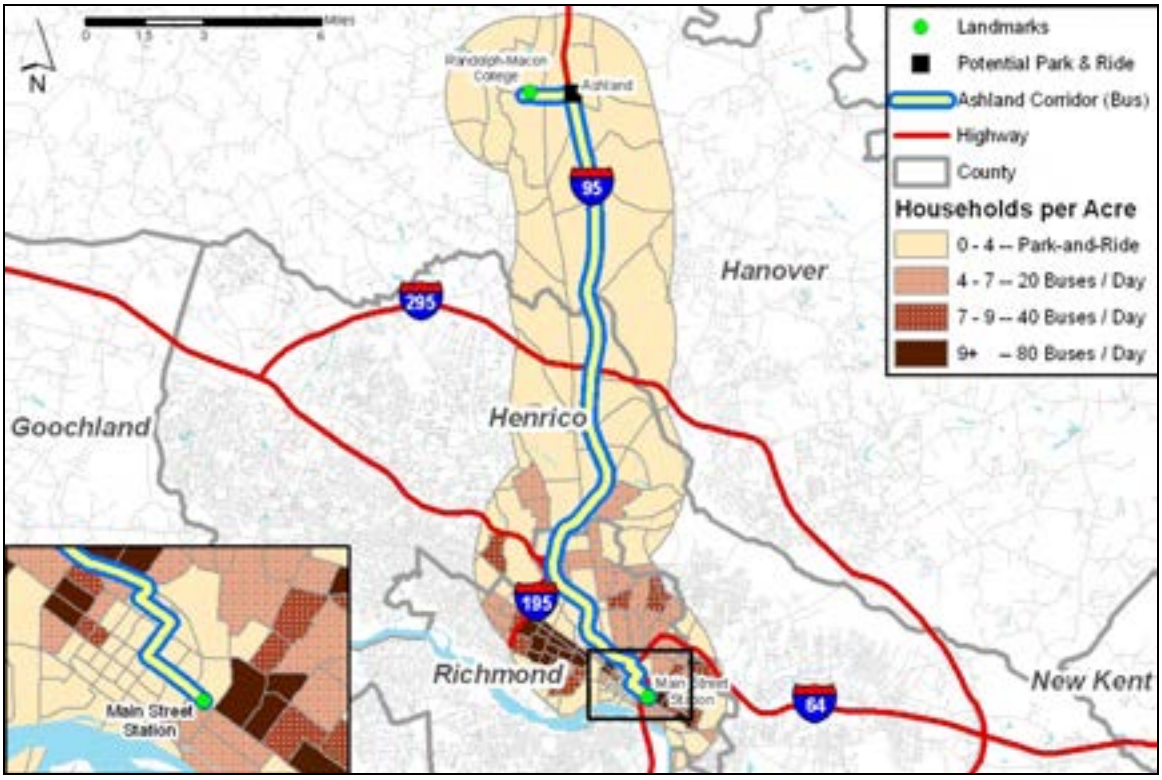


Figure 4-9: Residential Density along I-95 North Bus Corridor (2031)

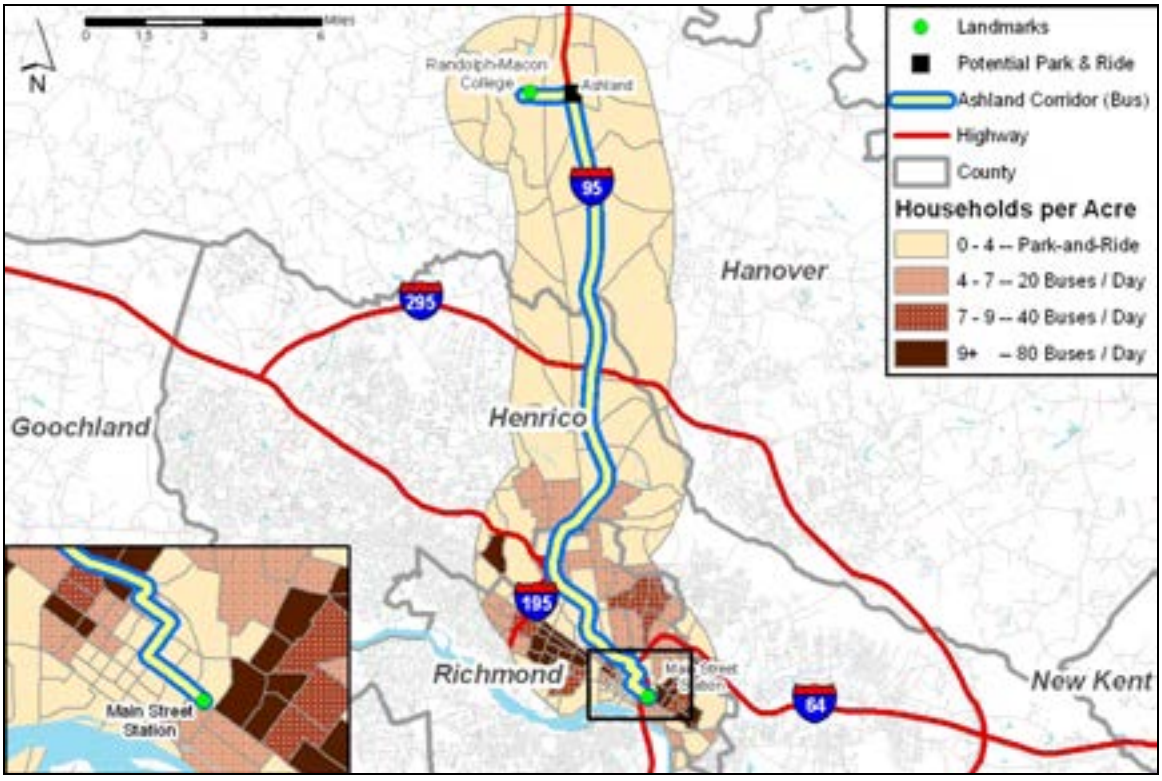


Figure 4-10: Employment Density along I-95 North Bus Corridor (2016)

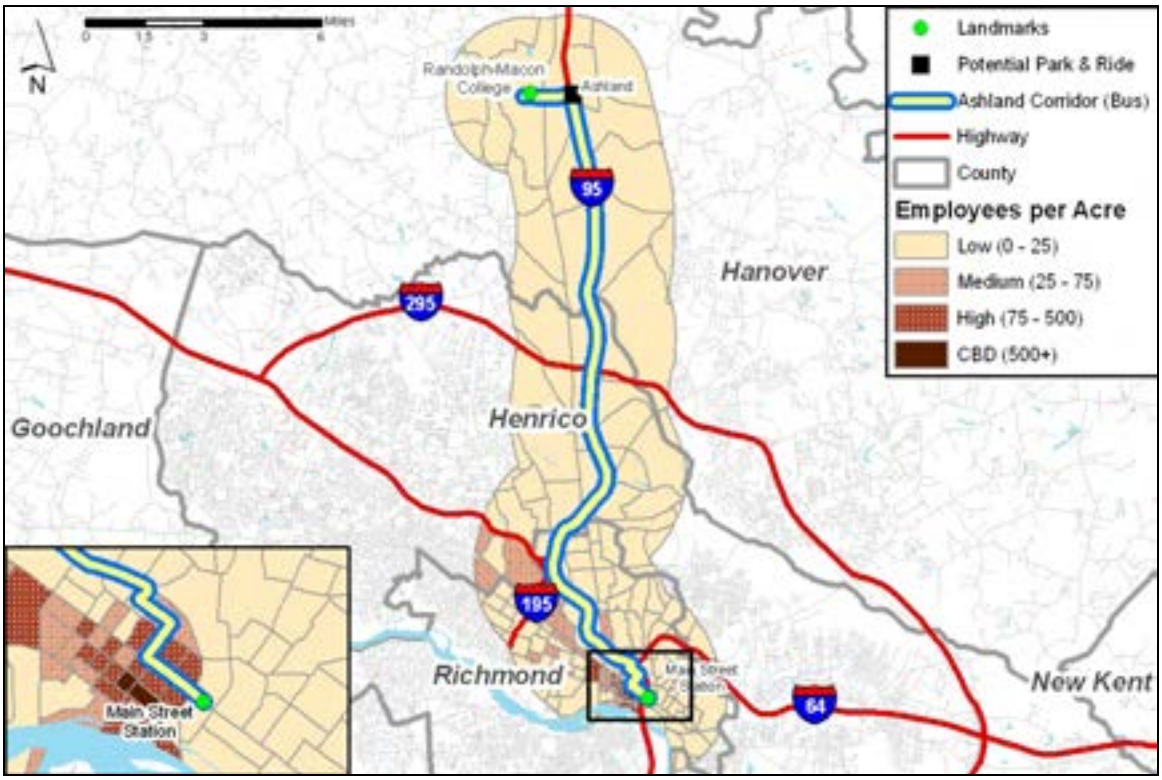


Figure 4-11: Employment Density along I-95 North Bus Corridor (2031)

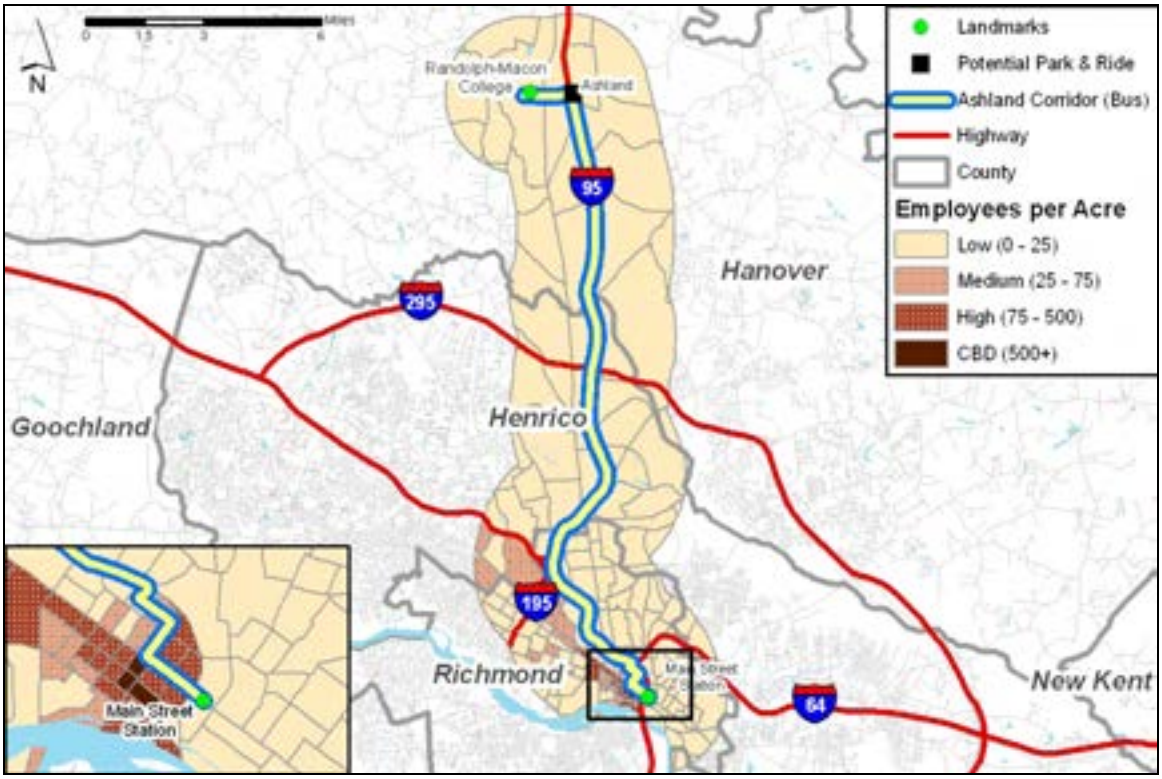
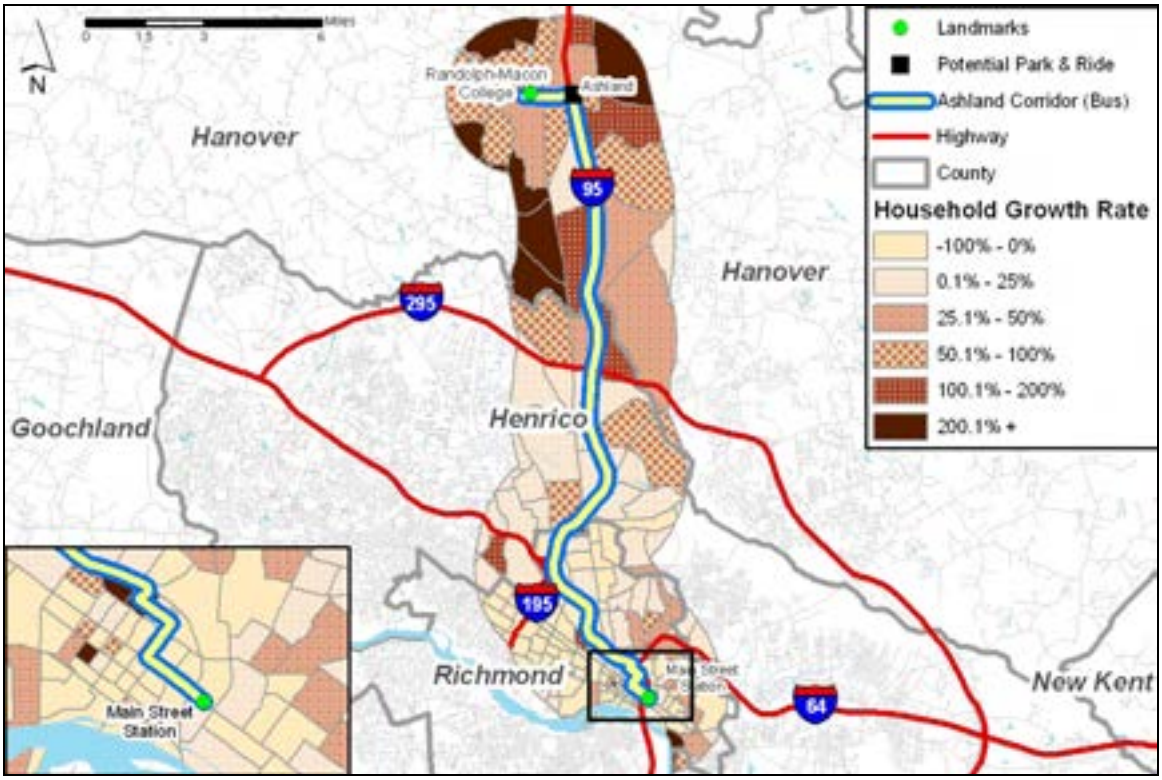


Figure 4-12: Household Growth Rate along I-95 North Bus Corridor (2006 to 2031)



Route Characteristics

The Ashland commuter bus would provide service on the I-95 North corridor Monday through Friday during peak periods and midday. This report proposes an operating concept of four inbound trips during weekday morning peak hours and four outbound trips during the weekday evening peak hours as well as one midday roundtrip. Four vehicles are required to operate service during peak periods. Service would be provided on 30 minute intervals. The annual operating cost is estimated to be approximately $0.1 million. Capital costs are estimated to be $3.0 million, including the cost of a park and ride lot. A summary of service characteristics and costs is provided in Table 4-3.

Table 4-3: Ashland Commuter Bus Summary

Service Characteristics	
Route:	Ashland Commuter Bus
Mode:	Bus
Length:	18.8 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.1 million
Capital Cost:	$3.0 million

Alignment

The Ashland commuter bus is an 18.8 mile route that travels between Ashland and Main Street Station in Richmond. From downtown Ashland, it travels east of Route 54, stopping at a park and ride lot that would be developed in the vicinity of the I-95 interchange. The route then heads southbound on I-95. It exits onto 3rd Street, makes a left onto Jackson Street, a right onto 8th Street and then a left onto Broad Street to Main Street Station.

PHASE 2: ASHLAND COMMUTER RAIL

Land Use Pattern

Land use patterns become denser on the Interstate 95 North corridor approaching Richmond. North of I-295 residential and employment densities are low. Moderate to high employment densities are found in the CBD, which is surrounded by moderate to high residential densities. High densities can be found around the Virginia Commonwealth University and downtown Richmond. Figure 4-13 to Figure 4-16 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. While South Richmond is within the two-mile buffer, it is not considered part of the Ashland commuter bus service area, since pedestrian connections between South Richmond and downtown Richmond are limited. Figure 4-17 shows that the greatest growth in the number of households occurs between 2006 and 2031 in the vicinity of Ashland, with growth exceeding 50 percent in some areas. Many areas in the vicinity of Main Street Station show a decline or no change in the number of households.

Figure 4-13: Residential Density along I-95 North Rail Corridor (2016)

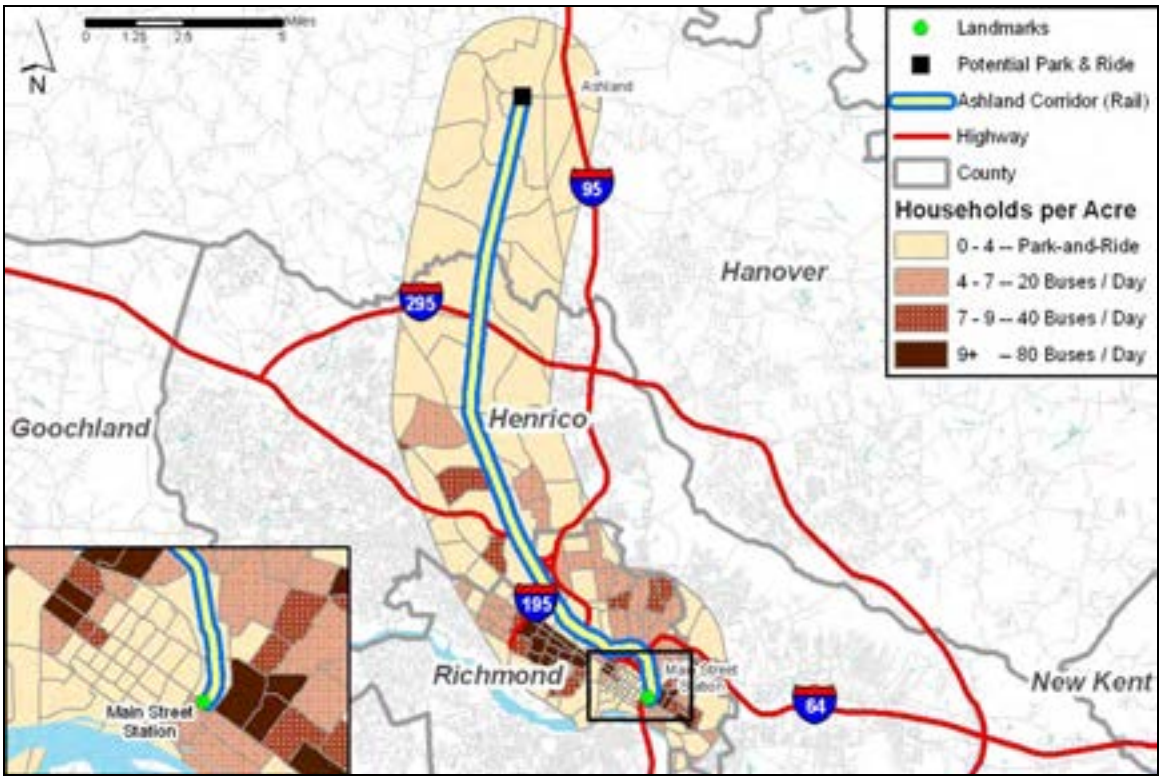


Figure 4-14: Residential Density along I-95 North Rail Corridor (2031)

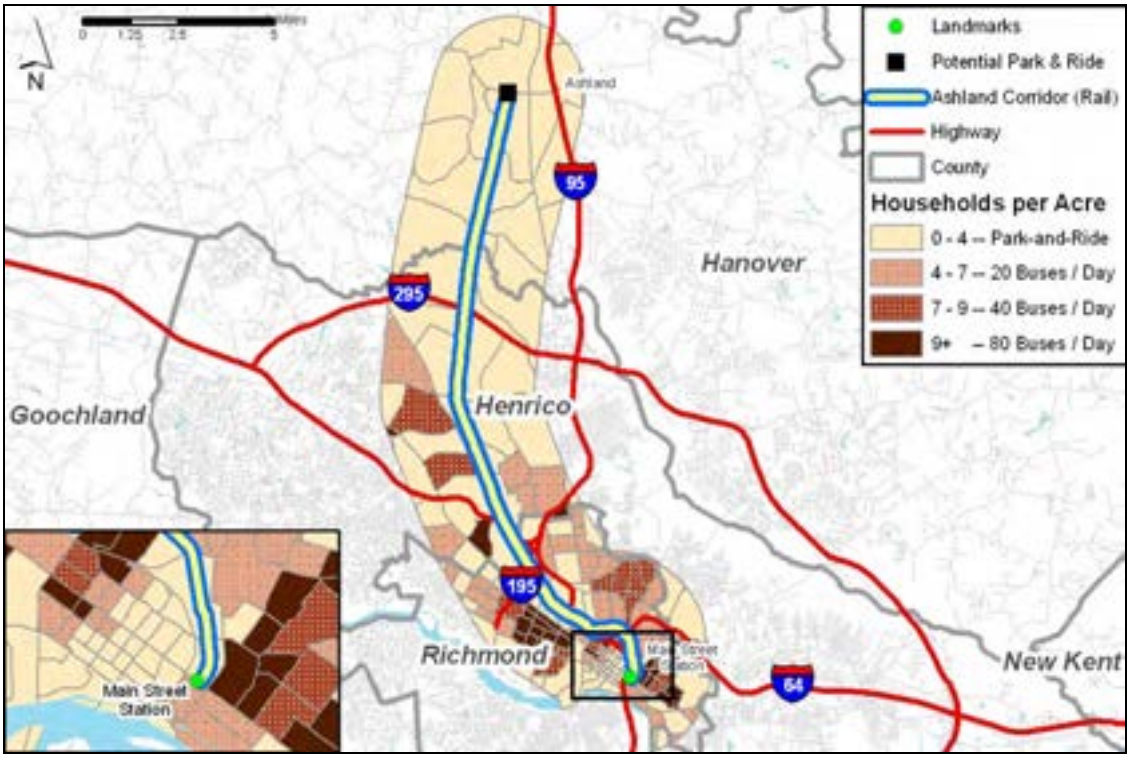


Figure 4-15: Employment Density along I-95 North Rail Corridor (2016)

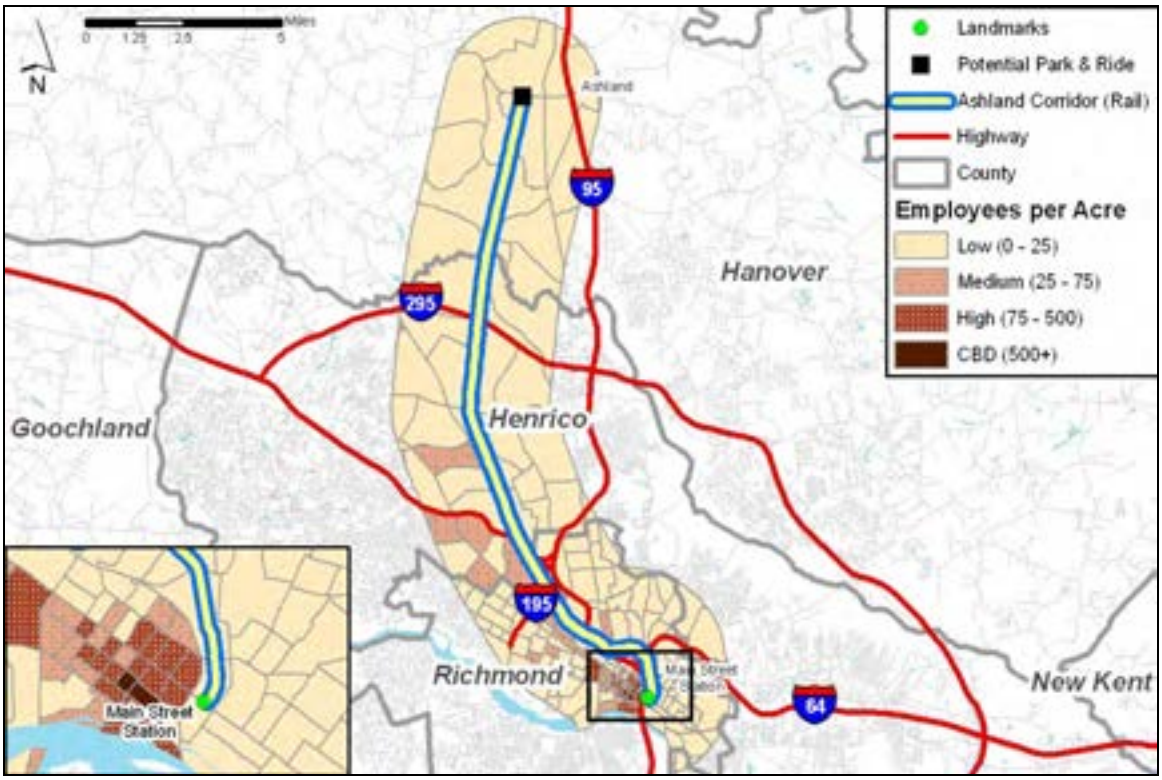


Figure 4-16: Employment Density along I-95 North Rail Corridor (2031)

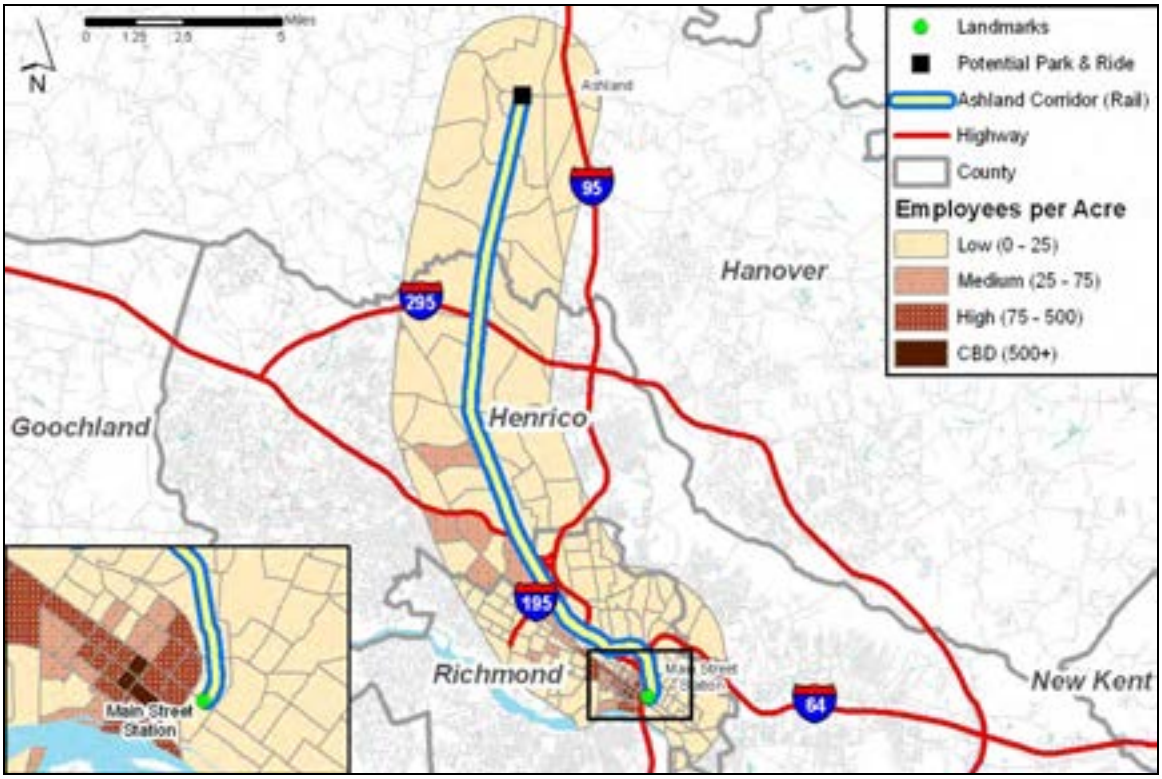
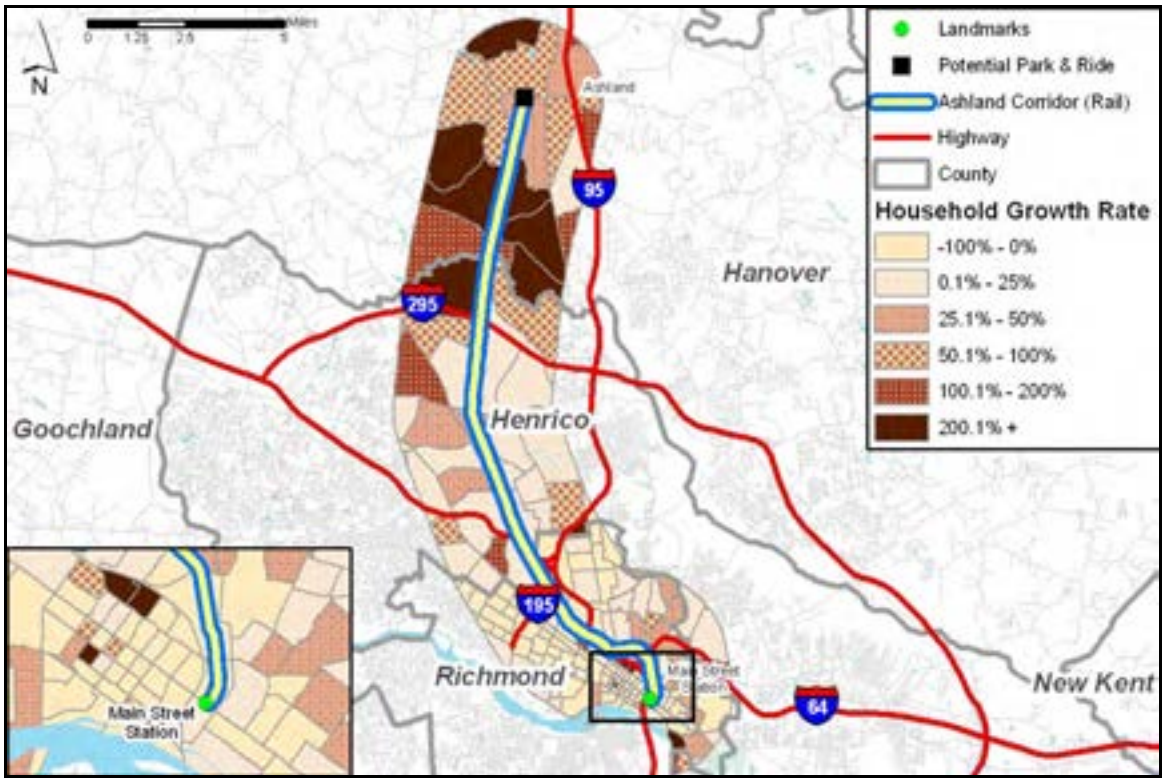


Figure 4-17: Household Growth Rate along I-95 North Rail Corridor (2006 to 2031)



Route Characteristics

An Ashland commuter rail route was proposed as part of the Richmond Rail Feasibility study (2003). The alignment, service span, and headways proposed in this report roughly follow those developed for the Rail Feasibility Study. The Ashland Commuter Rail would operate Monday through Friday during peak periods and midday between Richmond Main Street Station and the Ashland Amtrak Station, a distance of 17.5 miles. This report proposes an operating concept of four inbound trips during weekday morning peak hours and four outbound trips during the weekday evening peak hours as well as one midday roundtrip. Four vehicles are required to operate this service during peak periods. The Richmond Rail Feasibility Study estimated this route would generate 1,800 boardings per weekday in 2023. Annual operating costs are $1.0 million and capital costs are $91 million. A summary of service characteristics and costs is provided in Table 4-4.

Table 4-4: Ashland Commuter Rail Summary

Service Characteristics	
Route:	Ashland Commuter Rail
Mode:	Rail
Length:	17.5 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$1.0 million
Capital Cost:	$91.0 million

Alignment

The Ashland Commuter Rail would operate along the existing CSX line between downtown Ashland and Main Street Station in Richmond, with several stops in between.

Rail Implementation Issues

Existing railroad lines appear to offer an opportunity to make use of an established right-of-way, free of roadway congestion, to provide a high-speed and reliable passenger transportation service. Often a passenger service operated over these rail lines at some time in the past. While there can be many benefits associated with using an existing rail line for passenger service, developing that service is not necessarily easy or inexpensive.

The railroads are private companies and the rights-of-way over which the trains operate are owned by those companies. While the large railroad companies are generally supportive of efforts to improve passenger transportation, the primary business for railroads at the beginning of the 21st century is to transport freight. Rail freight traffic has grown at a rapid rate in recent years. The railroads need to protect capacity for freight service. While they are willing to discuss passenger operations, they will typically insist that there be no conflict with existing or contemplated future freight needs.

The railroads will also insist that the company either incurs no additional costs or liabilities as a result of the passenger operations or that they are fully compensated for any costs incurred. The view of the railroads is that it is permitting the public agency to use the railroad's right-of-way and that the company should incur no burdens or liabilities even for acts for which the railroad may be fully responsible. In Virginia, VRE agrees to indemnify the railroads over which it operates for $250 million, a limit set by Virginia state legislation, should there be a crash or other incident involving damages.

Before passenger operations over a rail right-of-way can be established lengthy negotiations may be required. Even after an agreement with the railroad is successfully concluded, there can be other significant costs. Often the tracks used for rail freight do not have signals and are not maintained to a standard sufficient for operations at the speeds required for passenger service. The public agency will likely have to bear the costs for any upgrading of track and signals and perhaps the installation of passing sidings. Rail cars and locomotives must be located and purchased. A location must be found and arrangements made for the storage and maintenance of the locomotives and cars when not in use. Stations must be located, often with significant parking areas, and constructed.

In summary, although use of railroad rights-of-way is appealing, the costs are significant and must be considered. All of these factors have been considered in the estimate of capital and operating costs shown in Table 4-4.

4.2.B CORRIDOR B: MECHANICSVILLE

The Mechanicsville area of Hanover County has seen an influx of new housing in recent years. This growth is projected to continue during the planning period. The Mechanicsville area is relatively close to downtown Richmond. Attractive bus connections could be easily established over existing roadways.

LAND USE PATTERN

Residential and employment densities are low in the vicinity of Mechanicsville and high in downtown Richmond. Figure 4-18 to Figure 4-21 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-22 shows that the growth in households between 2006 and 2031 is the greatest in the vicinity of Mechanicsville.

Figure 4-18: Residential Density along Mechanicsville Corridor (2016)

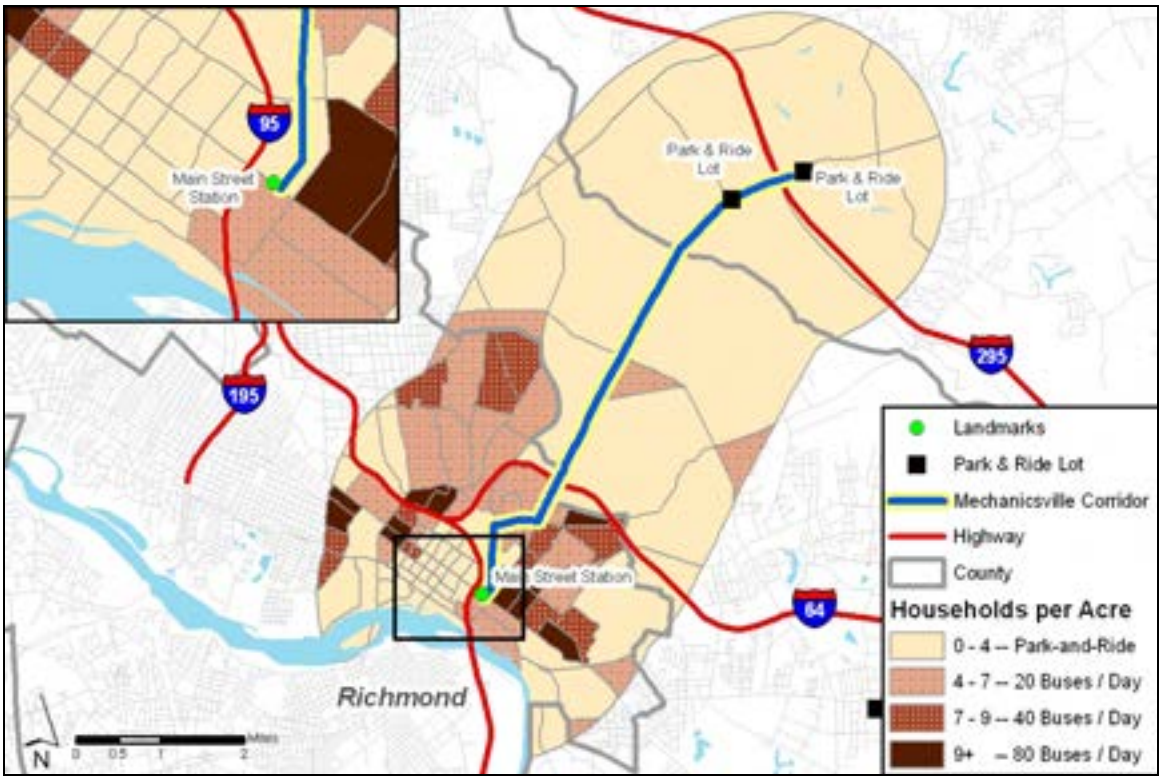


Figure 4-19: Residential Density along Mechanicsville Corridor (2031)

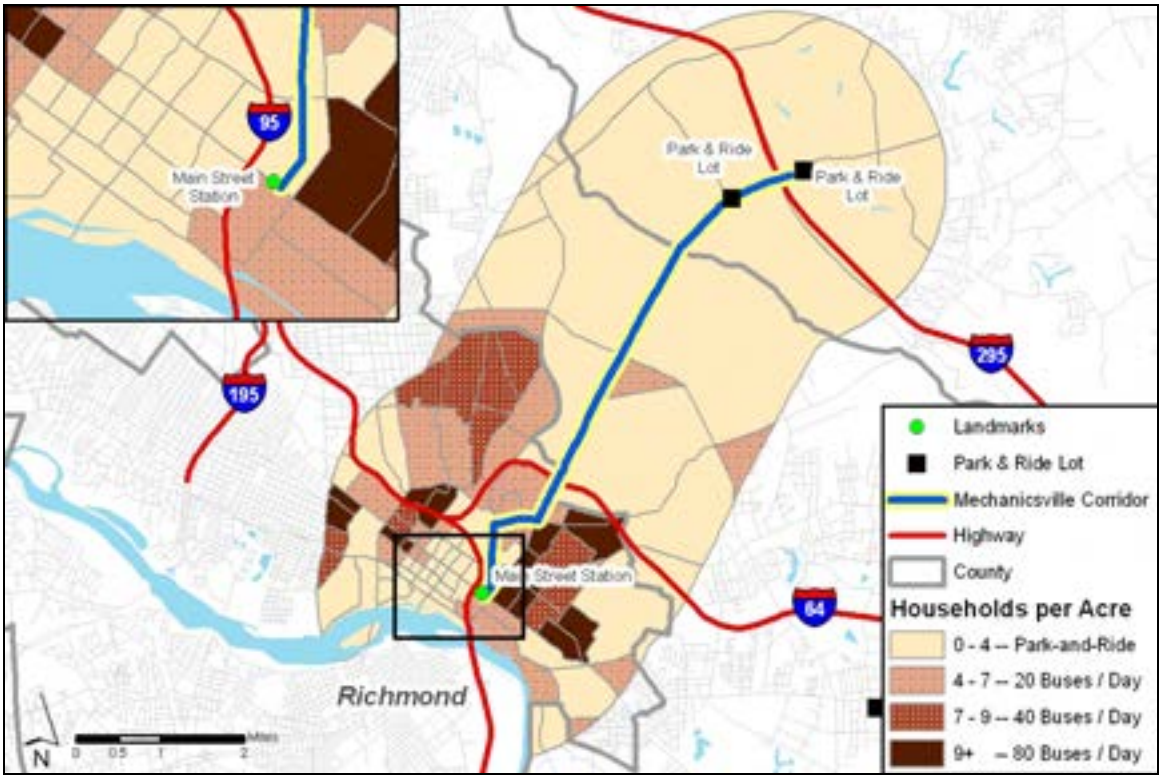


Figure 4-20: Employment Density along Mechanicsville Corridor (2016)

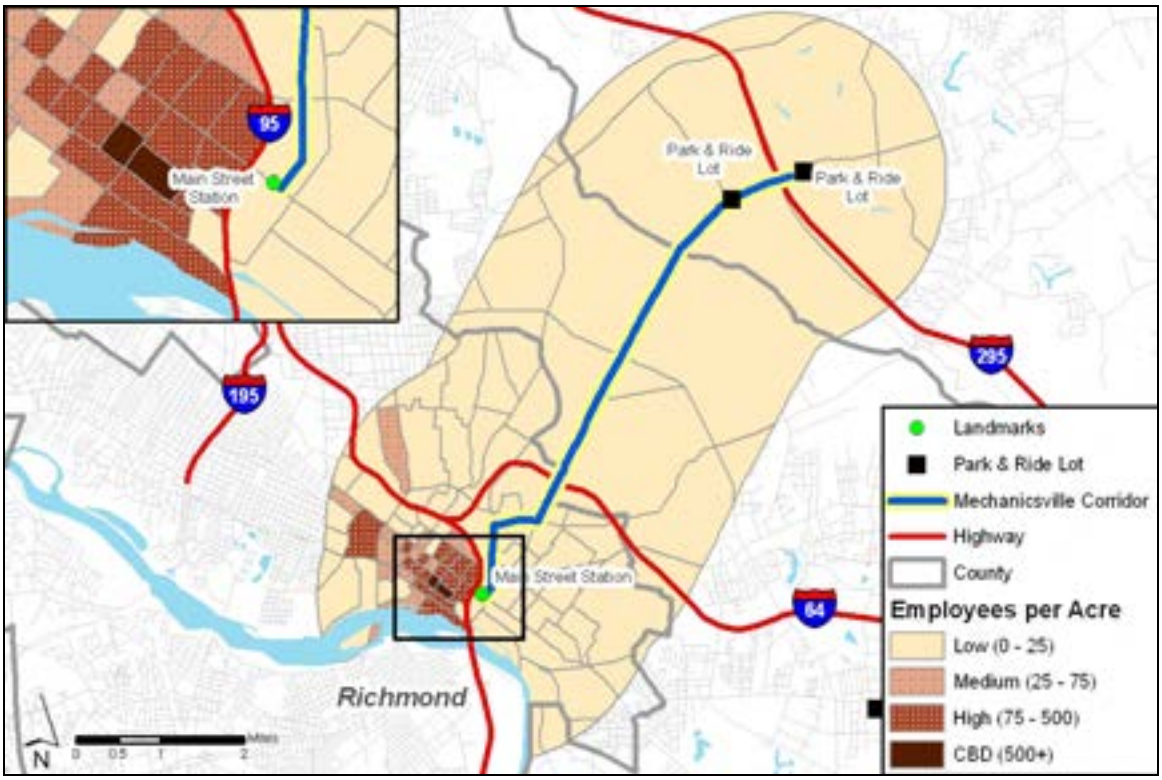


Figure 4-21: Employment Density along Mechanicsville Corridor (2031)

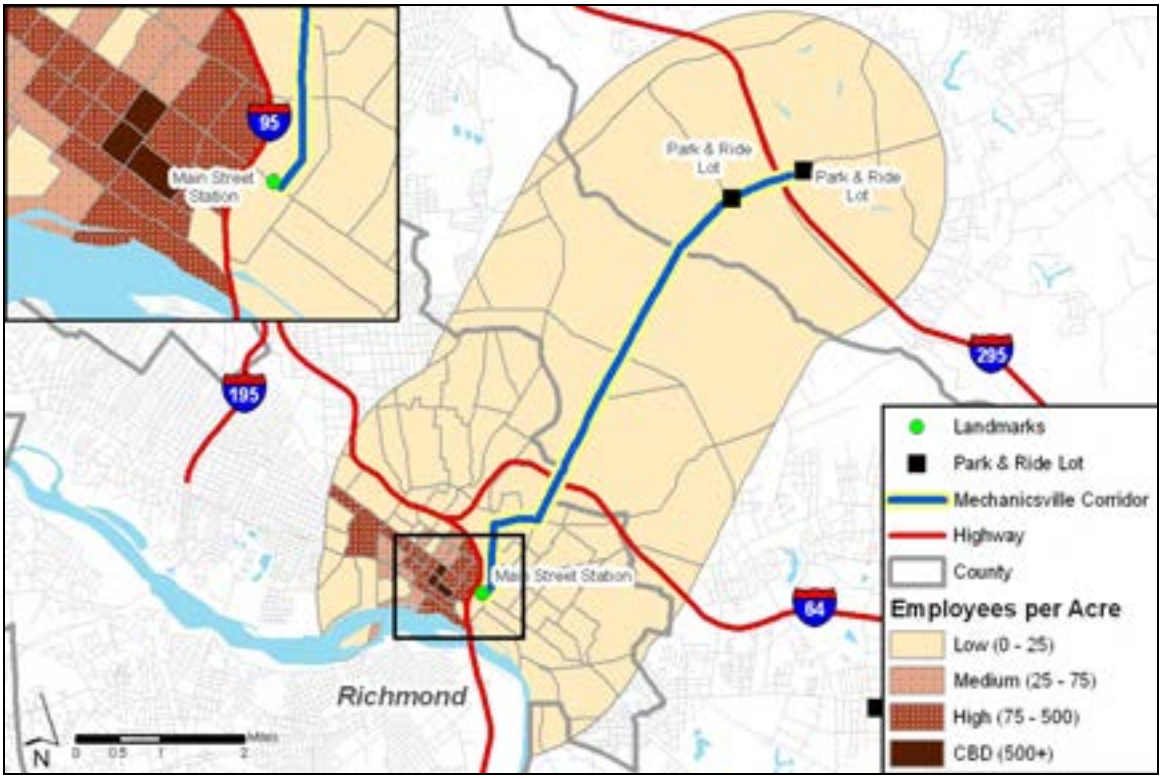
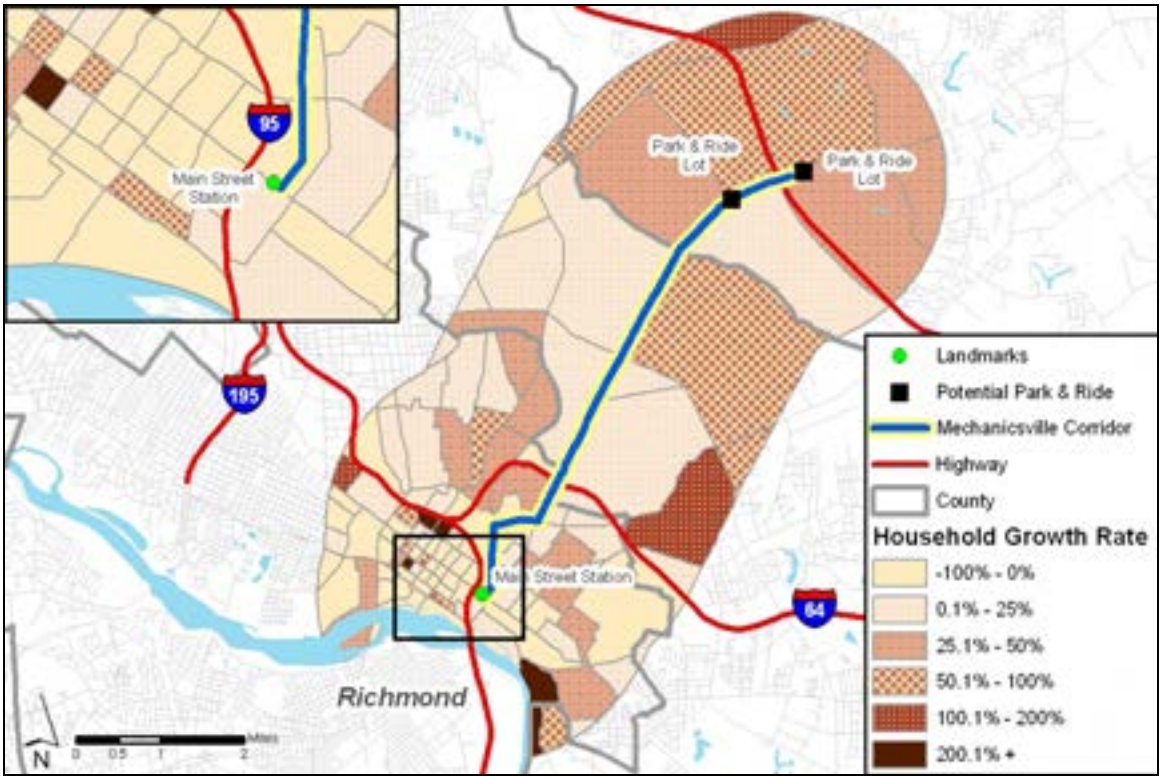


Figure 4-22: Household Growth Rate along Mechanicsville Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

A potential transit service strategy for the Mechanicsville corridor is to operate commuter bus service between the Route 360 and I-64 interchange to Main Street Station in Richmond, a distance of 6.7 miles. This study proposes an operating concept of four inbound trips and one outbound trip during weekday morning peak period and four outbound trips and one inbound trip during the weekday evening peak period. Four vehicles are required during peak periods. Operating costs are estimated to be approximately $0.1 million. Capital costs are estimated to be $4.0 million and include the cost of two park and ride lots. A summary of service characteristics and costs is provided in Table 4-5.

Table 4-5: Mechanicsville Commuter Bus Summary

Service Characteristics	
Route:	Mechanicsville Commuter Bus
Mode:	Bus
Length:	6.7 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.1 million
Capital Cost:	$4.0 million

ALIGNMENT

The Mechanicsville commuter bus would begin service on Route 360 in Mechanicsville, serving potential park and ride lots on Route 360 on both sides of I-295. After passing the I-64 interchange, this route turns right onto Fairfield Ave and then left onto 17th St.

4.2.C CORRIDOR C: I-64 EAST

I-64 provides a direct connection to downtown Richmond from New Kent County and is also the preferred roadway route for portions of Charles City County.

LAND USE PATTERN

The I-64 East corridor is characterized by low-density development except in downtown Richmond. Figure 4-23 to Figure 4-26 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. In addition, Figure 4-27 shows that growth in the number of households along the corridor between 2006 and 2031 is forecast to be highest in New Kent County.

Figure 4-23: Residential Density along I-64 East Corridor (2016)

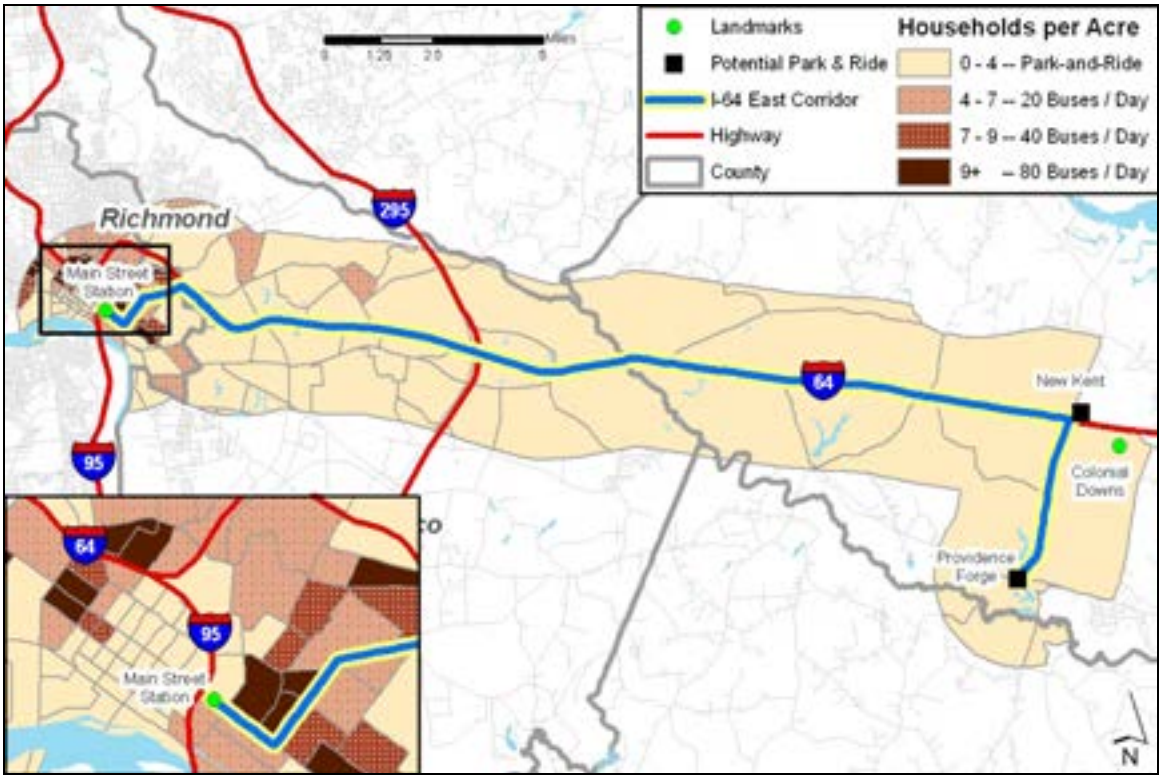


Figure 4-24: Residential Density along I-64 East Corridor (2031)

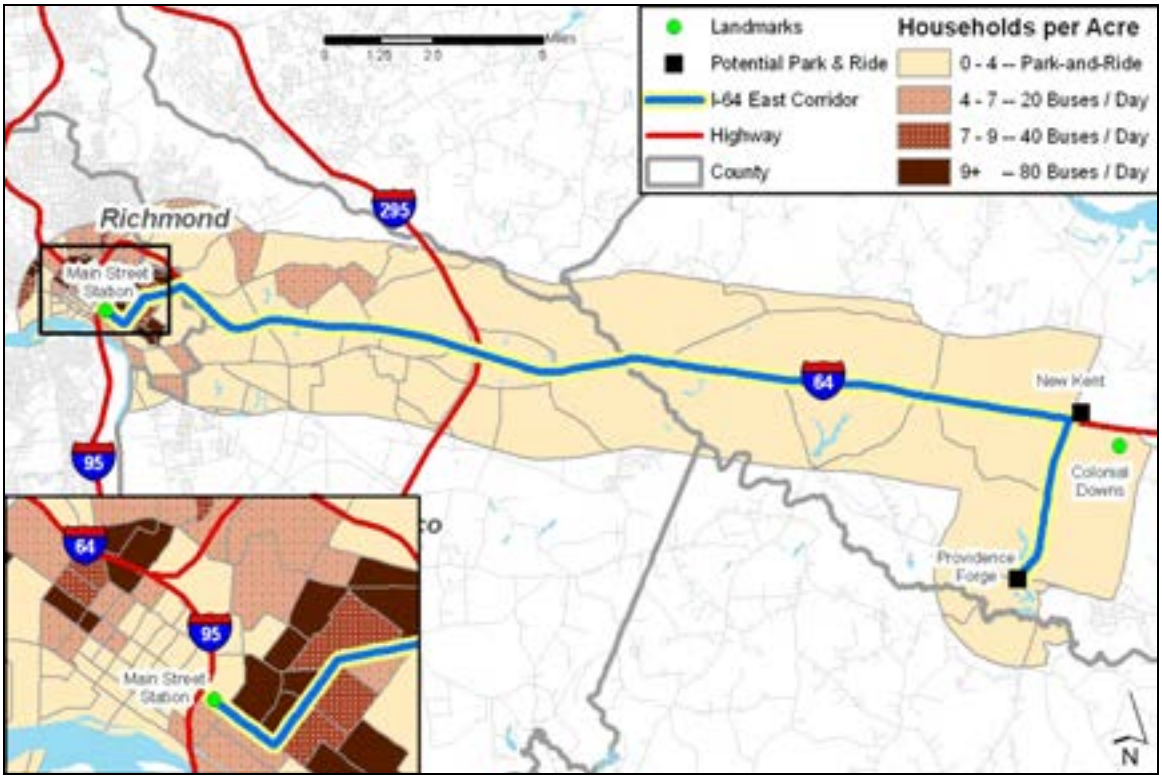


Figure 4-25: Employment Density along I-64 East Corridor (2016)

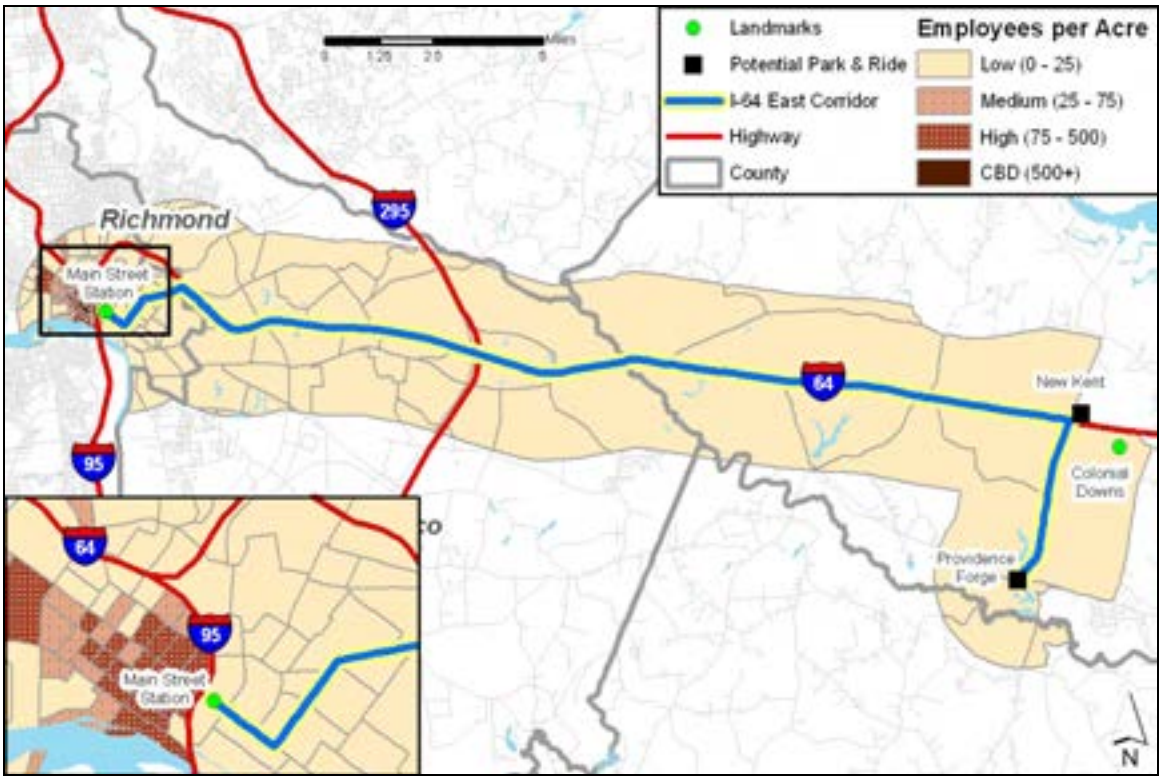


Figure 4-26: Employment Density along I-64 East Corridor (2031)

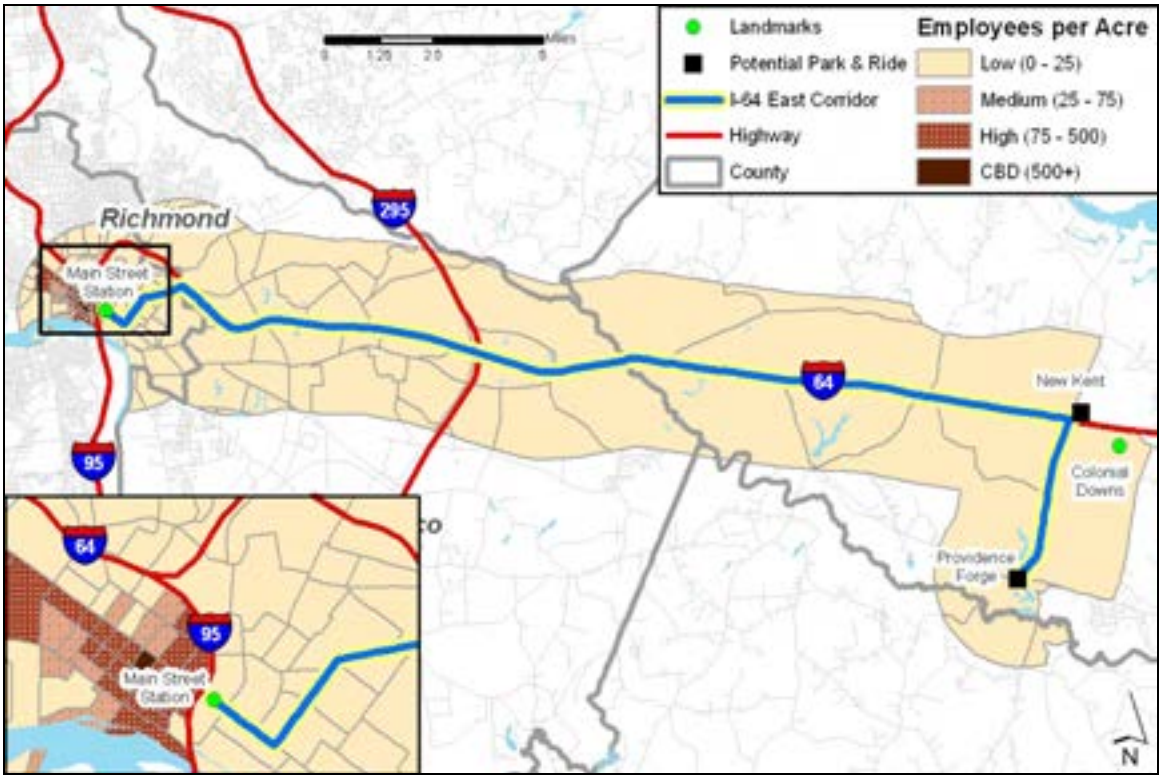
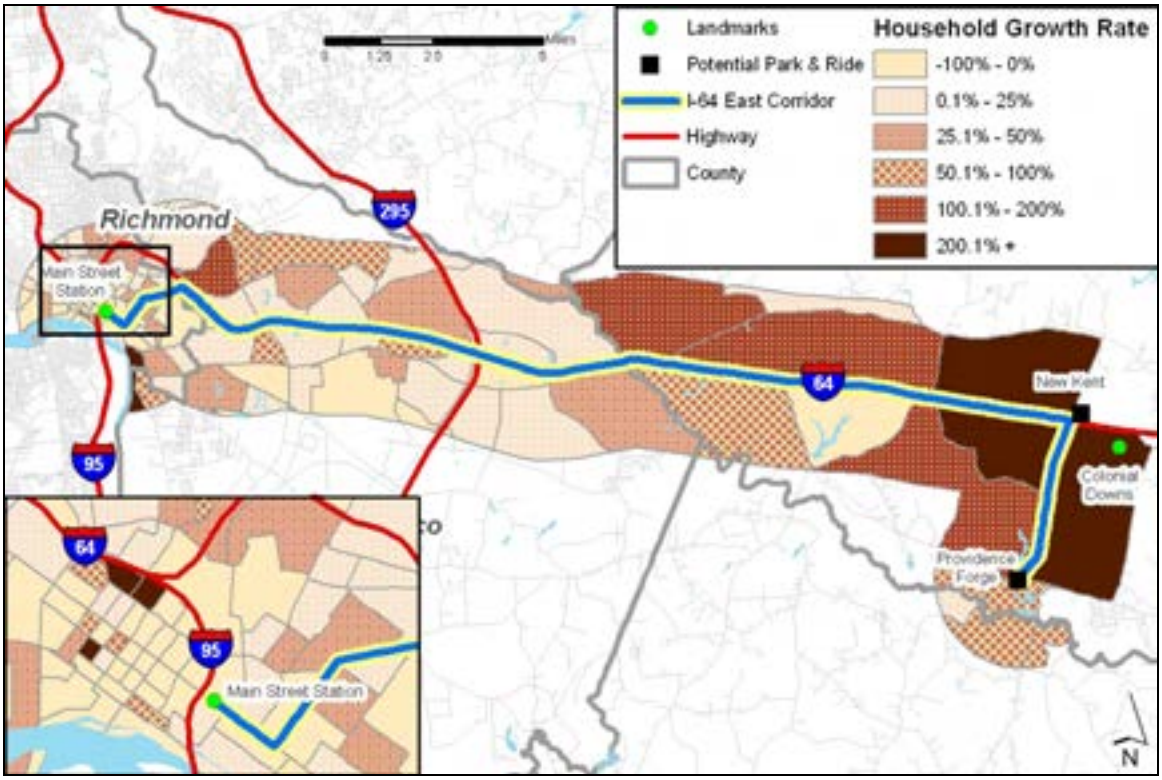


Figure 4-27: Household Growth Rate on I-64 East Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

One potential service option for the I-64 East corridor is to provide commuter bus service between Providence Forge and Main Street Station in Richmond, a distance of 27.3 miles. Park and ride lots are located at Providence Forge and at the interchange of I-64 and Route 155. This study proposes an operating concept of four inbound trips and one outbound trip during weekday morning peak period and four outbound trips and one inbound trip during the weekday evening peak period. It would require four vehicles during peak periods. The annual operating cost is approximately $0.1 million. Capital costs are approximately $4.0 million and include the cost of two park and ride lots. A summary of service characteristics and costs is provided in Table 4-6.

Table 4-6: I-64 East Commuter Bus Summary

Service Characteristics	
Route:	I-64 East Commuter Bus
Mode:	Bus
Length:	27.3 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.1 million
Capital Cost:	$4.0 million

ALIGNMENT

The I-64 East commuter bus would begin service at a park and ride lot located in Providence Forge and travel northbound on Route 155. It would serve a second park and ride lot in the vicinity of I-64 and Route 155 and then would travel westbound on Route 64, entering downtown Richmond via Nine Mile Road, 5th Street, and Broad Street.

4.2.D CORRIDOR D: RICHMOND INTERNATIONAL AIRPORT

Richmond International Airport is not only the gateway to Richmond for air travelers, but also a significant employment site attracting workers from all portions of the metropolitan area. GRTC currently provides only limited service to the airport. In many metropolitan areas public transportation is available throughout the day connecting the regional airport with the central business district.

Technical Memorandum #2 identified two potential service options for the Richmond International Airport corridor. In the short term, a limited-stop bus route could provide service between the airport and Main Street Station in Richmond. In the long term, based on the ridership of the limited-stop bus route, it may be appropriate to enhance transit service in this corridor to light rail.

The travel forecasts for 2031 project over 275,000 daily trips in this corridor (see Table 4-7). If 1% of the daily travel were attracted to either the limited-stop bus route or LRT line it would serve almost 2,800 trips. In addition, Richmond International Airport forecasts that enplanements will likely grow by 84% between 2006 and 2026, from approximately 1.6 million enplanements per year in 2006 to over 3.0 million enplanements per year in 2031[3].

Table 4-7: Airport Intra-Corridor Trips (2031)

Trip Type	Peak	Off Peak	Total
Work	11,729	20,854	32,583
Non Work	27,488	216,361	243,849
Total	39,217	237,215	276,432

PHASE I: AIRPORT LIMITED STOP BUS

One short-term option for providing transit service to Richmond International Airport is via limited-stop bus service. This route would provide service between the airport and Main Street Station.

Land Use Pattern

The Richmond International Airport corridor is characterized by low-density development along most of the alignment. While several locations exceed a residential density of four dwelling units per acre, these are located close to the CBD. They include Shockoe Bottom and Tobacco Row in 2016 and extend to Rocketts Landing in 2031. Although this area is projected to experience rapid population growth over the next two decades, the overall population density will still be low. Employment densities are low along most of the corridor except for downtown Richmond, which is forecast to maintain its high employment densities in 2016 and 2031. Major generators along the corridor are downtown Richmond and the airport. Figure 4-28 to Figure 4-31 show residential and employment densities along a two-mile buffer of the rail corridor in 2016 and 2031. While South Richmond is within the two-mile buffer, it is not considered part of the Airport corridor, since pedestrian connections between South Richmond and downtown Richmond are limited. Figure 4-32 shows that the largest change in households between 2006 and 2031 is south of the Airport corridor, with several TAZs growing by over 50%. If the growth in these areas is concentrated in specific nodes closely tied to the transit route and light rail stations, then implementation of service prior to 2031 may become attractive. Otherwise, this will likely be a Tier III project.

[3] Source: Capital Region Airport Commission

Figure 4-28: Residential Density along Airport Bus Corridor (2016)

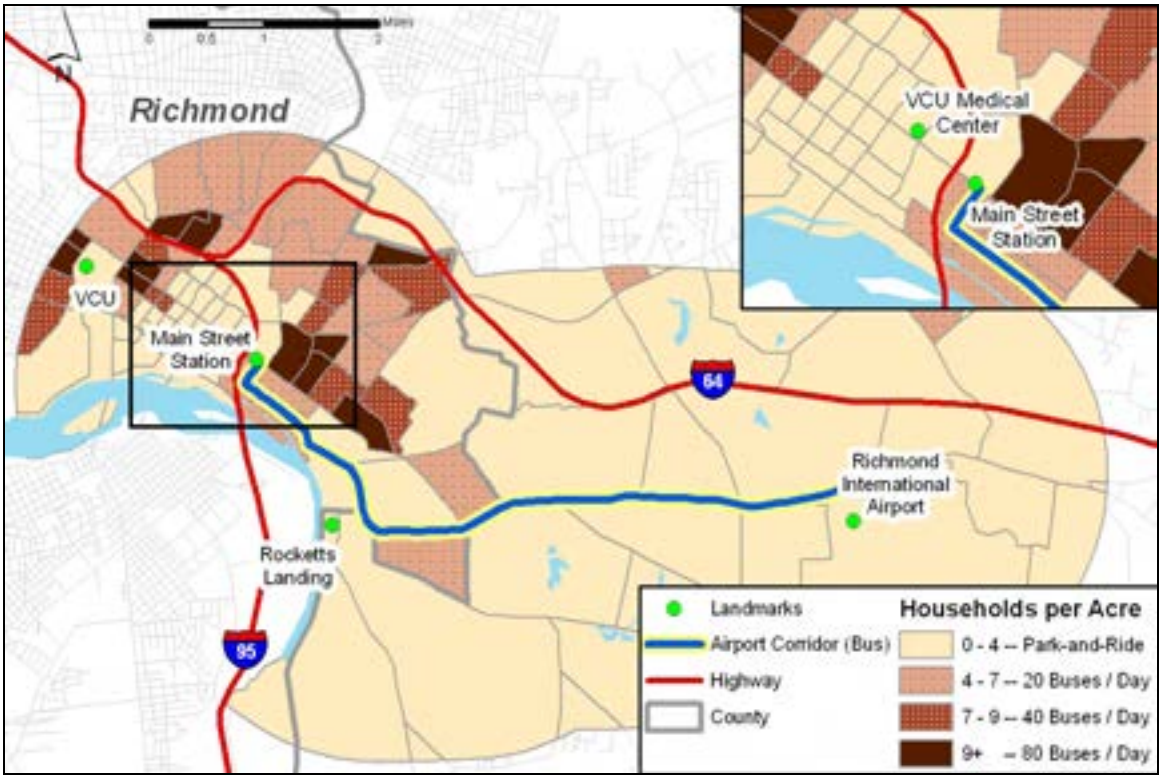


Figure 4-29: Residential Density along Airport Bus Corridor (2031)

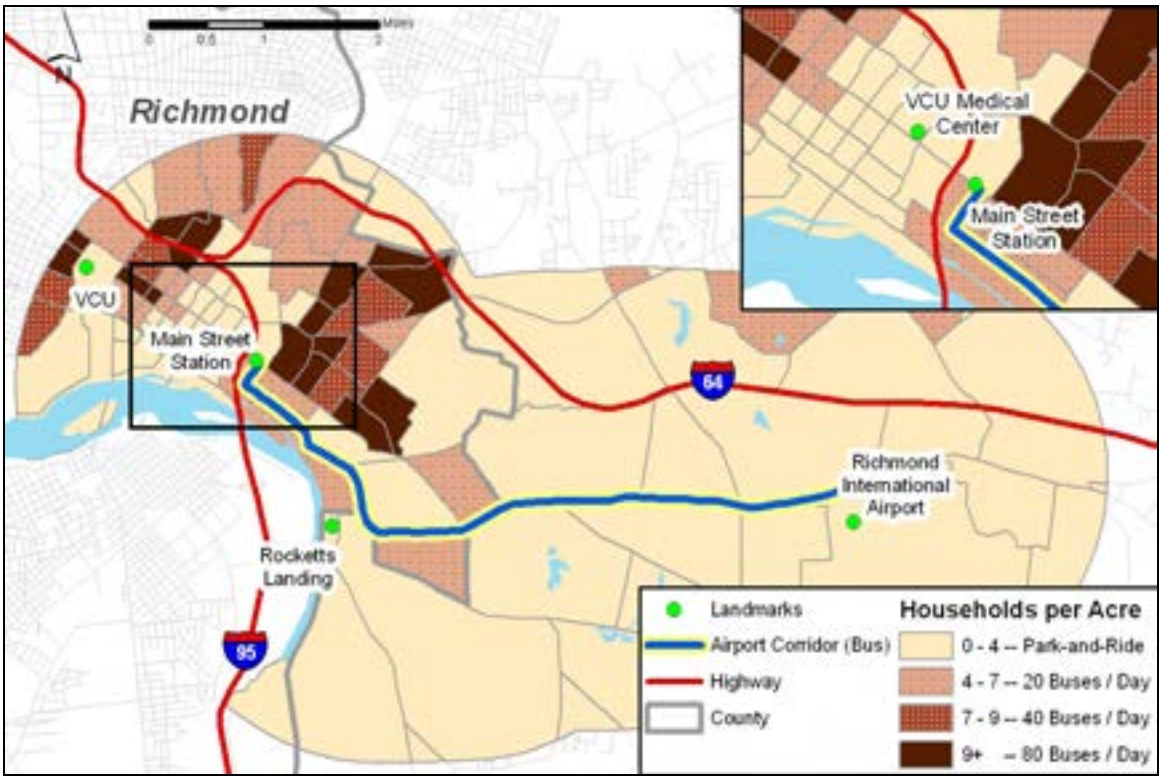


Figure 4-30: Employment Density along Airport Bus Corridor (2016)

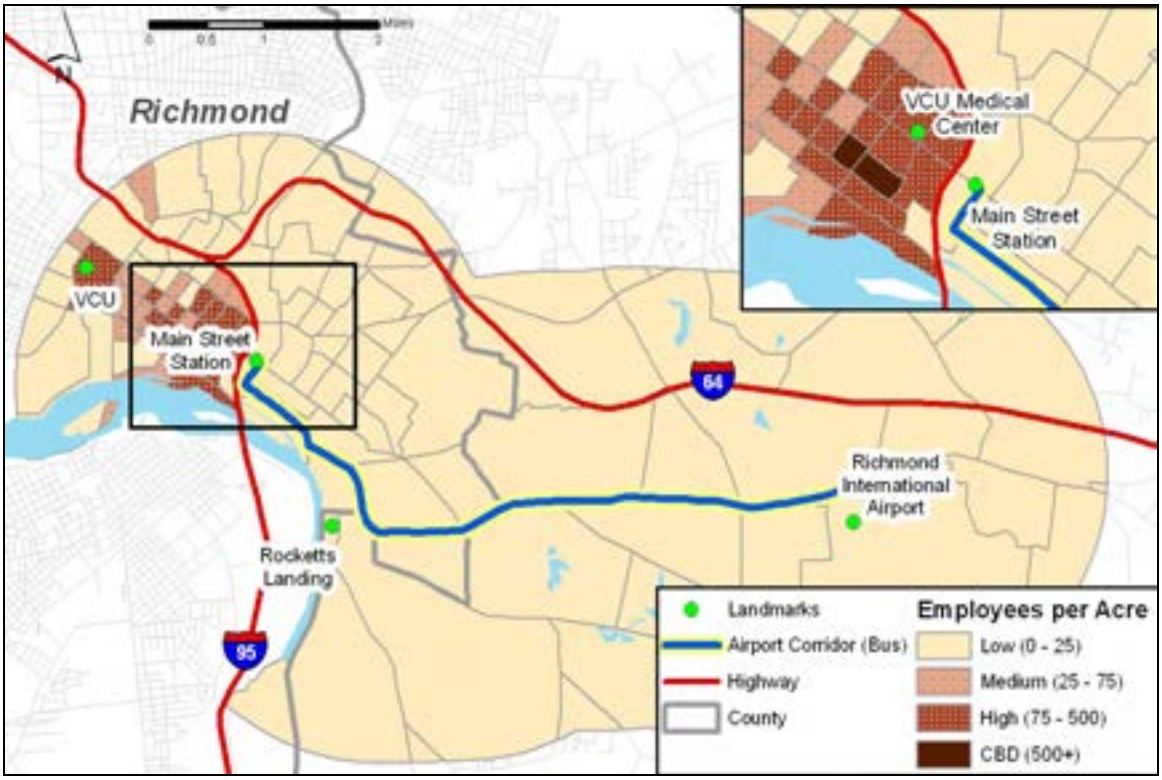


Figure 4-31: Employment Density along Airport Bus Corridor (2031)

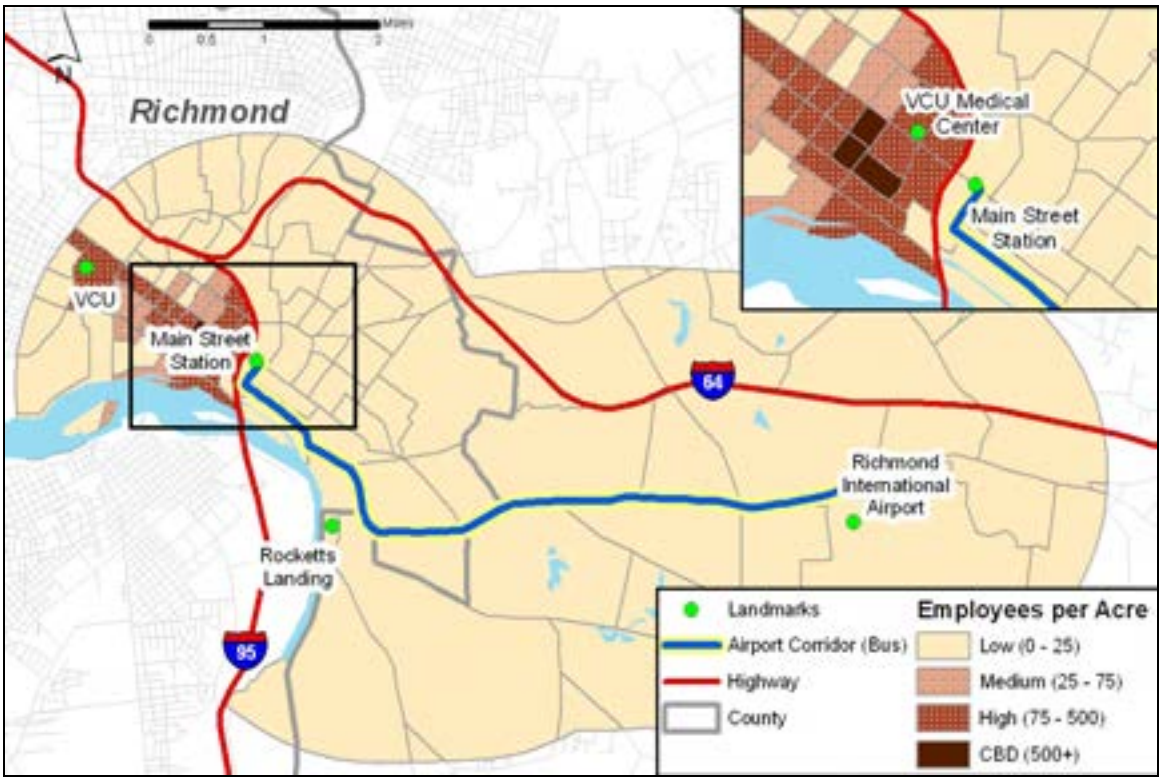
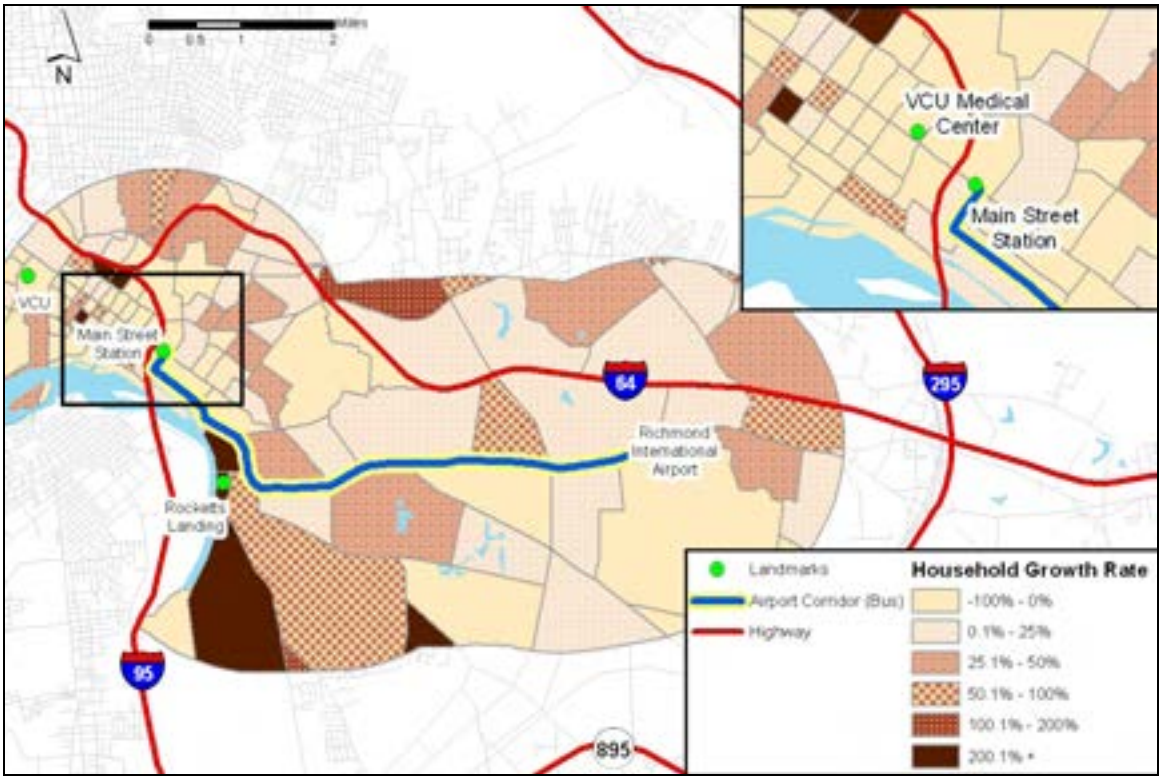


Figure 4-32: Household Growth Rate along Airport Bus Corridor (2006 to 2031)



Route Characteristics

The limited-stop bus route would operate seven days a week, between 6:00 am and 11:00 pm (10:00 pm on Sundays), and would require 2 vehicles to operate peak service. Recommended headways are 30 minutes on weekdays and Saturdays and 60 minutes on Sunday. The annual operating cost for this route is approximately $0.7 million and capital costs are approximately $1.8 million (including the cost of constructing a park-and-ride lot). A summary of service characteristics and costs is provided in Table 4-8.

Table 4-8: Airport Limited Stop Bus Summary

Service Characteristics	
Route:	Airport Limited Stop
Mode:	Bus
Length:	7.0 miles
Headway:	30 minutes (Monday through Saturday) 60 minutes (Sunday)
Service Span:	6:00 am to 11:00 pm (Monday through Saturday) 6:00 am to 10:00 pm (Sunday)
Peak Vehicles:	2

Cost (2006 dollars)	
Annual Operating Cost:	$0.7 million
Capital Cost:	$1.8 million

Route Alignment

The limited-stop bus service would travel between Richmond International Airport and Main Street Station along Williamsburg Rd, with a stop at Rocketts Landing. The length of the route is 7.0 miles.

PHASE II: AIRPORT LIGHT RAIL

A second potential transit mode for the Airport corridor is light rail, which was proposed as part of the Richmond Rail Feasibility Study (2003).

Land Use Pattern

See *Phase I: Airport Limited Bus Stop* in Section 4.2.D.

Figure 4-33: Residential Density along Airport Rail Corridor (2016)

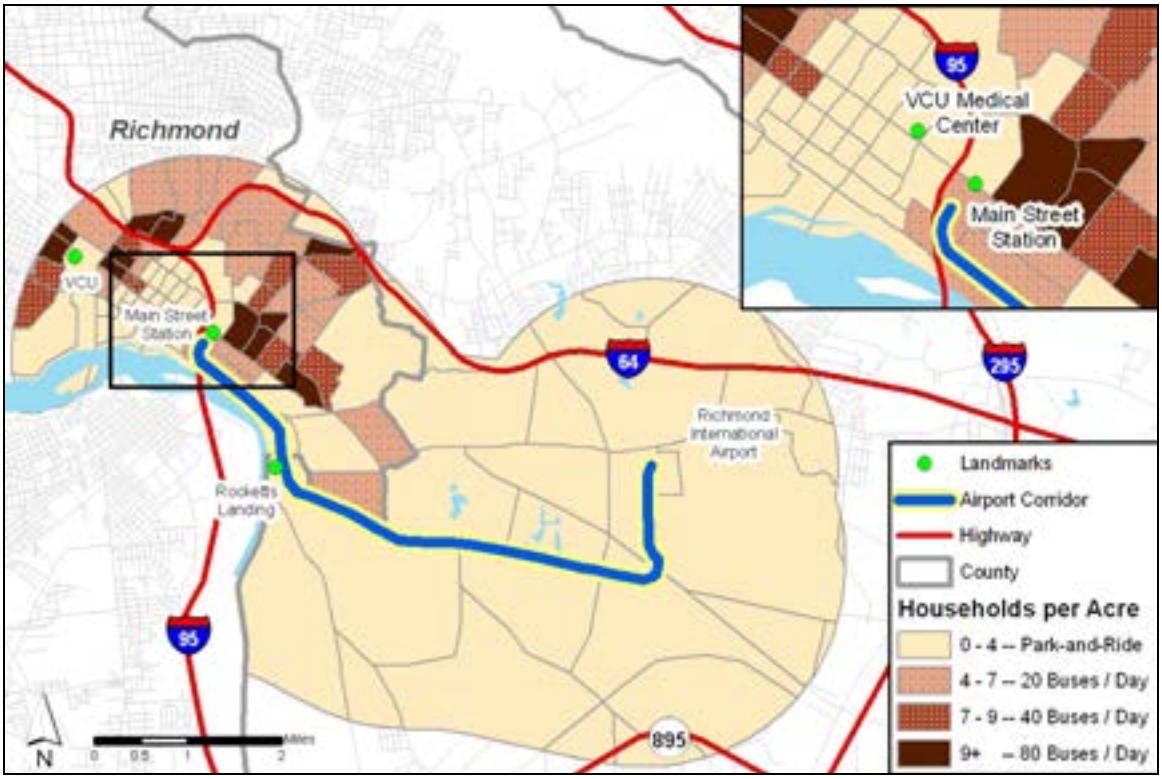


Figure 4-34: Residential Density along Airport Rail Corridor (2031)

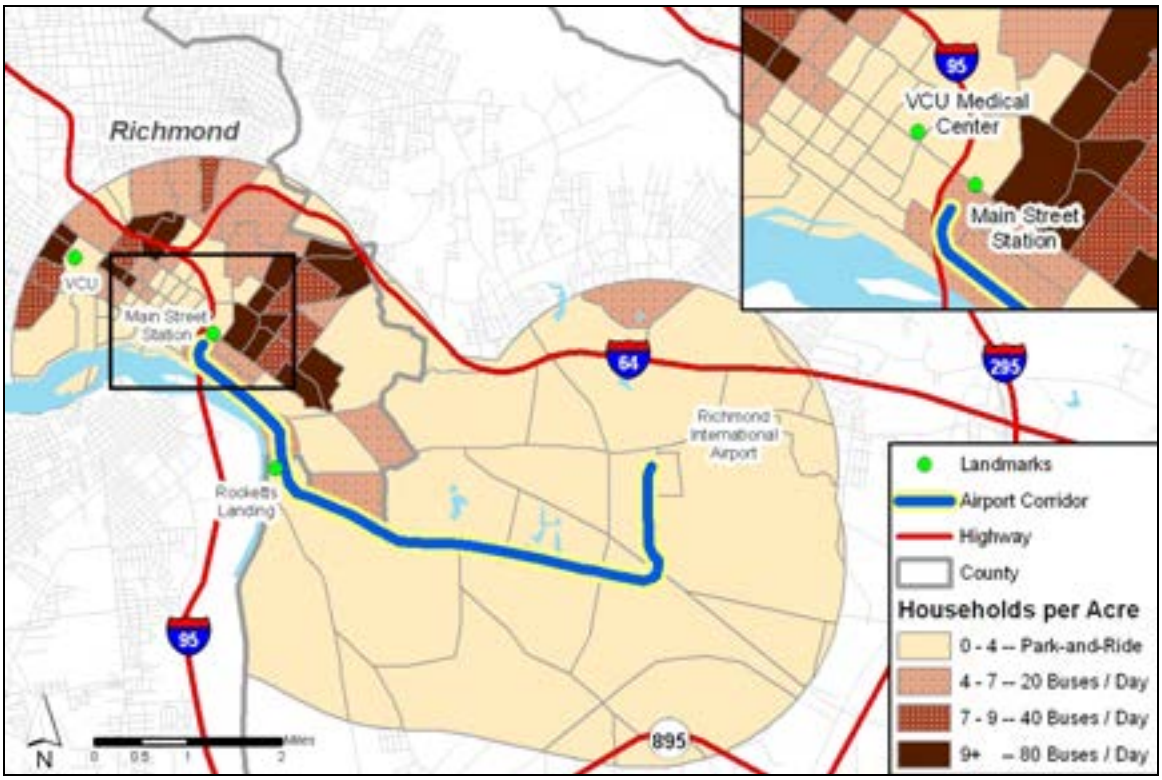


Figure 4-35: Employment Density along Airport Rail Corridor (2016)

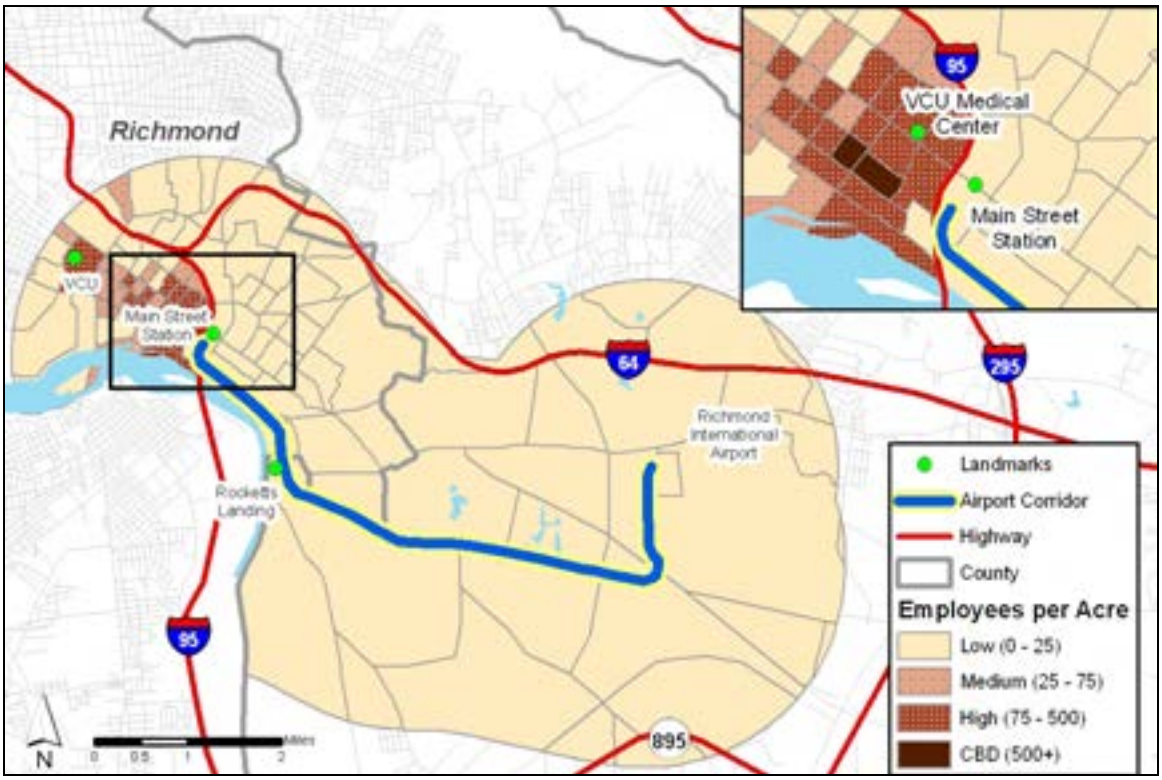


Figure 4-36: Employment Density along Airport Rail Corridor (2031)

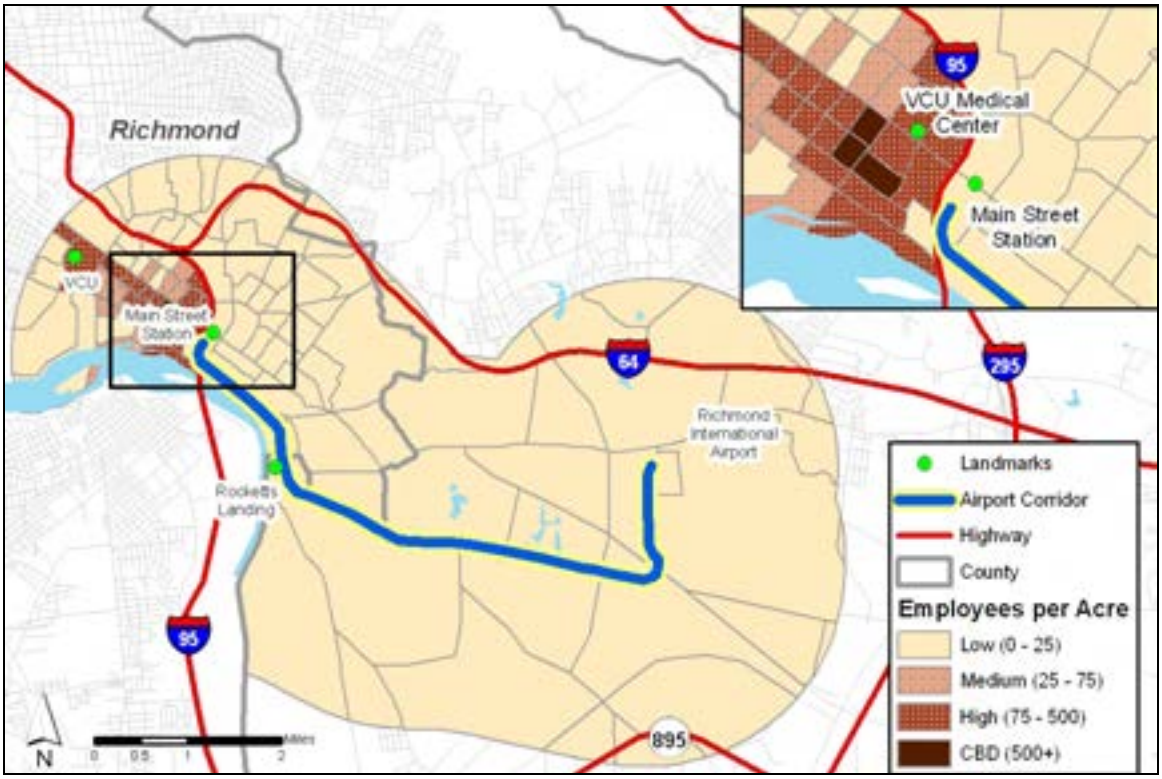
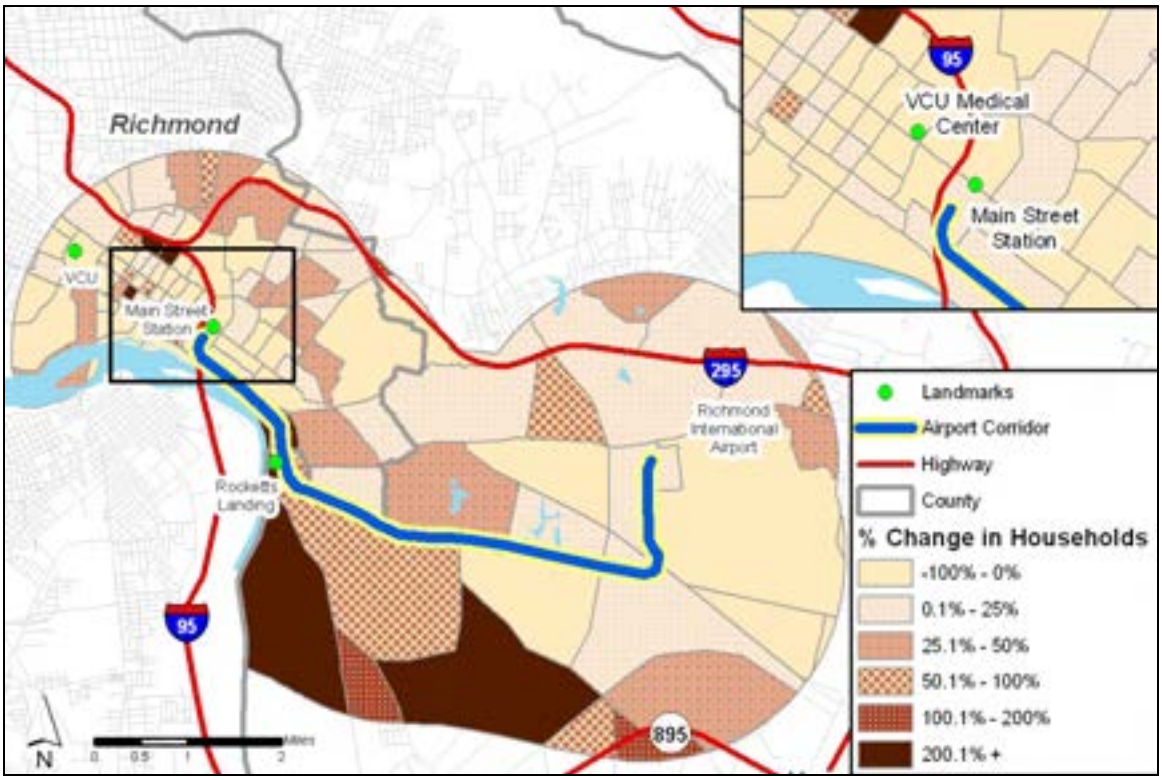


Figure 4-37: Household Growth Rate along Airport Rail Corridor (2006 to 2031)



Route Characteristics

The alignment, service span, and headways proposed in this study roughly follow those developed for the Richmond Rail Feasibility Study. Light rail transit service would operate seven days a week, between 5:30 am and midnight. During peak periods, it would operate on 10 minute headways, while during off-peak periods and weekends, the headway would be reduced to 15 and 30 minutes. This requires operating six vehicles per hour during peak service. The Richmond Rail Feasibility Study estimated a weekday ridership of 19,100 boardings. Annual operating costs are estimated to be $7.6 million. Capital costs are estimated to be $395 million. A summary of service characteristics and costs is provided in Table 6-9.

Table 4-9: Airport Light Rail Summary

Service Characteristics	
Route:	Airport LRT
Mode:	Light Rail
Length:	7.3 miles
Headway:	Peak: 10 minutes
	Off-Peak/Weekends: 15 – 30 minutes
Service Span:	5:30 am to midnight (7 days a week)
Peak Vehicles:	6

Cost (2006 dollars)	
Annual Operating Cost:	$7.6 million
Capital Cost:	$395.0 million

Route Alignment

The Richmond International Airport LRT is a 7.3 mile long and runs from Main Street Station to the Richmond International Airport. Much of the proposed alignment is adjacent to existing rail lines. Three segments of this route are:

- Cary Street / Viaduct: Uses existing right of way on Cary Street or viaduct and 17th or 18th Streets. Corridor could travel along these roadways or as elevated track.
- CSX railroad line: Right of way exists but is heavily used for freight travel. May be possible to construct additional tracks on this right of way
- Airport access: No existing right of way, however airport appears to have sufficient land

Rail Implementation Issues

See *Phase II: Ashland Commuter Rail* in Section 4.2.A.

Enhanced inter-city rail service between Richmond and the Peninsula is being considered as part of the Richmond/Hamptons Roads Passenger Rail study. Should such a service be established the capital cost for developing an Airport rail service would be reduced, especially for a transit station at the airport that is served by both the passenger rail service and the light rail service.

4.2.E CORRIDOR E: I-95 SOUTH

The I-95 South corridor is generally defined as connecting downtown Richmond with Petersburg. Two potential rights-of-way are available for high-quality transit services – I-95 which could support a commuter bus operation and the CSX rail right of way which is used by Amtrak and has been previously studied for commuter rail service. Currently, GRTC operates a commuter bus route between downtown Richmond and Petersburg on I-95.

LAND USE PATTERN

Figure 4-38 to Figure 4-41 show low residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-42 shows significant household growth throughout the I-95 south corridor.

Figure 4-38: Residential Density along I-95 South Corridor (2016)

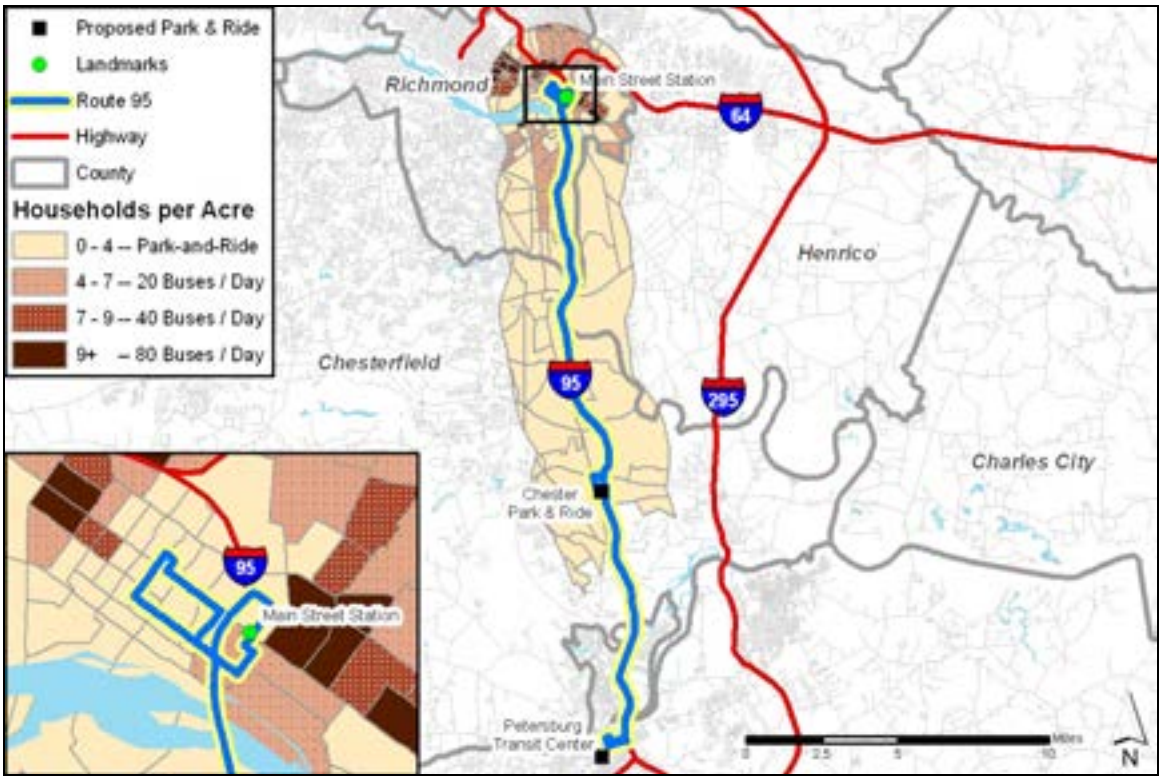


Figure 4-39: Residential Density along I-95 South Corridor (2031)

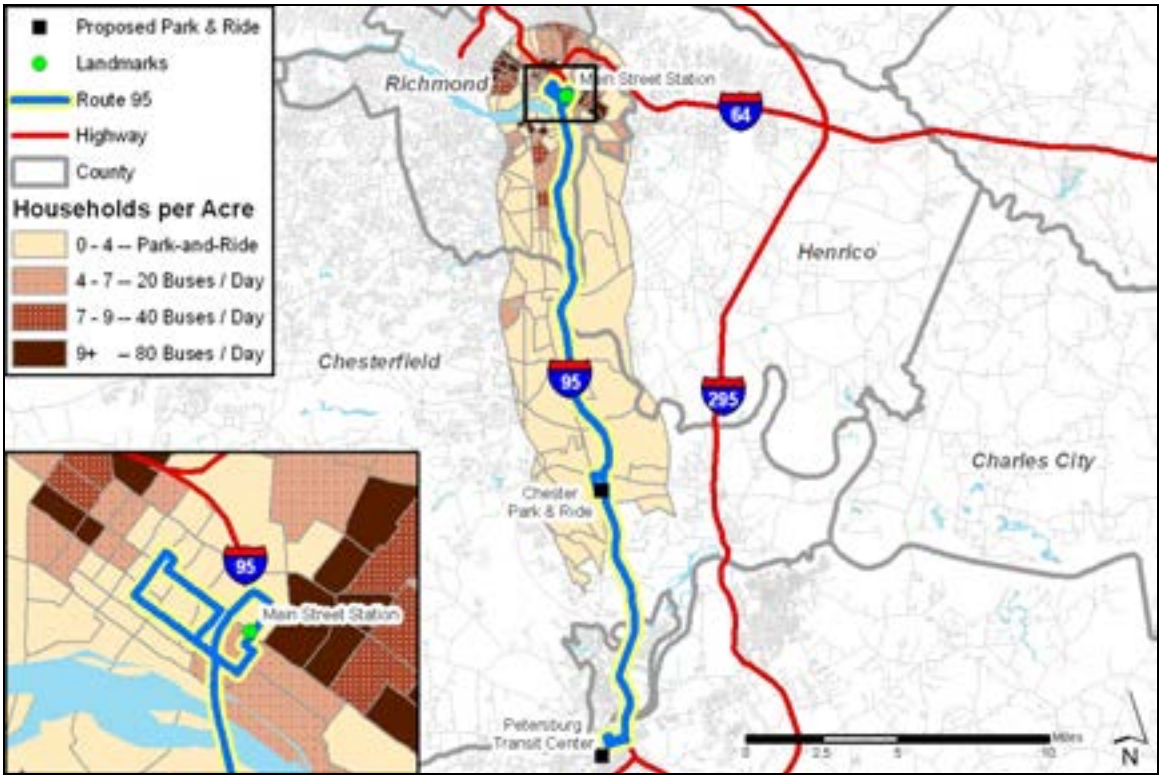


Figure 4-40: Employment Density along I-95 South Corridor (2016)

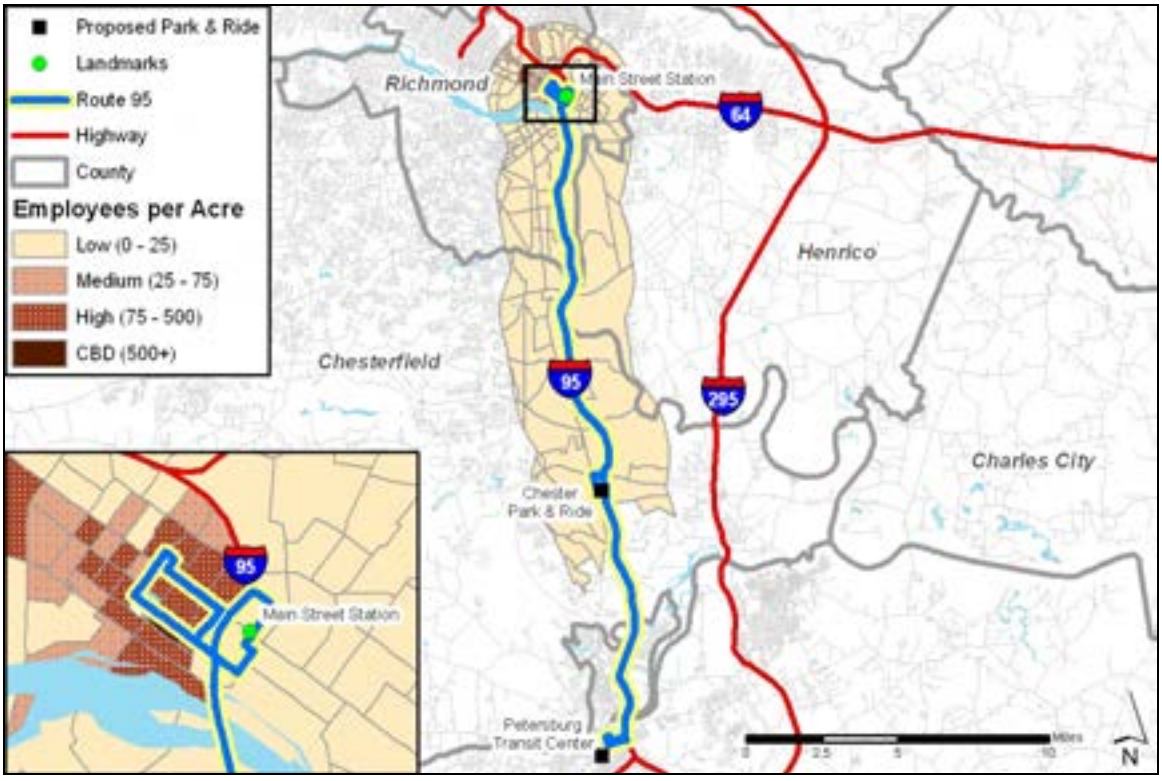


Figure 4-41: Employment Density along I-95 South Corridor (2031)

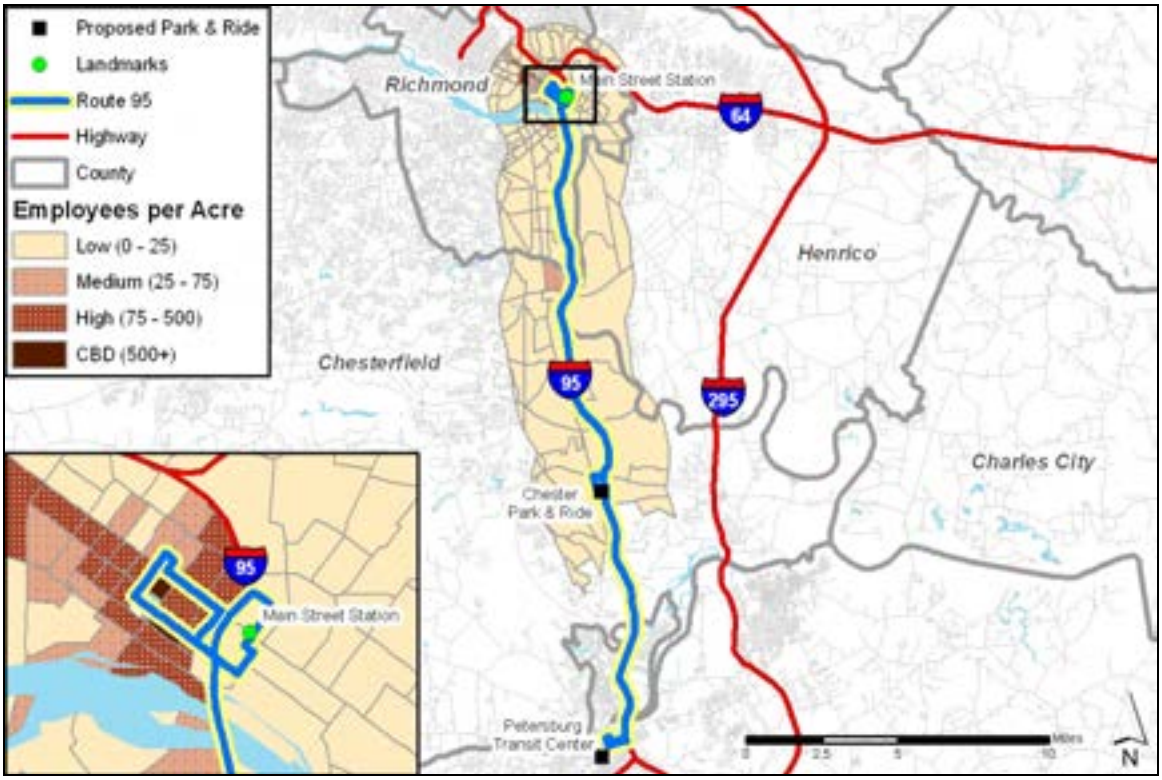
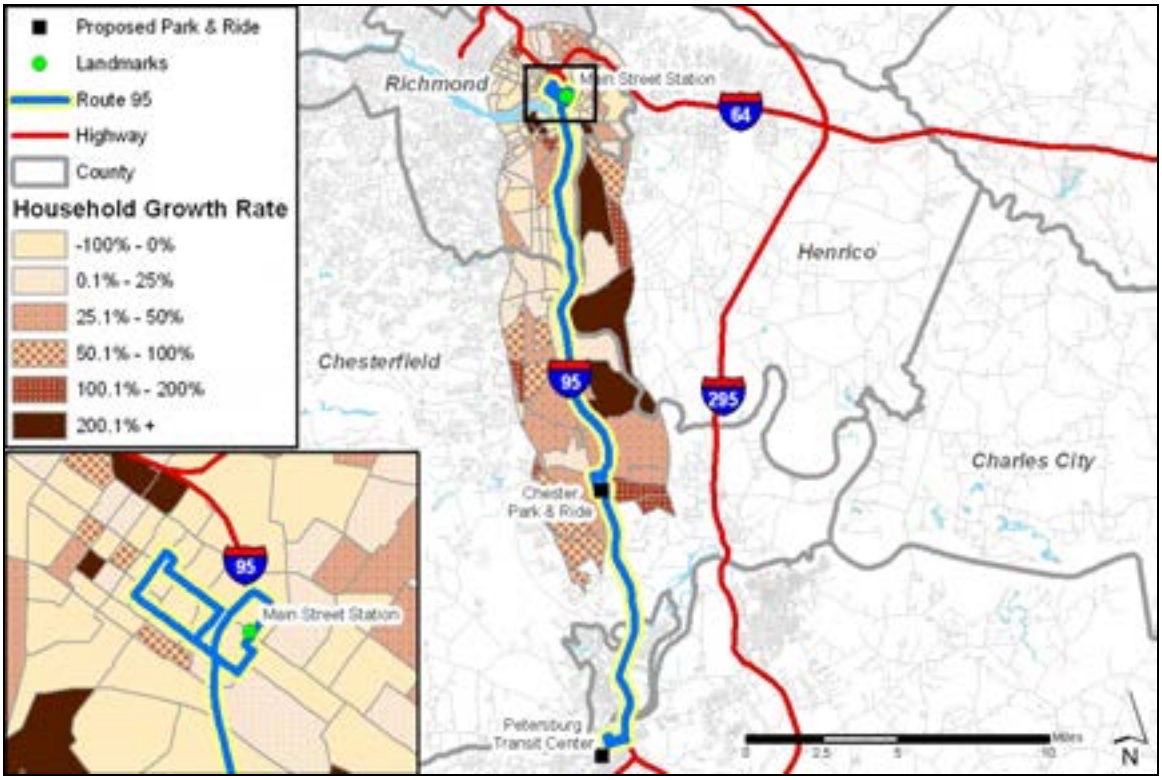


Figure 4-42: Household Growth Rate along I-95 South Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

The Richmond/Petersburg Express (Route 95) is an existing GRTC commuter bus service on the I-95 South corridor. One option is to improve transit service along the I-95 corridor by expanding service to 30-minute headways between 6:00 am and 9:00 pm on weekdays. It would require three vehicles during peak periods. The annual operating cost is estimated to be approximately $0.7 million (the net increase in operating costs is $0.4 million). Capital costs are estimated to be $2.4 million and include the cost of a park and ride lot at Chester. A summary of the Richmond/Petersburg Express is provided in Table 4-10.

Table 4-10: Richmond/Petersburg Express (Route 95) Summary

Service Characteristics	
Route:	I-95 South Express Bus
Mode:	Bus
Length:	28.5 miles
Headway:	30 minutes
Service Span:	6:00 am to 9:00 pm (weekdays)
Peak Vehicles:	3

Cost (2006 dollars)	
Annual Operating Cost:	$0.4 million
Capital Cost:	$2.4 million

ALIGNMENT

This route operates on I-95 south between Petersburg and Main Street Station in Richmond, a distance of 28.5 miles.

4.2.F CORRIDOR F: POWHATAN

The Powhatan Corridor is generally defined as connecting Powhatan County and the western portion of Chesterfield County with downtown Richmond. Currently, GRTC provides no transit service to Powhatan County.

LAND USE PATTERN

Residential and employment densities are low in Powhatan County and high in downtown Richmond. Figure 4-43 to Figure 4-46 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-47 shows that areas with the highest forecast household growth rates between 2006 and 2031 are located in western Chesterfield County and Powhatan County.

Figure 4-43: Residential Density along Powhatan Corridor (2016)

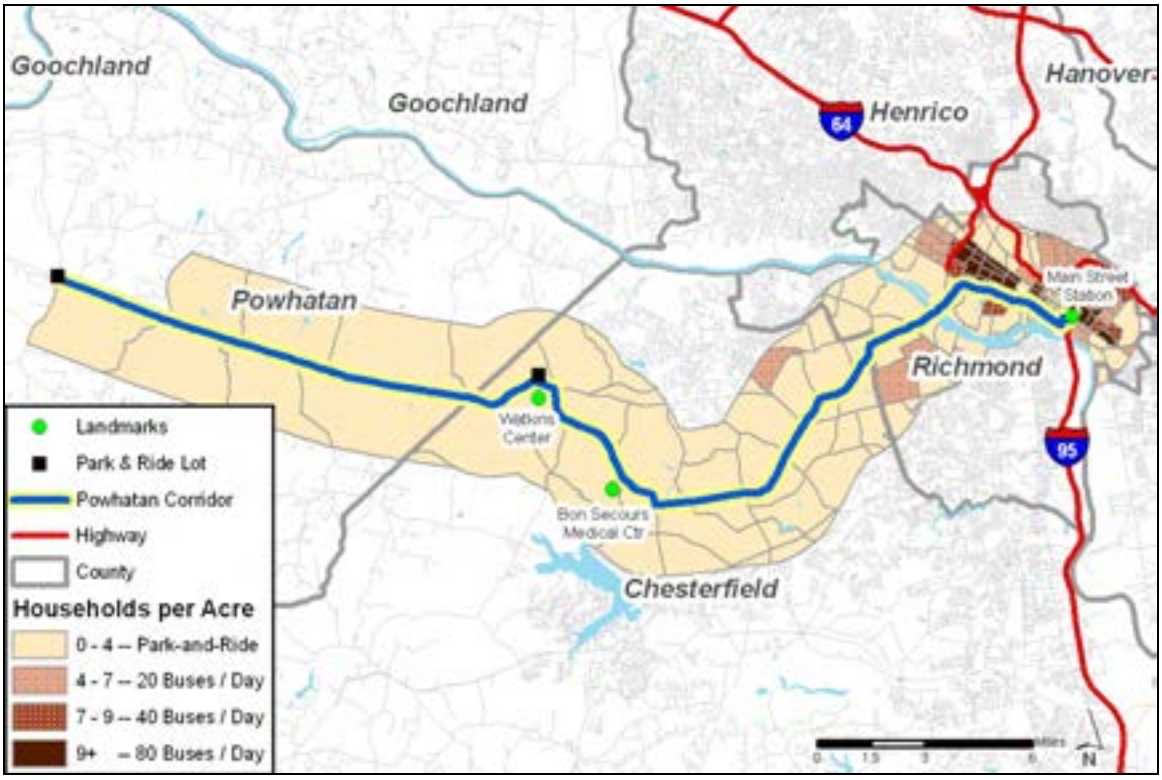


Figure 4-44: Residential Density along Powhatan Corridor (2031)

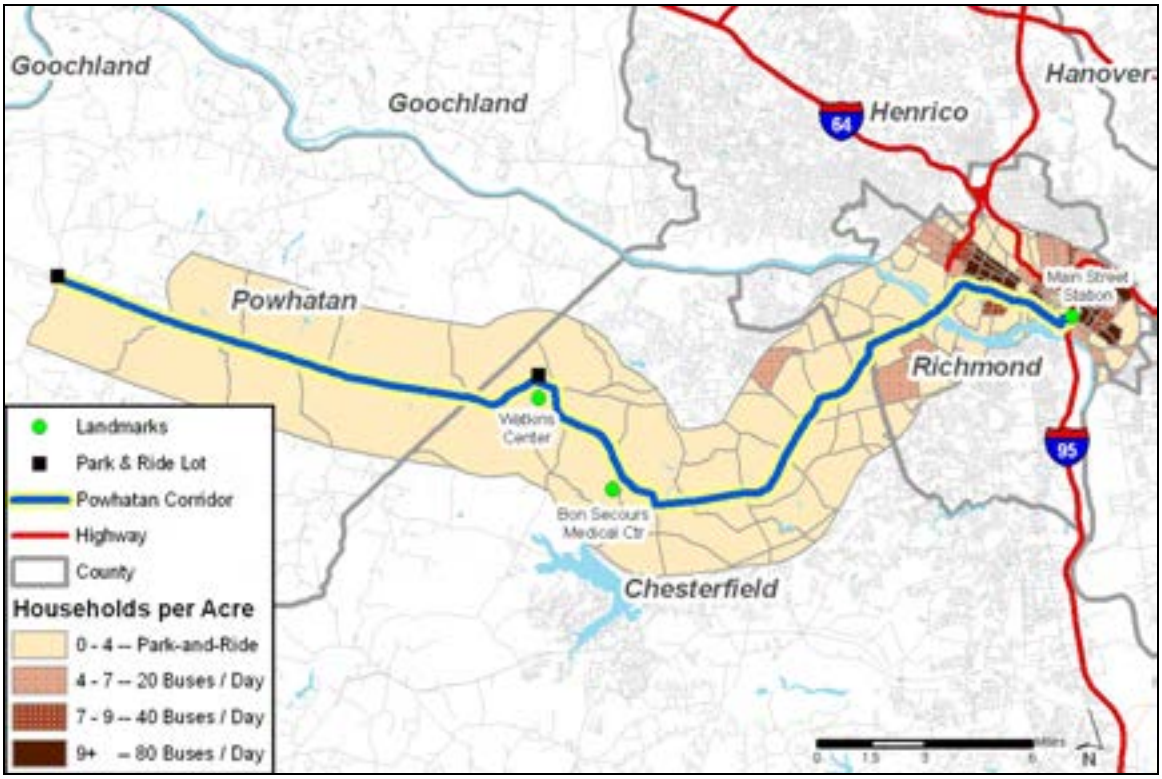


Figure 4-45: Employment Density along Powhatan Corridor (2016)

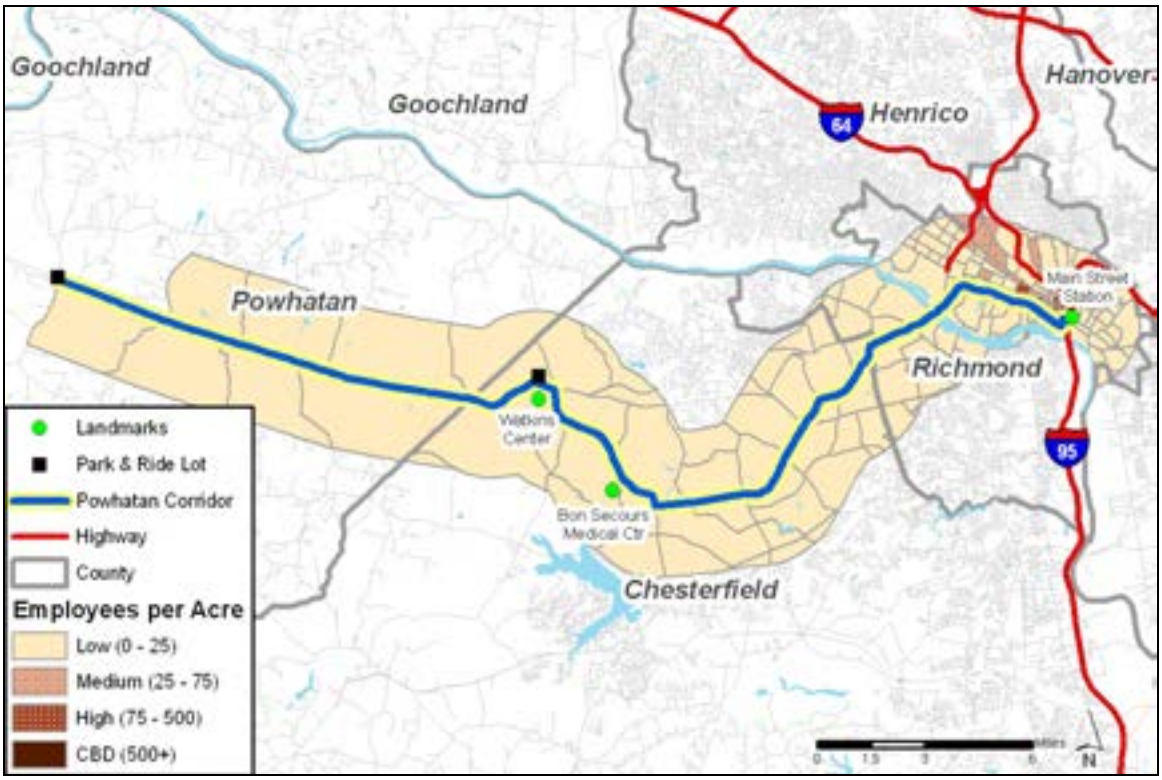


Figure 4-46: Employment Density along Powhatan Corridor (2031)

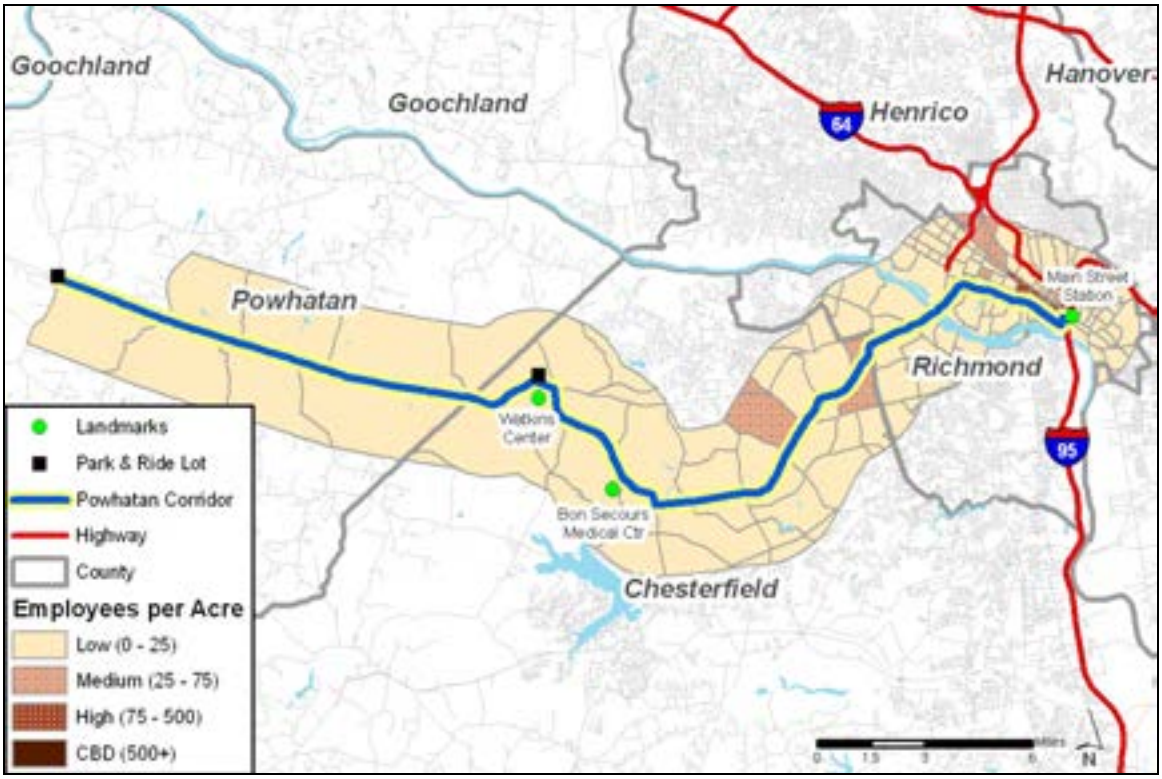
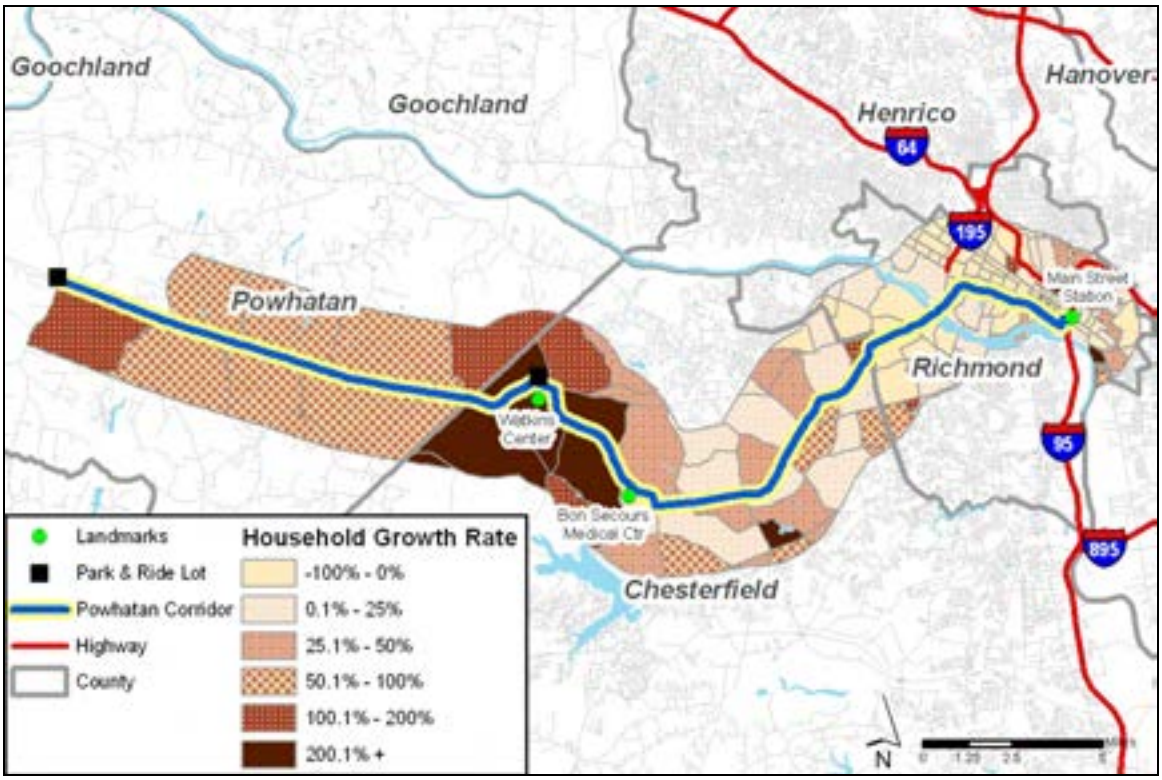


Figure 4-47: Household Growth Rate along Powhatan Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

One strategy for providing service on the Powhatan corridor is to operate a commuter bus between the interchange of Route 60 and Route 522 in Powhatan County and Main Street Station, a distance of 34.1 miles. This study proposes an operating concept of four inbound trips and one outbound trip during weekday morning peak period and four outbound trips and one inbound trip during the weekday evening peak period. Four vehicles are required during peak periods. The annual operating cost is estimated to be $0.2 million. Capital costs are estimated to be $2.9 million and include a park and ride lot in Powhatan County. The park and ride lot at Watkins Center is included with the Midlothian Commuter Bus route.

Table 4-11: Powhatan Commuter Bus Summary

Service Characteristics	
Route:	Powhatan Commuter Bus
Mode:	Bus
Length:	34.1 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.2 million
Capital Cost:	$2.9 million

ALIGNMENT

After departing a potential park and ride lot in the vicinity of the Route 60/Route 522 interchange, the Powhatan commuter bus would travel eastbound on Route 60 to the Watkins Center in western Chesterfield County. The bus would then travel on Route 288 to the Powhite Parkway to Main Street Station.

4.2.G CORRIDOR G: MIDLOTHIAN

The Midlothian Corridor connects Chesterfield County with downtown Richmond via Route 60 (Midlothian Turnpike). The Midlothian Turnpike is recognized as a route that regularly experiences substantial congestion. The corridor, extending from the Richmond city line to Route 288, contains substantial retail activity and continues to attract new retail and employment developments. There is no local, all-day bus service in the corridor. GRTC currently operates a successful commuter bus service from Chesterfield Town Center area to downtown Richmond.

Technical Memorandum #2 identified two potential transit service options for the Midlothian corridor. In the short term, a commuter bus route could provide service between Midlothian and Main Street Station in Richmond. In the long term, based on the ridership of the commuter bus route, it may be appropriate to enhance transit service in this corridor to commuter rail.

The travel forecasts for 2031 projects over 1.0 million daily trips in this corridor (see Table 4-12). If 1% of the peak period travel in the corridor were attracted to transit it would serve almost 1,000 daily trips.

Table 4-12: Midlothian Intra-Corridor Trips (2031)

Trip Type	Peak	Off Peak	Total
Work	32,993	58,650	91,643
Non Work	57,916	454,904	512,820
Total	90,909	513,554	604,463

PHASE 1: MIDLOTHIAN COMMUTER BUS

Initially, local and commuter bus service could be operated to develop ridership in this corridor. Significant residential, business, and commercial growth is anticipated over the next 25 years. Local bus routes could be extended to provide service to the Bon Air region of Chesterfield County, extending out Huguenot Road to the intersection with Robious Road. Commuter bus service would operate to Midlothian using the Powhite Parkway and Midlothian Turnpike. Additional commuter bus service operating on Route 288 would serve the Watkins Centre.

Land Use Pattern

Figure 4-48 to Figure 4-51 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. The Midlothian commuter bus corridor is generally low density (less than four dwelling units per acre) west of South Richmond, with a few areas with residential densities exceeding four dwelling units per acre in 2016. By 2031, the residential densities are anticipated to grow somewhat, especially in the vicinity of South Richmond. Employment densities are low along the corridor outside of downtown Richmond in 2031. By 2016, several TAZs are expected to reach employments densities in the 'medium' range. Figure 4-52 shows that the areas with the highest household growth rate between 2006 and 2031 on the Midlothian rail corridor are the western part of the corridor and South Richmond. With this rapid growth expected early provision of commuter bus service could help establish a pattern of transit use and promote patterns of development that would be conducive to efficient provision of transit service and earlier development of a rail based service.

Figure 4-48: Residential Density along Midlothian Bus Corridor (2016)

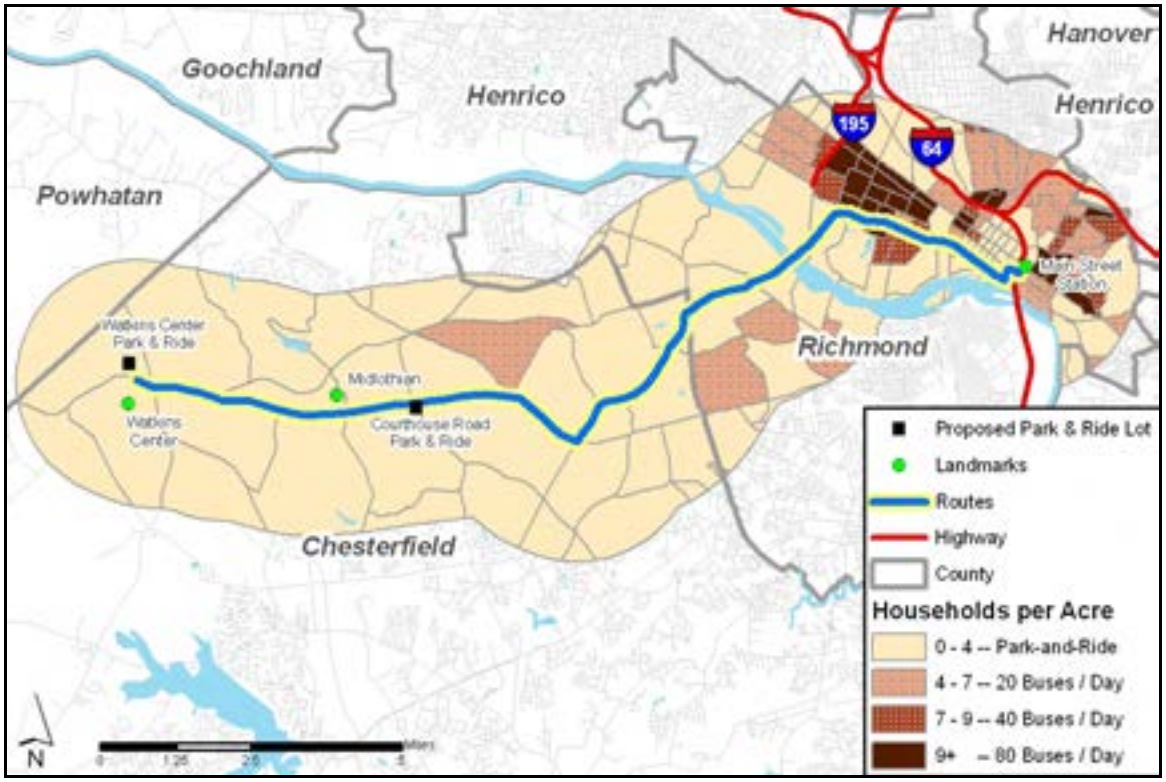


Figure 4-49: Residential Density along Midlothian Bus Corridor (2031)

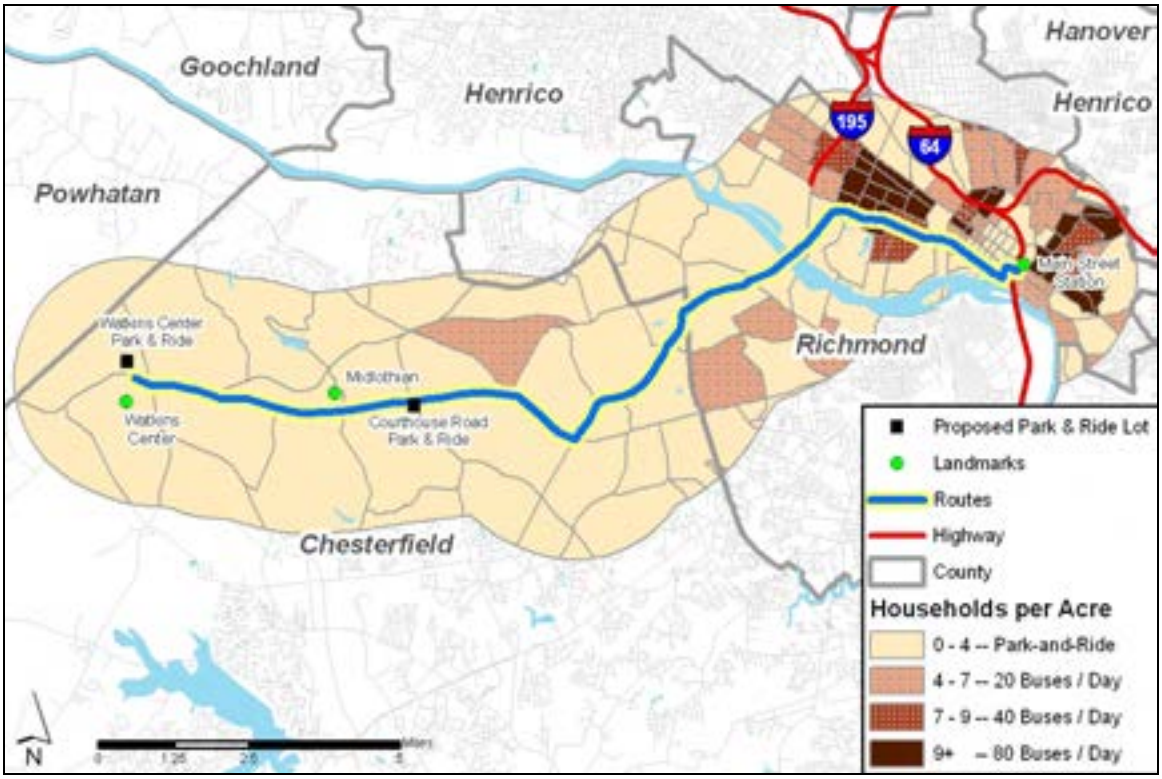


Figure 4-50: Employment Density along Midlothian Bus Corridor (2016)

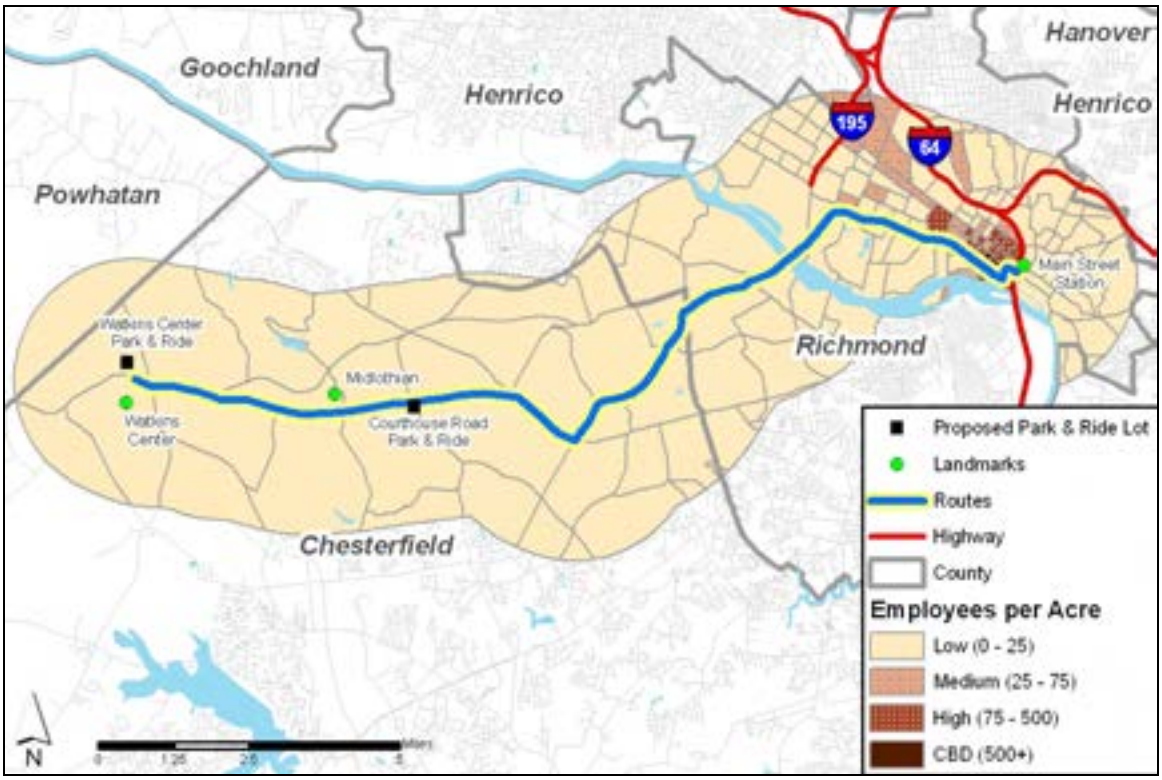


Figure 4-51: Employment Density along Midlothian Bus Corridor (2031)

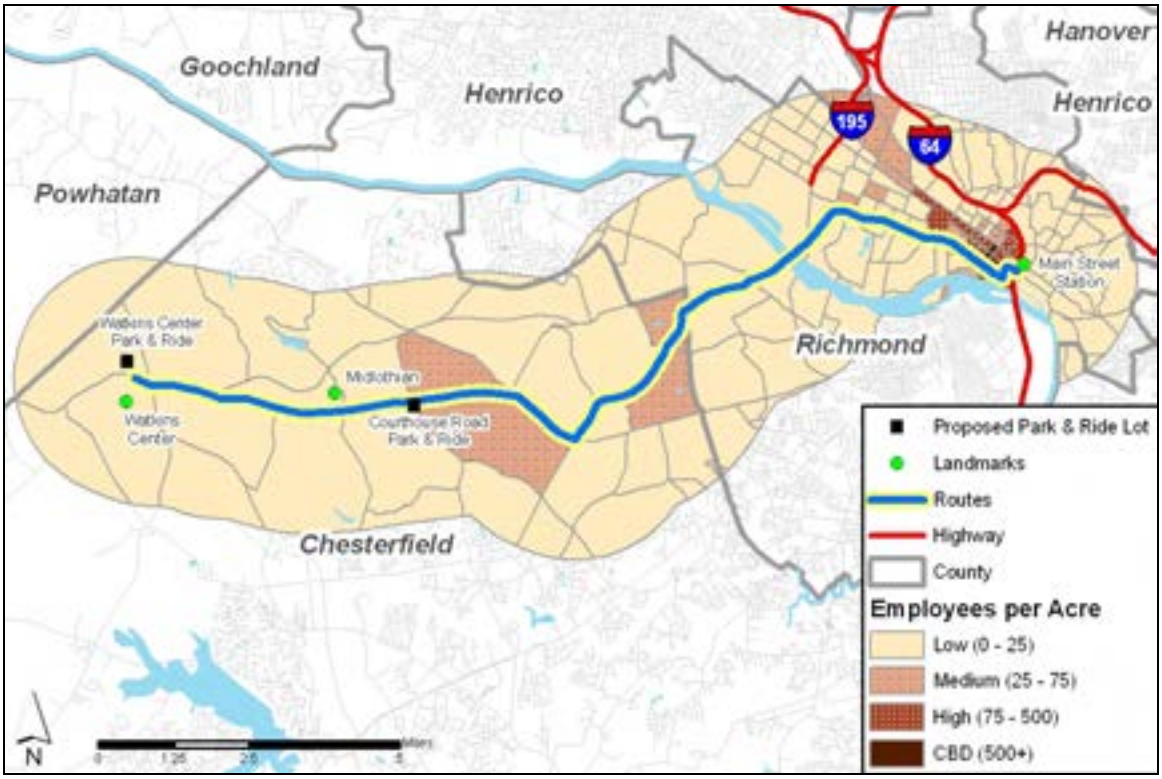
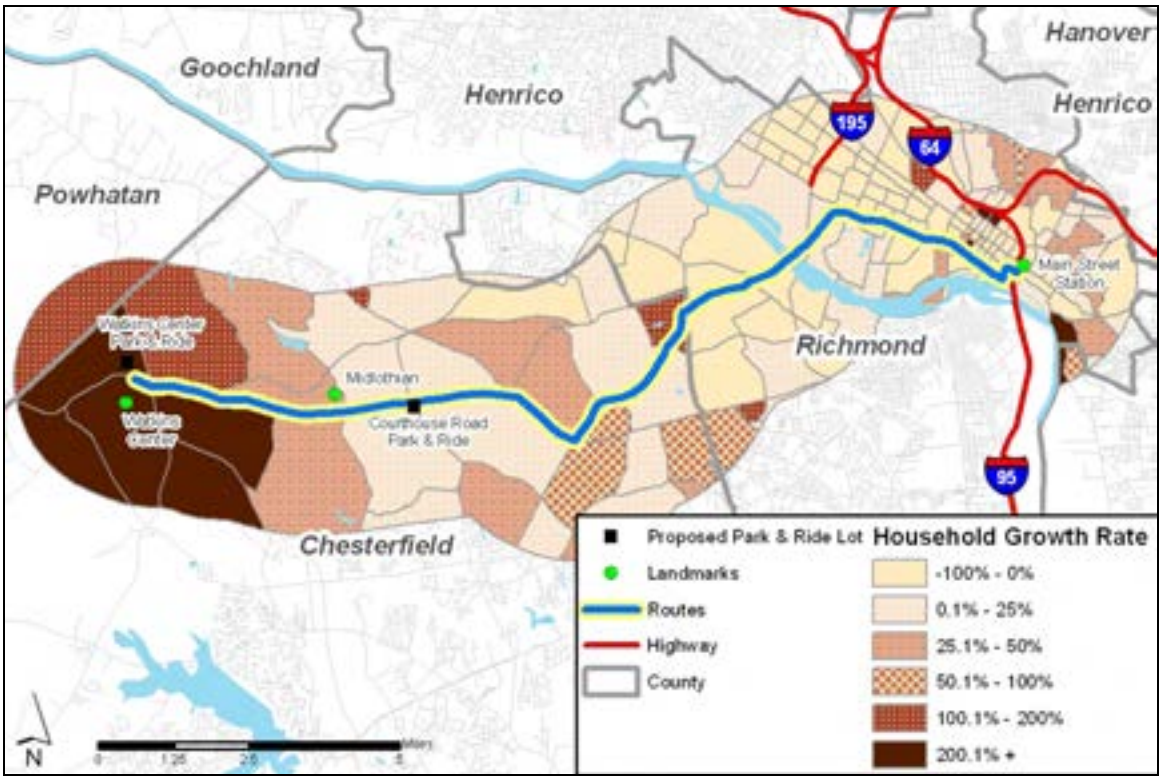


Figure 4-52: Household Growth Rate along Midlothian Bus Corridor (2006 to 2031)



Route Characteristics

One strategy for providing service on the Midlothian corridor is to operate a commuter bus between the Watkins Centre and Main Street Station, a distance of 17.2 miles. This study proposes an operating concept of four inbound trips and one outbound trip during weekday morning peak period and four outbound trips and one inbound trip during the weekday evening peak period. Four vehicles are required during peak periods. Annual operating costs are estimated to be $0.1 million. Capital costs are estimated to be $3.9 million and include park and ride lots at Courthouse Road and the Watkins Center. A summary of service characteristics and costs is provided in Table 4-13.

Table 4-13: Midlothian Commuter Bus Summary

Service Characteristics	
Route:	Midlothian Commuter Bus
Mode:	Bus
Length:	17.2 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.1 million
Capital Cost:	$3.9 million

Alignment

The Midlothian commuter bus runs from Main Street Station in downtown Richmond to the Midlothian area along Main Street, Powhite Parkway, and the Midlothian Turnpike, a distance of 17.2 miles.

PHASE 2: MIDLOTHIAN COMMUTER RAIL

If the Midlothian commuter bus is successful in attracting substantial riders, a second phase of transit service improvements in the Midlothian corridor could be to replace the commuter bus service with commuter rail service.

Land Use Pattern

Figure 4-53 to Figure 4-56 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Residential densities are the highest in the vicinity of downtown Richmond and generally decrease as the corridor moves outward. Employment densities are low except in downtown Richmond. Figure 4-57 shows that the areas with the highest household growth rate on the Midlothian corridor between 2006 and 2031 are the western part of the corridor and South Richmond.

Figure 4-53: Residential Density along Midlothian Rail Corridor (2016)

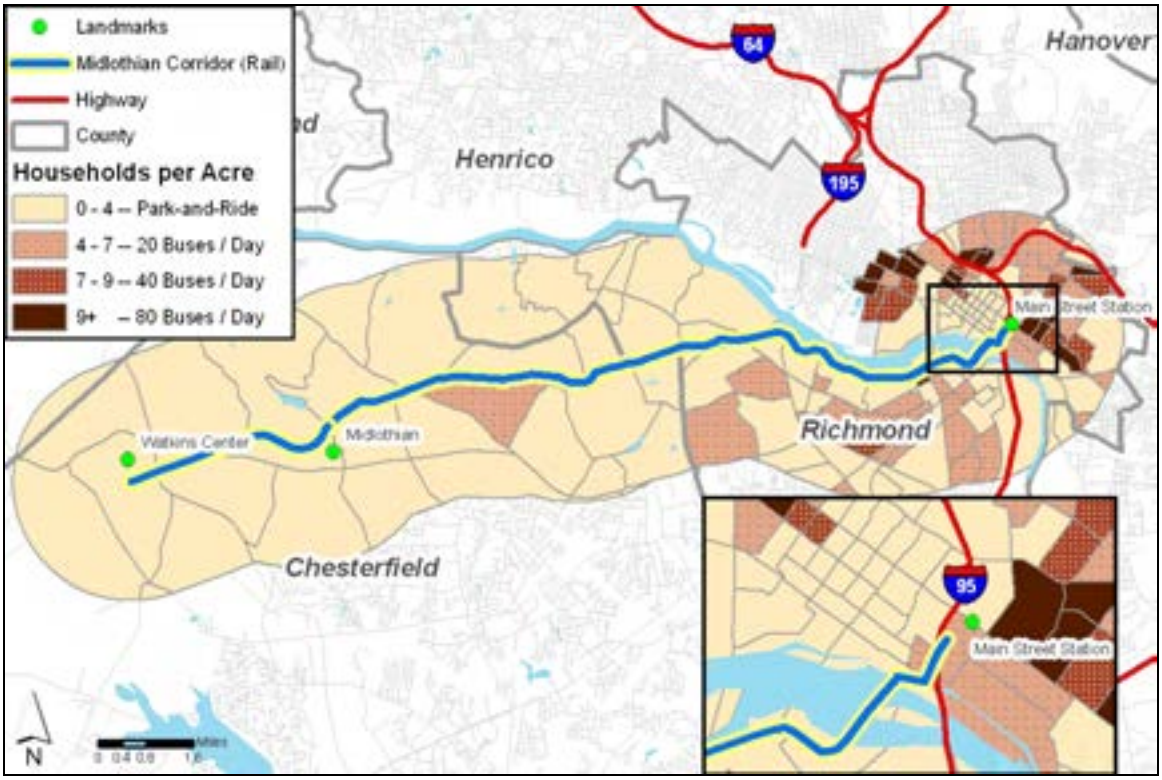


Figure 4-54: Residential Density along Midlothian Rail Corridor (2031)

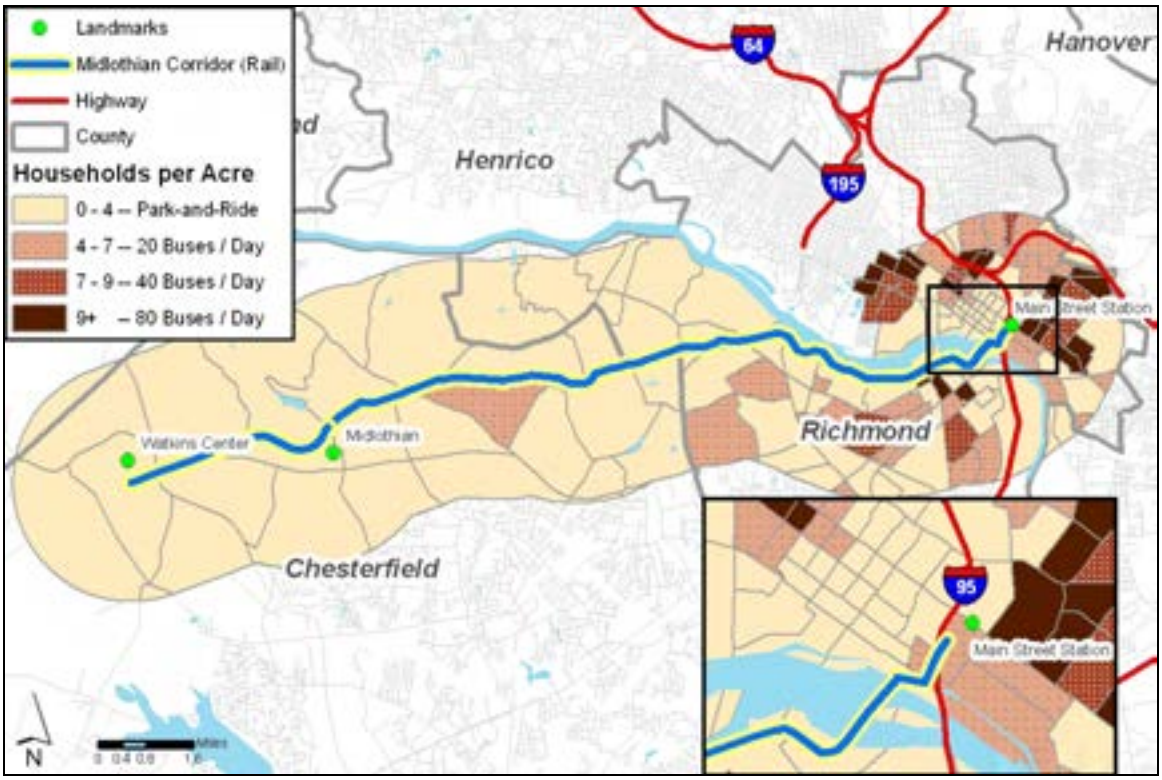


Figure 4-55: Employment Density along Midlothian Rail Corridor (2016)

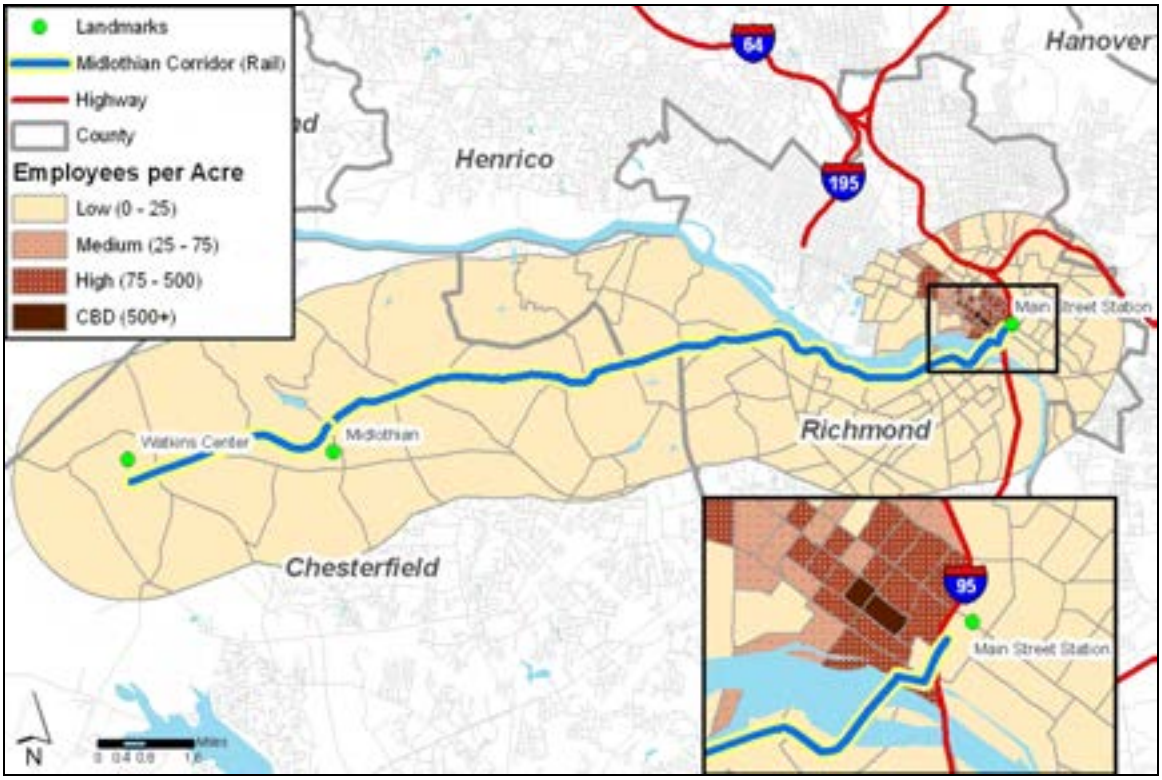


Figure 4-56: Employment Density along Midlothian Rail Corridor (2031)

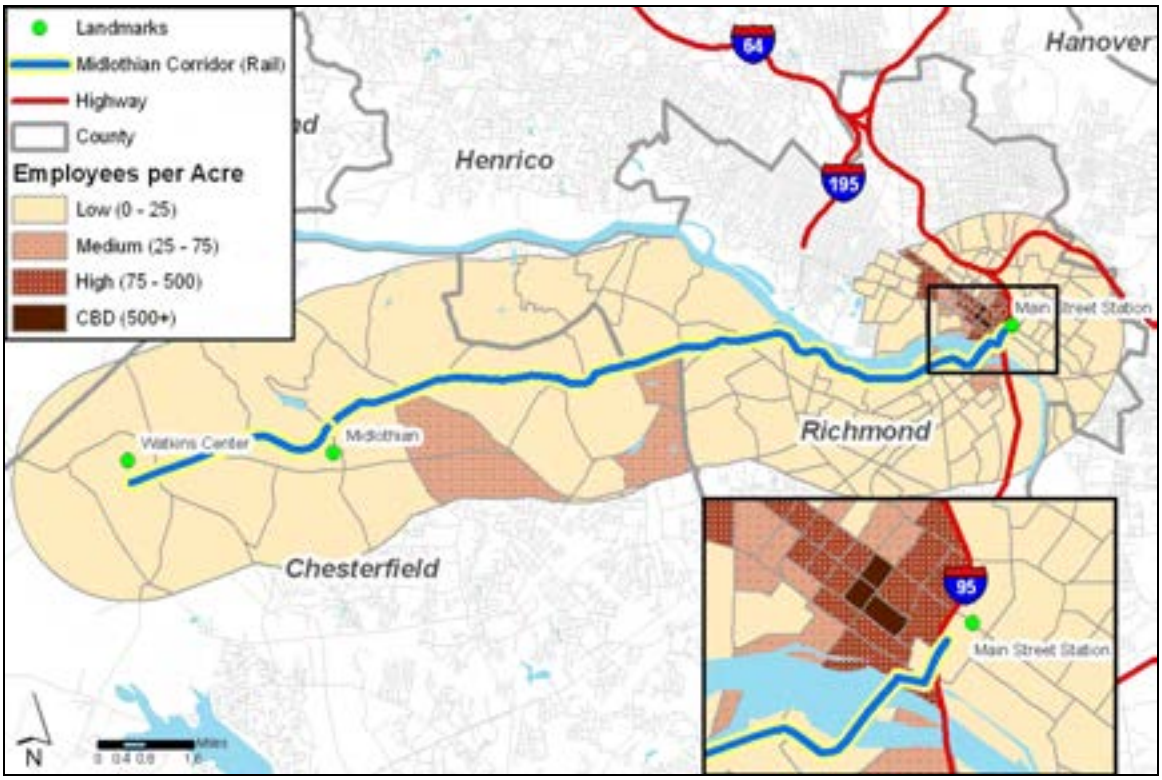
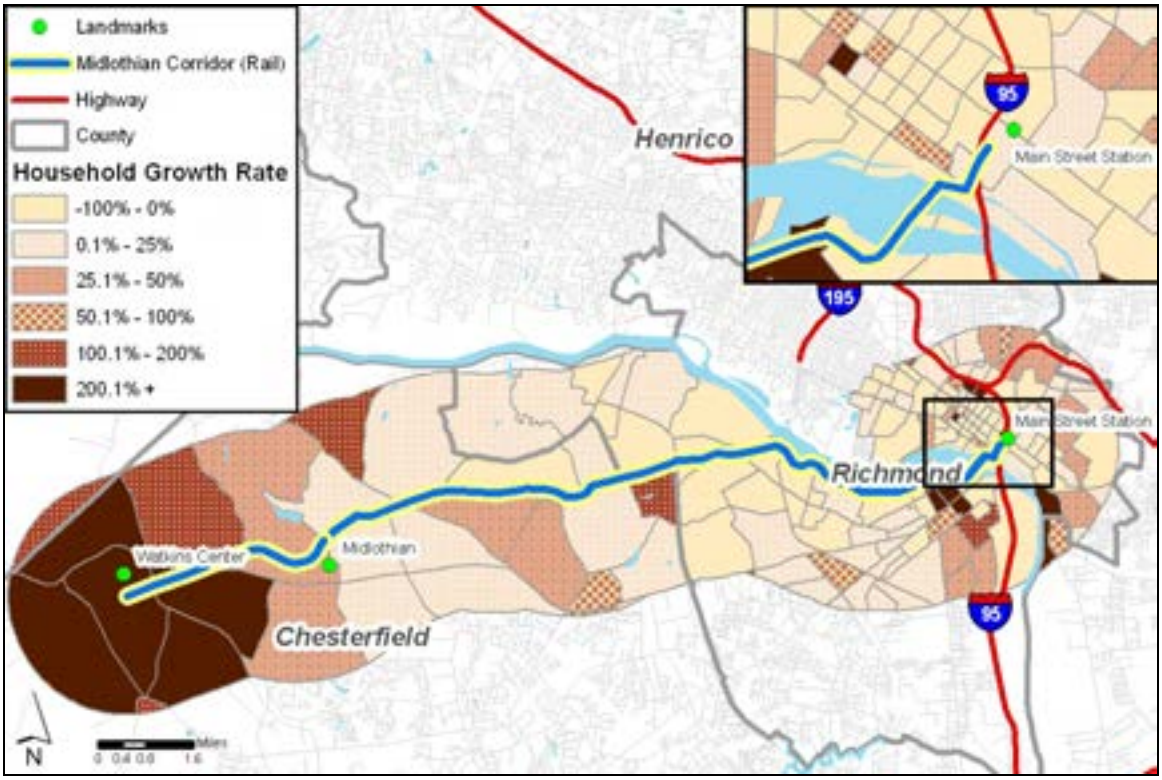


Figure 4-57: Household Growth Rate along Midlothian Rail Corridor (2006 to 2031)



Route Characteristics

The Richmond Area Rail Feasibility Study prepared for the MPO in 2003 analyzed the potential for commuter rail service to the Midlothian area of Western Chesterfield County. The Rail Feasibility Study proposed a 14.1 mile long route between Main Street Station and Salisbury Drive with six intermediate stops spaced an average of 1.7 miles apart. The estimated capital cost of this service was $81 million. This study proposes an operating concept of four inbound trips during weekday morning peak hours and four outbound trips during the weekday evening peak hours as well as one midday roundtrip. This route requires four vehicles during the peak period. Total ridership was estimated to be 1,900 per day by the Richmond Rail Feasibility Study. Annual operating costs are estimated to be $1.5 million. Capital costs are estimated to be $80 million.

With the opening of Route 288 and the proposed residential, commercial and office development occurring in the Midlothian Turnpike corridor, it appears that the terminus of this route should be extended further to the Watkins Centre, with three additional stations. The total distance this extended commuter rail service is 16.3 miles. A summary of service characteristics and costs is provided in Table 4-14.

Table 4-14: Midlothian Commuter Rail Summary

Service Characteristics	
Route:	Midlothian Commuter Rail
Mode:	Rail
Length:	16.3 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$1.5 million
Capital Cost:	$80.0 million

Alignment

This proposed service would utilize an existing Norfolk Southern freight rail line that runs from downtown Richmond through Forest Hills, Bon Air and Midlothian and then continues west to Burkeville. The Midlothian Rail line is in the same corridor that would be used by the Trans-Dominion Express (TDX), and if the TDX is implemented, the capital costs for the Midlothian Rail could be substantially lower.

Rail Implementation Issues

See *Phase II: Ashland Commuter Rail* in Section 4.2.A.

4.2.H CORRIDOR H: BROAD STREET

Broad Street has historically been a key transportation route in Richmond. Within Richmond, Broad Street is the focus of many bus services with bus volumes in peak hours exceeding 40 vehicles per hour in each direction at some locations. The corridor is anchored by the State Capital area, the central business district and the VCU Medical Center. The corridor also serves the Monroe Park campus of VCU, and office and retail areas to the west along Broad St., at Willow Lawn, at Innsbruck and the growing areas at Short Pump. The freeway serving the Broad St. Corridor, I-64, is often perceived as congested and greater congestion is projected by 2031. The existence of a rail line that generally parallels Broad St. suggests the possibility of commuter rail operations. The recently completed Comprehensive Operation Analysis conducted for GRTC identified the Broad Street corridor as appropriate for implementation of Bus Rapid Transit (BRT)[4].

LAND USE PATTERN

The land use pattern along the Broad Street corridor varies considerably; including several types of development (residential, office, commercial, etc) and densities (low to high). Residential densities are the highest in the Fan district, Carytown, Shockoe Bottom, and in the vicinity of Willow Lawn and Tuckernuck Square Shopping Center. Employment densities are highest in downtown Richmond, but medium density employment continues along a large portion of Broad Street. Major generators include downtown Richmond, Deep Run Business Center, Philip Morris, the Shops at Willow Lawn, and Westmoreland Office Park. Figure 4-58 to Figure 4-61 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-62 shows that the largest increase in household growth is projected to occur in the Short Pump and Rocketts Landing areas, between 2006 and 2031. While much of the area in downtown Richmond is expected to lose households or remain unchanged, there are several TAZs that are expected to have household growth of over 25 percent during that period.

[4] Vanasse Hangen Brustlin, Inc., *Comprehensive Operations Analysis, Final Report,* Greater Richmond Transit Company, March 2008

Figure 4-58: Residential Density along Broad St Corridor (2016)

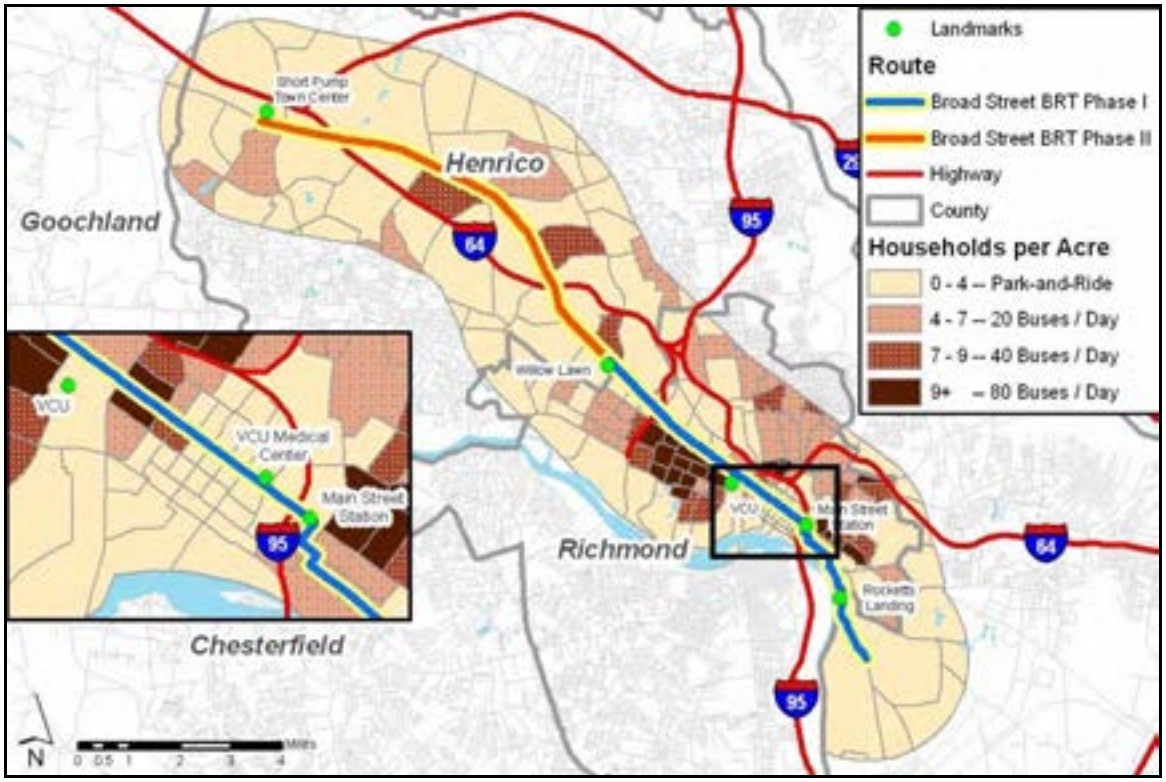


Figure 4-59: Residential Density along Broad St Corridor (2031)

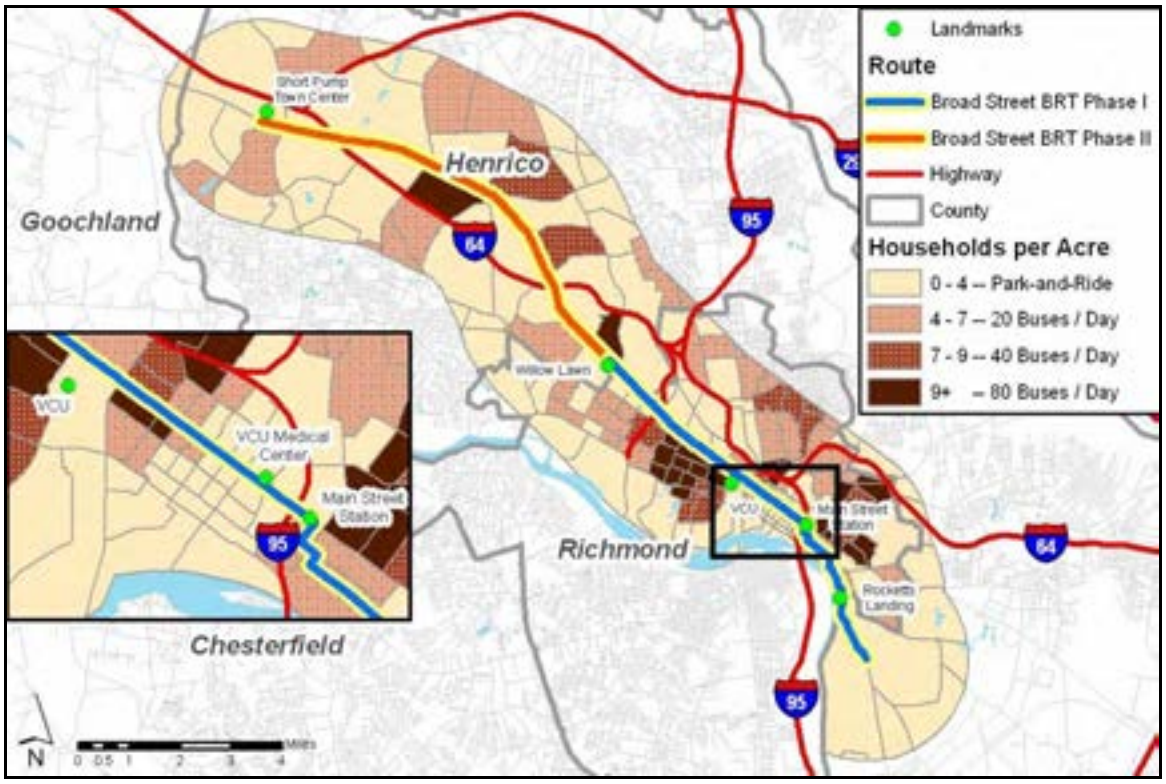


Figure 4-60: Employment Density along Broad St Corridor (2016)

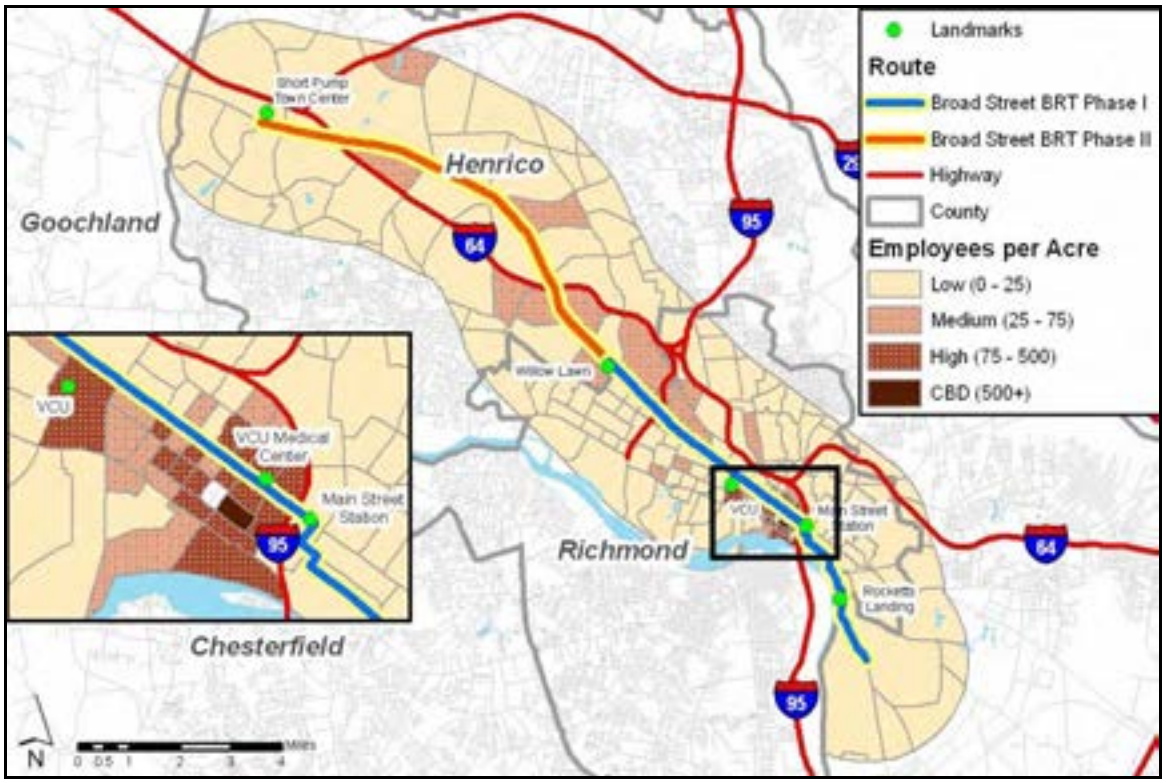


Figure 4-61: Employment Density along Broad St Corridor (2031)

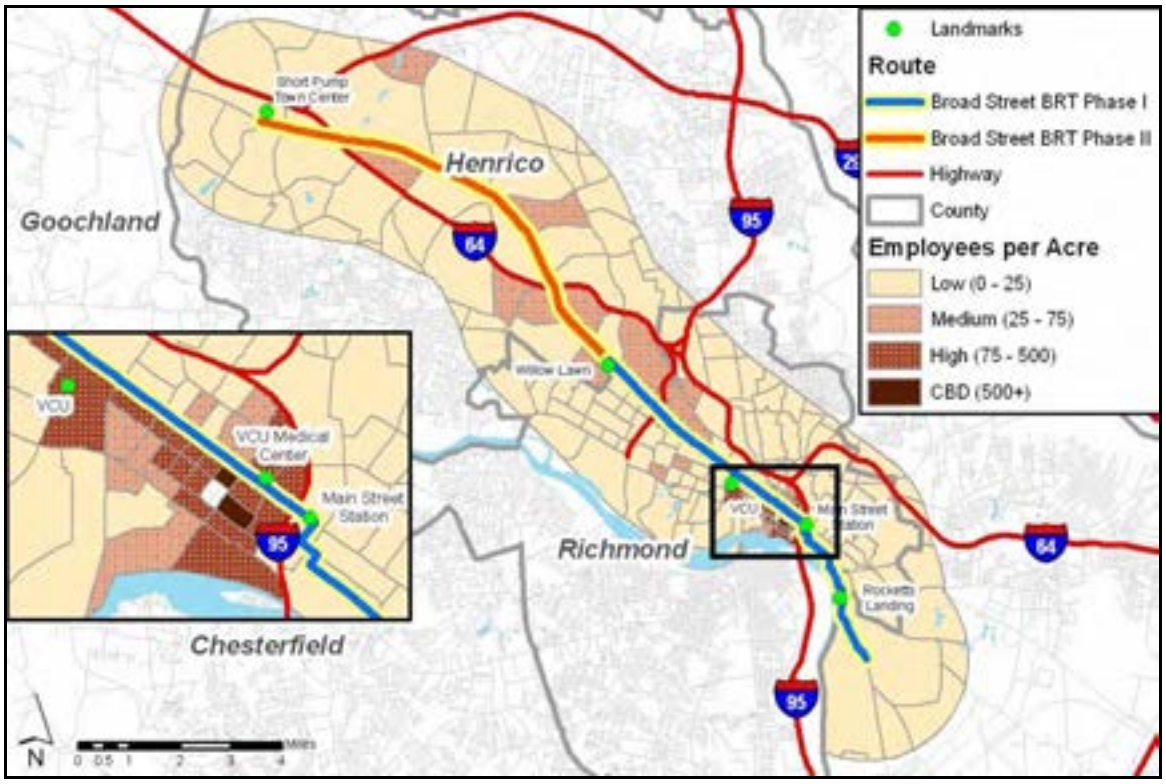
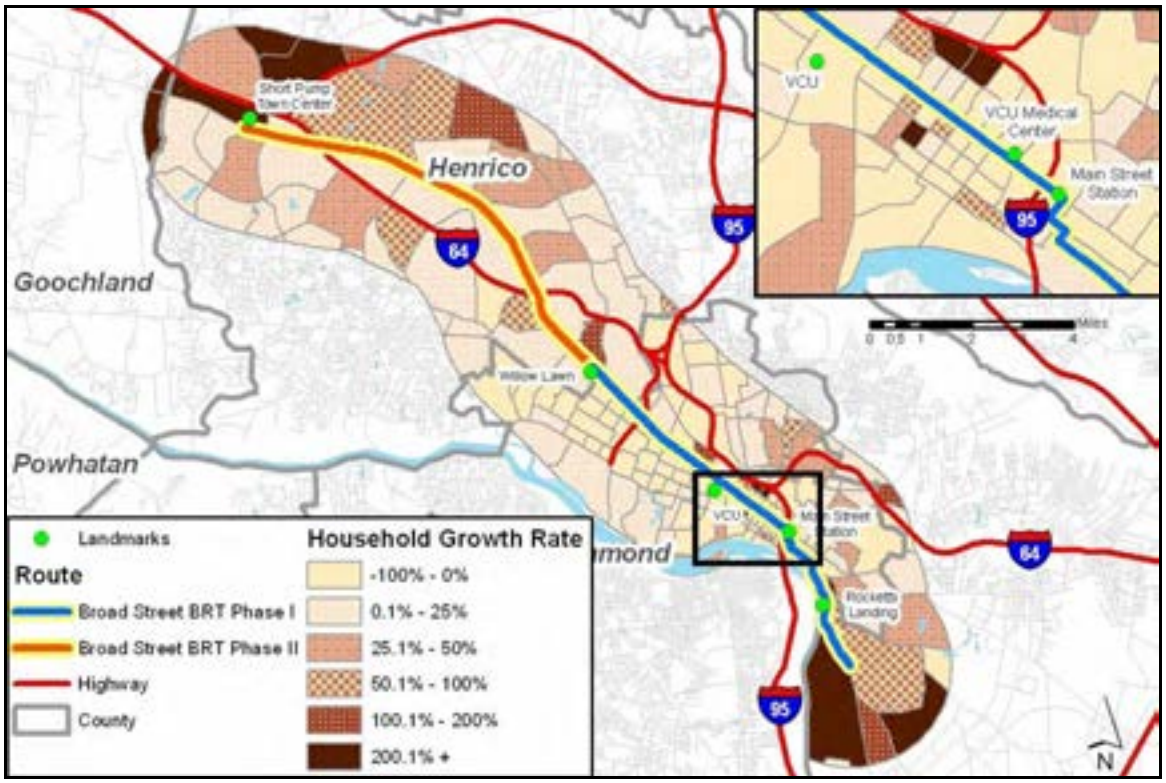


Figure 4-62: Household Growth Rate along Broad Street Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

To provide high-frequency and high-speed transit service on the Broad Street corridor, a Short Pump light rail route was proposed as part of the Richmond Rail Feasibility Study (2003). An enhanced bus service in the corridor along Broad Street from downtown Richmond to short Pump was recommended in the GRTC Comprehensive Operations Analysis (2007), with Bus Rapid Transit (BRT) from downtown to Willow Lawn and improved feeder services between Short Pump and Willow Lawn. The alignment, service span, and headways of the Broad Street route proposed in this technical memorandum roughly follow those developed for the Richmond Rail Feasibility Study, with two exceptions. First, the Broad Street route includes an additional segment between Main Street Station and Rocketts Landing. Second, the Broad Street route is envisioned as a BRT route or a LRT route, whereas the Short Pump route was envisioned as a LRT route only. The Broad Street route would operate five days a week between 5:00 am and 1:00 am. Service would be provided on 10 minute headways during peak periods and 15 to 30 minutes during off-peak periods and weekends. Fifteen vehicles are required during the peak period. The Richmond Rail Feasibility Study estimated a weekday ridership of 33,700 boardings. The annual operating cost is estimated to be $4.9 million for BRT and $20.7 million for LRT. Capital costs are estimated to be $54.4 million for BRT and $973 million for LRT. A summary of service characteristics and costs is provided in Table 4-15.

The Broad Street BRT could be divided into two phases:

- Rocketts Landing to Willow Lawn
- Rocketts Landing to Short Pump

Table 4-15: Broad Street BRT/LRT Summary

Service Characteristics	Bus Rapid Transit	Light Rail Transit
Route:	Broad Street BRT	Broad Street LRT
Mode:	Bus Rapid Transit	Light Rail Transit
Length:	17.6 miles	
Headway:	Peak: 10 min Off peak: 15-30 min Weekend: 15-30 min	Peak: 10 min Off peak: 15-30 min Weekend: 15-30 min
Headway:	5:30 am to midnight (7 days a week)	5:30 am to midnight (7 days a week)
Peak Vehicles:	15	15

Cost (2006 dollars)	Bus Rapid Transit	Light Rail Transit
Annual Operating Cost:	$4.9 million	$20.7 million
Capital Cost:	$54.4 million	$973 million

ROUTE ALIGNMENT

The Broad Street corridor is 17.6 miles long and travels from the Short Pump to Rocketts Landing, passing through Main Street Station in downtown Richmond. Potential alignments for light rail transit or bus rapid transit service could travel in lanes dedicated for transit vehicles for all

or part of the day or, in some areas, in lanes shared with private vehicles on Broad Street[5]. The Richmond Rail Transit Feasibility study proposed an alignment for this route between Short Pump and Main Street Station, however the alignment in this memo continues to Rocketts Landing.

- Rocketts landing to Main Street Station: Right of way on Main Street
- Main Street Station to Short Pump: Right of way on Broad Street

MARKET POTENTIAL

The travel forecasts for 2031 project almost 1.4 million daily trips in this corridor (Table 4-16). If 1% of the daily travel were attracted to the new transit line it would serve almost 14,000 trips.

Table 4-16: Broad Street Intra-Corridor Trips (2031)

Trip Type	Peak	Off Peak	Total
Work	98,032	174,264	272,296
Non Work	123,627	976,300	1,099,927
Total	221,659	1,150,564	1,372,223

4.2.I CORRIDOR I: I-64 WEST

The I-64 West corridor generally consists of low density development. It extends from central Richmond west to Goochland County. The inner portion of the corridor, from Short Pump to downtown was discussed above in Section 4.2.H.

LAND USE PATTERN

Land use densities vary considerably on the I-64 West corridor. High residential and employment densities are found in downtown Richmond. Moving westward along I-64, employment densities are generally low, though the corridor is characterized by medium to high densities in the vicinity of Parham Road and Glenside Drive. Figure 4-63 to Figure 4-66 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-67 shows that the growth in the number of households is greatest west of I-295.

[5] As part of the GRTC Comprehensive Operations Analysis (2008), the BRT service is proposed to operate in dedicated bus lanes for at least 50% of its length during peak hours. At other times and in some locations it may operate in mixed traffic. However, the specific details of the location of the exclusive lanes, the station locations, the use of signal preemption, the fare collection strategy, and the detailed operating plan are not included.

Figure 4-63: Residential Density along I-64 West Corridor (2016)

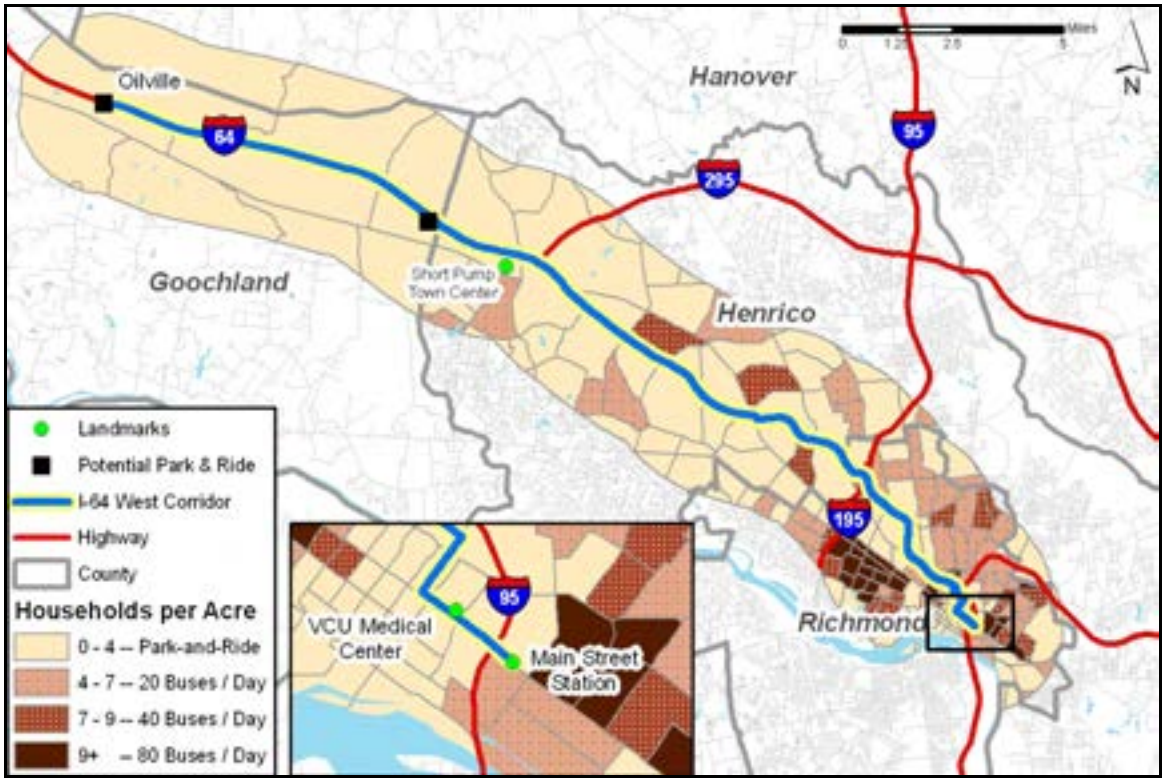


Figure 4-64: Residential Density along I-64 West Corridor (2031)

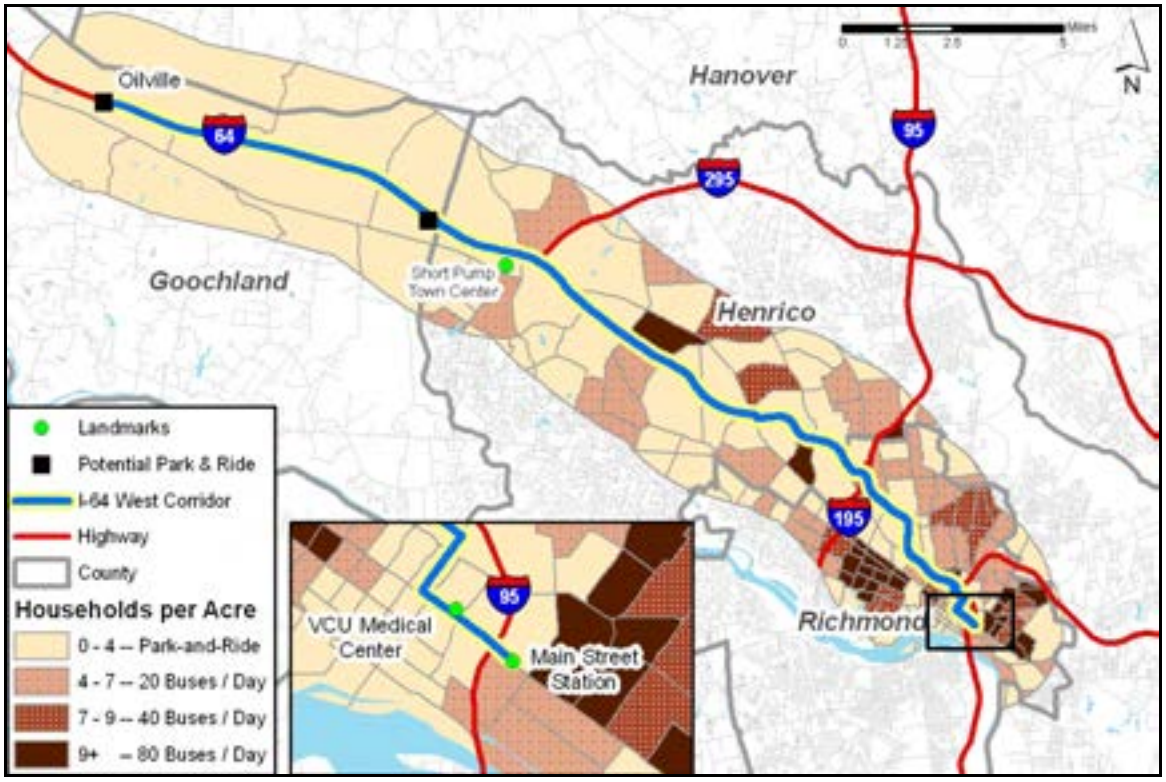


Figure 4-65: Employment Density along I-64 West Corridor (2016)

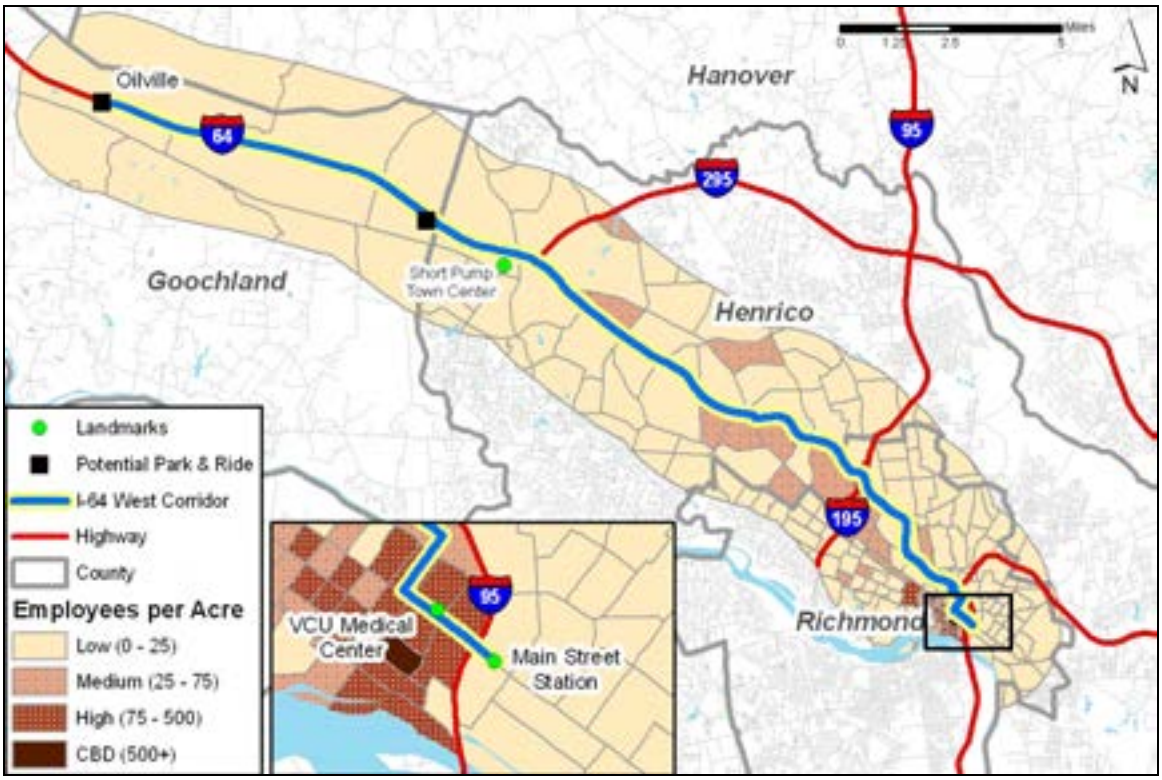


Figure 4-66: Employment Density along I-64 West Corridor (2031)

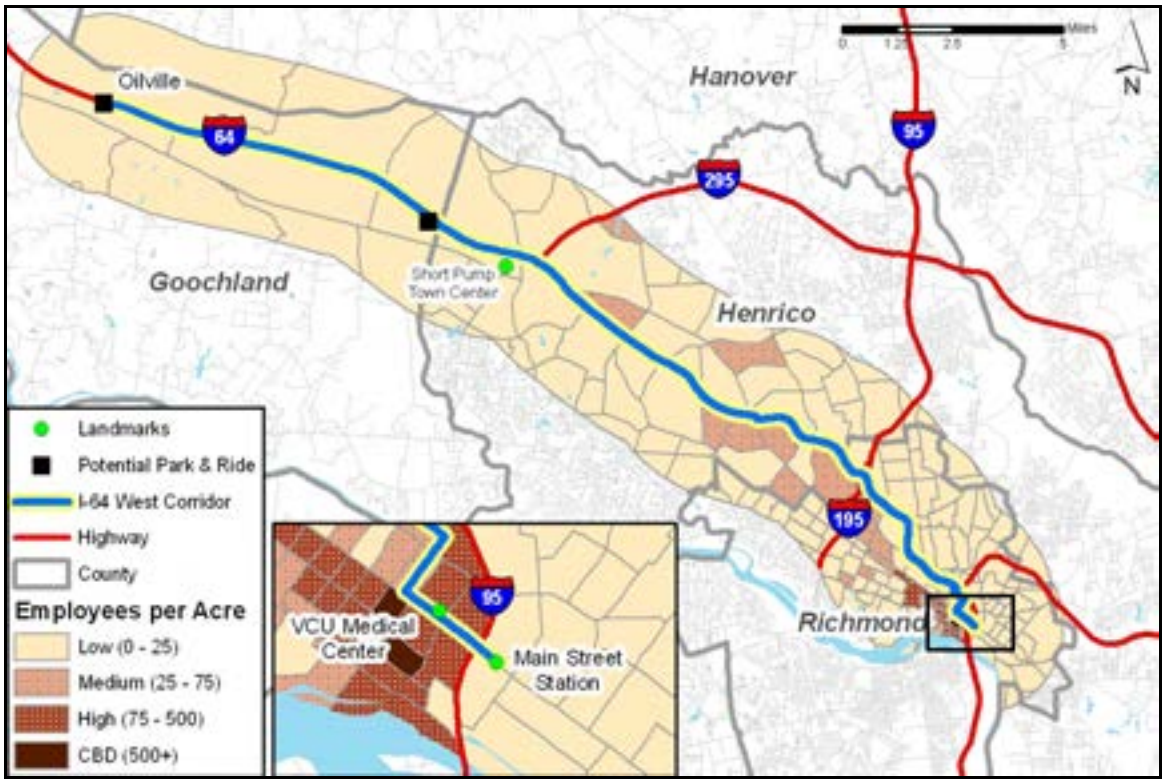
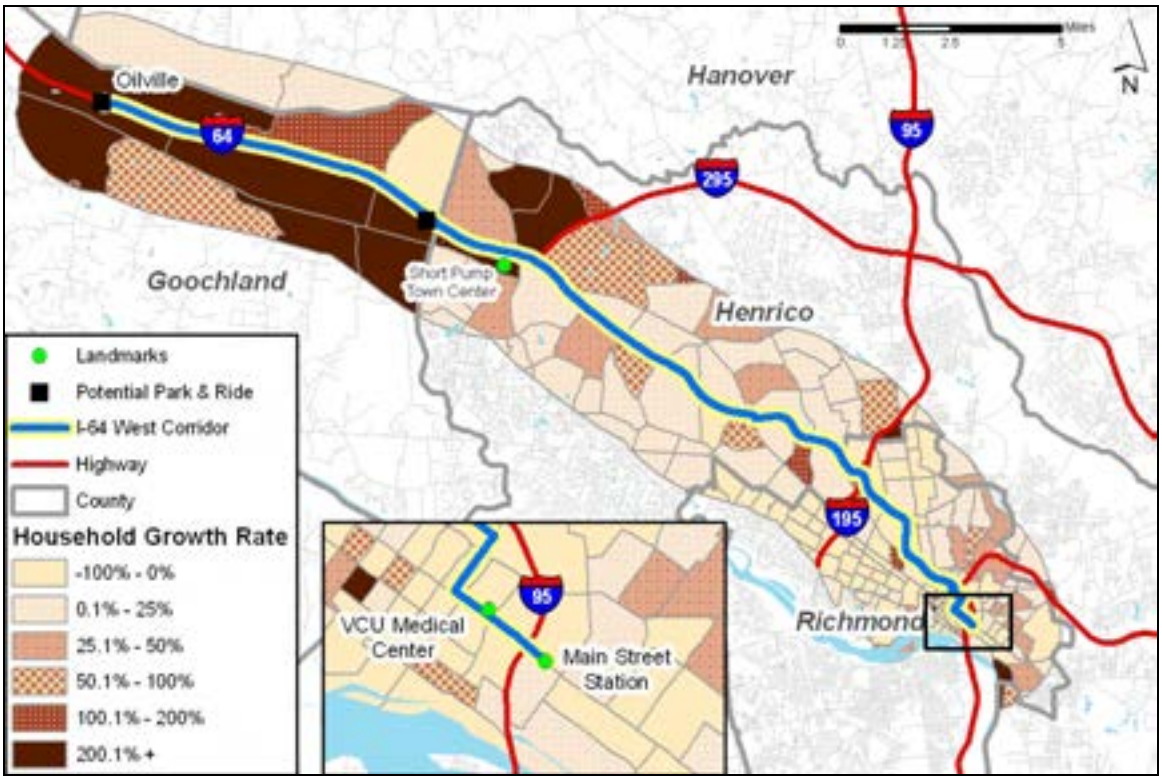


Figure 4-67: Household Growth Rate along I-64 West Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

One potential service option for I-64 West corridor is to provide commuter bus service between Oilville and Main Street Station, a distance of 24.8 miles. Park and ride lots could be located in Oilville and at the I-64/Route 288 interchange. This study proposes an operating concept of four inbound trips and one outbound trip during weekday morning peak period and four outbound trips and one inbound trip during the weekday evening peak period. Four vehicles are required during peak periods. Operating costs are estimated to be approximately $0.1 million. Capital costs are estimated to be $4.0 million and include the cost of two park and ride lots. A summary of service characteristics and costs is provided in Table 4-17.

Table 4-17: I-64 West Commuter Bus Summary

Service Characteristics	
Route:	I-64 West Commuter Bus
Mode:	Bus
Length:	24.8 miles
Service Span:	
Morning	4 inbound trips (weekdays)
Midday	1 round trip (weekdays)
Evening	4 outbound trips (weekdays)
Peak Vehicles:	4

Cost (2006 dollars)	
Annual Operating Cost:	$0.1 million
Capital Cost:	$4.0 million

4.3 INTERCITY RAIL

The Virginia Department of Rail and Public Transportation (DRPT) is in the process of investigating three intercity passenger rail corridors that would provide service to the Richmond Region. These corridors include two regional priorities for service to Washington, DC (along I-95) and to Hampton Roads (along I-64). A third intercity passenger rail service—the TransDominion Express—would run from Bristol to Richmond and Washington, DC.

4.3.A RICHMOND/HAMPTON ROADS PASSENGER RAIL

DRPT is currently studying the potential for providing high-speed passenger rail service between Richmond and Hampton Roads. One potential corridor would provide service between the two regions along the I-64 corridor, with a stop in Williamsburg. Service would be provided along the existing CSX rail line. In spring 2008, the draft Environmental Impact Statement (EIS) identifying the preferred alternative will be available for public review based on five existing alternatives identified in the Richmond/Hampton Roads Passenger Rail Study. Figure 4-68 illustrates the rail alignments and Table 4-18 summarizes the operating characteristics.

Status Quo Alternative: Under this alternative, passenger rail service continues unchanged. Two daily round trips would continue to be provided by Amtrak between Richmond and the Peninsula, stopping at Richmond Main Street Station, Williamsburg Station, and Newport News Amtrak Station. The maximum operating speed is 79 mph.

No-Action Alternative: This alternative includes no major improvements, but would provide three daily round trips between Richmond and the Peninsula. Stops would be made at Richmond Main Street Station, Williamsburg Station, and Newport News Amtrak Station. The maximum operating speed is 79 mph.

Alternative 1: This alternative would provide service to both the Peninsula and the Southside. Three daily roundtrips would be made between Richmond Main Street Station and Newport News Amtrak Station, with a stop at Williamsburg Station. The maximum operating speed is 79 mph. Six daily roundtrips would be made between Richmond Main Street Station and Downtown Norfolk, with stops at Petersburg and Chesapeake. Trains would reach a maximum speed of 90 mph or 110 mph.

Alternative 2a: This alternative would provide service to both the Peninsula and the Southside. Six daily roundtrips would be made between Richmond Main Street Station and the proposed Newport News Downtown Station, with a stop at Williamsburg Station. The maximum operating speed would be 90 mph or 110 mph. Three daily roundtrips would be made between Richmond Main Street Station and Downtown Norfolk, with stops at Petersburg and Chesapeake. Trains would reach a maximum speed of 79 mph.

Alternative 2b: This alternative would provide nine daily round trips to the Peninsula. Trains would operate at maximum speeds of 90 mph or 110 mph, providing service to Richmond Main Street Station, Williamsburg Station, and the proposed Newport News Downtown Station.

Improvements made to support service to the Peninsula service could affect the provision of rail service to the Airport. Track and station improvements would make it easier to initiate a commuter rail operation but could make introduction of light rail in this corridor more difficult.

Added service to Southside would make operating a commuter rail service between Petersburg and Richmond more feasible.

Table 4-18: Richmond/Hampton Roads Passenger Rail Study Operating Characteristics

	Richmond to Peninsula			Richmond to Southside (via Petersburg)		
Alternative	**# of Daily Round Trips**	**Max Speed (mph)**	**Stations**	**# of Daily Round Trips**	**Max Speed (mph)**	**Stations**
Status Quo	2	79	1, 2, 3	--	--	--
No Build	3	79	1, 2, 3	--	--	--
Alternative 1	3	79	1, 2, 3	6	90 or 110	1, 5, 6, 7
Alternative 2a	6	90 or 110	1, 2, 4	3	79	1, 5, 6, 7
Alternative 2b	9	90 or 110	1, 2, 4	--	--	--

Stations:

1 = Richmond Main Street Station
2 = Williamsburg Station
3 = Newport News Amtrak Station
4 = Proposed Newport News Downtown Station
5 = Petersburg
6 = Chesapeake (Bower's Hill Station)
7 = Downtown Norfolk

Figure 4-68: Richmond/Hampton Roads Passenger Rail Study Alternatives

Source: VDRPT

4.3.B RICHMOND TO WASHINGTON, DC

The Southeast High-Speed Rail corridor would provide intercity passenger rail service between Washington, DC and Charlotte, NC. In 2002, the Tier I Environmental Impact Statement (EIS) identified a preferred corridor between Richmond and Raleigh, NC. Virginia and North Carolina are now conducting a Tier II study, which provides a detailed analysis on the impacts and capital improvements (such as track alignment, station arrangement, roadway improvements related to grade separation and detailed design) for the segment of the route between Raleigh, NC and Petersburg. In January 2007, the VDRPT approved an extension of the study area to include the route segment between Petersburg and Richmond Main Street Station.

The Commonwealth of Virginia has been working with the CSX and the Virginia Railway Express (VRE) to provide additional capacity for passenger rail service on the corridor between Richmond and Washington, DC. While most of these improvements have occurred in VRE territory north of Fredericksburg, there are several improvements in the Richmond region that have helped to improve the reliability of intercity rail service, including the installation of a new crossover south of Ashland and the upgrade of switches in Acca Yard. DRPT is studying alternatives to improve access to Main Street Station by providing an upgraded route for passenger trains through or around Acca Yard. Any improvements made for conventional or high speed intercity passenger rail service would provide additional rail capacity that could make a commuter service from Ashland to Richmond more feasible.

4.3.C TRANSDOMINION EXPRESS

The TransDominion Express (TDX) is an intercity passenger rail service that would provide service between Bristol and Washington, DC and between Bristol and Richmond. It would operate on existing Norfolk Southern tracks between Bristol and Lynchburg, where service would branch off in two directions, one to Richmond and the other to Washington, DC. Two roundtrips would be provided daily. Capital improvements would include signal and track improvements to increase rail capacity, station upgrades, storage and maintenance facilities, and a connection between NS and CSX tracks in Richmond. To fully implement this service, Norfolk Southern estimates a capital investment of $120 million and an annual operating subsidy of $14 million.

The TransDominion Express, as currently proposed, would use the same tracks as the Midlothian Commuter rail line. Double tracking and other improvements may be necessary to provide additional capacity to accommodate freight, intercity, and commuter rail service between Midlothian and downtown Richmond. However, track improvements made to support the TDX would significantly reduce the cost of establishing commuter rail operations in this corridor.

4.4 LOCAL SERVICE

This study also addresses logical extensions of GRTC bus service into areas where service is now limited. This includes local bus services that provide circulation within Chesterfield County and Hanover County, feeder services to the Broad Street BRT/LRT corridor in Henrico County, and regional routes.

4.4.A ROUTE 1 NORTH

The Route 1 North corridor extends north from downtown Richmond through Henrico County to Ashland. Commuter bus or commuter rail services between Richmond and Ashland were discussed in Section 4.2.A. GRTC currently operates local bus services between downtown Richmond and portions of Henrico County. Service extensions of existing GRTC local bus routes between Henrico County and Ashland are considered in this section.

LAND USE PATTERN

Land use along the Route 1 North corridor is characterized by low density residential and employment development in all but the areas of Henrico County that border Richmond. Figure 4-69 to Figure 4-72 show residential and employment densities along a two-mile buffer of the corridor in 2016 and 2031. Figure 4-73 shows that the greatest growth in the number of households between 2006 and 2031 occurs north of I-295, with growth exceeding 50 percent in some areas.

Figure 4-69: Residential Density along Route 1 North Corridor (2016)

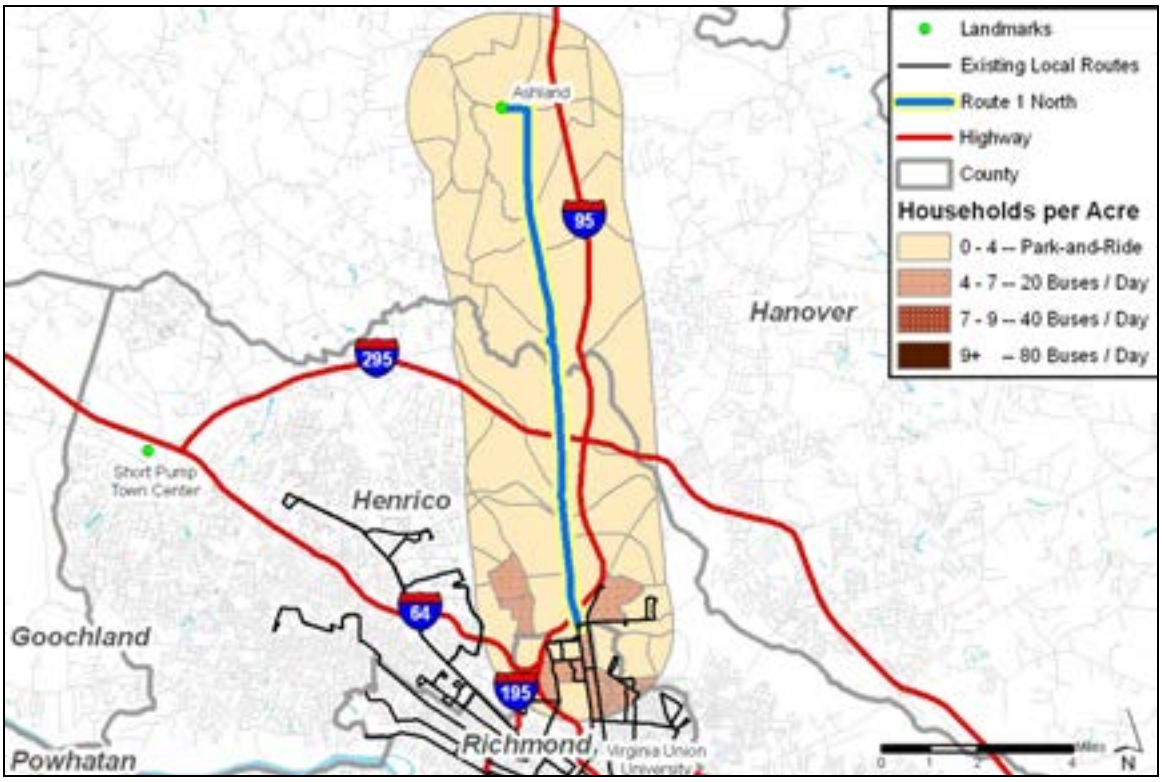


Figure 4-70: Residential Density along Route 1 North Corridor (2031)

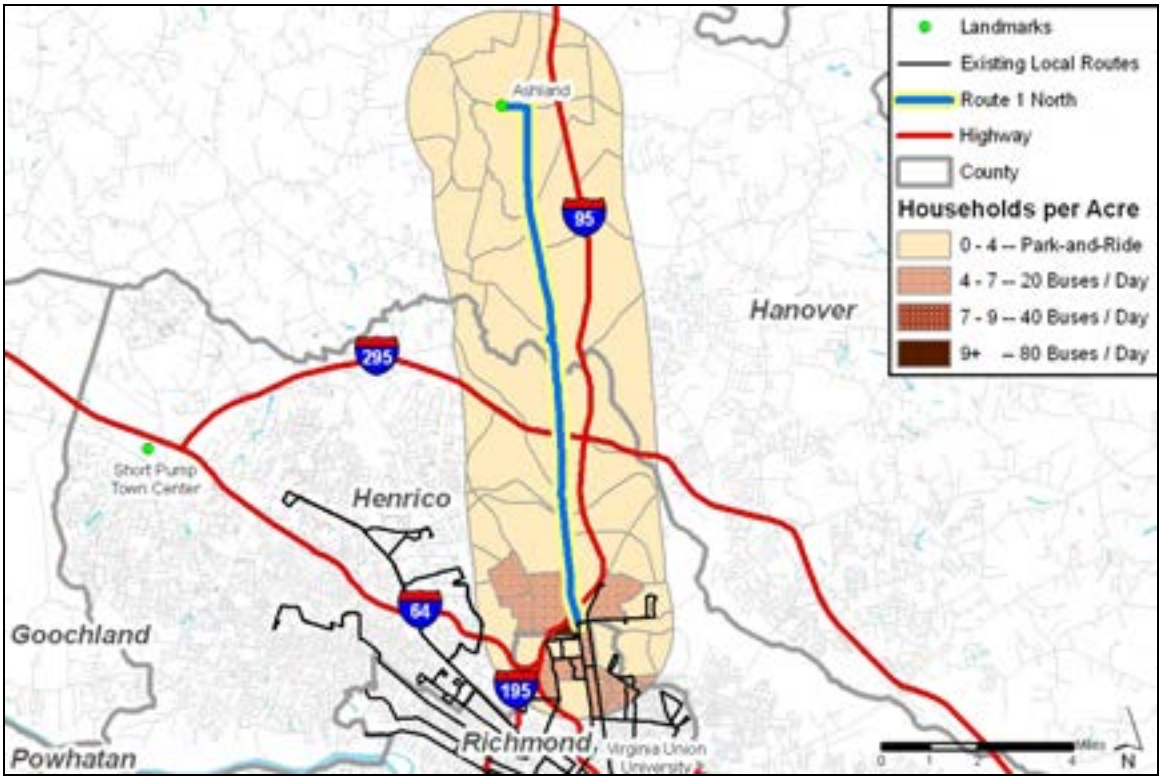


Figure 4-71: Employment Density along Route 1 North Corridor (2016)

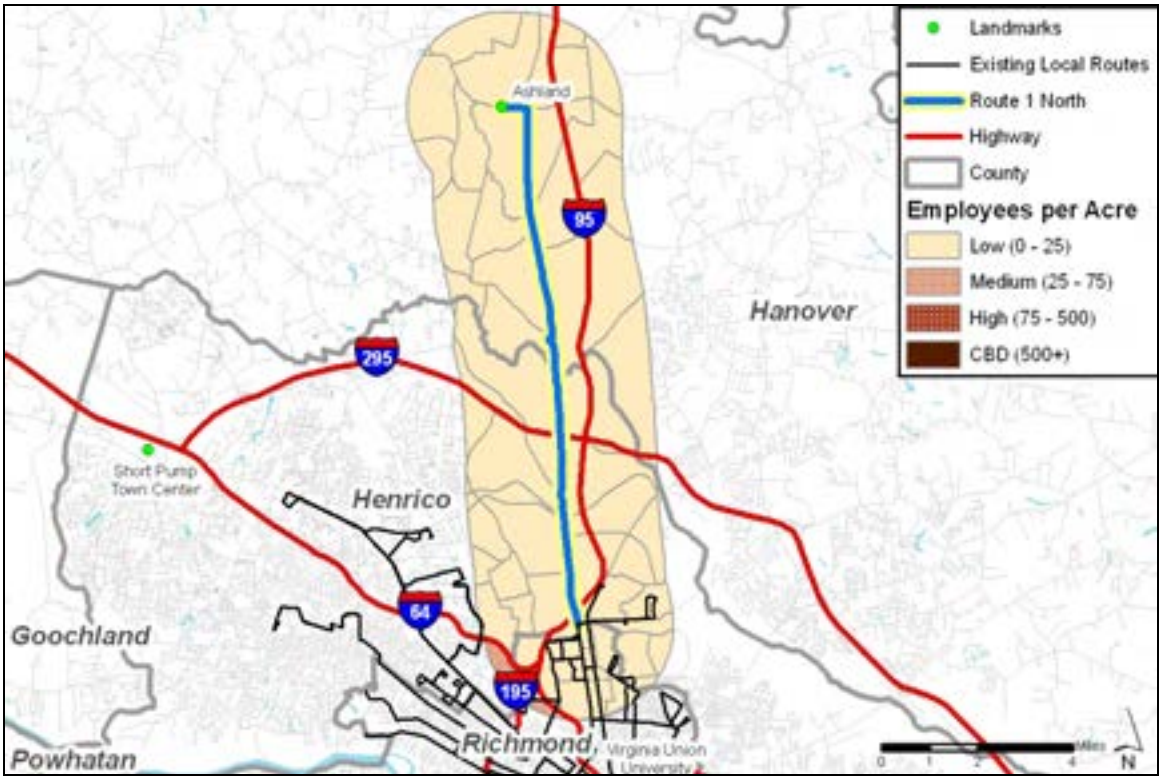


Figure 4-72: Employment Density along Route 1 North Corridor (2031)

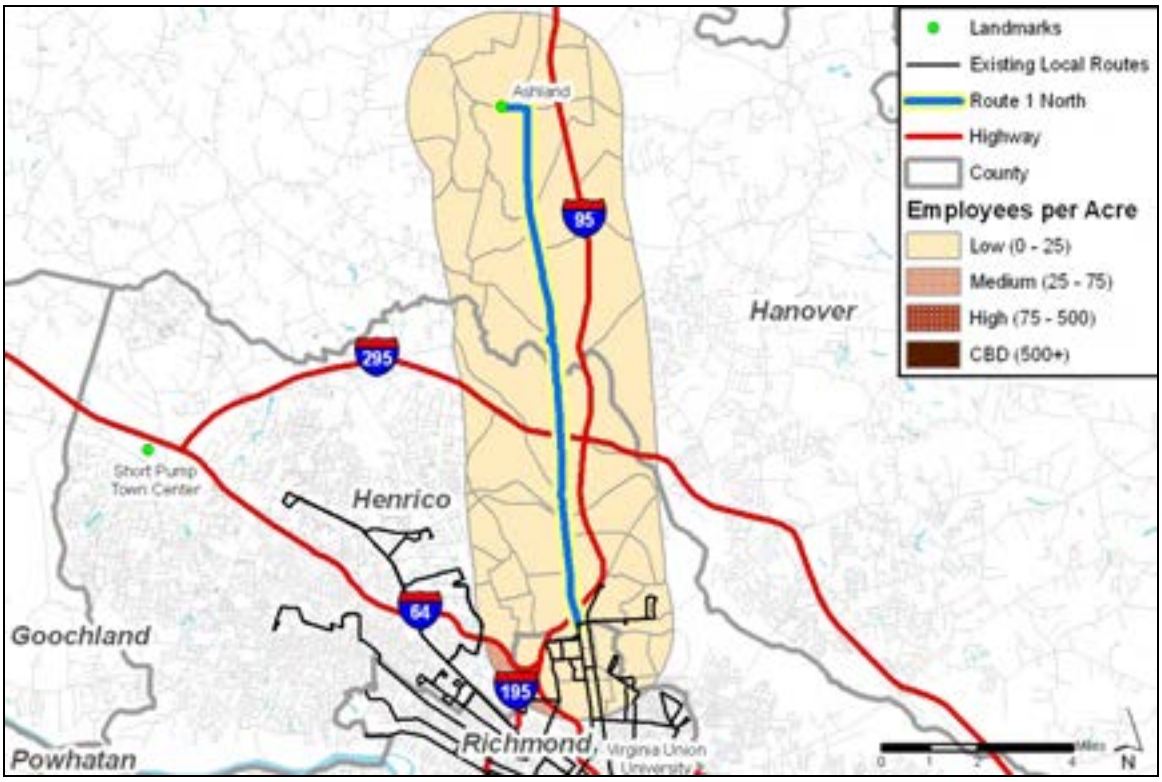
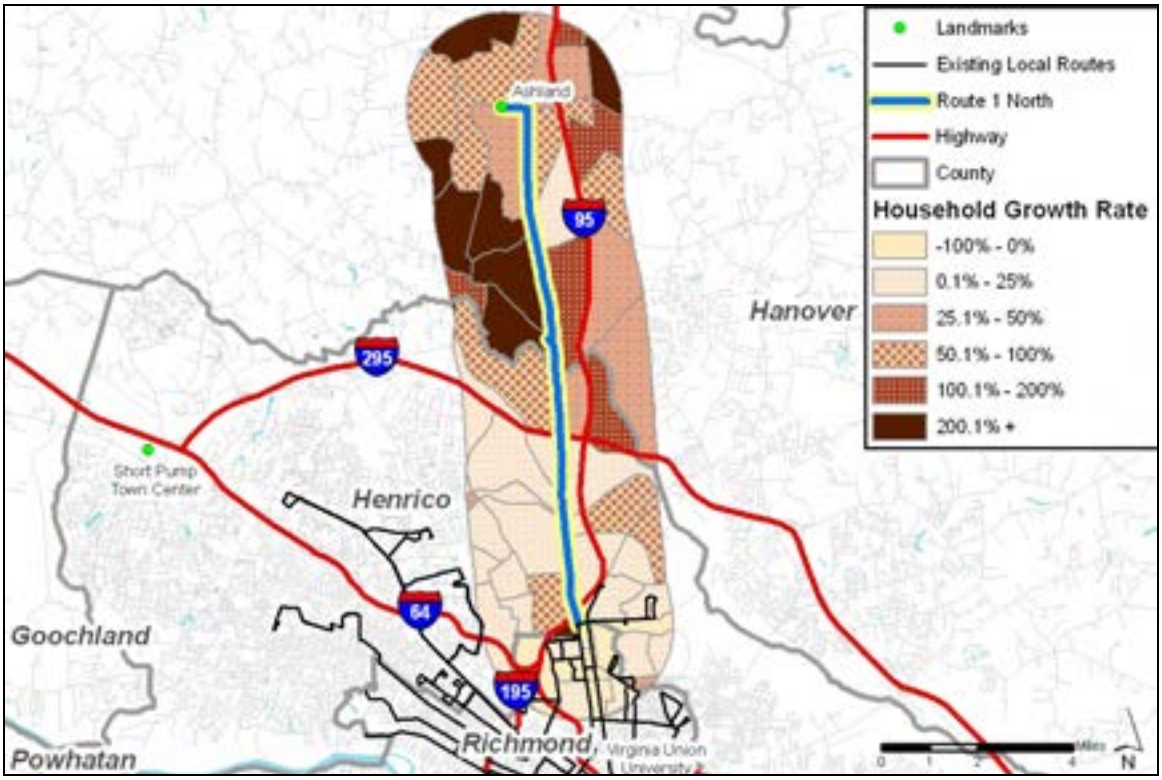


Figure 4-73: Household Growth Rate along Route 1 North Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

Service on the Route 1 North extension would be provided by local bus service. This route would operate seven days a week, between 6:00 am and midnight on weekdays. On weekends service would commence at 6:00 am and terminate at 11:00 pm on Saturday and 10:00 pm on Sunday. The route would require 5 vehicles during peak periods. Recommended headways are 30 minutes on weekdays and Saturdays and 60 minutes on Sundays. The annual operating cost for this route is approximately $1.6 million and capital costs are approximately $2.1 million. A summary of service characteristics and costs is provided in Table 4-19.

Table 4-19: Route 1 North Local Bus Summary

Service Characteristics	
Route:	Route 1 North Local Bus
Mode:	Bus
Length:	11.6 miles
Headway:	Weekdays and Saturdays: 30 minutes Sundays: 60 minutes
Service Span:	Weekdays: 6:00 am to midnight Saturdays: 6:00 am to 11:00 pm Sundays: 6:00am to 10:00 pm
Peak Vehicles:	5

Cost (2006 dollars)	
Annual Operating Cost:	$1.6 million
Capital Cost:	$2.1 million

ALIGNMENT

Route 1 North is an extension to existing GRTC local bus service, such as Route 37, between Ashland and Henrico County. This route travels northbound on Route 1 and turns left onto Route 54 into downtown Ashland.

4.4.B ROUTE 1 SOUTH

The Route 1 South corridor extends south from downtown Richmond through Chester and Colonial heights to Petersburg. GRTC now operates a commuter route between Petersburg and Richmond. Express bus or commuter rail services between Petersburg and Richmond were discussed in Section 4.2.E. In the northern segment of the corridor GRTC bus services operate to the city line. Between the city line and Chester, an area that has many residents who could be characterized as transit dependent, there in no current local bus service. The Route 1 South route, discussed below, would provide connecting service between developing areas of Chesterfield County and existing GRTC service.

LAND USE PATTERN

Outside of downtown Richmond, the Route 1 South corridor is characterized by low density residential and employment development. While densities are forecast to grow in South Richmond, between 2016 and 2031 (Figure 4-78), the southern portion of the corridor is expected to remain low density (Figure 4-74 through Figure 4-77).

Figure 4-74: Residential Density along Route 1 South (2016)

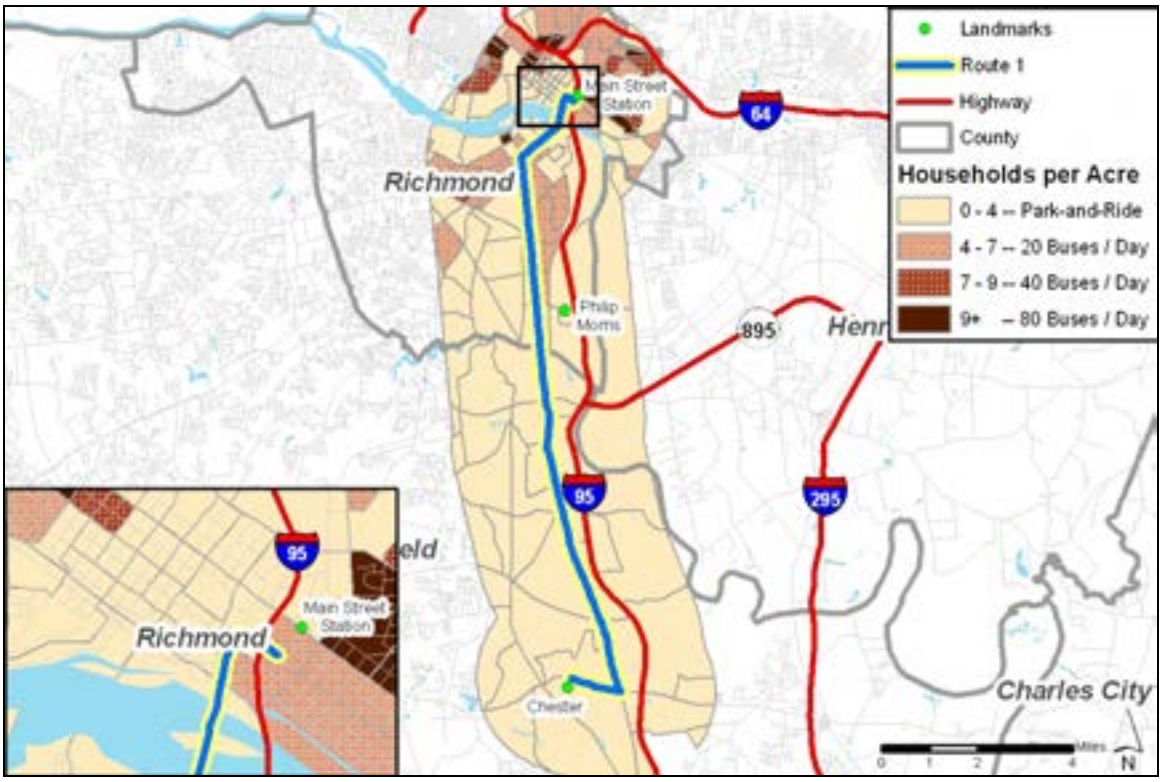


Figure 4-75: Residential Density along Route 1 South (2031)

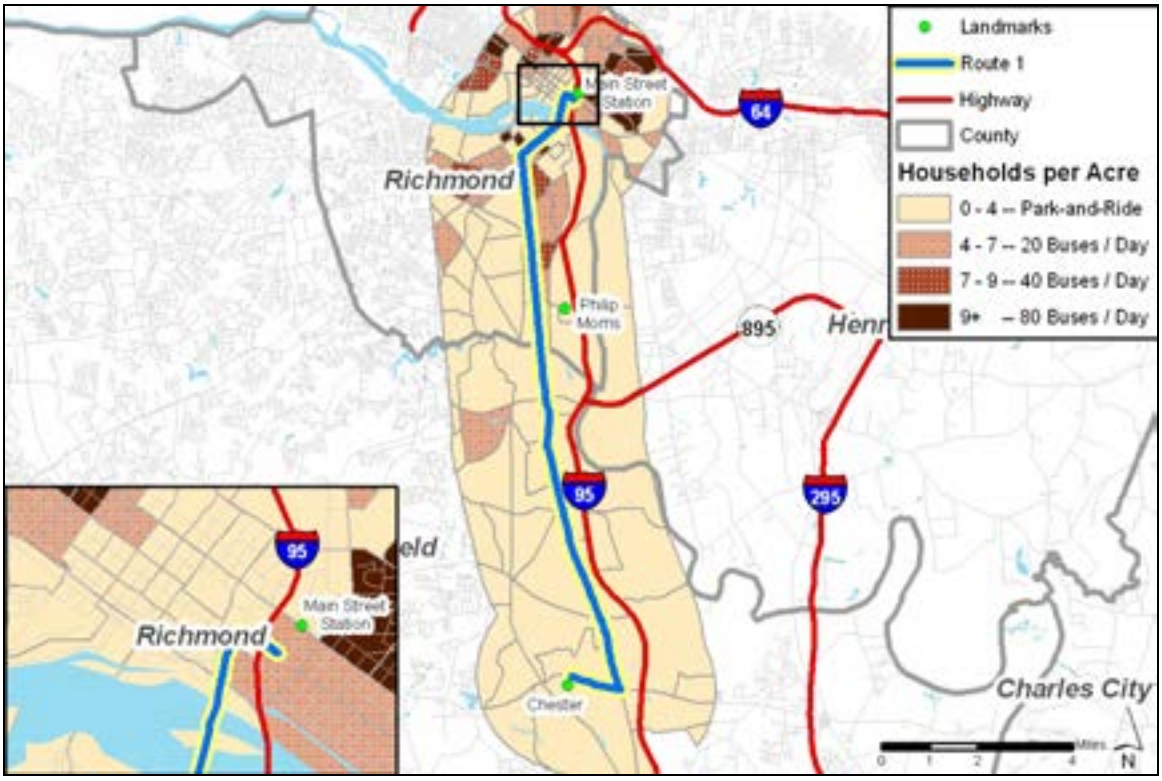


Figure 4-76: Employment Density along Route 1 South (2016)

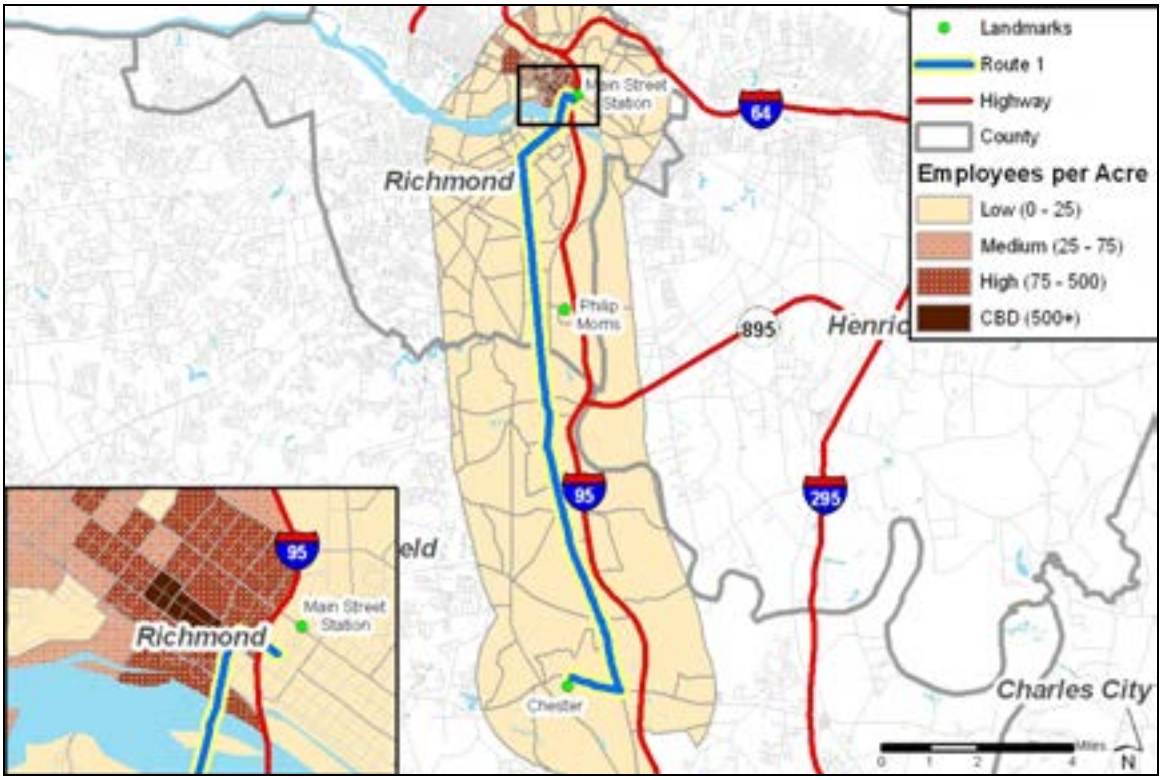


Figure 4-77: Employment Density along Route 1 South (2031)

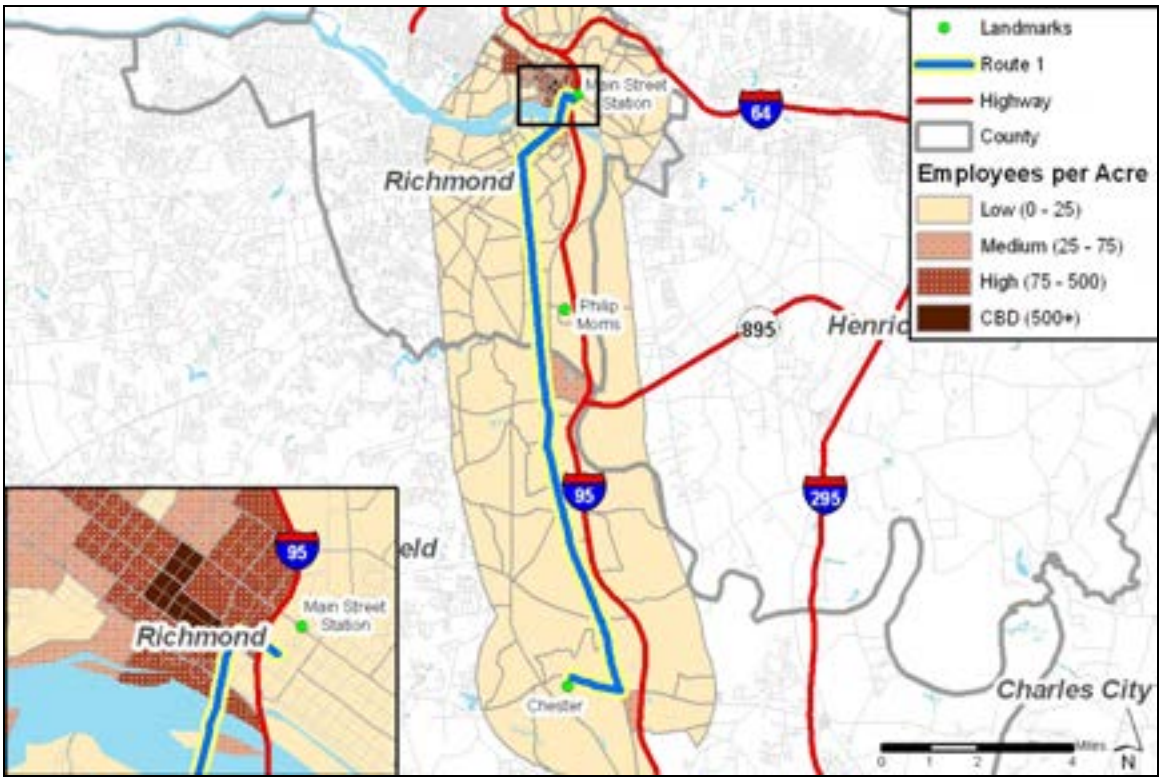
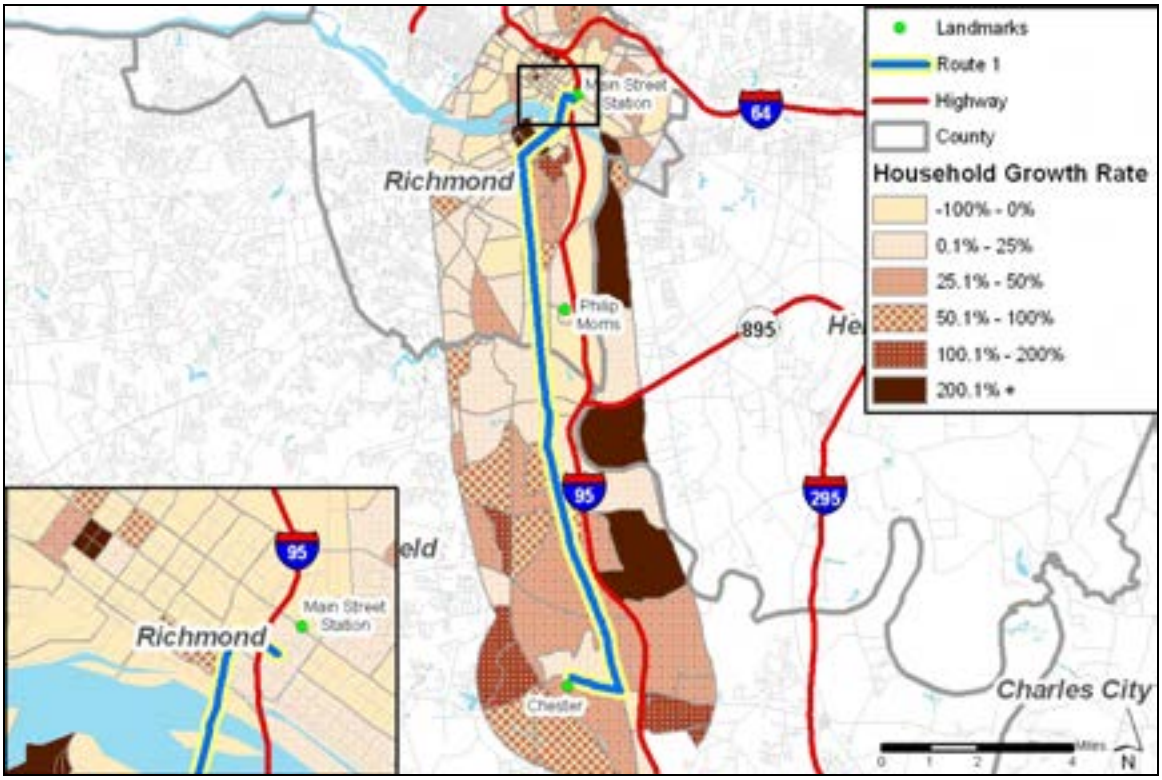


Figure 4-78: Household Growth Rate along Route 1 South Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

Service on the Route 1 South corridor would be provided by local bus service. This route would operate seven days a week, between 6:00 am and midnight on weekdays. On weekends service would commence at 6:00 am and terminate at 11:00 pm on Saturday and 10:00 pm on Sunday. The route would require 5 vehicles during peak periods. Recommended headways are 30 minutes on weekdays and Saturdays and 60 minutes on Sundays. The annual operating cost for this route is approximately $2.0 million and capital costs are approximately $2.1 million. A summary of service characteristics and costs is provided in Table 4-20.

Table 4-20: Route 1 South Local Bus Summary

Service Characteristics	
Route:	Route 1 South Local Bus
Mode:	Bus
Length:	14.4 miles
Headway:	Weekdays and Saturdays: 30 minutes Sundays: 60 minutes
Service Span:	Weekdays: 6:00 am to midnight Saturdays: 6:00 am to 11:00 pm Sundays: 6:00am to 10:00 pm
Peak Vehicles:	5

Cost (2006 dollars)	
Annual Operating Cost:	$2.0 million
Capital Cost:	$2.1 million

ALIGNMENT

Route 1 South travels between Main Street Station in downtown Richmond to Chester, via Route 360 and Route 1, a distance of 14.4 miles.

4.4.C ROUTE 5

The Rocketts Landing development straddling the Richmond/Henrico county border is emblematic of the changes occurring and projected to continue to occur in this corridor. Over the next twenty-five years it is expected that the success of these projects will lead to further proposals for developments in this corridor that would support local transit services. At present, there is no local bus service along Route 5 in Henrico County.

LAND USE PATTERN

While the household growth rate is forecast to exceed 100 percent along much of the Route 5 corridor, this corridor is expected to continue to be characterized by low density residential and employment development in 2031 (see Figure 4-79 through Figure 4-83).

Figure 4-79: Residential Density along Route 5 Corridor (2016)

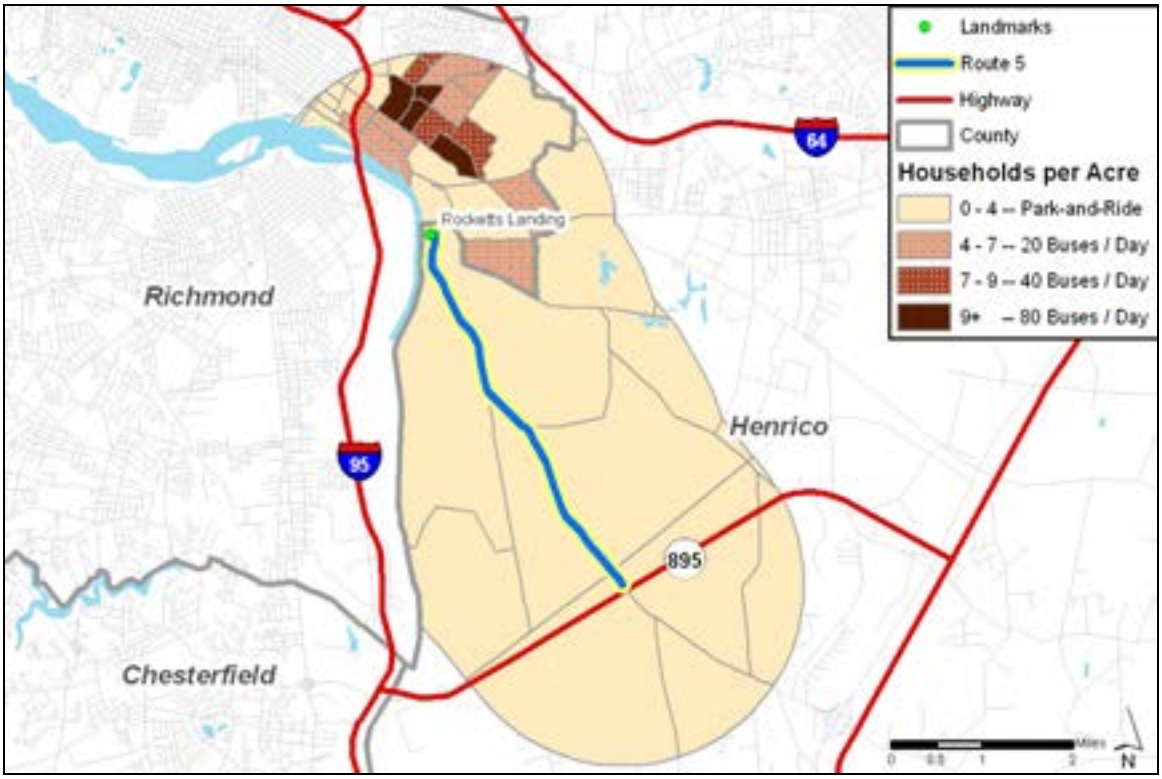


Figure 4-80: Residential Density along Route 5 Corridor (2031)

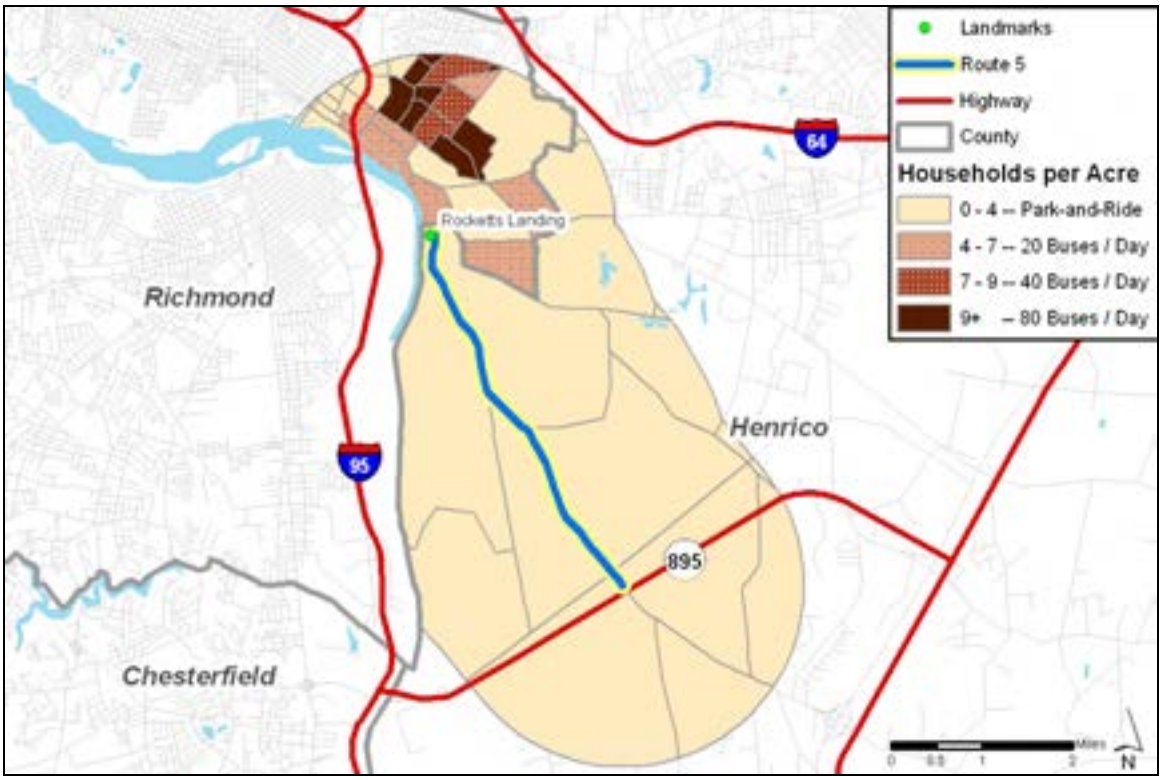


Figure 4-81: Employment Density along Route 5 Corridor (2016)

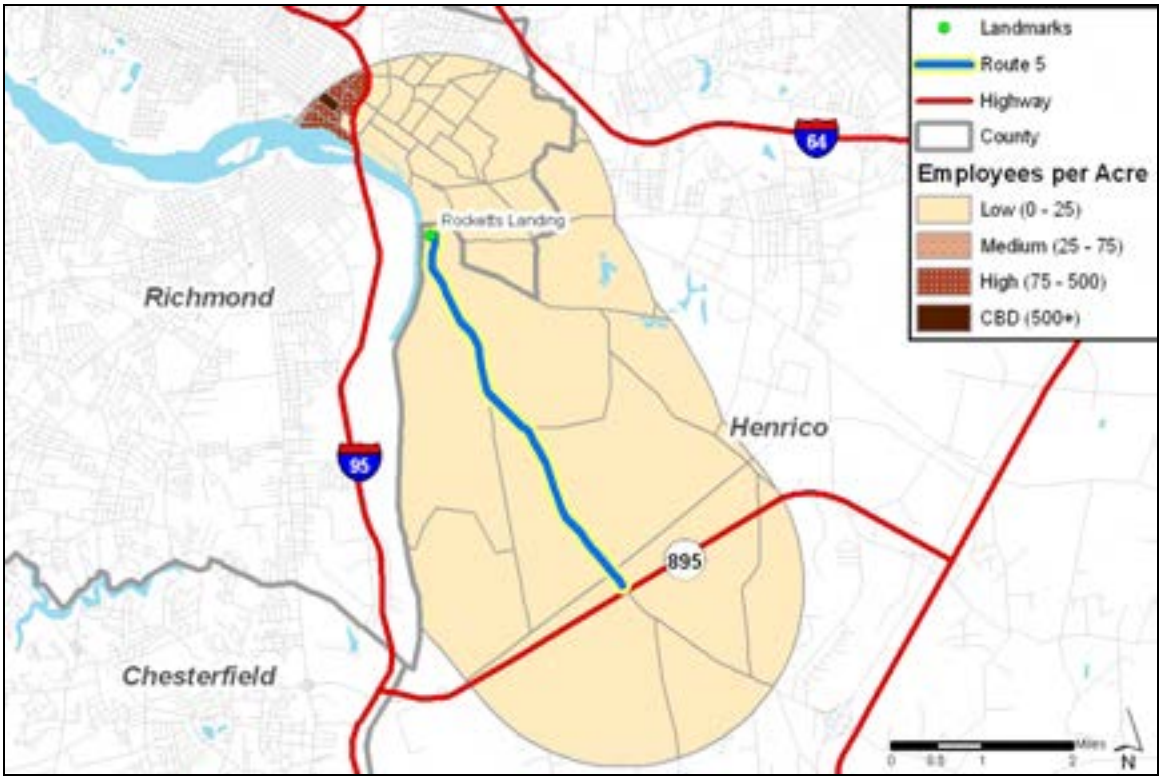


Figure 4-82: Employment Density along Route 5 Corridor (2031)

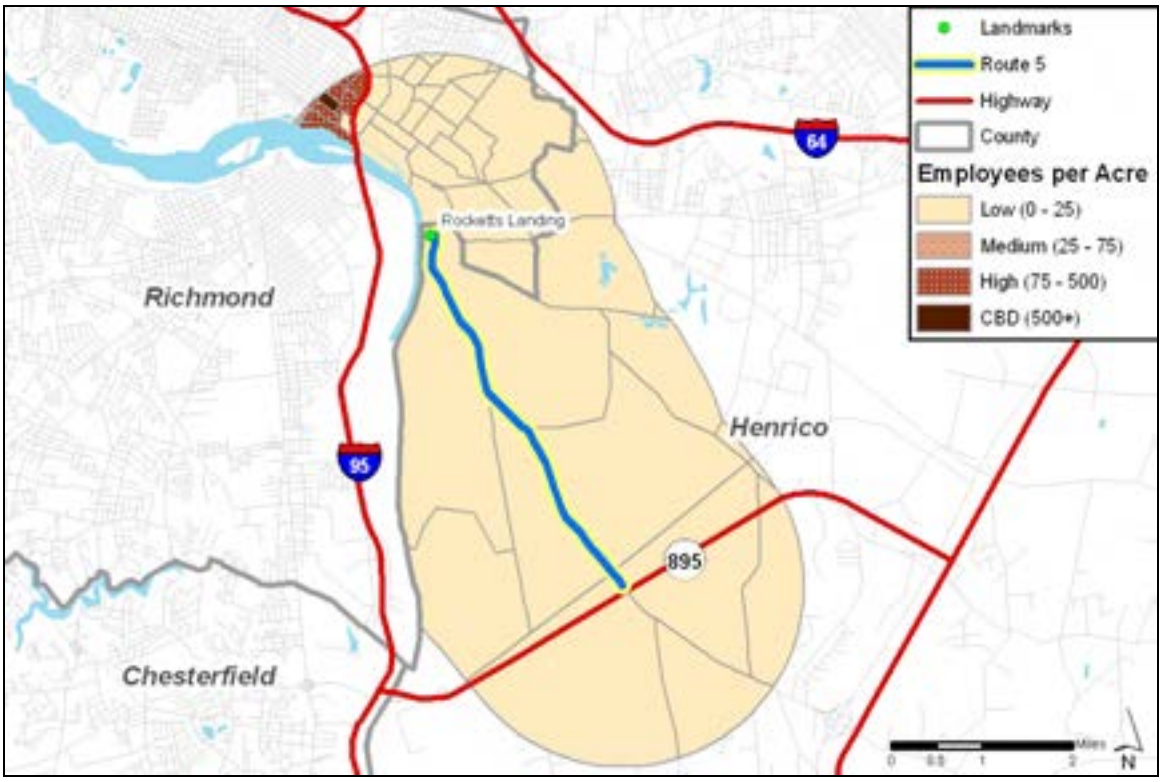
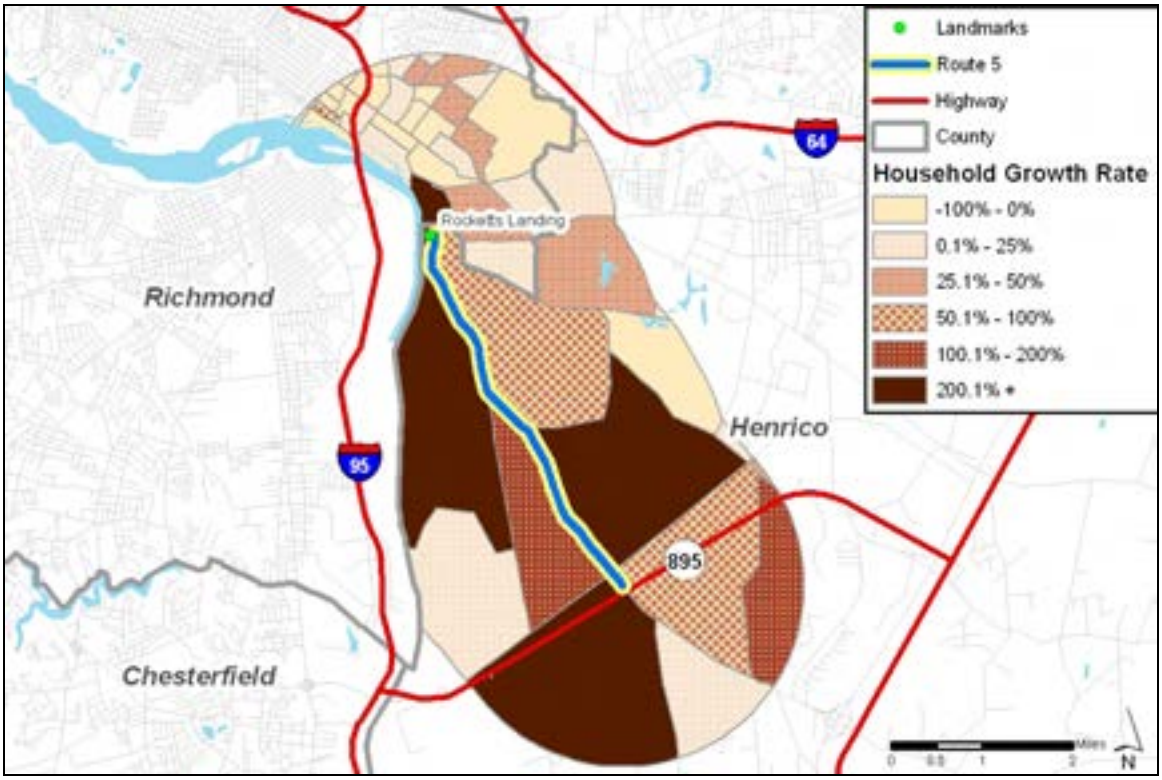


Figure 4-83: Household Growth Rate along Route 5 Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

Service on the Route 5 corridor would be provided by a local bus route that travels along Route 5 between Route 895 and Rocketts Landing, where it would feed into BRT or LRT service on the Broad Street to Rocketts Landing corridor. This route would operate seven days a week, between 6:00 am and midnight on weekdays. On weekends service would commence at 6:00 am and terminate at 11:00 pm on Saturday and 10:00 pm on Sunday. It might be operated independently or as extensions of existing GRTC routes service the City of Richmond (see Figure 4-84). The route would require 3 vehicles during peak periods. Recommended headways are 30 minutes on weekdays and Saturdays and 60 minutes on Sundays. The annual operating cost for this route is approximately $1.2 million and capital costs are approximately $1.3 million. A summary of service characteristics and costs is provided in Table 4-21.

Figure 4-84: Route 5 and Existing GRTC Local Routes

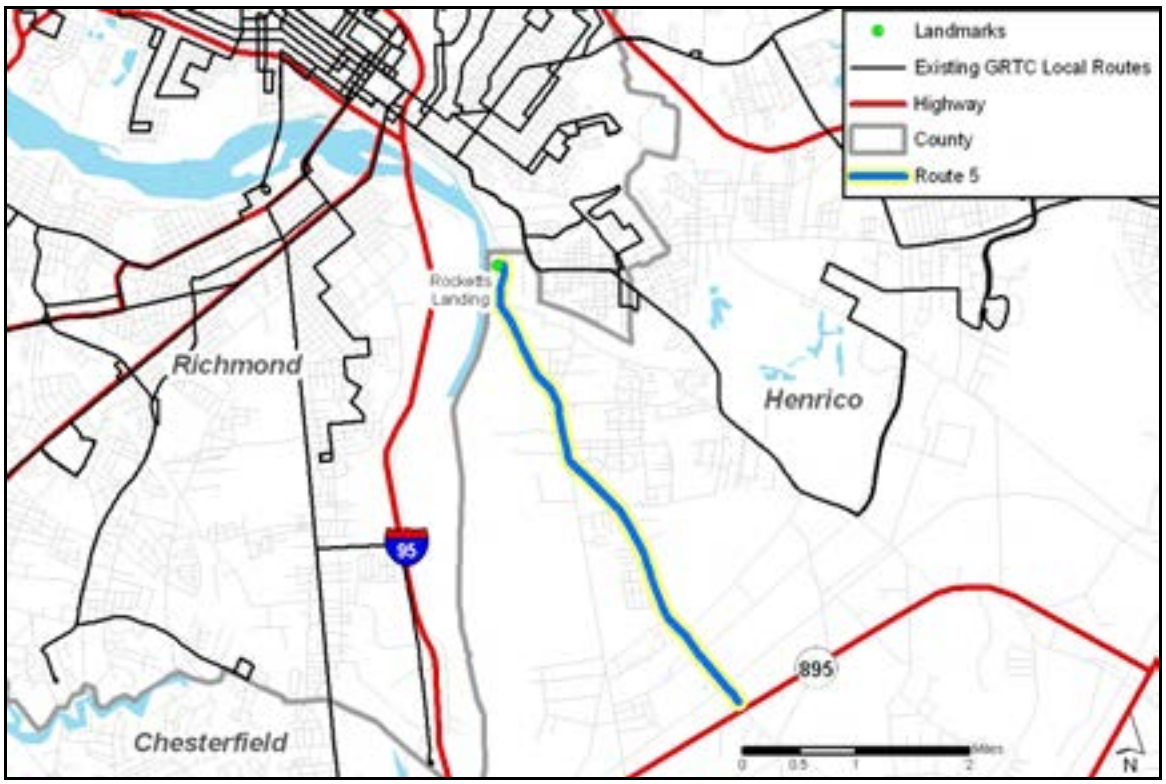


Table 4-21: Route 5 Local Bus Summary

Service Characteristics	
Route:	Route 5 Local Bus
Mode:	Bus
Length:	7.2 miles
Headway:	Weekdays and Saturdays: 30 minutes Sundays: 60 minutes
Service Span:	Weekdays and Saturdays: 6:00 am to 11:00 pm Sundays: 6:00am to 10:00 pm
Peak Vehicles:	3

Cost (2006 dollars)	
Annual Operating Cost:	$1.2 million
Capital Cost:	$1.3 million

ALIGNMENT

This route operates on Route 5 between Route 895 and Rocketts Landing, a distance of 7.2 miles.

4.4.D ROUTE 288

Route 288 provides a major circumfrentail roadway connection between Chesterfield County and the rapidly developing areas in western Henrico County and Goochland County, including Short Pump and the West Creek Corporate Center with Capital One. A transit service along Route 288 would permit travel between these areas without the requirement to travel by bus to and through downtwon Richmond.

LAND USE PATTERN

Figure 4-85 to Figure 4-88 show residential and employment densities along a two-mile buffer of the Route 288 corridor in 2016 and 2031. This corridor is characterized by low-density development throughout the corridor. Somewhat higher residential densities are located in the West Creek Corporate Center. Figure 4-78 shows that the majority of the corridor is expected to experience high growth in households between 2006 and 2031.

Figure 4-85: Residential Density along Route 288 Corridor (2016)

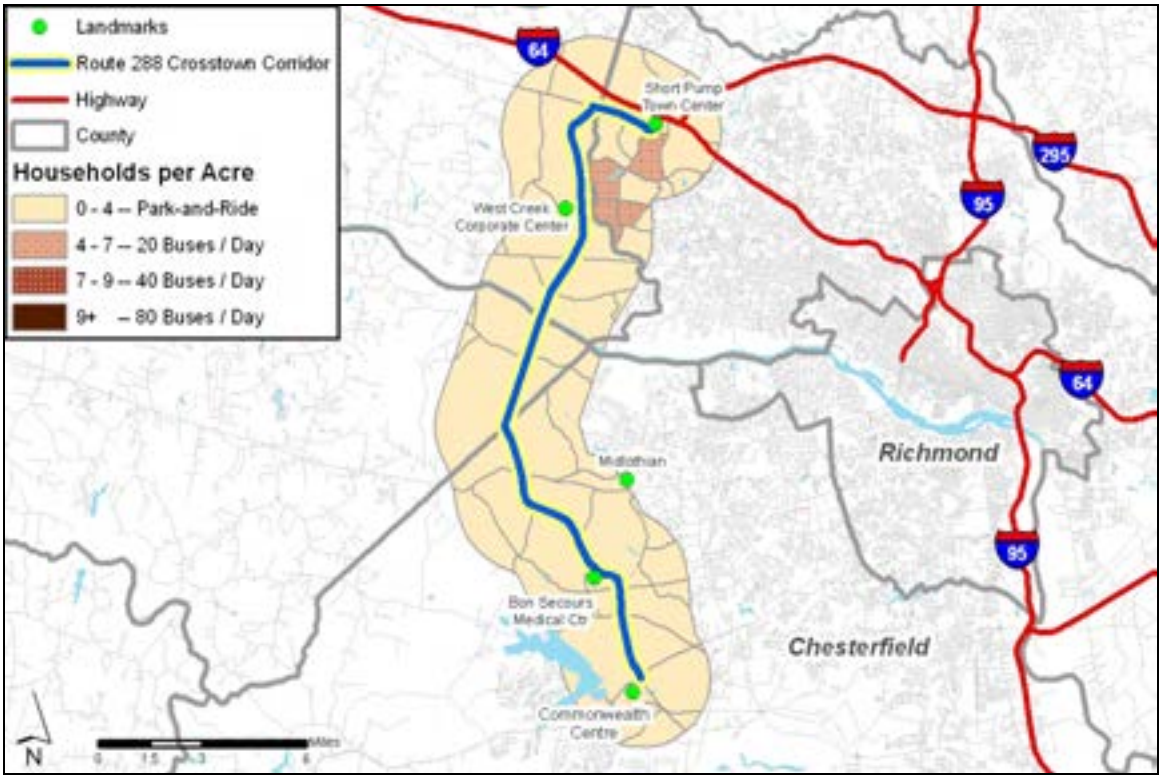


Figure 4-86: Residential Density along Route 288 Corridor (2031)

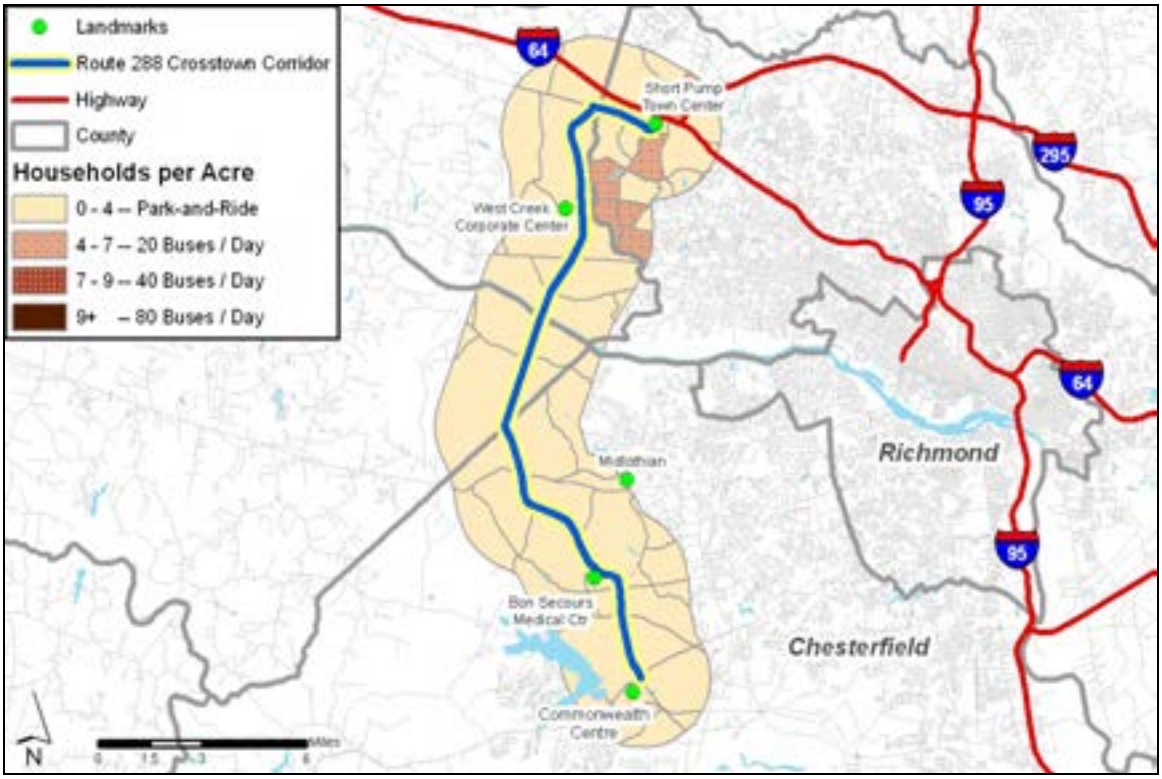


Figure 4-87: Employment Density along Route 288 Corridor (2016)

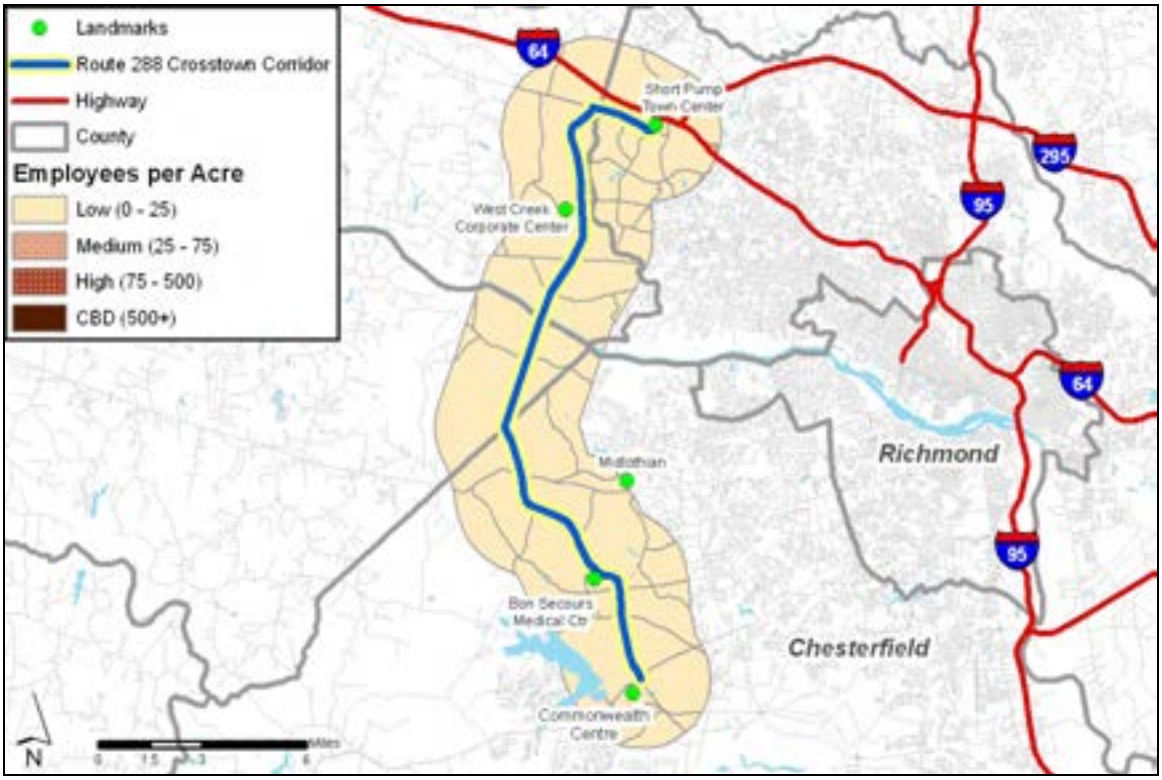


Figure 4-88: Employment Density along Route 288 Corridor (2031)

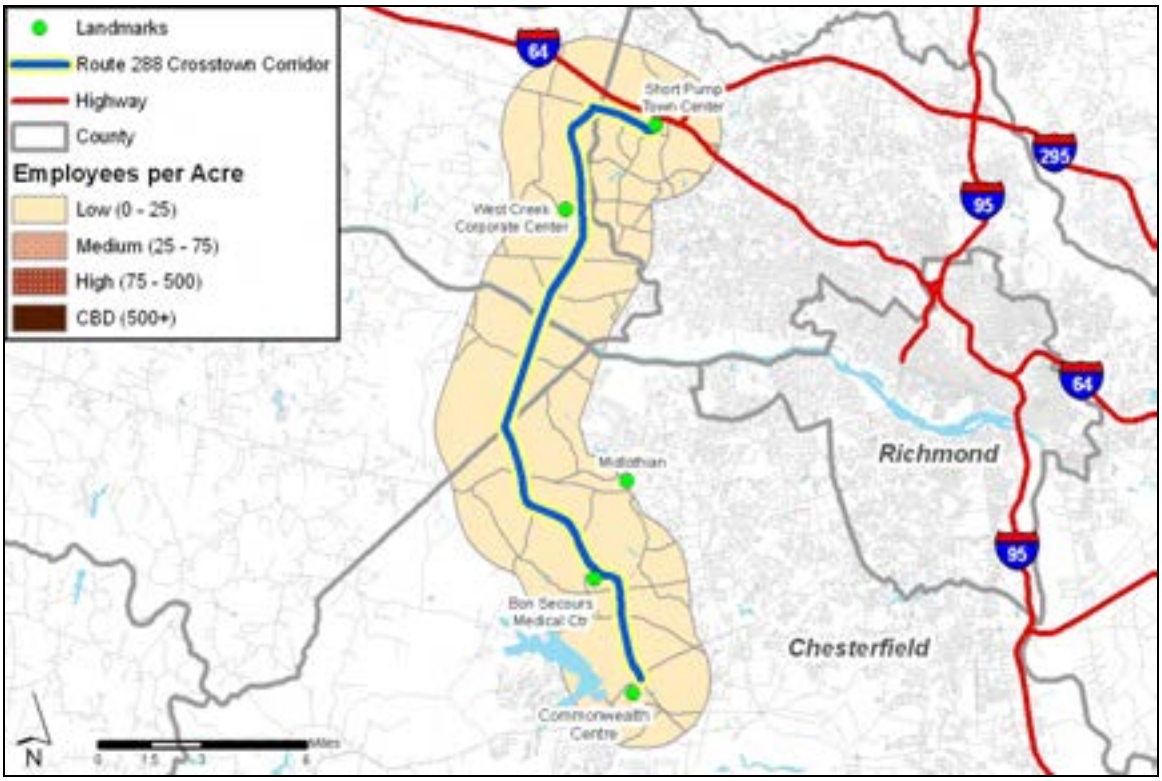
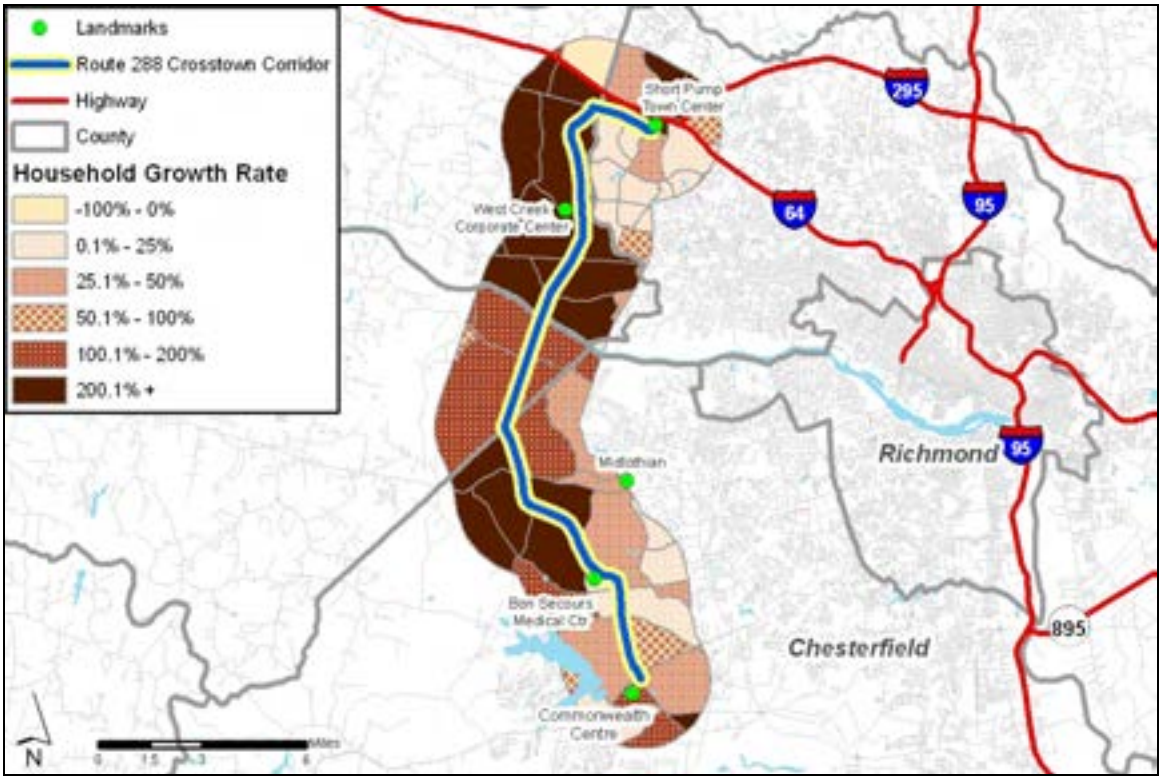


Figure 4-89: Household Growth Rate along Route 288 Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

Service on the Route 288 corridor could be provided by a regional bus route (Route 288 Crosstown) that travels along Route 288, from the Short Pump Town Center to central Chesterfield County. It would operate seven days a week, between 6:00 am and midnight on weekdays, 11:00 pm on Saturdays, and 10:00 pm on Sundays. It would require 11 vehicles during peak periods. Recommended headways are 20 minutes during peak periods and 60 minutes during off-peak periods and weekends. The annual operating cost for this route is approximately $1.6 million and capital costs are approximately $4.6 million. The primary purpose of this crosstown route would not be to serve development along the corrdior, but rather to facilitate conncetions between Chesterfield County and Western Henrico County without having to travel to and through downtown Richmond. A summary of service characteristics and costs is provided in Table 4-22.

Table 4-22: Route 288 Crosstown Summary

Service Characteristics	
Route:	Route 288 Crosstown
Mode:	Bus
Length:	20.7 miles
Headway:	Peak: 20 minutes
	Off-Peak and Weekends: 60 minutes
Service Span:	Weekdays: 6:00 am to midnight
	Saturdays: 6:00 am to 11:00 pm
	Sundays: 6:00am to 10:00 pm
Peak Vehicles:	11

Cost (2006 dollars)	
Annual Operating Cost:	$1.6 million
Capital Cost:	$4.6 million

ALIGNMENT

Route 288 Crosstown is a 20.7 mile route that operates on Route 288 between Short Pump Town Center and central Chesterfield County. Key stops are the Short Pump Town Center, the West Creek Corporate Center, the Watkins Centre, and Bon Secours Medical Center.

4.4.E HULL STREET ROAD (ROUTE 360)

Hull Street Road (Route 360) is an arterial roadway connection between western Chesterfield County and downtown Richmond. A local service along the route would provide all day operations connecting the residential areas and activity nodes being developed along this corridor.

LAND USE PATTERN

The Hull Street Road corridor is characterized by low density residential and employment development. The only TAZs that exceed residential densities of 4 dwelling units per acre are along the Richmond border (see Figure 4-90 through Figure 4-94).

Figure 4-90: Residential Density along the Hull Street Road Corridor (2016)

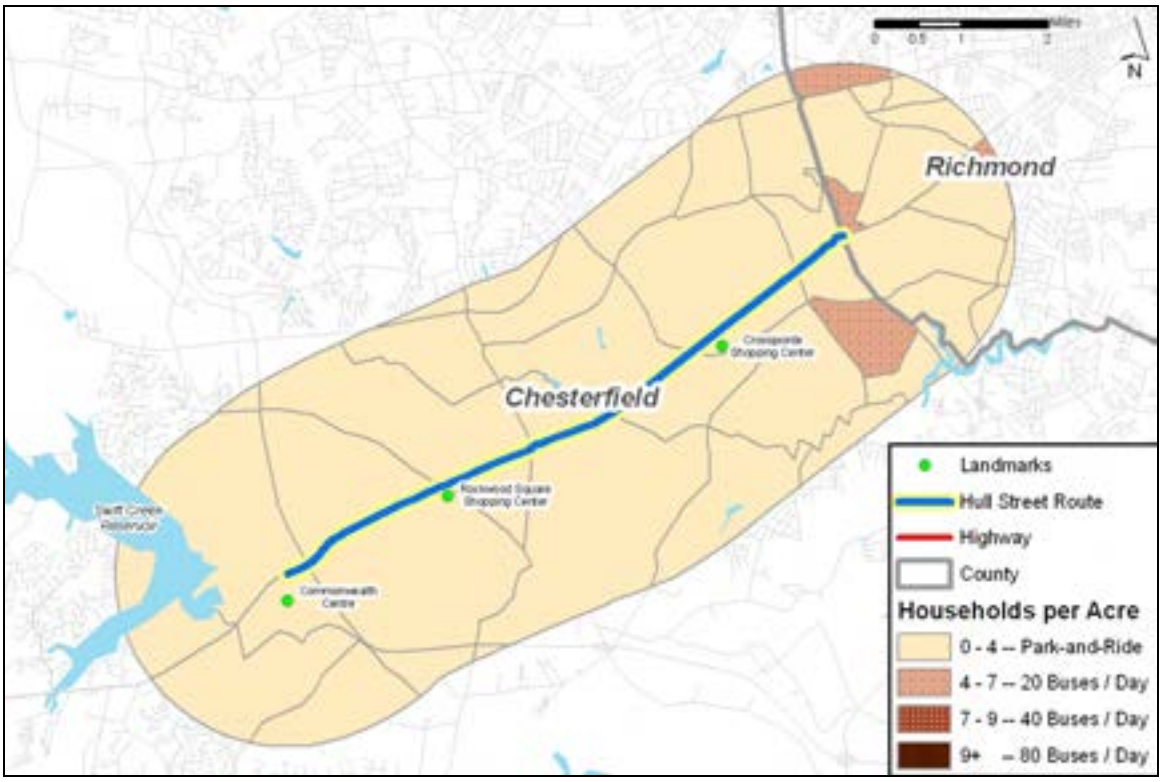


Figure 4-91: Residential Density along the Hull Street Road Corridor (2031)

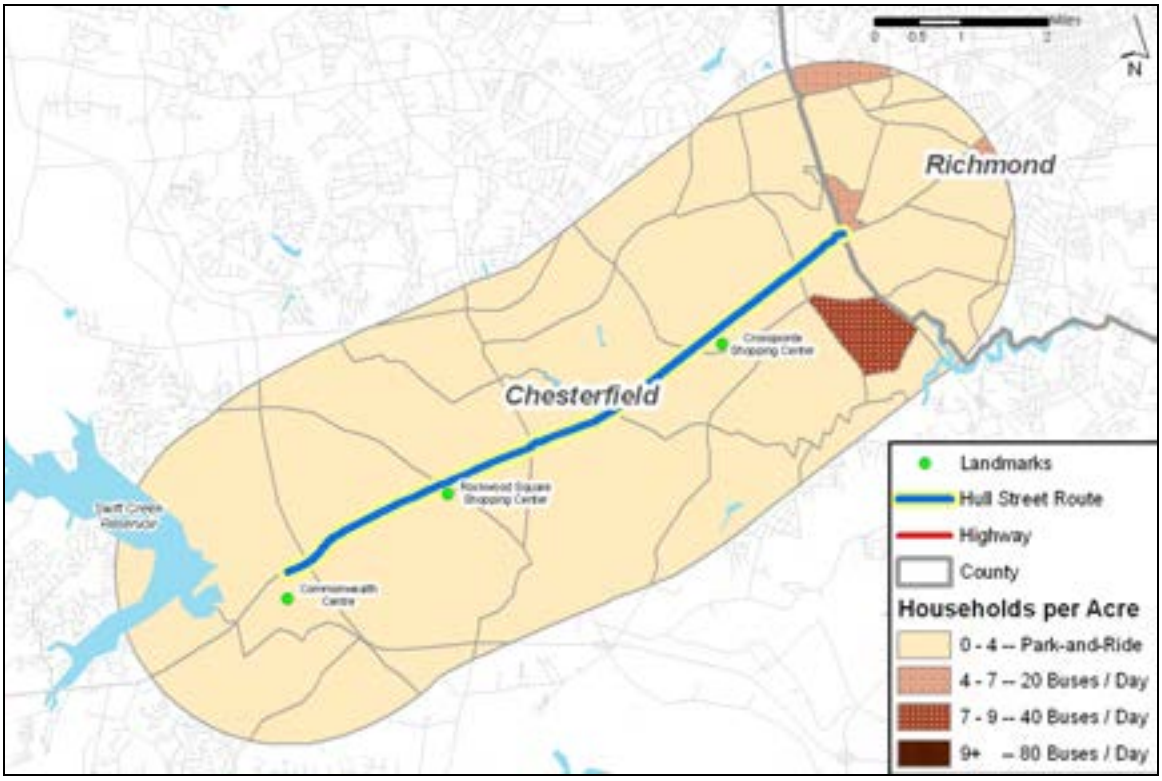


Figure 4-92: Employment Density along the Hull Street Road Corridor (2016)

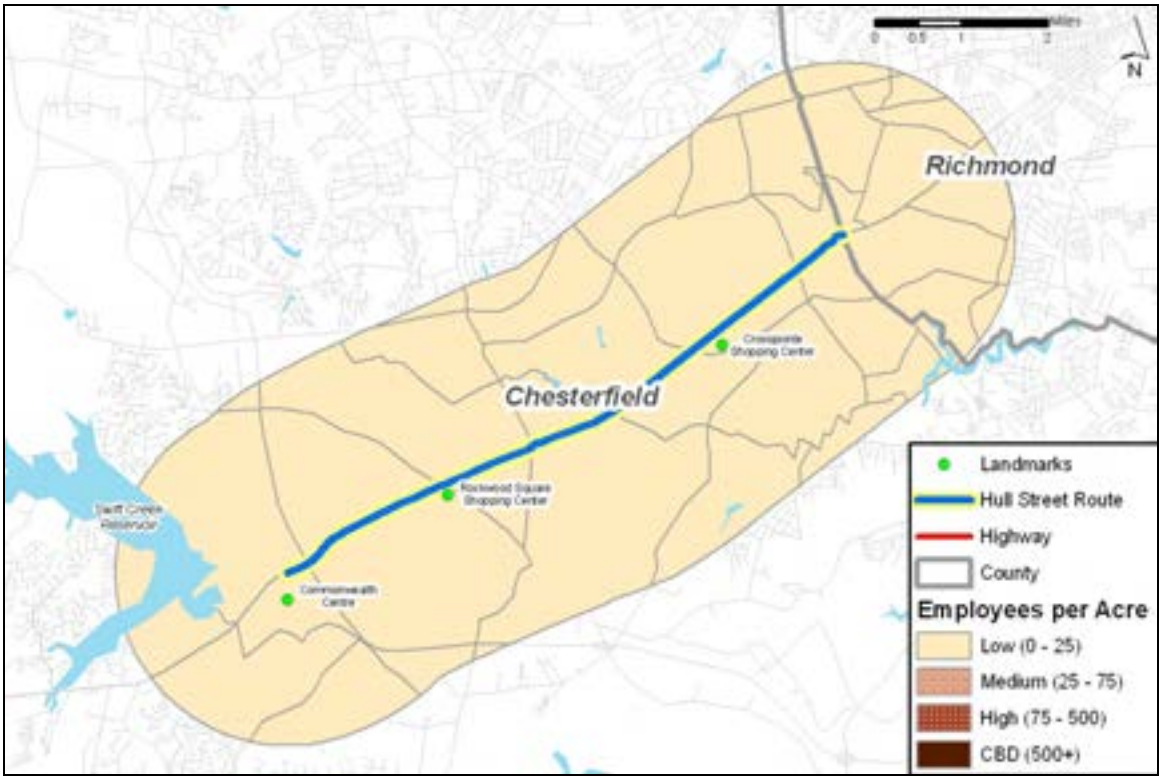


Figure 4-93: Employment Density along the Hull Street Road Corridor (2031)

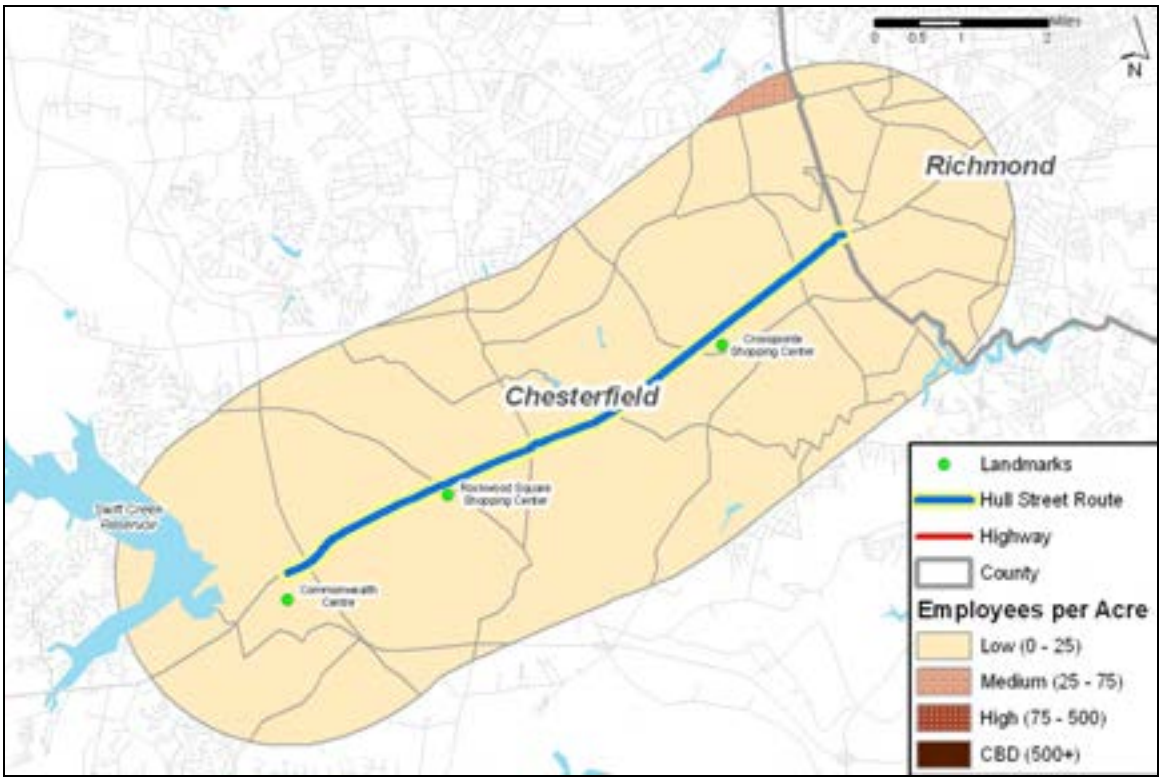
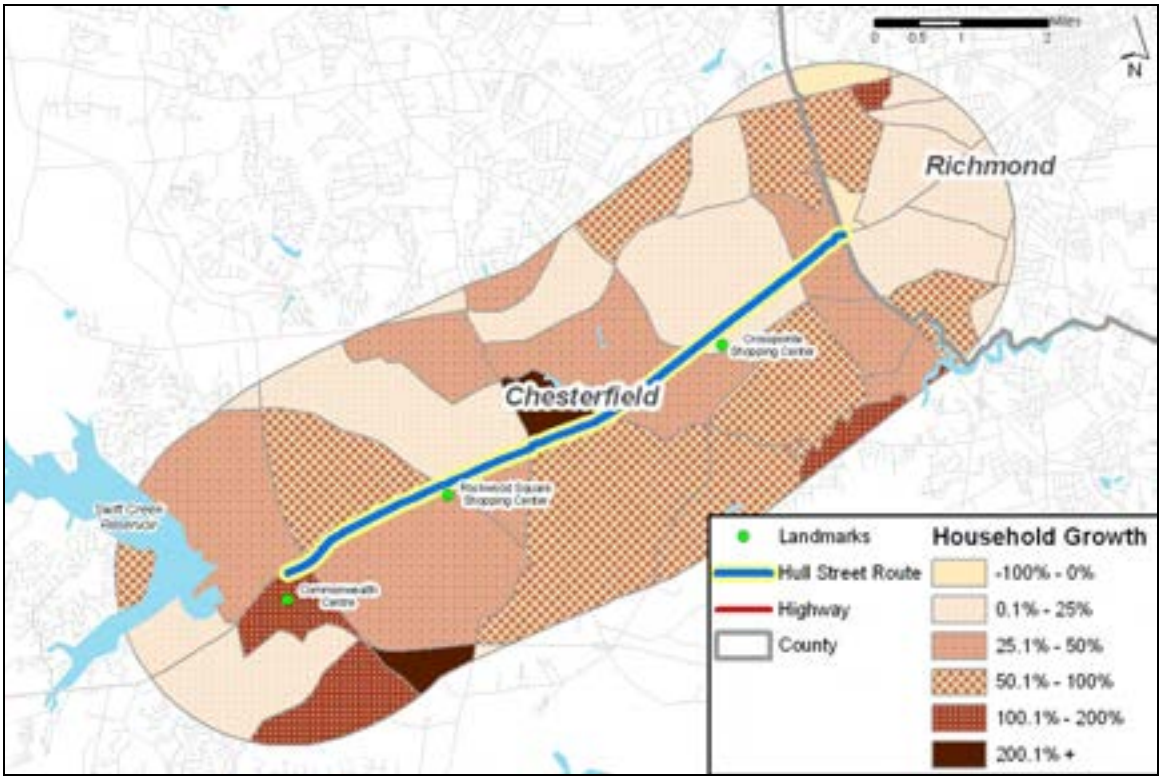


Figure 4-94: Household Growth Rate along the Hull Street Road Corridor (2006 to 2031)



ROUTE CHARACTERISTICS

Service on the Hull Street Road corridor would be provided by a local bus service. This route would operate seven days a week, between 6:00 am and midnight (terminating at 11:00 pm on Saturdays and 10:00 pm on Sundays). The route would require 3 vehicles during peak periods. Recommended headways are 30 minutes on weekdays and Saturdays and 60 minutes on Sundays. It might be operated independently or as extensions of existing GRTC routes service the City of Richmond (see Figure 4-95). The annual operating cost for this route is approximately $1.2 million and capital costs are approximately $1.3 million. A summary of service characteristics and costs is provided in Table 4-23.

Figure 4-95: Hull Street Route and Existing GRTC Local Routes

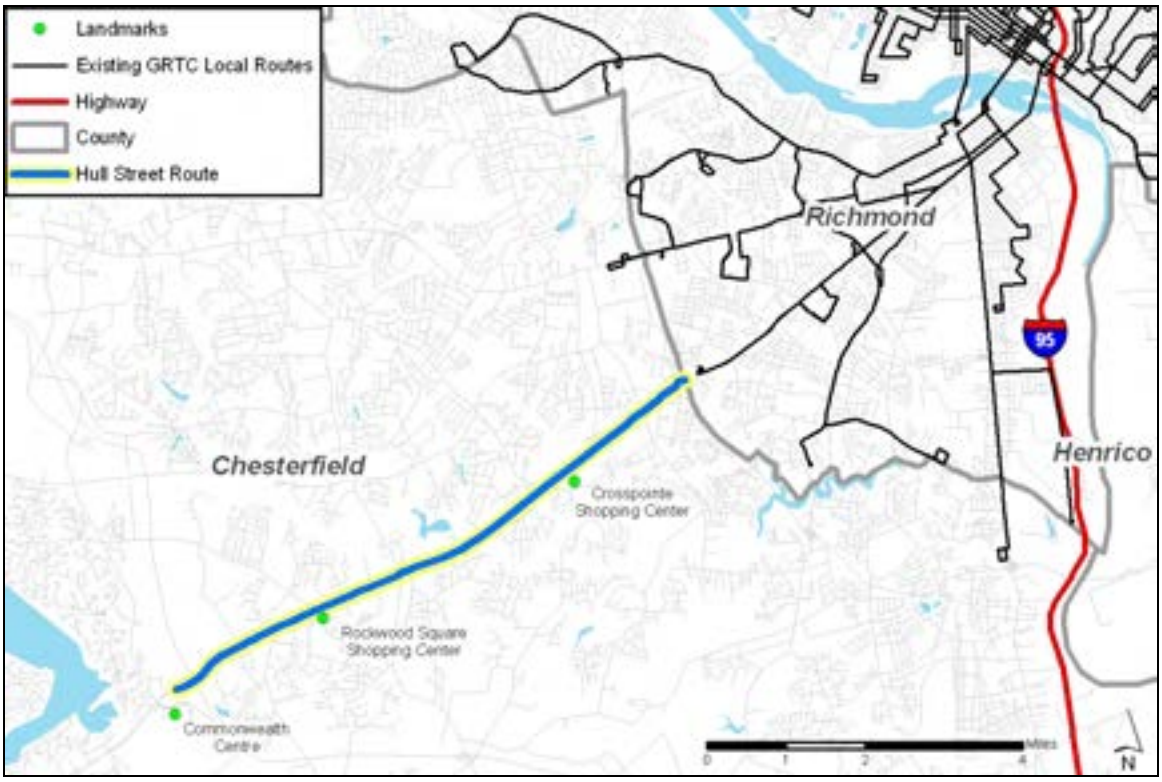


Table 4-23: Hull Street Road Local Bus Summary

Service Characteristics	
Route:	Hull Street Road Local Bus
Mode:	Bus
Length:	7.6 miles
Headway:	Weekdays and Saturdays: 30 minutes Sundays: 60 minutes
Service Span:	Weekdays: 6:00 am to midnight Saturdays: 6:00 am to 11:00 pm Sundays: 6:00 am to 10:00 pm
Peak Vehicles:	3

Cost (2006 dollars)	
Annual Operating Cost:	$1.2 million
Capital Cost:	$1.3 million

ALIGNMENT

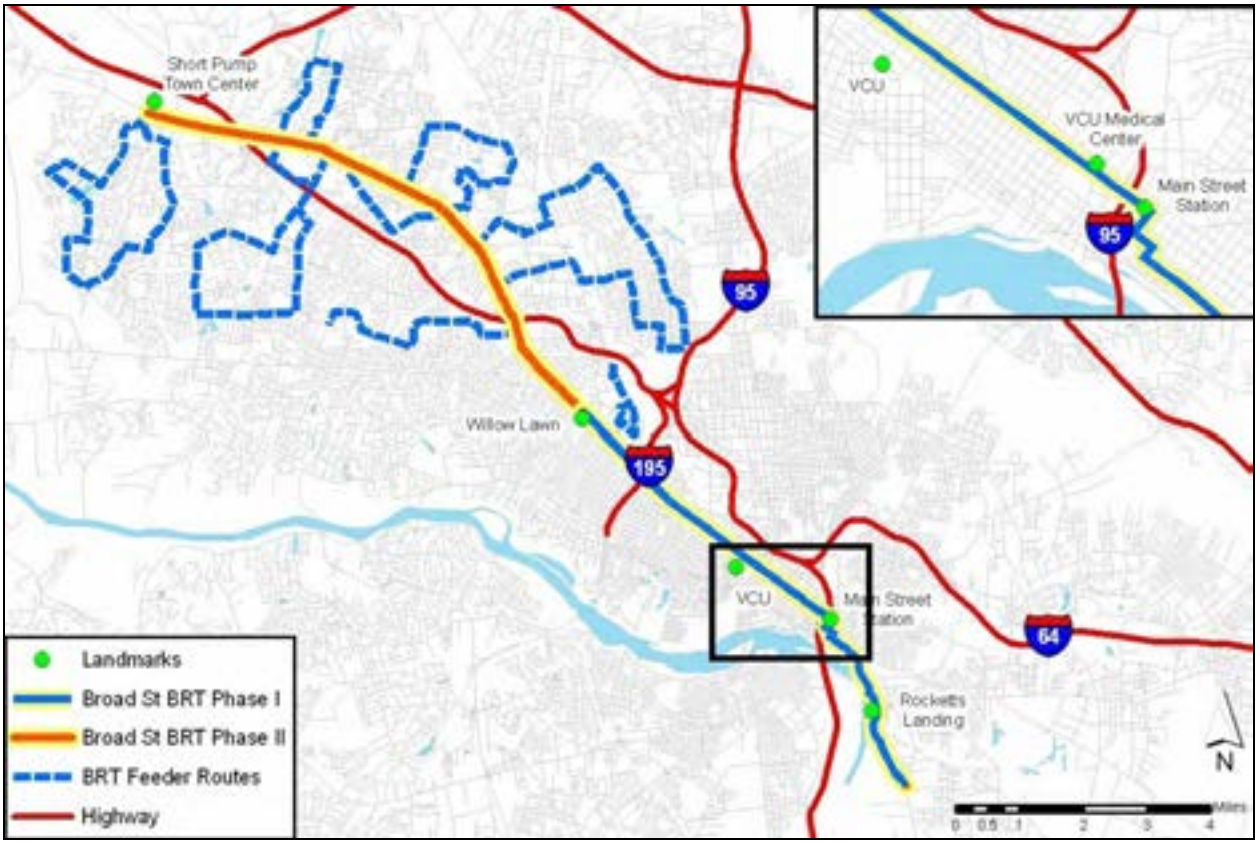
This route would operate on Hull Street Road, between the City of Richmond and Commonwealth Centre, a distance of 7.6 miles.

4.4.F BROAD STREET BRT/LRT FEEDER ROUTES

Establishing a major, high-capacity transit route in the Broad Street corridor provides enhanced opportunities for travel between the higher density areas projected to be developed in western Henrico County and destinations at Short Pump, Willow Lawn, and downtown Richmond. A network of local bus services will provide access to the trunk routes for residents of these areas and a distribution network for workers and shoppers traveling to these areas. At present there is limited GRTC local bus service in this portion of Henrico County.

Figure 4-96 shows the alignments of eight potential feeder routes into a BRT or LRT service operating on West Broad Street. These routes would operate seven days a week on 30 minutes headways from Monday through Saturday and 60 minute headways on Sunday. The service would operate between 6:00 am and midnight on weekdays. During the weekends service would end at 11:00 pm. Operating these routes would require 18 vehicles. Annual operating costs are estimated to be $5.3 million (2006 dollars) and capital costs are estimated to be $7.6 million (2006 dollars).

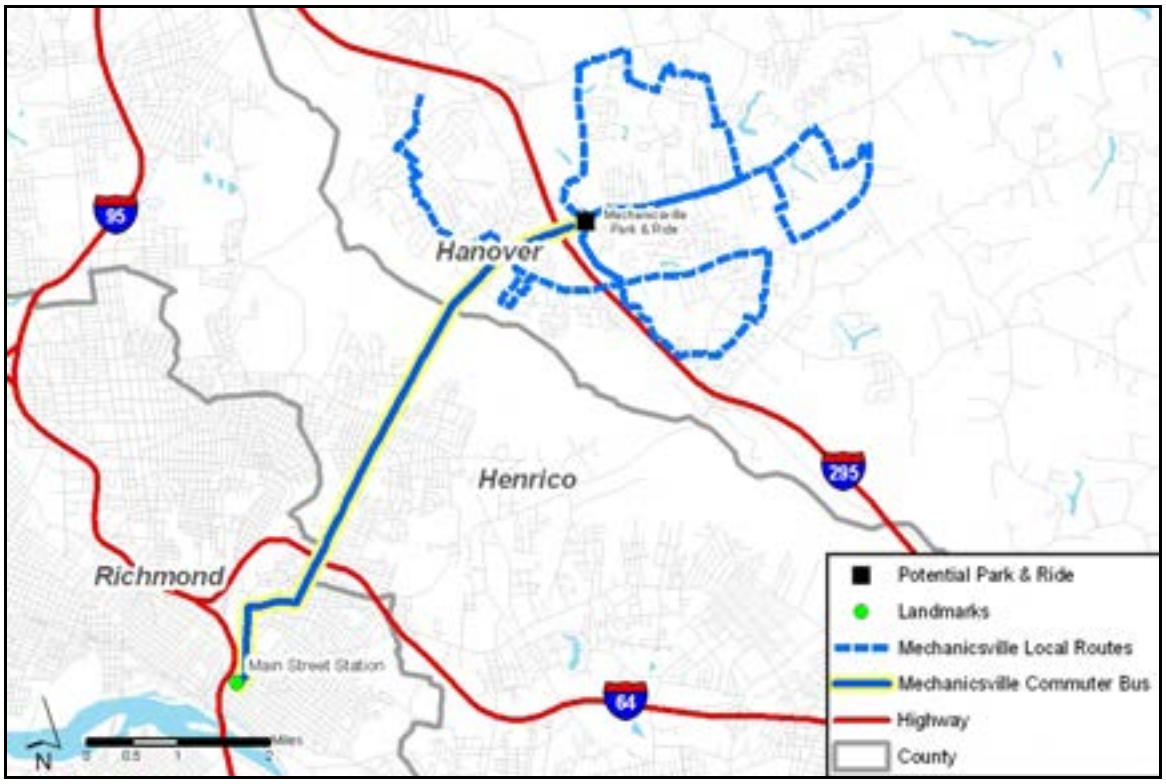
Figure 4-96: Broad Street BRT/LRT Feeder Routes



4.4.G MECHANICSVILLE LOCAL ROUTES

In the corridor analyses above, a commuter bus service between Mechanicsville and downtown Richmond was addressed. Additional local services in the Mechanicsville area may be appropriate. Figure 4-97 shows three potential local routes serving the Mechanicsville area. Each route would provide service to downtown Mechanicsville and also connect with the Mechanicsville park and ride lot, providing connecting service to the Mechanicsville commuter bus. These routes would operate seven days a week on 30 minutes headways from Monday through Saturday and 60 minute headways on Sunday. The service would operate between 6:00 am and midnight on weekdays. During the weekends service would end at 11:00 pm. Operating these routes would require 18 vehicles. Annual operating costs are estimated to be $3.0 million (2006 dollars) and capital costs are estimated to be $3.4 million (2006 dollars).

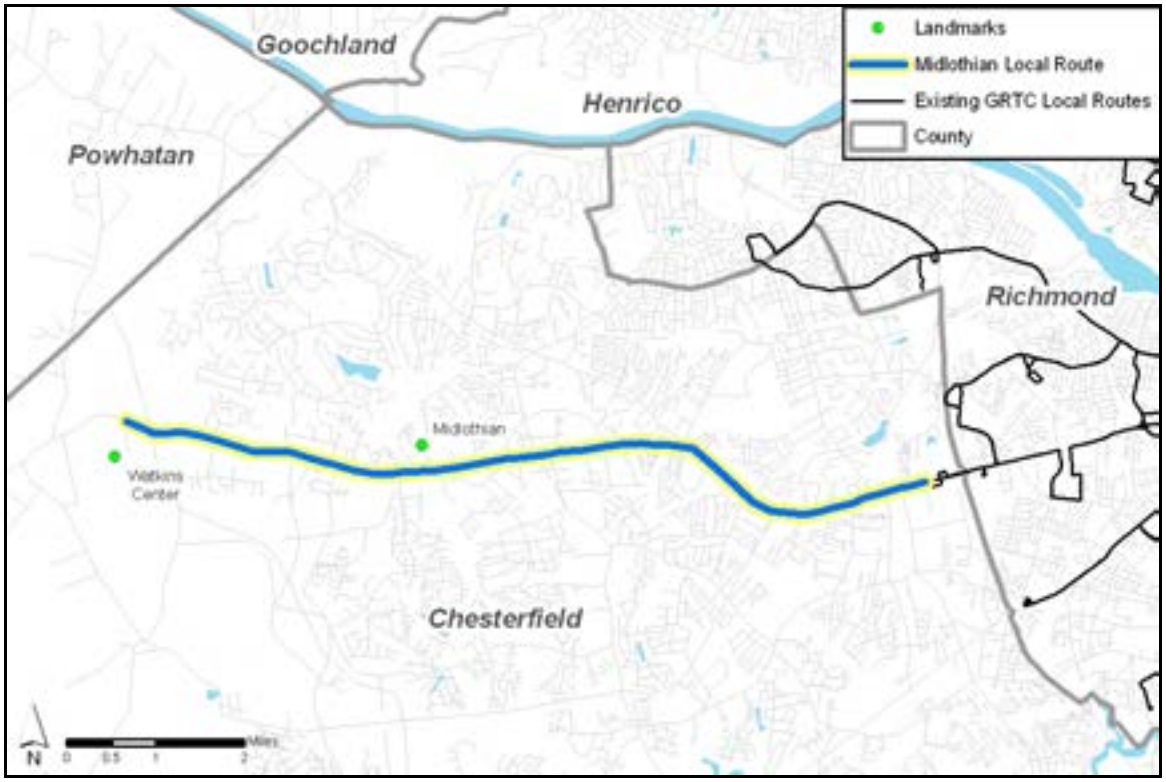
Figure 4-97: Mechanicsville Local Routes



4.4.H MIDLOTHIAN LOCAL ROUTE

The Midlothian corridor extends west from downtown Richmond through Chesterfield County to Powhatan County. Commuter bus or commuter rail services between Richmond and the Watkins Center in western Chesterfield County were discussed in Section 4.2.G. GRTC currently operates local bus services from downtown Richmond to the easternmost portions of Chesterfield County, bordering South Richmond. Service extensions of GRTC's Route 63 between South Richmond and the Watkins Center are shown in Figure 4-98. This route would operate seven days a week on 30 minutes headways from Monday through Saturday and 60 minute headways on Sunday. It might be operated independently or as extensions of existing GRTC routes service the City of Richmond. The service would operate between 6:00 am and midnight on weekdays. During the weekends, service would end at 11:00 pm on Saturdays and 10:00 pm on Sundays. Operating this route would require 4 vehicles. Annual operating costs are estimated to be $1.6 million (2006 dollars) and capital costs are estimated to be $1.7 million (2006 dollars).

Figure 4-98: Midlothian Local Route

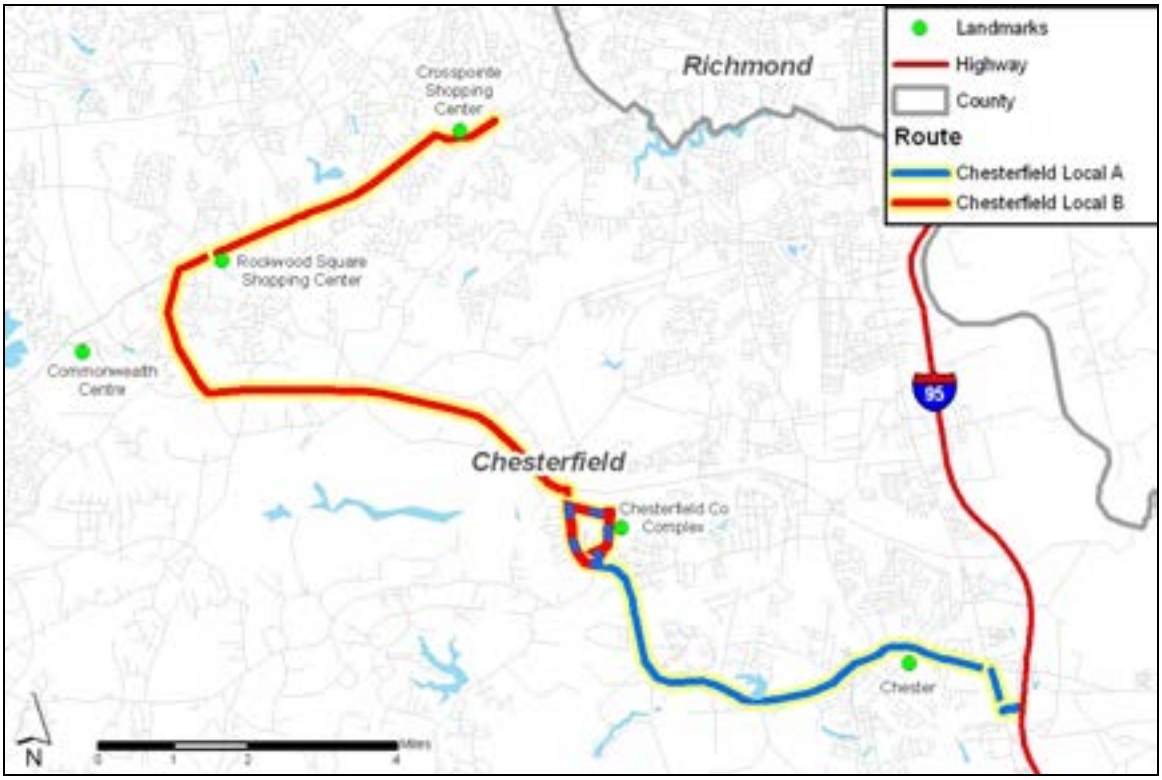


4.4.I CHESTERFIELD COUNTY LOCAL ROUTES

The analysis of areas of transit need based on projected residential densities shows areas of Chesterfield County that would qualify for local services. In the corridor analyses above, services along Midlothian Turnpike and Route 1 were addressed. Additional local services to areas such as Route 10, the Government Center complex, and Hull Street may be appropriate.

Figure 4-99 shows two potential local routes operating in Chesterfield County. These routes would operate seven days a week on 30 minutes headways from Monday through Saturday and 60 minute headways on Sunday. The routes might be operated independently or as extensions of existing GRTC routes service the City of Richmond. The service would operate between 6:00 am and midnight on weekdays. During the weekends service would end at 11:00 pm. Operating these routes would require 20 vehicles. Annual operating costs are estimated to be $7.0 million (2006 dollars) and capital costs are estimated to be $8.4 million (2006 dollars).

Figure 4-99: Chesterfield County Local Routes



4.5 INSTITUTIONAL ARRANGEMENTS

As a supplement to the Regional Mass Transit Study a series of meeting was sponsored by the Richmond Chamber of Commerce in the City and in three of the surrounding counties - Chesterfield, Hanover and Henrico. At each of these meetings the study concepts and issues were presented to representatives of the business community in the jurisdiction. The participants were asked to respond to a series of questions:

1. Is the provision/expansion of transit service important to the Richmond Region? If yes, why?
2. Is the provision of transit service important for Hanover County? If yes, why?
3. Do you see transit as important to attract workers? Employees?
4. Which modes of transit do you believe deserve the highest priority?
5. Are employers in the Richmond Region willing to support employer transit pass program as a benefit provided by employers to employees?

As would be expected there was a diversity of comments from the participants, but several themes emerged from the meetings that were common to all of the jurisdictions and represented the views of most of the participants. A sample of these comments include:

"It is the obligation of the community to provide transportation services."

"Transit is important to attract workers. "

"The population of the region is growing and we need to move larger groups of people with multi-modal options."

"The provision of transit service is important to the economic growth, quality of life, and to employees of the businesses in Hanover County."

"… transit is important to attract employees, especially in affordable housing areas."

"Bus system should be top priority, perhaps also acquire right of ways for future rail as necessary, as well as collection areas for Park & Rides."

Similar comments were received at the public meeting held on November 8, 2007.

As part of the Comprehensive Operational Analysis conducted for GRTC in 2007, information on typical residents living in the metropolitan Richmond area and their views about public transportation was collected through a household phone survey. Randomly selected households (1,034) in the metropolitan Richmond region—including at least 250 households each representing the City of Richmond, Henrico County, Chesterfield County, and Hanover County—were called to complete surveys in January 2006. These surveys aimed to collect information on the general public's travel behavior, demographic characteristics, and issues that may prevent use of the system. This information provides insight into what kind of service could potentially attract new choice riders. Among the key findings were:

- Approximately 25 percent of respondents indicated that a member of their household had used some form of public transportation during the past three years

- 47 percent of respondents indicated they did not have transit service near their home. Of these 47 percent, 63 percent said they would like to have transit service available for use near their home
- Only approximately 38 percent of respondents' work or school destinations have GRTC service
- Nearly 75 percent of respondents indicated that they believe the city or county in which they live should provide financial support for transit

In the meetings with the business community, the public meeting, and the telephone survey of random households a majority of those participating expressed the view that a more extensive transit service was needed for the Richmond region and that the should be public financial support for an expanded system.

Currently, fixed-route transit service in the Richmond region is provided by GRTC. As a public corporation, owned by the City of Richmond and Chesterfield County, GRTC could operate the services envisaged in any of the scenarios. However, those operations in jurisdictions other than the City of Richmond and Chesterfield County would be based on purchase-of-service contracts between the served jurisdictions and GRTC. GRTC does not have an appropriate institutional structure to fund and operate a truly regional transit system, as envisioned in the Maximum scenario.

More appropriate regional institution structures are available that would give all participating members a voice in the planning and operations of regional transit services and at the same time define cost allocations and funding mechanisms that would provide the regional entity with a stable financial base. These institutional structures were described in detail in Technical Memorandum #2. One such institutional structure would be formation of a Regional Transportation Authority with defined revenue sources. This would require an act of the state legislature. Legislation to create such an authority was proposed in the 2008 session of the General Assembly, but has since been tabled and may be considered again in 2009. Currently, three transportation authorities exist in Virginia: the Northern Virginia Transportation Authority, the Hampton Roads Transportation Authority and the Williamsburg Transit Authority. The chief benefits of this form of governance are the regional approach and, if authorized by the legislature, the ability to levy taxes and fees to support transportation initiatives in the region. However, in February 2008, the Virginia Supreme Court ruled that transportation authorities cannot constitutionally impose taxes and fees. One way to fund transportation authorities is for the legislature to levy a statewide or regional transportation tax. Alternatively, the legislature could grant to the local jurisdictions the power to levy similar taxes. Another possibility would be to constitute the Authority as a body with an elected board; this would meet the requirements of the Virginia constitution. While the form of the financial powers that will be granted to Authorities is yet to be fully defined, the likelihood is that some mechanism will be developed and approved.

4.6 SUPPORTIVE LAND USES

For transit to be efficient and effective, it must operate in an environment that concentrates potential riders around transit stations and stops. Transit is most effective when travelers walk to and from them, but can also work when there is high quality feeder bus services and park-and-ride lots.

FTA has developed guidelines for evaluating, rating, and recommending funding for candidate New Starts and Small Starts projects. These are programs for developing high-capacity priority transit services requiring significant investments (such as commuter rail, light rail, and bus rapid transit). The New Starts program provides funds for constructing new fixed guideway systems or extensions to existing fixed guideway systems through the Section 5309 grant program. By statute, the maximum federal contribution to a New Starts project is 80 percent of the project cost. However, project sponsors are encouraged to minimize the funding share they are applying for. Beginning in 2007, the Small Starts program has provided capital funds for applications of less than $75 million and for projects that cost less than $250 million, through Section 5309. Projects must be a fixed guideway for at least 50 percent of the project length, or a non-fixed guideway corridor improvement, such as bus rapid transit.

The FY 2009 rating guide considers the following transit supportive land use categories:

1. Existing Land Use
2. Transit Supportive Plans and Policies
3. Performance and Impacts of Policies

A preliminary analysis was conducted for the existing land-use category for four routes that could be candidates for New Starts funding. Both the Airport LRT, Ashland Commuter Rail, and Midlothian Commuter Rail routes rate 'low' in each of these categories, while the Broad Street route rates between a 'low' and 'medium'. It should be noted that these ratings represent only part of the existing land-use factor and that the presence of transit generators, such as airports, universities, and hospitals, as well as parking supply, play an important role in providing an overall rating for each project. The results of this partial analysis are shown in Table 4-24.

Table 4-24: Potential New Starts Ratings

Corridor	Employees Served by System	Avg Pop Density (Persons per Sq Mile)	Residential DU per Acre
Airport LRT	Low	Low	Low
Ashland Commuter Rail	Low	Low	Low
Broad BRT/LRT	Medium	Low-Medium	Low
Midlothian Commuter Rail	Low	Low	Low

The features of development that would support high ridership include:

- Higher densities of residential, commercial, and employment development increases the number of potential riders in the transit station/stop service area
- Short blocks with grids patterns permit more direct pedestrians access to transit stations/stops
- Mixed-use development
- Minimum parking requirements allow developers to provide less parking, which reduces the advantage of driving
- Reduced building setbacks encourage higher density, pedestrian and transit-oriented development

One example of a transit-oriented development is Market Commons, which is located at the Courthouse Metrorail station in Arlington, Virginia (See Figure 4-100). This area provides a variety of uses, including residential, employment, and institutional areas that supports alternative modes of transportation, such as transit, walking, and bicycling. A short subway ride connects Market Commons with employment centers in downtown Washington, DC. A second example of transit-oriented develop is in Englewood, Colorado and is shown in Figure 4-101

Figure 4-100: Transit-Oriented Development at Market Commons

Figure 4-101: Transit Oriented Development at Englewood, CO

Source: Reconnecting America

4.7 SUPPORTIVE TRANSIT USES

Several additional programs can be implemented to support expanded transit service in the Richmond Region. Chief among them would be:

- Improvements to pedestrian facilities that enable pedestrians to safely and comfortably access transit stops.
- Improved bicycle facilities that enable people to access transit.
- Local government development policies that encourage patterns of development that would focus busing access on areas easily served by transit.
- Government and private sector support for employer supported transit passes for employees (a tax exempt benefit up to a specific amount).

The ridesharing matching services provided by Ridefinders support improved transit in at least two major ways:

- The Guaranteed Ride Home program permits workers to choose to use public transportation but to be assured that in the event of an emergency or an unexpected change in schedule that can still get home easily and quickly.
- By encouraging commuters to use a carpool or vanpool for the trip to and from work, a market is created for use of public transportation for travel in midday and work related appointments.

4.8 ASSESSMENT OF FEASIBILITY AND PROGRAM/ SERVICE ALTERNATIVES FOR PARATRANSIT SERVICES

4.8.A COMPLEMENTARY ADA PARATRANSIT SERVICES

The Americans with Disabilities Act (ADA) requires transit agencies to provide paratransit service within the service area of all fixed routes. The transit service area is generally assumed to be with a ¾ mile radius of fixed routes. For those customers who are unable to use fixed-route transit service, there are several paratransit services in the Richmond region, GRTC provides demand responsive paratransit service through the Community Assisted Ride Enterprise (CARE) program. CARE provides shared-ride, curb-to-curb service to ADA eligible riders within the City of Richmond, Henrico County and portions of Chesterfield County. Care operates seven days per week in the City of Richmond, but only between the hours of 6:00 am and 7:00 pm on weekdays in Henrico and Chesterfield Counties. Each one-way trip costs $2.25 and must be reserved at least one day in advance. The service also accepts standing reservations for commuters.

CARE operates a fleet of 60 vehicles with seating capacities of 8 to 12 people. All of the vehicles can accommodate a wide range of mobility aids including wheelchairs, walkers, crutches, canes, and guide dogs. Two-thirds of the vans were purchased in 2006, while the remainder ware purchased 2000.

In FY 2006, CARE's operating costs were approximately $3.4 million (See Table 4-25). Operating costs were projected for the three scenarios (Tier I, Tier II, and Tier III), based on the forecast population residing within ¾ miles of local bus routes, BRT/LRT routes, and commuter rail stations. They range from $5.0 million for Tier I to $8.2 million for Tier III.

Table 4-25: Forecast Operating Costs for CARE (2006 dollars)

Scenario	Operating Cost
Existing	$3.4 million
Tier I	$5.0 million
Tier II	$7.6 million
Tier III	$8.2 million

Access Chesterfield provides paratransit service within Chesterfield County, Richmond, Petersburg, Hopewell, and Colonial Heights. The program operates between 6:00 am and 8:30 pm during the week and from 8:30 am to 4:30 pm on Saturdays. Trips must be reserved one day in advance. Fares vary based on the trip. In FY 2007, Access Chesterfield provided over 20,300 trips at a cost of $489,000.

Capital costs are due to the additional vehicles that would need to be purchased to serve an expanded service area for GRTC. Table 4-26 shows the paratransit vehicle requirements for each forecast year and service scenario. Between 4 and 14 vehicles would need to be purchased.

Table 4-26: Paratransit Vehicle Requirements

Scenario	# of Vehicles
Tier I	28
Tier II	74
Tier III	85

The capital costs associated with additional vehicle purchases ranges from $3.4 million for Tier I to $6.4 million for Tier III (see Table 4-27).

Table 4-27: Forecast Additional Capital Costs for CARE Service Expansion 2006 (in millions of dollars)

Scenario	Capital Cost
Tier I	$2.1 million
Tier II	$5.6 million
Tier III	$6.4 million

4.8.B ADDITIONAL PARATRANSIT SERVICES FOR THE TRANSPORTATION DISADVANTAGED

In addition to the services mandated by ADA, there is a real need to provide enhanced paratransit service to all of the transportation disadvantages residents of the Richmond region.

Paratransit services to members of the general public having specific needs are provided in the City of Richmond and in Chesterfield and Henrico Counties. The Chesterfield service is provided by Access Chesterfield, which is operated by the County. Costs for the service and information about the use of the service, separate from those for the City and Henrico County services, are available. Since the patterns of development in the areas not now having paratransit service are more likely to be similar to conditions in Chesterfield County that in the City of Richmond, non-ADA related paratransit operating costs were estimated based on data provided by the Access Chesterfield paratransit service. In 2006, Access Chesterfield provided approximately 20,000 paratransit trips, at a cost of approximately $24.00 per trip. A rate of 0.078 paratransit trips per capita in Chesterfield County (20,000 paratransit trips divided by 254,990 persons) is multiplied by the projected populations in each county to estimate the demand for paratransit trips in 2006, 2016, and 2031. Since RideFinders currently provides paratransit service throughout the City of Richmond, this jurisdiction is not included. Using this per capita trip factor, number of annual additional paratransit trips was calculated and is shown in Table 4-28.

Table 4-28: Additional Paratransit Trips per Jurisdiction (2006, 2016, 2031)

County	2006	2016	2031
Charles City County	479	544	666
Chesterfield County	20,000	23,391	32,856
Goochland County	654	995	1,939
Hanover County	7,678	9,262	12,685
Henrico County	22,411	25,415	32,693
New Kent County	655	903	1,827
Powhatan County	1,264	1,591	2,264
Total	**53,142**	**62,218**	**85,421**

Based on an operating cost per trip of $24.00 per paratransit trip in Chesterfield County, operating costs for additional paratransit service are $1.28 million in 2006, $1.49 million in 2016, and $2.04 million in 2031.

Table 4-29: Forecast Operating Cost for Regionwide Paratransit Service (2006 Dollars)

Scenario	Capital Cost
Tier I	$1.3 million
Tier II	$1.5 million
Tier III	$2.0 million

4.9 SUMMARY

4.9.A TIERED IMPLEMENTATION

Based on the projected growth patterns and the prior studies of opportunities for transit service expansion, a three-tiered approach to expanding transit was identified. The following suggested priority ordering is proposed for the Richmond region:

- Tier I - those corridors/modal alternatives for which existing pattern of development and size of the travel market are indicative of effective use of resources by an immediate investment
- Tier II – corridors/modal alternatives for which the projected changes suggest that investment prior to 2031 is likely to be effective
- Tier III – corridors/modal alternatives for which investment prior to 2031 is not likely to be effective with currently projected growth patterns

Table 4-28 identifies the tier that each of the identified corridor/modal alternatives fits into.

Tier I includes the Airport limited stop bus, Broad Street BRT (between Rocketts Landing and Willow Lawn), as well as four new commuter bus routes (I-95 North, I-64 East, Midlothian and Mechanicsville) and an enhanced express route to Petersburg (see Figure 4-102). Three local bus routes include service on Route 1 North, Route 1 South, Route 5, and Hull Street. Tier II includes an extension of the Broad Street BRT to Short Pump, two commuter bus routes (I-64 West and Powhatan), as well as expanded local service in Henrico and Chesterfield counties and Mechanicsville (see Figure 4-103). Tier III includes converting the Broad Street BRT into LRT, as well as commuter rail lines to Petersburg (via the I-95 North corridor), Midlothian, and the Richmond International Airport (see Figure 4-104).

Table 4-30: Corridor/Modal Alternatives by Tier

Tier	Corridor/Local Route	Mode
Tier I	Airport	Limited Stop Bus
	Broad Street	Bus Rapid Transit (Phase I)
	I-95 North	Commuter Bus
	I-95 South	Commuter Bus
	I-64 East	Commuter Bus
	Midlothian	Commuter Bus
	Mechanicsville	Commuter Bus
	Route 1 North	Local Bus
	Route 1 South	Local Bus
	Route 5	Local Bus
	Hull Street Local Bus	Local Bus
Tier II	I-64 West	Commuter Bus
	Powhatan	Commuter Bus
	Broad St	Bus Rapid Transit (Phase II)
	Broad St	Feeder Buses (8 routes)
	Chesterfield	Local Buses (2 routes)
	Mechanicsville	Local Buses (3 routes)
	Midlothian	Local Bus
	Route 288	Local Bus
Tier III	Broad Street	Light Rail Transit
	Midlothian	Commuter Rail
	I-95 North	Commuter Rail
	Airport	Light Rail Transit

Figure 4-102: Tier I Service Expansion Recommendations

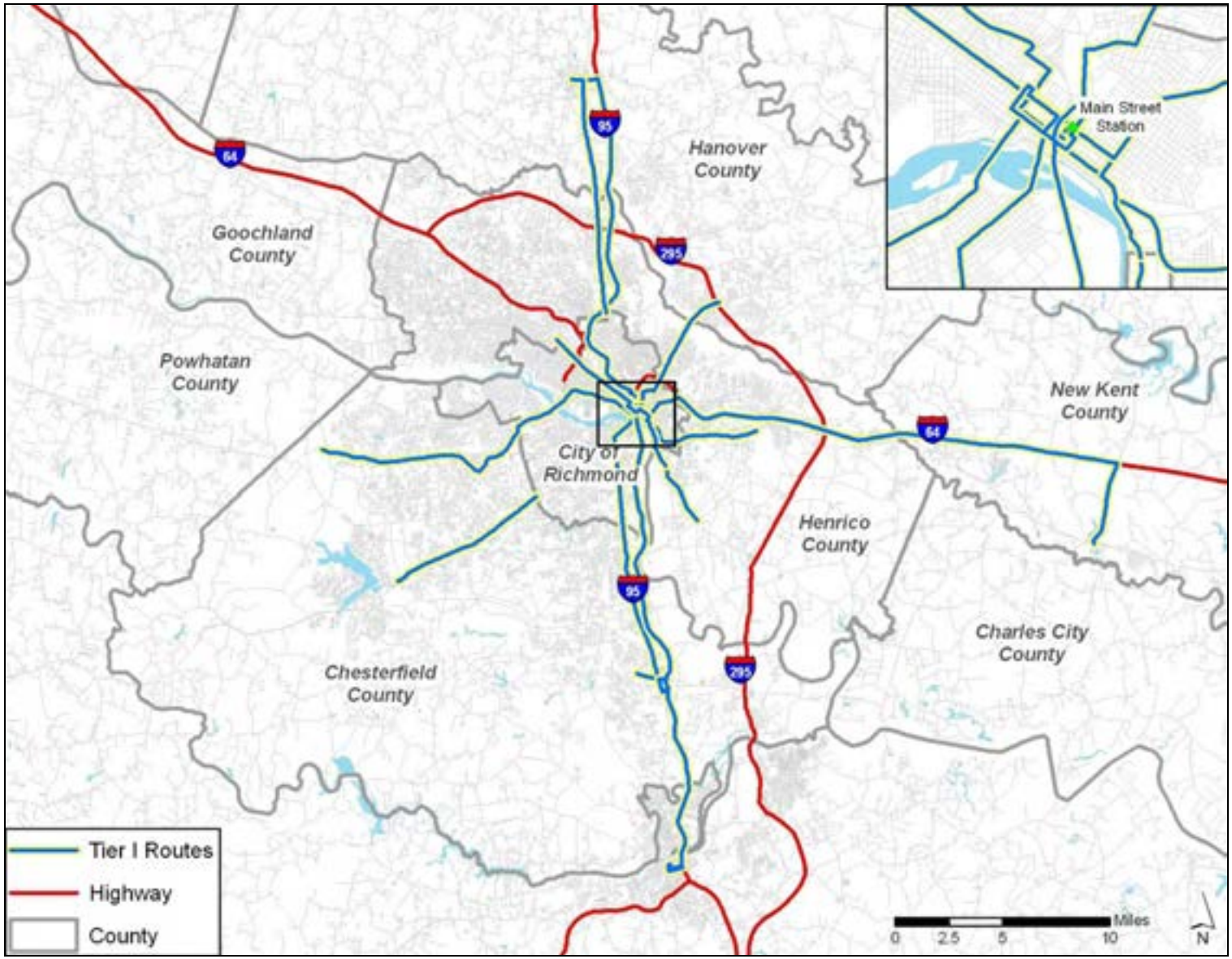


Figure 4-103: Tier II Service Expansion Recommendations

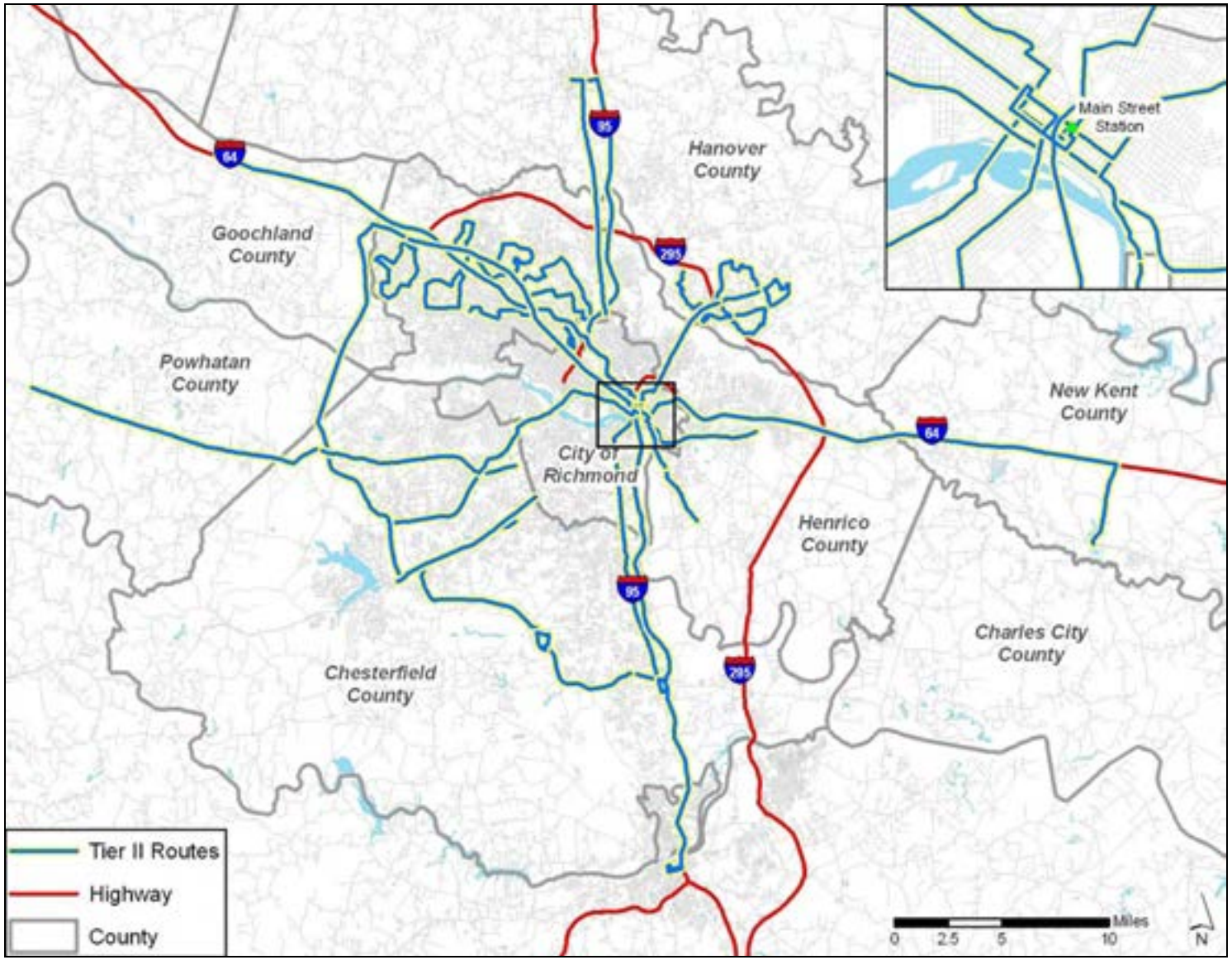
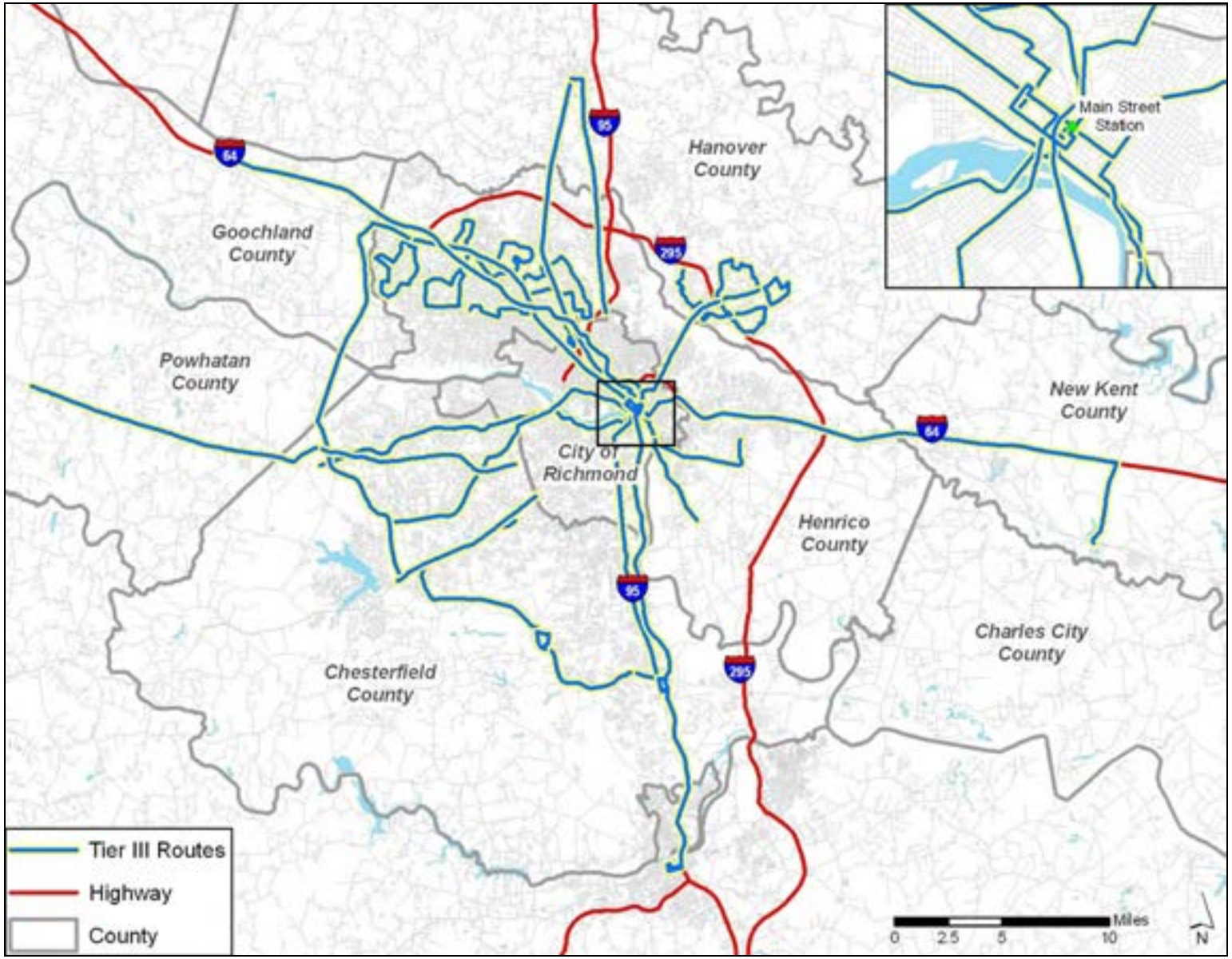


Figure 4-104: Tier III Service Expansion Recommendations



4.9.B OPERATING COSTS

Table 4-31 provides a summary of operating costs based on a proposed initial service plan (i.e. route, frequency, and span of service) for Tier I, Tier II, and Tier III recommendations. This includes the cost of existing services. Operating costs could increase if more frequency service is required to satisfy demand. Tier I recommendations would cost approximately $41.5 million per year. Operating costs increase to $60.6 million in 2031 and $85.6 million after 2031. As Table 4-31 shows, several of the bus services that provide service in Tier I and Tier II, are eliminated in Tier III in favor of fixed-guideway services. For example, commuter bus service to Ashland (I-95 North corridor) and Midlothian, as well as the Broad Street BRT and the Airport Limited Stop bus services are replaced with light rail and commuter rail services.

Table 4-31: Operating Costs 2006 (in millions of dollars)

Corridor/Local Route	Tier I	Tier II	Tier III
Existing Service	$31.0	$31.0	$31.0
Airport Limited Stop Bus	$0.7	$0.7	--
Broad Street BRT	$3.0	$4.9	--
I-95 North Commuter Bus	$0.4	$0.4	--
I-95 South Express Bus	$1.6	$1.6	$1.6
I-64 East Commuter Bus	$0.5	$0.5	$0.5
Midlothian Commuter Bus	$0.3	$0.3	--
Mechanicsville Commuter Bus	$0.1	$0.1	$0.1
Route 1 North Local Bus	$1.6	$1.6	$1.6
Route 1 South Local Bus	$2.0	$2.0	$2.0
Route 5 Local Bus	$1.2	$1.2	$1.2
Hull Street Road	$1.2	$1.2	$1.2
I-64 West Commuter Bus	--	$0.5	$0.5
Powhatan Commuter Bus	--	$0.6	$0.6
Broad St Feeder Buses (8 routes)	--	$5.3	$5.3
Chesterfield Local Buses (2 routes)	--	$5.4	$5.4
Mechanicsville Local Buses (3 routes)	--	$3.0	$3.0
Midlothian Local Bus	--	$1.6	$1.6
Route 288 Crosstown Local Bus	--	$1.6	$1.6
Broad Street Light Rail	--	--	$20.7
Midlothian Commuter Rail	--	--	$2.0
Ashland Commuter Rail	--	--	$2.5
Airport Light Rail	--	--	$7.6
Total	$43.6	$63.4	$90.0

Previous sections projected operating and capital funding to 2031, based on historic trends. Table 4-32 shows that actual non-local operating funds were $25.0 million in 2006. Non-local operating funds are projected to increase to $29.1 million in 2031.

Table 4-32: Operating Funds from Non-Local Sources (millions of 2006 dollars)

Operating Source	2006 (actual)	2031 (projected)
Federal	$7.9	$9.8
State	$7.4	$9.5
Farebox	$9.6	$9.8
Total	$25.0	$29.1

Table 4-33 shows the projected funding gap between the projected operating costs and the projected non-local operating funds that will be available to the Richmond region in 2016 and 2031. This represents the minimum level of operating funds that the region would need to contribute, if all of the routes in this memorandum are implemented. In reality, federal and state funding programs require a local match. To implement Tier I recommendations the projected operating gap is $16.5 million and increases to $31.5 million to implement Tier II. The projected operating gap for Tier III depends on the implementation year, but is estimated to be less than $56.5 million.

The cost of complimentary paratransit services adds between $0.3 million and $1.2 million to projected operating costs.

Table 4-33: Projected Annual Operating Funds Gap (2006 dollars)

	Tier I	Tier II	Tier III
Projected Operating Costs	$41.5	$60.6	$85.6
Projected Operating Funds (non-local sources)	$25.0	$29.1	>$29.1
Projected Funding Gap (local share)	$16.5	$31.5	<$56.5

The analysis showed that absent more rapid growth in state and federal transit funding than has occurred since 1996, local funding would need to be an ever increasing portion of operating funds. Realization of this funding level would require either that local governments devote larger amounts to transit from general revenues or that mechanisms be established to generate additional taxes and fees in the Richmond Region.

4.9.C CAPITAL COSTS

Capital costs for proposed transit services were calculated using industry average unit costs. Bus vehicle costs were based on recent procurements throughout the United States and are shown in 2006 dollars. The cost of a local bus is estimated at $350,000 and a commuter bus is $400,000. The total number of buses required was determined using the peak hour vehicle requirements for each proposed service plus an approximately 20% spare ratio. The cost of park and ride lots was included at $1 million per lot. The bus capital costs do not include the costs of vehicle replacement, bus stop enhancements for local buses, or maintenance and storage facilities.

The capital costs for implementing bus rapid transit, light rail, and commuter rail services were calculated based on per mile averages of recently implemented services in the United States. These averages, which are shown in Table 4-34, include the costs of guideway construction, vehicles, stations and maintenance facilities. The capital costs for the proposed

rail service in the Richmond Region were calculated using the corridor length multiplied by the average cost per mile as shown in Table 4-35.

Table 4-36 provides a summary of projected capital costs based on a proposed initial service plan for Tier I, Tier II, and Tier III recommendations (see Table 4-31). Capital costs could increase if more frequency service is required to satisfy demand. They do not include the costs of vehicle replacement, bus stop enhancements for local buses, or maintenance and storage facilities. Tier I recommendations would cost approximately $52 million in 2006 dollars. Capital costs increase to nearly $680 million to implement Tier II, and nearly $1,600 million to implement Tier III. As Table 4-36 shows, several of the bus services that provide service in Tier I and Tier II, are eliminated in Tier III in favor of fixed-guideway services. For example, commuter bus service to Ashland (I-95 North corridor) and Midlothian, as well as the Broad Street BRT and the Airport Limited Stop bus services are replaced with light rail and commuter rail services.

Table 4-34: BRT and Rail Capital Costs (2006 $ millions)

Location	Line Name	Year Opened	Construction Cost	Length (Miles)	Cost per mile
Commuter Rail					
Houston	Main Street Line	2003	$380	7.5	$50.70
Minneapolis	Hiawatha Line	2004	$788	12.0	$65.70
St Louis	Cross County Line	2006	$690	8.0	$86.30
Denver	Southeast Line	2006	$907	19.0	$47.70
Sacramento	South Line	2003	$251	6.8	$39.80
Portland	Interstate Line	2004	$385	5.8	$66.40
Charlotte	South Line	2007	$480	9.6	$50.00
Norfolk	The Tide	2010	$232	7.4	$31.36
Commuter Rail Average Cost Per Mile					**$54.05**
Light Rail					
New Mexico	Rail Runner Phase I	2006	$135	47.0	$2.87
New Mexico	Rail Runner Phase II	2008	$255	42.0	$6.07
Minneapolis	Northstar Corridor Rail	2010	$317	40.1	$7.92
Rhode Island	South County Rail	2010	$49	20.0	$2.46
Light Rail Average Cost Per Mile					**$5.07**
Bus Rapid Transit					
Arizona	Flagstaff BRT	2010	$10.4	5.8	$1.79
Kansas City	Troost Ave. BRT	2009	$30.7	9.0	$3.41
Washington	Bellevue-Redmond BRT	2010	$27.0	9.3	$2.91
Michigan	Grand Rapids South BRT	2012	$36.7	9.8	$3.74
Bus Rapid Transit Average Cost Per Mile					**$3.09**

Table 4-35: Richmond BRT and Rail Corridor Capital Costs (2006 $ millions)

Corridor	Mode	Length (Miles)	Cost per mile	Estimated Total Cost
Airport	Light Rail	7.3	$54.05	$395.0
Broad Street	Bus Rapid Transit	17.6	$3.09	$54.4
Broad Street	Light Rail	18.0	$54.05	$973.0
Midlothian	Commuter Rail	15.7	$5.07	$80.0
Ashland	Commuter Rail	17.9	$5.07	$91.0

Table 4-36: Projected Capital Costs (2006 dollars)

Corridor/Local Route	Tier I	Tier II	Tier III
Airport Limited Stop Bus	$1.8	$1.8	--
Broad Street BRT	$26.3	$54.4	--
I-95 North Commuter Bus	$2.9	$2.9	--
I-95 South Commuter Bus	$2.4	$2.4	$2.4
I-64 East Commuter Bus	$3.9	$3.9	$3.9
Midlothian Commuter Bus	$3.9	$3.9	--
Mechanicsville Commuter Bus	$3.9	$3.9	$3.9
Route 1 North Local Bus	$2.1	$2.1	$2.1
Route 1 South Local Bus	$2.1	$2.1	$2.1
Route 5 Local Bus	$1.3	$1.3	$1.3
Hull Street Local Bus	$1.3	$1.3	$1.3
I-64 West Commuter Bus	--	$3.9	$3.9
Powhatan Commuter Bus	--	$2.9	$3.9[6]
Broad St Feeder Buses (8 routes)	--	$7.6	$7.6
Chesterfield Local Buses (2 routes)	--	$8.4	$8.4
Mechanicsville Local Buses (3 routes)	--	$3.4	$3.4
Midlothian Local Bus	--	$1.7	$1.7
Route 288 Crosstown Local Bus	--	$4.6	$4.6
Broad Street Light Rail	--	--	$973.0
Midlothian Commuter Rail	--	$80.0	$80.0
Ashland Commuter Rail	--	$91.0	$91.0
Airport Light Rail	--	$395.0	$395.0
Total	$52.0	$678.5	$1,589.5

[6] Watkins Center park and ride lot is reflected in Powhatan Commuter Bus capital costs, since Midlothian Commuter Bus is not a Tier III recommendation.